

The Promises of Biology and the Biology of Promises:
An Ethnography of the Korean Stem Cell Enterprise

By

JIEUN LEE

B.S. (Yonsei University) 2003

M.A. (Yonsei University) 2005

DISSERTATION

Submitted in partial satisfaction of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

Anthropology

in the

OFFICE OF GRADUATE STUDIES

of the

UNIVERSITY OF CALIFORNIA

DAVIS

Approved:

(Joseph Dumit), Chair

(Timothy Choy)

(Alan Klima)

Committee in Charge

2015

i

ProQuest Number: 3737066

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



ProQuest 3737066

Published by ProQuest LLC (2015). Copyright of the Dissertation is held by the Author.

All rights reserved.

This work is protected against unauthorized copying under Title 17, United States Code
Microform Edition © ProQuest LLC.

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

ABSTRACT

The Promises of Biology and the Biology of Promises:

An Ethnography of the Korean Stem Cell Enterprise

This dissertation considers the ontology of stem cells as a future-oriented life form characterized by its potentiality in relation to the anticipatory mode of living in contemporary Korea. The biological notion that stem cells *have* the potential for differentiation and the capacity for self-renewal is central in the future-oriented enterprise of stem cell research and industry, as it promises the technological control of biological time within the vision of regenerative medicine. And it is *through* the promises of regenerative medicine that stem cells are *cultured* both as a biological object and an object of investment that holds the biological and economic potential in themselves. I conceptualize stem cells as a “promissory thing”—a material-semiotic entity whose mode of being enacts and is enacted by diverse forms of future-oriented practices, and explore how this promissory thing is produced by and becomes generative of a myriad of anticipations that instigate scientific, religious, and economic commitments with differently imagined futures. Through this, I argue that promises are constitutive of the stem cell biology, rather than derivative of it.

Since the biological concept of stem cells is predicated on the future that they promise, the biological life of stem cells is inextricably intertwined with the social life of promises. I first examine the sites where the biological concept of stem cells is materialized and their promises are substantiated through various forms of experimental labor. Part I concerns the bodily,

intellectual, and affective engagements of donors, scientists, and patients as the mediums of (re)production of stem cells and promises. As stem cells are derived from the living tissues, cultured and studied by scientists, and made to show their efficacy through patients' bodies in anticipation of materializing the promises of stem cell biology, they are produced as a new form of biovaluable. The promises of biology move beyond the closed circuit of scientific knowledge production, and proliferate in the speculative marketplaces of promises. Part II looks at how the promises of stem cell promises create and find their niches in places where the future-oriented affects are valorized—faith in the potent entity, anxieties about the uncertain futures, and dreams about futures that are different from the present. In these future-oriented marketplaces, the plasticity of technologized biology and biological time can appear promising with the backdrop of the imagined intransigence of social, political, and economic order in the Korean society.

Keywords: Stem cells, Labor, Promise, Future, Potentiality, Biovalue/Biocapital, Korea

ACKNOWLEDGEMENT

Keeping things vital requires lots of labor from many, many people. My interest in the vital potential of stem cells might have simply withered away without all the people who guided, tolerated, and nurtured me for many, many years. Joseph Dumit taught me how fun it is to think with other people. I would like to thank all my teachers, friends, and informants for thinking with me and pushing my thinking to the directions that I had never anticipated, which made the whole process really fun.

I was fortunate to have a wonderful dissertation committee who taught me how to read, write, think, and care: Joseph Dumit, Timothy Choy, and Alan Klima. Marisol de la Cadena, Donald Donham, James Greisemer, Colin Milburn, James Smith, Kaushik Sunder-Rajan, and Li Zhang have inspired, guided, and helped me at various stages in developing this project. I would also like to thank to my mentors that I worked with earlier at Yonsei University, Yoon Kyung Nah, Hyun Mee Kim, and Young Ok Kim.

The dissertation itself has greatly benefitted from productive comments and critiques from Chris Kortright, Michelle Stewart, Seo Young Park, Maya Costa-Pinto, Ishani Saraf, Rima Praspaliauskiene, Nate Freiburger, Rossio Motta, Jong Hwa Kwon, Hee-won Tae, and Euisol Jeong who were generous and patient enough to read and comment on my “rough” drafts, sometimes repeatedly. They immensely helped me in the long and somewhat frustrating process of writing. I should also address that every page of this dissertation contains the traces of intellectual and friendly conversations with my colleagues in the Department of Anthropology and the STS community at UC Davis and the Culture and Gender Studies Program at Yonsei University. Andres Barragan, Vivian Choi, Eunjoo Choi, Jake Culbertson, Nicholas D’Avella, William Difede, Doris Duangboudda, Jonathan Echeverri, Julia Alejandra Morales Fontanilla, Young-beom Go, Stephanie Graeter, Inja Jang, Seunghwa Jeong, Nina Kessler, Jeongmin Kim, Haksil Kim, Ingrid Lagos, Juyoung Lee, Youjin Lee, Laura Meek, Vandana Nagraj, Matthew Nesvet, Gowoon Noh, Aaron Norton, Ju-hee Roh, Camilo Sanz, Tamar Kaneh-Shalit, Jeongsu Shin, Yeonkyoung Shin, Adrian Yen, and Yu-Seon Yu. Hyunkyung Hwang and Hwa Chang Sung have always been good friends. I also want to acknowledge the STS coffee hours at UC Davis, Lunch meetings at Yonsei University, and annual California STS Retreats—the venues that fed me with ideas, thoughts, and camaraderie as well as food and/or beverages.

The research would not have been possible without my informants. Although they remain anonymous in this dissertation, the insights and supports they provided me have been vital. I especially thank the researchers at the PRL who generously granted their time, shared their daily life, tolerated my dumb questions, and taught me the value of care. Another special thanks to the patients who shared their experiences and hope with me.

Support for this project has come from the Social Science Research Council, UC Pacific Rim Research Program, the UC Davis Humanities Institute, and the Department of Anthropology at UC Davis.

Lastly, I want to thank to my mother, sister, and brother for being there for me. The dissertation is dedicated to my father who taught me and is still teaching me so many things about life even when he is not there.

TABLE OF CONTENTS

ABSTRACT	II
ACKNOWLEDGEMENT	IV
LIST OF FIGURES	VI
INTRODUCTION EVERYONE LOVES STEM CELLS	1
PART I: THE PROMISES OF BIOLOGY	45
CHAPTER 1 GIVING MY LITTLE LIFE	46
CHAPTER 2 POTENTIATING OBJECTS, OR WRITING CURRICULUM VITAE OF THINGS	85
CHAPTER 3 LABORS AT THE FINGERTIPS, LIVELY CELLS, AND IN VITRO ECOLOGY	121
CHAPTER 4 PROMISE, INCORPORATED	159
INTERLUDE LIVING WITH THE PROMISE	197
PART II: THE BIOLOGY OF PROMISES	205
CHAPTER 5 GOD HAS PREPARED STEM CELLS FOR US	206
CHAPTER 6 BE PREPARED, OR SUFFER YOUR LONGEVITY	250
CHAPTER 7 THE ANTS AND THE STEM CELLS	293
CONCLUSION PROMISSORY LANDSCAPES	331
REFERENCES	353

LIST OF FIGURES

Figure 1: A stamp issued to commemorate Hwang's SCNT-hESC breakthrough	1
Figure 2: "The Likelihood That I Will Face the Centenarian Shock Is..."	267
Figure 3: Illustration of the Ant Revolution	322
Figure 4: Waddington's diagram of epigenetic landscape	333
Figure 5: Yamanaka's modification of Waddington's diagram	333
Figure 6: Zhou and Melton's modification of Waddington's diagram	334

**The Promises of Biology and the Biology of Promises:
An Ethnography of the Korean Stem Cell Enterprise**

INTRODUCTION

Everyone Loves Stem Cells



Figure 1 A postage stamp issued to commemorate Woo-suk Hwang's SCNT-hESC research

On February 12, 2005, Korea Post, under the authority of the Ministry of Information and Communication (later changed to the Ministry of Knowledge and Economy), issued a stamp to celebrate Woo-suk Hwang's claimed success in establishing

human embryonic stem cell lines (hESC) with somatic cell nuclear transfer technique (SCNT), or conveniently termed “therapeutic cloning.” On the left, there are four pictures depicting the process of SCNT procedure—an egg is enucleated, then is introduced with a patient’s nucleus. What appears to be a patient nucleus is depicted in fluorescent green, while the enucleated egg looks like a dark-colored ball. The last scene, an introduction of glowing nucleus into a dark, dull egg, is particularly emphasized on a red background. A magnified image of a stem cell colony appears on the other side. Against this backdrop of laboratory-produced images, there is a series of illustrations that look as though they were cuts taken out of flipbook animations. It depicts a man, once sitting in his wheelchair, now stands up, runs, jumps, and finally holds a woman, presumably his partner, in his arms. The sequence of life changes resonates what the stamp commemorates: a stem cell breakthrough that would revolutionize medicine. At a presentation ceremony for the stamp Woo-suk Hwang, the lead researcher of SCNT-hESC project, said, “In return to the national support, I will make what the stamp depicts happen, make a patient with an incurable disease stomp out of the wheelchair” (Lee 2005). His promise was never kept. In December of the same year, it was disclosed that his data and claims were fabricated, which

entailed an intense scandal both in Korea as well as in the international scientific community. Following Hwang's disgrace, 43,158 pieces of stamps, that were left unsold out of 1,600,000 pieces initially printed, were recalled by Korea Post on January 11, 2006. Since Hwang was a figure that represented stem cells and their promise for the future in Korea, it appeared at that moment that the stem cell promise might wither away from the purview of the Korean public.

While Hwang lost his credit and his promise was not tenable, the promises of stem cells for cure and better future are still alive in Korea and have been actively promoted and sold in the commercial, consumer-oriented markets. In August 2011, I attended a public forum organized by the Korea Stem Cell Research Center (KSCRC), entitled "Stem Cell Research 10 Years: The State of Art and the Future of Clinical Application of Stem Cells" to celebrate its 10th anniversary. In the opening remarks, the director Dong-wook Kim emphasized that it was a forum for a general public to better understand stem cell research to have the "right hope." As he stressed that the public should not view stem cells as "panacea," it became rather clear that the promise of stem cells has grown to the extent that stem cell researchers are concerned with the safety of patients, and potential harm to the credibility of stem cell enterprise in Korea. At the end of the meeting, however, an old man stood up leaning on his cane, to say that he recently started stem cell treatment cycles for his neurological conditions in China, and what he and other patients would really want is to be able to receive treatments in Korea. While doctors and researchers told him that it could be not only ineffective, but also dangerous, he and his wife seemed not convinced. After the meeting, I introduced myself to the old couple in their 70s, and briefly talked with them about the stem cell treatment he was getting. After hearing lots of good things about stem cells from people in their church, the old man decided to try one. What good things? His wife, in a very lively tone, listed some of them: somebody who had a stroke got

better, somebody with Parkinson's got better, and somebody who got treatments for her dementia found out her wrinkles were gone and black hair began to grow again. She even told me what I should write: "So, you said you're writing about stem cells...? Just remember one thing—everyone thinks stem cells are good. Everyone loves stem cells. Just write that." Indeed, I remember two things: that everyone loves stem cells (pardon me for a little exaggeration!); and that she seemed really excited when she was talking about stem cells while her worn-out knee soared for which she wanted to receive stem cell treatments if possible.

Return to the stamp. You may an egg, micropipettes, nuclei that are transferred, and a colony of stem cells, as well as a patient being cured. Among them, two images stand out, as they are literally highlighted. The first is the nuclei being transferred, which is marked in fluorescent green. It resembles the stars that emerge from the tip of magic wand. It awakens the latent vitality in the enucleated egg and magically turns it into stem cells, a peculiar life form that can be induced into specific cells to cure incurable conditions, which will make the impossible possible with its own vitality. But, the dull color of an egg, sitting in a dish (although we cannot see the dish or other technological infrastructure that makes life of an egg or stem cells *in vitro* in the pictures), still begs questions: what is the nature of its dormant vitality, where does it come from, and how does it suddenly turn into a lively one touched by the magic wand? The second image is the sequence of a man's life change on the foreground, which is outlined and colored in white. In this series of images that remind jump cut animation, one sees the heroic and miraculous resuscitation of a paralyzed man who finally gets back to his happy and normal life to hold his beloved in his arms. The narrative starts with him in his wheelchair waiting for the miracle to come (or being hopeless). He does not simply stand up or walk, but suddenly runs and jumps. His excitement is obvious, and his jump is joyous and vigorous (since it is an outline of a

person jumping, one may recall the famous Nike “Air Jordan” logo). Then, suddenly a woman, his beloved, appears on the stage, held in his arms. This ending, typical of the heterosexual family drama, of “happily ever after” signifies his regained masculinity. But, what was she doing, and what was he doing before the magic wand touched about her care? What about his own vigor to live with his paralyzed body? In the last scene of the jump cut animation on the foreground, a woman suddenly appears—where did she appear? What would happen if we read the image focusing on what are *not* readily visible, all the actions and relations that are not on the foreground while being necessary to make those figures to present themselves as active agents of transformations? This dissertation is an exercise to look at the grounds that enable the figure of stem cells to emerge as an autonomous, potent, and capable entity.

The glaring magic wand of technology, which Hwang famously phrased as “chopstick technology”¹ foregrounding the dexterous “Korean finger techniques,” seems to epitomize the power of biotechnology to manipulate life itself (contained in genes and eggs). But, wouldn’t the patient’s hope, which could have been maintained in part by the promise of cure and in part by care from many other people, be one of the forces that make things happen? On the stamp, the donor’s care for other people’s life and her bodily labor are also made invisible, as the figure of an egg appears isolated from its reproductive past. All these things that require certain technological infrastructure for the cellular living *in vitro* and for proving its potentiality are also simply removed. All these people, things, and labors that become the conditions of production and reproduction of stem cells and their miraculous promises are naturalized as if they were given. They appear as (or disappear into) a transparent background of the images on the stamp.

¹ In an interview with The New York Times, Hwang attributed one of the reasons that his lab could succeed in the human cloning experiment to the dexterity of lab members. He said, “our Korean finger techniques helped. Koreans eat with metal chopsticks, which are very slippery” (Dreifus 2004). It was dubbed as “*chōtkarak kisul*” (lit. chopstick technology) in Korea.

As these naturalized conditions of (re)production are erased, the promissory image of the stem cell future foregrounds the already technologized life forms *in vitro* (enucleated eggs and stem cells that are seen valuable) and technology that transforms them into biovaluables. Awakened by the force of technology, stem cells appear as a promising entity that contains the magical capacity for regeneration in itself. The erasure of those bodies and labors in the background renders stem cells as a bio-object that stands on its own at the center of the stem cell enterprise. Furthermore, it promises a vision of labor-less economy in which value emerges out of (proprietary) knowledge of life by means of which the generativity of biological entities will turn into surplus value which resonates with the imaginary of biocapital, or knowledge-based bioeconomy (Cooper 2008a, Birch and Tyfield 2013). At the more mundane level, the imagery of the stem cell entity as a reservoir of the regenerative capacity works powerfully in the consumer-oriented markets of stem cell promises. It speaks to people that they should invest in stem cells in various forms, as they hold the promise of better future in their vitality—not only by researching them, but also banking their own stem cells, using stem cell products, or buying stem cell stocks.

Through the erasure of bodies, the temporal gap between the present and future, and the peculiarity of imagination of knowledge-based bioeconomy are rendered elusive. My dissertation looks at the bodies, labor, affects, and things that are erased when the power of the magic wand of technology that transforms the latent form of vitality into a promissory thing is celebrated. These bodies, labor, affects, and things, which are enacted and co-ordinated (Mol 2003) through the promises anchored in the stem cell's potential, make and maintain both the stem cell as a promissory entity and its promises. The stem cell conceived, cultured, and studied as an entity with the potential for regeneration is inextricable from its promises, and the engagements of

people who invest time, money, and efforts in stem cells and their promises—which I call the “promisees” of the stem cell enterprise—as those engagements enable the flows of money, tissues, and words. Stem cell promises would not be realized without their engagements. Without them, it would not be possible for stem cells even to make and sustain those promises. In the future, those things, people, and labors may become superfluous when the promise is actually realized. However, they are still an indispensable part of the stem cell enterprise, as they enable the promise’s maintenance in the meantime between the present (when stem cells appear promising), and the future (when the promise is realized).

This is an ethnography of the proliferation of the stem cell promises in Korea, as they live through the promisees’ engagements of in the potential of stem cells to save health, wealth, and the nation in the moment of anticipatory present—in the meantime between the coming into being of stem cells (or, inception of the promise) and the realization of stem cell promises (or, the closing of the promissory horizon). I argue that the biological life of stem cells is inextricably intertwined with the social life of promises of futures different from the present. Rather than being derivative of the unique biology of stem cells, the promises are constitutive of it. Through the affective, bodily, intellectual, and financial investments and labors made by promisees stem cells as a life form with potentiality are reproduced. At the same time, it is the very potentiality of stem cells that become the basis of these various forms of investments with the promise of regeneration. I call stem cells a promissory thing—a material and semiotic anchor for promises about the future whose ontology enacts and is enacted by the very force of promises. Stem cells, as we know of now, can stay vital, only when promisees directly and indirectly feed them, which is also instigated by the promises of regeneration (of cells, life, hope, and economy) anchored to the stem cell form which is *conceived* through a promise of technological control of life. In the

next section, I will briefly review some debates on the concept of stem cells and elaborate what I mean by stem cells *conceived* through the biotech promise.

ARE STEM CELLS ENTITIES?

The glossary definition provided by stem cell researchers highlight the stem cell's ability to actively give rise to other cell types. It is said that pluripotent cells "*can become all the cell types* that are found in an implanted embryo, fetus, or developed organism, but not embryonic components of the trophoblast and placenta (these are usually called extra-embryonic)" (ISSCR n.d.), or are "*able to form all the body's cell lineages, including germ cells, and some or even all extraembryonic cell types*" (Smith 2006:1060). The cells are portrayed as capable agents that contain the potential in themselves. The potential, capacity, or ability to do something—these three words are used almost interchangeably, except when the potential is explicitly pronounced in terms of differentiation potential. And these cells are characterized not by what they "are," or what they "do (or what they tend to do)," but rather what they "can" do, or what they "have" as their capacity. Interestingly, the definition of stem cells, since it takes the capacity, ability, or capacity as something held by cells, renders not only stem cells, but also what is said to be their capacity as value-objects. What could be viewed as certain behavioral patterns that could momentarily observed is postulated as an object that intrinsically belongs to cells. Accordingly, stem cells by virtue of being cells that hold the value-object could also appear an agent that *possesses* intrinsic properties in themselves. Accordingly, the mode of inquiry provoked by stem cells often focuses on *how to* maintain the capacity of cells, or direct them to realize the potential inherent in stem cells. One might say that stem cell research is a field that is interested in the cellular capacity or potential as an object of technological investigation as much as it is interested in the thing called stem cells.

When the state of not-yet-differentiated is translated into the entity's potential to become something else, the language of potential or capacity valorizes the undetermined state—it is not simply being undetermined, but rather being free from constraints. Austin Smith's explanation of stem cells that I quoted above portrays differentiated cells (functional cells) as having “more restricted properties.” Differentiation is a process cells become committed to specific developmental lineages, and eventually turn into cells with specific functions necessary for an organism's daily function. They could be seen as “mature, specialized cells” as in the ISSCR glossary. But, to a stem cell biologist like Smith who is particularly interested in how to maintain pluripotency, specialization could also mean restriction. While Smith's use of language is more or less peculiar led by his own interest in pluripotency, one can, rather than dismissing his explanation as an outlier skewed by his peculiar interest, take it as a case that exemplifies how the life of cells is differently envisioned when pluripotency or cellular capacity kept in the undetermined state is valorized.

When stem cells are studied, what is pursued is not the cells themselves, but the potential of cells that will unfold with the aid of technology, or indeed the future(s) that could be brought by the biological potential. However, it is the cell form that makes it possible to grasp this imagination. In this sense, stem cells are indeed a crystalized, materialized form of cellular potential that enables people to grasp the generative instants *in vitro* that are only transient *in vivo* as they capture and amplify the moments in vitro. The very definition of stem cells and technologies of stem cell culture are making an otherwise transient process into a tangible and manipulable object. Capturing the moment in the form of stem cells, it is now possible for scientists to manipulate a living process and explore the possibilities enfolded in the moment of indeterminacy—a stem cell is a medium through which scientists get hold of otherwise transient

temporal processes. If a stem cell could be seen as an entity, it is an entity that is captured in a specific moment of living process and requires a specific condition to maintain its existence as a living being suspended in time. Obviously, stem cells are one of the products of contemporary tissue culture technology that has been invested in intervening in cellular temporality and plasticity (Landecker 2005). Yet, stem cells add another layer to the cultural history of tissue culture technology. Stem cell technology has reified a temporal moment into a tangible form, when it has isolated cells at a specific developmental state or in a particular state in a living process. It has made possible not only to manipulate cellular temporality by controlling cellular lifecycle *in vitro*, but also to control time itself by enabling isolation of temporary states in the form of stem cells. At the same time, it also seeks to locate the ability or potential *within* stem cell entity.

The impulse to locate the “abilities” in stem cells is evident in the search for “stemness” genes. “Stemness” is a neologism that was introduced to the world of stem cell science in 2002 with two overlapping studies published in *Science* on the molecular properties of stem cells (Ramalho-Santos, et al. 2002, Ivanova, et al. 2002). It refers to “core stem cell properties [...] that underlie self-renewal and the ability to generate differentiated progeny” (Ramalho-Santos, et al. 2002: 599) based on the notion that “different stem cells are regulated by common genes and mechanisms” (Smith 2006:1060). The debate among biologists triggered by the stemness hypothesis stages this peculiar orientation, or a kind of ontology implicit in stem cell biology. The concept of “stemness” attempts at fixing the attribute as a kind of object that can be searched and sought for. The name “stem cells,” given to various kinds of undifferentiated cells that are found in different contexts, has rendered those cells as an object that *has* a set of specific characteristics. The neologism of stemness further crystallizes the attributes that are seen in stem

cells as specifically belong to stem cell kind. It assumes that we already know what stem cells are, and what their attributes as established facts. The next step taken by some researchers is to identify genes that are responsible for this stemness. Two groups conducted experiments to identify stemness genes. The data did not give coherent answers, and some technical commentaries followed pointing to the problems in experimental designs. However, some stem cell biologists started taking issue with the research program that is structured with the assumption that stem cells have “stemness” as their intrinsic properties (Zipori 2004, Lander 2009). Approaching from the systems biology view, they suggest that the search for stemness markers that are unique to “stem cells” might be futile. It is because what is seen as the properties of stem cells (stemness) can be a transient state, rather than an intrinsic property of cells, which is induced by specific feedbacks from their microenvironments in certain circumstances. In his provocatively titled article “The ‘Stem Cell’ Concept: Is It Holding Us Back?,” Arthur Lander (2009) suggests that stemness is a “property of *systems*, rather than cells, with the *relevant system* being, at minimum, a cell lineage, and more likely a lineage plus an environment” (5). This view shifts the locus of the “stemness” from the self-contained entity (cells) to the dynamic system (the cellular environment in which cells reside and change over time). Then, what could have been viewed as the ability or capacity of stem cells is now to be seen as the transient attributes of cells that manifest in the system in specific circumstances. In stem cell biology, the question whether stem cells are an entity or a state is a question that has implications on research methods as well as theories (see also Fagan 2013, Laplane 2014). This debate has also reprised the debate on cancer stem cells (CSC) which might need more attention to the interaction between SCSs and their microenvironments than exclusively focusing on the method to target CSCs (Lander 2009, Laplane 2014).

This debate on the ontology of stem cells (entity vs. state) is interesting in the present context as it illuminates the dominant view of stem cells in stem cell biology and its promise. The “opinion” is raised against the dominant view that ontologizes stem cells as an entity with certain capacities, to draw attention to stem cells *in* circumstances, *in* time and place. While it can be seen as an internal debate in the scientific community, it also tells us how powerful the entity-concept of stem cells is in the contemporary stem cell science. From the interest in CSCs as a target for anti-cancer therapy, we may find a clue. The entity view of stem cells allows room for the promise of technological control of life itself. Stem cells as an entity could be seen as a “technical object” in a sense that it serves as a tool that appears stable in a sense. The entity can give scientists (and others) *grips* to hold onto the vital forces for regeneration, and further regenerative futures. This can be extended beyond the scientific community: one can imagine to grip the future therapeutics by storing one’s own stem cells presumed to have the potential for regeneration, for instance. The entity-concept is enticing because it enables one to get firm hold of something that is not necessarily tangible, providing the point of contact which is already promising.

I borrow a metaphor of “grip” from Anna Tsing (2004). Grappling with the question of universality and particularity, she draws attention to global connections through which universal dreams and schemes are sought for, and proposes a powerful metaphor of friction. Friction refers to the grip of encounter. She writes, “[a] wheel turns because of its encounter with the surface of the road; spinning in the air it goes nowhere. Rubbing two sticks together produces heat and light; one stick alone is just a stick” (5). Events happen in the encounter, but not a random one. A wheel’s encounter with the air does not make it move. Tsing’s focus is on the particular circumstances through which the universals, not as abstract thoughts but through material

practices, are sought for and gain their tractions as “engaged universals.” Stem cells are, similarly, engaged potentials. Since their peculiar ontology, as a form of potentiality, gives grips to futures, they engage people. As they *engage* people and their investments in their potentiality continue to maintain their potentialities. Stem cells as an entity are *promising*.

STEM CELLS, A PROMISSORY THING

The concept of stem cells is closer to the stem cell entity rather than the temporary state—they are isolated from their living milieu and cultured to maintain their “stemness” in the labs. They are *cultured* as the entity holding stemness in the contemporary culture in which promises are valued and sought. They would not exist in the same manner if there were no promise. It is not to say that stem cells are “made up” or “socially constructed.” Rather, it is to say that the entity-status of stem cells and the way it is employed in the biological research to study *how to* (not simply *how*) is inextricably tied to what it promises. It is a recursive process: the biological entity of stem cells is promising because of its “stemness”; and because it is promising, this biological entity of stem cells can come into being and maintain the stemness outside of their “natural” habitat. In this sense, the biological life of stem cells and the social life of its promise are deeply intertwined as both are anchored in the notion that stem cells *have* the biological and therapeutic potentials. The potentiality itself promises the future, for what matters is *how to do things with* the potentiality, which appears to be a technological problem to be solved by researchers over time. Of course, there are uncertainties, but they are seen rather as technical “hurdles” that can be overcome, rather than fundamental problems that can foreclose the whole field. The potential is at hand, in the form of stem cells, and it promises to make the impossible possible, make human life better, and create health and wealth.

In the ontology of stem cell entity, stem cells' behaviors (or functions) in given circumstances are construed as their capacities and potentials, i.e., their intrinsic biological properties. Stem cells come to gain a semantically different value, and move into a different discursive and technological terrain which is explicitly oriented toward the future. The present moment when the potentials are at hand is rendered as the past of the future full of opportunities and points of decisions. It is in this sense that stem cells are a "promissory thing" as well as an "epistemic thing," and simultaneously a "technical object" (Rheinberger1997). Stem cells could be seen as an epistemic thing in a sense that it is at the center of the research field ("stem cell research") that has recently emerged around it, and is in the process of constant redefinition drawing on more and more things in its own category, albeit with some controversies. In Rheinberger's original formulation, epistemic things differ from technical objects that are already stabilized, or "blackboxed" in Latour's term. Stem cells that are routinely used as the tools for tissue engineering or other experiments could be seen as a technical object.

Rheinberger's original formulation of epistemic thing highlights the temporality that epistemic things entail; how they are always incomplete and "absent" in a sense as it is pursued as an object of inquiry, something yet to be stabilized. Since he is interested in "historial" processes through which scientific objects come into being, the distinction between epistemic things and technical objects are essential. What interests me is the simultaneous existence of the stem cells both as an epistemic thing and as a technical object. While scientists themselves acknowledge the "fuzziness" of stem cell concept (Robert 2004:1008, Shostak 2006) and uncertainty regarding the materiality of stem cells (Fagan 2013), scientists actively work with and speak about stem cells as a technical object relying on the working definition of stem cells. While it can be seen as part of historial processes through which stem cells (or maybe something else) comes into being

and is stabilized, I consider this pragmatic mode of engaging with stem cells (as if they were blackboxed despite the controversies) in relation to the promise of stem cell futures. The promise that the potentiality of stem will have yield regenerative cures shapes the particular mode of engagements with stem cells. The fuzziness of stem cell concept, within this promissory terrain, is not necessarily avoided, but rather is exploited to include more things in it. This is why I call stem cells a “promissory thing.” The promissory thing finds its niche in the laboratory practices as Rheinberger’s “epistemic things” do. The difference is that the experimental systems in which the promissory thing emerges are constituted not only of the products of former epistemic practices, but also of the promises that render certain modes of mattering more attractive than others.

Calling stem cells a promissory thing is to engage with the debate on the *nature* of stem cells as it concerns the question of how scientific objects emerge in the current promissory landscape of technoscience. Back to Rheinberger, his distinction of epistemic things and technical objects is tied to his refusal to subject science to technology as in “technoscience.” What the stem cell enterprise elicits, however, is the inextricability of techno- and science in the contemporary biomedical enterprises. Furthermore, the “social” is deeply involved in the making of technoscientific objects. The historical trajectory that the concept/category of “mesenchymal stem cells” has taken offers an interesting example, and it also illuminates the significance of the notion of “promissory thing” from an ethical perspective. As a stem cell scientist Paolo Bianco (2013) observes, the concept of mesenchymal stem cells (MSCs) and the method of studying them have extended in response to the commercial interests in the therapeutic application of stem cells, the promise itself is constitutive of the biological concept. The working definition of stem cells, as cells that have different degrees of differentiation potential and self-renewal capacity,

holds different kinds of cells together under the name of stem cells. What holds them together and directs the research programs in specific ways is the promise tied to the potential of stem cells. If it was not as promising as it is now, stem cell research might have been quite different—if the field called “stem cell research” existed at all. Promises are the condition for stem cells’ presumed ontological stability; their presumed stability is the condition for promises. My notion of “promissory thing” points to the thing-ness of stem cells that emerges in this recursive process. It is not simply that there is a given entity called stem cells with all sorts of different promises extrinsic to it. Rather, stem cells are “mattered” as a material-semiotic entity in a form that could exploit the force of promise to *engage* people—promisees.

PROMISE, PROMISING, AND BEING PROMISED

“Promise” is a much-rehearsed term in the forecasts, popular media discourse, and critical analysis of biotech future (as in “the promise of stem cell research,” or “stem cells are promising”). “Promise” creates relations and time. “Promise” creates a relation between the promisor and the promisee. At the same time, it brings the future into the present, and recreates the present into an anticipatory moment, while raising questions about the uncertainties of the future. My dissertation is particularly interested in the promisees who come to engage with the promise and live the present as an anticipatory moment, not necessarily in relationship with a promisor, but rather with a promissory thing.

“Promise” or “promising” in this context does not necessarily bind someone to a moral obligation to perform what is promised, as in “I promise to do...” The Korean translation makes it clearer. In Korean, the noun “promise” as in “the promise of stem cell research” can be translated into *kanŭngsŏng*, which refers to the possibility of something to happen or to grow in the future. And, the adjective “promising” can be translated into “*yumanghan*,” which refers to

the quality of something/someone that shows hope or bright prospect. A Korean word for “promise” in “I promise” is *yaksok*—literally meaning binding—which is not close to the other words for “promise” in the biotech context. The question of morality or obligation is not present in the “promise” of stem cells. Indeed, it is rather a message about the future which, different from “forecast,” that highlights only hopeful, optimistic unfolding of the future from stem cells. Most moral philosophical discussions on “promise” (focusing on the moral obligation to keep promise) are not very relevant in this context. Rather, we are speaking of “promise” that has been made “already” “elsewhere”—that is not localizable, and accordingly it does not necessarily bind someone as a promisor obliged to keep the promise. Yet, there are promisees who are engaged by promises; who are bound to the promise in anticipation of the promised future. They are bound to the promise that has been made not by someone, but by a thing, stem cells, the nonhuman entity that does not speak “I promise,” but that presents itself as something that “can” do something in the future.

My ethnographic engagement with the promises of stem cells in the Korean stem cell enterprise focuses on the figure of “promisees” rather than the act of promising itself or the (absent) figure of promisor. There is no one who is obligated to keep the promise and is to be punished by violating it in this promissory enterprise, but there are many people who invest in the promised future(s) and are at risk of being betrayed when the promises are not kept. While there is no speaking (human) promisor whose credit can be checked in advance, there is a promissory thing at the center of this promissory economy, whose credit comes from the “fact” that they have the potential to do things that are desired. To borrow the terms from J.L. Austin’s speech act theory (1962), while the statement about the glossary definition of stem cells (“stem cells are cells with capacities...”) could be read as a constative statement, as a description of

what they are, it can also work as a performative statement that induces certain responses from its audiences making them “what to do with these capacities” and “how to do so.” The definition itself becomes a kind of promise, as it engages people to the future(s) that will be unfolding from the potential of stem cells. Here, we oddly face the proliferation promises without the act of “promising,” and promises without “promisors”; then, what is it that makes something (the promise) “promising”? How does the force of promise emerge? And, how can something remain promising over time, despite the constant deferral of its realization? These questions beg attention to promisees through whose commitment promises, whether made explicitly by a promisor or somewhere else, can keep alive, stem cells can remain “promising.” If the figure of promisor and act of “promising,” whether inspired by speech-act theory (as a performative utterance) or by moral philosophy of promise (focusing on the question of moral obligation to keep the promise), has been central in the theory of promise, I shift attention from the promisor to the promisee, from promising to being promised. If humans are, as Nietzsche put, “an animal with the prerogative to *promise*” (35), their counterpart, also humans, are the ones that take up the promises made. Hence, I would add, humans are an animal with the capacity to *be promised*. Focusing on the question of morality, Nietzsche himself already has hinted at the promisees with the figure of creditors who exploit the pleasures of exerting power over the powerless (the promisor/debtor who violated his promise). But, promisees who are not bound with promisors, but with promises themselves of futures, may find pleasure from something else—the excitement about the future that a promise opens up, hope for different life, and possibilities of having control over the future that often confronts contemporary Koreans as threats.

Mike Fortun’s *Promising Genomics* (2008) attends to the biotech promises that are unlocalizable, dwelling on the adjective, “promising” and its relation to “promise” as a verb and

noun. At one point, Fortun writes, “Promising works on the level of affect, in the field of the body. [...] Promising comes, therefore, to be associated with the quotidian, the singular, the field of practice, rather than with the theoretically generalizable” (Fortun 2008:109)—with the trivialities of doings. When something appears “promising” to someone, Fortun argues, it is because that very thing (it does not have to be a human promisor, a human speech act) has *engaged* someone beyond his/her cognitive capacity. Fortun’s example is a scientist looking at the result of experiments finding, say, certain gene associations promising. Of course, the scientist himself could become a promisor as he writes about, speaks for, and garners funding for the promising molecules—translating what appeared “promising” to *interest* (in the words that Bruno Latour 1987 and Michell Callon 1999 use) or engage others as promisees. It does not mean the scientist ceases to be a promise when they are speaking for the promise of genes—the molecule that appeared promising still drives his/her actions. In some ways, following Shoshana Felman (2002) from whom Fortun draws inspiration, this act of promising is also an act of seduction that makes others desire the promised future, and also an act of inducing belief. Reading *Don Juan* with J.L. Austin, Felman emphasizes that seduction, or induction of belief exploits the gap between two different languages—the constative and the performative. Believing in words is to take the referential quality of language (the constative) seriously, which could have been a performative, self-referential utterance—in this case, the statement that “stem cells can...”

Promise is generative of expectations. The sociology of expectations also pays close attention to the future-oriented temporality of biotech/biomedical enterprises with specific focus on the management of uncertainties and expectations in the innovation process (Brown 2003, Brown and Michael 2003). Within the convention of actor-network theory, they show us how

different actors “mobilize” the future as they try to “marshal resources, coordinate activities, and manage uncertainties” (Brown and Michael 2003). When uncertainties are high, expectations or promises are also inflated in order to mobilize resources which usually happens in the early stage of innovation. As the “inflated” expectations can also harm the reputation of innovative research causing disappointments, there emerge demands to modify promises and expectations. As such, sociologists of expectations give us insights on how the discourses on uncertainties constantly shift over time in innovation actors’ attempts at managing expectations.

What distinguishes ethnographies of promising/promise from the sociology of expectations is how the gap between the present and the future is construed by those scholars. For sociologists of expectations, the gap is marked by uncertainties—risk and opportunities—that are constantly evaluated by subjects of expectations, and managed by actors that are participating in innovation. The problem with uncertainties is an epistemological one—we do not know what will happen in the future, and there are efforts to make them intelligible. Making the uncertainties intelligible is needed to communicate with other actors—one may call it “the public.” It is not surprising that sociology of expectations has attended to cutting-edge, nascent technologies that are also controversial. The implicit context for sociology of expectations is the public sphere where deliberation, or “communicative action” is essential in the making of decisions not only on the matter of the present, but also on the matter of future investment. In the deliberation process, uncertainties will constantly be brought into the public purview, and they will be mobilized to make specific arguments about innovation projects.

For the scholars of promise/promising, the gap is not necessarily about the uncertainties. It is rather about the generativity of undecidability in which one is promised that what s/he desires *will have been* realized sometime in the future. We never know how and when it will

happen, but there is a sense that, as long as there is a promise which has not died, the future will come. Right at this moment when one feels hastened to make a decision, to see the chance to join the future, the promise starts exerting its force. What makes this possible is not only the promise's own force, but the force of desire of a soon-to-be promisee who would, despite the uncertainties, see the unfolding of promised future. Hence, it is already about the desire, and the problem of uncertainties is not really relevant. Rather, the question is how one subjects oneself to the promise; there might be certain deliberation, but between the desired future and the continuation of present (nothing will happen), one's deliberation is not so much about risk versus opportunities, but rather about all or nothing. Once again, it is not surprising to see the most interesting texts on promise/promising have dealt with fertility clinics (Thompson 2005), or speculative genomics research/industry (Fortun 2008, Sunder Rajan 2006). The success rate of fertility treatments is not necessarily very high, and there are uncertainty regarding complications as well as actual success. Yet, if one does not try, one cannot be made into a parent. One never knows if ova with supposedly "good" genetic materials would really unfold into smart babies, but if one does not commit, the whole question is meaningless. Things could be said differently in retrospect, but the commitment, or strong engagement is central in the working of promise. You will never have a chance even to regret, if you do not commit. It is a matter of commitment rather than of constant deliberations. And, the subjects of promise (promisees) are not necessarily the subjects of calculative reason whose decisions are made on the risk/opportunity assessments. Rather, they commit themselves, money, time, and/or efforts to promise as the promise affectively engage them, as the promise excite them in some ways or the other, not simply with the expected "benefit" but also with the pleasure of committing the promise,

imaging the future to come, and becoming part of the unfolding future. Promise, in this sense, often involves belief, or rather faith on the part of promisee.

My question is rather what it means to be an animal that is capable of “being promised.” By putting an adjective that implies the subject’s quality of being active (capable) and a passive voice verb (be promised) together, I want to highlight the interesting role that promisees play in the working of promise. My ethnography engages with the seemingly passive, yet indeed active engagement with promises that promisees make. Without someone being promised, there is no promise. To see something “promising,” to be a promisee, one needs to be excited, affected, and engaged. It implies a kind of excitability of the promisee. Through the promisee’s continued engagement, the promise is renewed and is valorized, even while the realization of promise is deferred. In this sense, the force of promise emerges from and continues to work through this excitability of promisees that actively choose to subject oneself to the promise, and sustain one’s own engagement with the promise. And, promises proliferate through those bodies that are excited, sometimes mutating into different kinds of promises. Indeed, the promissory economy cannot work without these excitements.

By “engagement,” I mean not only apparently serious and sustained commitment to stem cell research as patient advocates or scientists, but also more casual and temporary forms of engagement with stem cells as consumers of stem cell related products and services, small-scale shareholders of stem cell companies, researchers who happen to work in stem cell labs, or even fans of a stem cell scientist who are rather interested in the person than stem cell science itself. Each of them might have different interests, and what they want could be fulfilled by something else, not necessarily by stem cells. It could be said that they are just hopping around and happen to join the stem cell “bandwagon” (Fujimura 1988) whatever options that are available options to

get what they want—healthy body, youthful skin, money, jobs, or somebody else’s fame. For whatever purpose they gathered, they share the premise that stem cells could do something for them, stem cells can change their life, and stem cells are good. They might not “love” stem cells in the way they love their family or friends, but they are at least very interested in stem cells, in their promises to bring them better futures in whatever ways. In Michell Callon’s term (1999), one may say stem cells are established as an “obligatory passage point” that translate myriads of interests into problems that could be solved by stem cells. Yet, in the speculative and spectacular economy, the “obligatory passage point” needs to be maintained by constantly demonstrating that it is a promising route toward the future. As much as stem cells may do something for them, they are also doing something for stem cells. By talking about stem cells, buying something that is related to them, and/or researching them, these people make stem cells present in Korea both discursively and materially.

The old lady might have not come for this public forum unless people in her church told her about their experiences of stem cell treatments, and her husband, after hearing them, started getting stem cell treatments. These talks about stem cells in the media, in everyday dialogues, and in the advertisement amplify attention, as they are communicated. Attention and excitement as well as evidences of stem cells’ promises emerge and grow with/in these people’s engagements, although they may appear not so serious. These engagements all together constantly draw attention to stem cells and their promises, filling in the temporal gap between the present, the time of investment in the potential of stem cells, and the promised future, the era of regenerative medicine where the potential will be realized. These engagements all together keep attention to stem cells alive. As long as there are constant production and reiteration of good-

enough stories about the stem cell promise, stem cells can continue to appear as a promising object of investment, which gives “appearances of success” (Tsing 2000).

ECOLOGY OF PROMISES

A physician who pen-named himself as Endo (2013) wrote a column on an online science news journal, which was titled “Stem Cells Cannot Do What Science Cannot Do.” He writes:

It is true that stem cells have great potential to cure many incurable diseases, and [the field] is rapidly developing thanks to diverse basic research and clinical trials. These facts are also well known to the general public. Paradoxically, it operates as a side effect to give them unrealistic hope and faith. Illicit stem cell treatment is a typical fraud that commercializes the potential of stem cells that is already known to the public and hope for it to sell as a medical commodity. However, it is impossible that stem cells can make it happen what the state-of-art science cannot do like a miracle.

He insightfully points to the “paradox” in the popular knowledge about the potential of stem cells. It is not the lack of understanding about stem cells, but rather the knowledge about stem cells that causes the problem. It can be a paradox, if one sees how having some knowledge puts people rather in a vulnerable position by giving them unrealistic hope and faith. Yet, one might ask if the kind of informing that Endo wants to do could resolve the paradoxical situation, which is caused by the facticity of the potential of stem cells that generates hope and faith. The crux of this problem may be not the lack of information, but rather the “fact” that stem cells have the potential. The paradox still remains—the fact is the source of “unrealistic” hope and belief. Since the familiar narrative of stem cell science revolves around the potential, or the capacity of cells, it is difficult to make a claim against those stem cell businesses except that they are not “proven” yet. One may simply decide to take the advantage of stem cells first rather than being kept in the degenerative process or aging. When it is said “stem cells cannot do what science

cannot do,” the warning not only speaks for the authority of science, but also points to the centrality of stem cells’ vital capacity in the popular conception of stem cells in Korea.

The vitality of biological materials is crucial in understanding contemporary biotech and biocapital, as promises of biotech are made on and are supposed to be substantiated through the living processes of the matters (Franklin and Lock 2003). Contemporary biotech, highly capitalized and explicitly promissory, has posed a myriad of questions to us. One of the important questions that STS scholars have been grappling with is on the new configurations of life and value (Cooper 2008a, Helmreich 2008, Sunder Rajan 2006, Thacker 2005, Waldby 2002, Waldby and Mitchell 2006). As its emphasis is on controlling over life and overcoming its biological limit as situated in a mortal organism that lives in time, contemporary biotech has led us to ask what it means to be human, what it means to be biological, what it means to be living, and so forth, which appeared more or less given before. It draws attention to reconfiguration of nature and culture, redrawing of the boundary between them as well as emergences of hybrids, in which nature is “enterprised-up” (Strathern 1992). It also asks us to think of changing ethos of life when “life itself” increasingly becomes not a destiny, but rather a controllable thing, or even as an enterprise. Contemporary biotech, as a site, has also reinvigorated Marxian problematics of “value” among STS scholars. Speculative investments in biotech have drawn attention to the promissory horizon that contemporary biotech flourishes on (Fortun 2008, Milburn 2008). Foregrounding the promise of controlling life itself and overcoming biological limits, contemporary biotech often sees proprietarized knowledge as a source of surplus value (Cooper 2008a). Yet, as systematic studies of biocapital suggest, promises of life itself (mostly in the first world countries) and surplus value for biocapital constantly demand various forms of bodily labors of humans and nonhumans in various sites (Cooper and Waldby 2014, Franklin 2013,

Sunder Rajan 2007), which further put the notion of labor to question (Vora 2012). These analyses of biocapital have not only drawn attention to the reconfiguration of “life itself” (Rose 2007), but also various forms of human and nonhuman labors that are taken to make biocapitalist accumulation possible: from cellular to organismic level, from “biomaterial labor” of the biological (Thacker 2005), to human labors such as experimental subjects for clinical trials in the global south and female “donors” for reproductive tissues.

Studies of biocapital problematize the speculative and promissory economy in which control of “life itself,” or prospects of this control, is articulated with logics of capital, while what “life itself” means to different scholars and what aspects of “logics of capital” they attend to vary. In these different views of biocapital, the vitality of biological entities, which is closely tied to their material specificities, occupies different places in these analyses. Sarah Franklin and Margaret Lock (2003) particularly pay attention to the tendency that they call “capitalization of biology” as the biological processes increasingly become and are imagined as sources of value. Drawing on materialist feminist critique of Marx’s notion of labor, they emphasize that these living entities actually produce things for capital. Questioning an anthropocentric assumption about labor as human activity, they conceptualize biological processes of these entities in terms of reproductive agency. In their call for reproductive agency, the vitality of biological materials is rendered as a crucial moment in biocapitalist mode of production. Franklin in another place suggests that stem cells are doing a kind of labor. Similarly yet in a different term, Catherine Waldby (2002) has proposed a notion of “biovalue” as the yield of vitality intensified by biotechnological reformulation of life itself. In *Tissue Economies*, which was coauthored with Robert Mitchell, she draws more explicit attention to the vitality transferred through reproductive materials. Waldby and Cooper (2008, 2013) later develop the notion of regenerative labor (of

tissue donors) based on the vitality that is contained in and transferred through those biological materials. Eugene Thacker (2005), drawing on autonomist Marxists' reading of Marx's theory of labor focusing on "living labor," conceptualizes the living process of biological materials as "biomaterial labor," as their vital forces, literally "living" labor, are incorporated to capitalist relations of production to produce value. In these discussions, the biologicals are presented as actually doing works. The biologicals do things, which are capitalized by the organization of labor and property regimes, while yielding "biovalue" which can turn into both health and wealth.

If these discussions highlight what the biologicals *do* with their biological properties, we could also ask how they are *made to do* those things within the networks that are weaved through threads of promises. Working on biocapital in the "post-genomic era", Kaushik Sunder Rajan (2006), in particular, looks at genes that are materialized through SNP Chips as a kind of fetish object. Similar to Marx's commodity, the genes appear to have inherent values in themselves, but those genes are rather a fetish object whose value emerges and is dependent on the complicated relations among people mediated by intellectual property regimes, regimes of truths, and biopolitics. Sunder Rajan's formulation of genetic fetishism is to question what kind of "life itself" is imagined in the post-genomic era, which is also mediated by intellectual property regime. Melinda Cooper's account (2008) that illustrates the parallel between stem cells and financial capital as they both embody delirious dreams of self-valorization draws attention to the materiality of human embryonic stem cells construed by the imagery of unlimited growth of surplus value. The vital potential of stem cells is more than a fetish, as it not only embodies the relations of valorization, but also enables them. For both Sunder Rajan and Cooper, these biological entities are rather concretized forms that capture the relations of production in

contemporary biocapital than things that have inherent values, or produce values in themselves. Here, they are objects that emerge within the complicated reformulation of life itself and value.

Reading these sets of literature together, it appears there are somewhat divergent views of the significance of the biologicals in biocapitalist enterprise. The biologicals and their living processes could be seen the material basis of value production as their living forces are absorbed in the machinery of biocapitalist value production, which consists of minute machines and propriety regime. Yet, if one focuses more on the speculative aspect of biocapital, they appear rather as a fetishistic thing whose “use value” disguises the operation of biocapitalist machinery in which value lies not necessarily in producing “life itself” but rather producing promises of enhancing life. Highlighting two different views on the biologicals in the analysis of biocapital is not to suggest that we choose one or the other. Indeed, they are engaging different moments of biocapitalist valorization of which the biological properties matter differently. What I want to emphasize here is the centrality of vitality in biocapital, as it is employed as the material force for production, and substantiates the promises that accrue flows of capital into the biotechnological enterprises. We may see the relation of mutual (re)production between the promises and vitality here: vitality makes promises of life itself possible, and promises of life itself become the condition of living for the biological entities employed by biotech. My dissertation draws attention to the processes of mutual enlivening of the biologicals and biotech promises in the Korean stem cell enterprise, which are made possible by many other bodies that accommodate their vital promises.

Instead of looking at the anatomy of biocapital—dissecting its components, identifying each entity’s functions, and locating the relations between parts as they are “organized” by biocapitalist logic—, my approach is to look at an ecology of vital potentialities and promises in

which opportunities of valorization for biocapital may emerge—the symbiotic relation between vital potentialities and promises as they garner interests, attentions, desires, hopes, and material and affective labors from human and nonhuman bodies in particular environments. My premise is that vitality of the biologicals and the power of promissory statements are both ephemeral and mortal: living things die if they are not fed by other beings, and statements cease to live as promises if they are not taken or remembered by their addressees. Accordingly, an ecological approach takes both the vitality and promises as achievements that are made in complex relations in their living milieus. By bringing into these diverse entities into account, it highlights the specificity of a particular living milieu for stem cells in which promises come to gain their social lives, and vitality is associated with particular promises. Various forms of investment in stem cells make it possible for stem cells to live as stem cells, a promissory and vital thing. Investments are made as there are promises made around the vitality of stem cells with which they are made to work. Promises are kept alive as long as they could yield investments by presenting the visions of futures that people hope for. All these together constitute the niche for stem cells to live in the state of the potentiality. This is what I mean by ecology of promises. The vitality of stem cells emerges within those symbiotic relations between words, things, and people.

Assemblages (Collier and Ong 2005) are also helpful when we try to grasp the emergence of new enterprises out of heterogeneous elements. Assemblages highlight the mutations of parts that are inherited from different times. It also highlights the works of assembling without which machinery would not work. There are intense forces that enable this machinery to work. Parts are mutable, yet they maintain certain elements of previous usages. This way, the notion of assemblages draws attention to the emergences out of historical contexts, mingling of

heterogeneous elements that mutate parts and wholes both in contingent ways. Considering that the concept of assemblages draws on Deleuze and Guattari, who were keen on the constant mutations, heterogeneity, movements, and intensities, “assemblage” appears to be a useful conceptual tool that is quite similar to my “ecology.” Yet, ecology does something more for me than assemblages. It helps me pay attention to *liveliness* of words, things, and people through which they multiply and proliferate. At the same time, ecology also provides an opportunity to pay attention to the “milieu” that shapes and is shaped by the emergent life forms such as stem cells, and to those lively movements through which “life itself” emerges and is enlivened in specific forms. The milieu is not simply an external environment to living things, but rather a condition of living on which the living thing depends, and a product that is constructed and organized by the living (Canguihlem 2008). Looking at the stem cell enterprise as an ecological site, I am interested in how stem cells, promises, and people are made lively in their niches proliferating each other.

The power of ecology as a methodological orientation is not only its emphasis on the relations and emergences (Choy 2011), but also it helps us to pay attention to the constant “feeding” (Weiner 1980, Strathern 2012) that takes place in those relations. Things do not grow on their own, by themselves, but rather are enlivened in those relations among those words, things, and people. Instead of taking stem cells as a self-evident thing, thinking ecologically of stem cells helps us ask how they emerge as “vibrant matters” in this field of intensities that are made in people’s desires for different futures than the present or the future presented to them in terms of prognosis. I borrow the term “vibrant matters” from Jane Bennett (2010), while my take is slightly different from her conceptualization of vibrant matters. As a political theorist, she proposes to recognize how nonhuman forces are actively participating in the events that the

modern political theory has thought exclusively human. Interrogating the modern ontological distinction between humans and nonhumans is salient in her political project. Bennett's proposal is part of the recent scholarly turn toward ontological politics and new materialism. While insightful, what I am more interested is how matters become "vibrant" in people's engagements with things, as the things come to resonate with what people care about and care for. It is not to dismiss the material force of nonhuman agent or privilege human agency once again, but rather to look at the process through which the nonhuman agency emerges by absorbing lively forces of desires among people as they imagine their futures mediated by the nonhuman capacity. Liveliness refers not only the vitality of the biologicals, but also lively traffic of words, feelings, and labors through which the vitality emerges, is maintained, and comes to be valuable. Stem cells are animated by the words, things, and people as they anticipate certain becomings, and while they also animate them with their promissory vital potentialities.

(RE)PRODUCING THE PROMISSORY ECONOMY

My emphasis on the role of "promisee" is to complicate the notion of "productivity" in thinking about the working of biocapital. Rather than focusing on the seemingly "productive" actors and activities, I foreground the seemingly passive and trivial engagements of promisees as a crucial element of bio-economy. The role of promisees might not appear very prominent if one only focuses on "production" proper, which privileges the kind of agency with transformative power and free will. "Production" proper that one could imagine in the field of technoscientific enterprise, for example, innovation that leads to the production of intellectual properties, clinical trials that are conducted to produce therapeutic products, venture capital and start-ups, and so forth. Rather, I focus on what might be termed as "reproduction" and "consumption," as well as "production" process that does not guarantee "products." I attend to consumption and

reproduction as they “feed” into this field of intensities. Consumption, in this affective economy, is not only the moment of exchange. As people consume the products, services, and promises, they gain attention without which the promissory economy may collapse. Attention often becomes an evidence of the significance, rather than the other way around, as we could see from fads in popular culture. This way, attention could be contagious, which recent “viral marketing” experts are often aiming at. Moreover, consumer products and services signal how “good life,” or “better future” is articulated through stem cells in Korea—it could help us situate stem cells in its local, social life.

My use of the term “reproduction” could be a little idiosyncratic, and needs a little bit more contextualization. When I use the word “reproduction,” I think of biological reproduction, but not necessarily “procreation” (as in “reproductive biology”). Engaging with feminist anthropologists’ discussions on the problematic distinction between production and reproduction, which is linked to naturalization, devaluation, and feminization of reproductive labor that is necessary to sustain our daily lives, I use the term “reproduction” to highlight the works to sustain lives of cells, people, and promises. Life, in a sense, is a constant process of reproduction, which does not necessarily assume the sameness, but rather meaningful repetitions.

Reproduction is an achievement that takes works and relations. The problematic of “reproduction” equips us to question the popular imagery of “innovation” that tends to focus only on the transformative moments, with the magical power of “technology.” At the same time, it helps us think through the vitality of the biologicals central to the stem cell enterprise as it emerges and is sustained in relations and labors. As I emphasize throughout this dissertation, nothing sustains its life on its own. Reproduction is an optic to pay attention to the works and relations that are necessary to sustain what appears to be given questioning both the magical

power of technology and of biologicals. It brings to the fore attention given to maintaining the lives of cells, people, and promises. If the stories of consumption highlight people's attention to stem cells in terms of their socio-cultural and politico-economic significance, "reproduction" stories highlight attention to stem cells in material and semiotic practices, highlighting the *doings*, as Maria Puig de la Bellacasa (2011) has emphasized in her work on "care." In a sense, reproduction is a term that I use to care about care, but also to highlight its necessity and sustained temporality, which is often forgotten in the purview of "production."

THE PROMISES OF BIOLOGY AND THE BIOLOGY OF PROMISES

As I said in the opening, I was told to remember one thing: everyone loves stem cells. While it is a bit of exaggeration by a chatty old lady, it captures how pervasive stem cells (and stem cell promises) are in Korea. Although not everyone makes serious and continued investment in and/or commitment to the promise of stem cells, "stem cells" are well sold as a promissory thing in various markets in Korea. The Korean government, in 2011, has dramatically increased funding for stem cell research, particularly focusing on the commercialization of stem cell therapeutics, to promote it as a "new growth engine (*shinsŏngjangdongnyŏk*)."

The Korea Food and Drug Administration (KFDA) has already approved four stem cell therapeutics for commercial uses, and is relaxing regulations on clinical trials for them. It is not only the government that is investing in the promise of stem cells. Many researchers are working on stem cells as they appear promising to them or to their funding agencies. But, the proliferation of stem cell promise is more explicit in the consumer markets. As of January 2013, about 8,000 Korean patients have received stem cell treatments through a company that offshore stem cell treatments. Many cosmetics brands have been selling expensive skin care products that contain the medium in which stem cells were cultured, which were

initially marketed as “stem cell cosmetics” until the KFDA banned it because the term could “exaggerate” the products’ effectiveness. Cosmetic surgery centers, too, have started joining the stem cell bandwagon (Fujimura 1988), equipped with cell processing systems such as SmartPrep®2 with which one could isolate supposedly “regenerative cells” for “stem cell breast augmentation,” hair loss treatments, and other types of anti-aging cosmetic surgery. Salespersons from umbilical cord blood banks would tell the potential clients that it is not only for leukemia (for which cord blood transplantation has been used), but also for various diseases for which stem cells from cord blood could be used. For the adults who had no chance to store their cord bloods but are worried about their future health, autologous stem cell banking programs are sold as a kind of “bio-insurance.” In the stock market, companies that work on stem cells or are related to stem cell companies, categorized as “stem cell theme stocks,” have been the targets of speculative personal traders. “Stem cells” also appear in the advertisement for nutritious supplements and guidebooks on healthy lifestyles.

All in all, stem cells as a name has a certain purchase in Korea as something promising—promising youthful life, healthy future, and economic prosperity. It may not be true that “everyone loves stem cells,” but at least most Koreans, in whatever ways, are aware of the promise(s) of stem cells, and making investment in them. There is a generic promise of stem cells—regenerative medicine that would bring cures for all the incurable conditions tied to cellular degeneration—which is yet to be realized. In the markets where stem cell promises are sold, this general promise is differentiated into specific promises, and they proliferate by attracting small and large investments in those promises. These promises enable the flows of tissues, cash, labor, and stories that are vital for the maintenance of the stem cell enterprise. The promises of biology proliferate, as they generate and rely on certain visions of future and affects

tied to them among the promisees. This is an ethnography of stem cell promises, as they differentiate, proliferate, and mutate in the promissory marketplaces of the Korean stem cell enterprise. I view stem cells as a promissory thing—an object that is constituted by and generative of engagements and commitments among promisees in anticipations of future(s) to come. It is not simply that promises are attached to a given entity called stem cells. The stem cell entity as it is studied and taken care of in the present moment could come into being precisely because they are promising, and the entity form is apt for the promissory economy. The imagery of stem cells, an entity that holds the vital potential and from which different futures can unfold, an entity that anticipates the coming of the future, is central in the promissory economy surrounding stem cells.

There is a generic promise in the stem cell enterprise: stem cells will offer cures to various kinds of incurable conditions that are caused by damage or degeneration of tissues. The biological property of stem cells, stemness is the material anchor for this generic promise. And, this seems to be good enough to draw investment in stem cell research. However, it is not that the promise automatically sustains itself without any input. If the promise does not appear “promising” any longer, it is not a promise; it loses its force. While promising might occur at one point, the promisee can always find it void, and cease to be a promisee. It can be done when the promise is completely broken. But even before, if the credibility does not hold any longer or the promise’s realization is deferred too long for the promisee to wait any more, the promisee may cease to be a promisee. Hence, the promise should be constantly reiterated; data should be generated, papers need to be published, and clinical trials need to be planned or conducted. Giving the sense of “progress” fills in the gap between the time the promise was made, and the future when it will have been realized. Research is done to “move forward,” but it also helps

keep the promise in its proper place; the anticipatory present in which the future is around the corner. Without this movement, promises could easily lose their appeal and force of seduction. The promisee can also give up, or simply forget about the promise. In other words, the promise needs to be fed by promisees' engagements; otherwise, it will be worn out—or it will lose its life. Indeed, promises need to be fed with those people's commitments. In each chapter, I visit different sites where promisees' commitments are feeding in the stem cell enterprise.

A simple and crude question that runs through following chapters is: how do stem cells proliferate in Korea as it generates and exploits excitement, hope, and expectations? Then, what does their vitality do in the world even while they stay in the state of the potential? By “proliferation,” I mean both proliferation of stem cells both as a biological object, a life form which is maintained in a certain, undifferentiated state in labs, but also a semiotic entity that embodies promises about the future. In turn, the vitality of stem cells that I am interested in is not “vitality” in a strictly biological sense, but liveliness of cells as they emerge in material-semiotic practices (Haraway 1997), through which stem cells come to embody promises with which people come to engage. The material qualities and biological features of stem cells still matter, as they allow promises to anchor onto them. Yet, as I argue throughout this dissertation, these features come to matter as they are able to incorporate lively promises in the image of “life itself” they are seen to embody.

The first half of the dissertation looks at three different bodies of promisees as they provide the conditions to produce the promises of stem cell biology. If stem cell science, in the context of regenerative medicine, is focused on how to make stem cells work in people's bodies to realize its promise, there should at least three different kinds of bodies are at work. Donors' body provides the materials from which stem cells can be derived; researchers' body is needed to

derive stem cells and make them work; and, patients' body should be recruited to prove the efficacy (along with safety) of stem cells. One may also add animals that are employed and/or sacrificed for in vivo studies in the lab (for similar reasons to patients' body), that have been sacrificed to produce serums used in the lab (like donor's body, although it appears to be more cruel), and workers other than researchers, like janitors, to maintain research environments (somewhat similar to certain part of researchers' labor) to the list. Yet, what makes the first set of bodies different from the second one is that the former bodies are brought to this scene as they are engaged by and committed to the promise of biology. Without those bodies, the promises of biology can hardly be reproduced. The promises of stem cell biology are anchored to the vital properties of stem cells, as a kind of abstract and autonomous form of "life itself" which in turn can be controlled by ingenious technologies and "reverse" bodily time with their own vitality. From the bodies of donors, those vital materials are extracted; through researchers' bodily labor, stem cells are maintained vital and put to work to produce data on stem cells; and in the bodies of patients, stem cells come to "work" to produce efficacy. Through their bodies and labors, stem cells and their promises are made vital, lively, and valuable. These bodies, committed to the promise of biology, in turn come to reproduce the promise of biology. The promises of biology make people work, and people make the promise of biology work. These bodies, then, can be seen as sites where the promises of biology are (re)produced in a peculiar way—producing the image of the vitality, or life itself, contained in the entity of stem cells.

The promise of stem cell biology, manipulating the abstract form of vitality to accrue specific, functional cells, does not stay in the labs, or in the scientific community. The second half of the dissertation follows how the stem cell promises proliferate in contemporary Korea as stem cells are inserted into the speculative future-oriented narratives where the future is already

being lived through faith, anxieties, and dreams. A promise exerts a kind of force not only to *engage* people in the way it was anticipated, but it is amplified and mutated in other places. They are circulated beyond the presumably proper place for itself (the scientific community) often begetting other ancillary promises. They proliferate, often mutating into something else, in the milieu that can accommodate it. Of course, all these living processes of promise cannot be sustained without bodies that produce the evidences of future. Backed up by the appearance of (future) success or the credibility of stem cell promise, different kinds of promise that have stakes on the stem cell future can proliferate. The popularity of the term “stem cells” in Korea associated with the image of cutting-edge technology that has the capacity of “regeneration” (*chaesaeng*) has permeated into the “anti-aging” market in which stem cells appear to remove the trace of time in the present (anti-aging cosmetics and plastic surgery), or in the future (stem cell banking as “bio-insurance”). Coupled with the anxieties about aging in Korea, the stem cell promises mutate into another form—if you do not prepare for the future with this promissory thing, you are damned. The promise of stem cells for regeneration can be taken to a church and get combined with the promise of God’s providence. It also sneaks into the stock market to seduce “ants” (personal investors) to trade the stocks. While scientists keep saying that the promises of stem cell biology is yet to be realized, it goes viral, proliferates through various channels, mutates into different forms, and infect others. This proliferation of stem cell promises is often related to stem cell companies’ strategies to accrue short-term profit, improve the cash-flow, or diversify channels for marketing. Yet, it is not simply “selling” the promises of stem cell biology in a commercialized form. Yet, when the promises of stem cell biology are sold in other venues, they are not simply inserted in the existing network. Their forms mutate, stem cells themselves are taken on different meanings following the forms of existing stories of life. At the

same time, the stem cell promise infects and affects the site where it migrates and proliferates. If the first part, *The Promises of Biology*, has dealt with the ways in which stem cells are reproduced as a potent entity, via the medium of bodies, fed by bodily labors of people committed to the promise, hence substantiates the promise, the second part, *Biology of Promises*, explores how the promises of stem cell biology sneak into other promissory markets, transfect those markets, replicate the regenerative promises there, and proliferate there while often mutating into different forms of promises (and threats) like a living thing. Stem cell promises find niches in places where the desire for health and wealth are encouraged, and the anxieties about the passage of time are amplified. Like a living thing, the stem cell promise constantly finds and recreates its niches, its living milieu, and change itself into some other forms. What is left intact, however, is the notion of biological potential of stem cells, as it makes it possible for the promise to enfold very different visions of future (whether promising or threatening) within the stem cell entity, the object of investment.

FROM AN ENTITY TO THE MEDIUM

As part of my fieldwork, I have worked in a placenta research lab where researchers were working with stem cells derived from the placenta. Youngmi was one of the grad student researchers in the lab. She once told me how placentas are attractive as a research material. She said, “If you think the chick is the sole protagonist, the yolk that forms the chick body would interest you. But, you might see something else if you look at the egg white. In a similar way, you can see a different aspect of human development by looking at the placenta, instead of focusing on how the blastocyst forms a human body.” It may not be the best comparison to make, given the different embryonic development process in these two species, but at least it made good sense to me, and I was also drawn to placenta as a thing that matters rather than as a

mere background for the protagonist's development. Like an egg white, it does not form the body in itself. After successful development, it ceases to function, it ceases to exist. It is an interesting thing in this sense. Its existence is only temporary, its presence is not very obvious, yet it does a vital function in the vital process of development. The embryo cannot develop without it.

One may think of promisees and their work through the figure of placenta, promisees and their commitments as a placental ground for the proliferation of stem cells and their promises. Rather than focusing on stem cells themselves, it drew my attention to the medium or media that feed stem cells of which words and people are part of. The placenta recalls the figure of "scaffolding" that Renato Rosaldo (2013) speaks of in the context of ethnographic writing. He compares ethnographic works to building an edifice. While everyday life is full of all the mundane encounters with people and an ethnographer is only able to survive by the help of all those helping hands, Rosaldo says, they disappear when the ethnographer finishes building the edifice called "ethnography". They are like scaffolding. The scaffoldings in Rosaldo's case are made present while he was recollecting the day of Michelle Rosaldo's death. Without their care, his coping with the death might have been quite different. Scaffoldings could be another name for placentas, the media, words, things, and people that sustain the lively ecology of promises. They are not necessarily directed to the success of the stem cell enterprise. Their works are all made for different objects of care. *Somehow*, stem cells grow in them, and the media also become lively with their promises.

For this reason, I incorporated media analysis as an important part of my dissertation. Media analysis has its own problem especially in the era of digital media where news articles are produced and consumed in a very fast pace, and often travel in different places out of contexts.

As a source of “information,” media materials are often not very reliable. Yet, they are useful when looking at the economy of attention as they are nodes that garner attention about stem cells. I include analysis of dialogues in online forums, particularly of biologist’s forum, patient forums and stock investors’ forums. One may consider them as less genuine sources as they are words that are spoken without the presence of speakers. They might be simply made up, and they might be not so serious. However, they are also part of this ecology of which proliferation of words is an important part. Words, reliable or not, scientifically verified or not, accurate or not, proliferate and people come to learn about stem cells through those words.

HOW STEM CELLS CAME TO KOREA?

Before closing the introduction, let me once again go back to the stamp that was issued in 2005 to celebrate SCNT-hESC. Why was a scientific report on SCNT-hESCs such a big deal? It was not just the promise of saving life that made stem cells so significant in Korea. Stem cells came to Korea with Hwang—although there were researchers who had been studying stem cells prior to Hwang’s popular success in 2004, stem cells had not been known much among the public before Hwang. The enormous attention that the public paid to Hwang and his “stem cells” is a pre-text for the Korean stem cell enterprise as of now, where “everyone loves stem cells” or at least “stem cells” can appear as something extremely promising to most ordinary people in Korea. Let me add a few words how it was possible.

Hwang Woo-suk was a professor of veterinary medicine at Seoul National University. Born as a son of a peasant farmer in 1953, the last year of the Korean war, he was one among many post-war baby boomers who overcame the poverty only through his hard work that can “move the heaven’s heart (*Hanŭrŭl Kamdongshik’ida*).” Hwang was a perfect figure that reminds the old promise of the nation-state in its post-Korean war development, which seemed to

have been crashed in the 1997 Asian Financial Crisis (called as the “IMF Crisis” among Koreans)—hard work rewards (if you do it, it will be done!). At the same time, stem cells that Hwang was studying at the time also conveyed the new promise of cutting-edge biotechnology and global recognition.

His first and second reports on the successful establishment of SCNT-hESC lines including improvements in the method and efficiency have attracted attention from scientists and international media, as well as the Korean public. Hwang may raise Gang Won-rae, a formerly dancer/singer from a team called “Clone” (what a great coincidence!) who was paralyzed a few years ago. He and his research would bring cures to incurable patients in Korea and all over the world. It was a “Korean” achievement that was done in Korea, by Korean scientists. Not only accruing enormous economic value from stem cell treatments, it was to increase the value of “Korea” as a brand, connecting “Bio-Korea” to “Buy Korea”² (KoreaPlus 2004). All in all, Hwang’s breakthrough was taken not only as a scientific breakthrough, but also as a breakthrough for the nation itself. President Roh, for instance, exclaimed after his visit to Hwang’s lab in 2003, “was so moved in my heart to the extent that my body would tremble as if I got an electric shock.” On the same day, Roh, commenting on Hwang’s other achievements, said, “I felt it was not a technology, but magic. I have been grappling with the question where to find the potential and hope for the new era of Northeast Asian prosperity and peace and the era of \$20K [GNP] for Korea, and I found an assuring evidence” (quoted in Shin 2005). On the level of official politico-economic discourse, it can be read as an instantiation of technonationalism

² “Buy Korea” was a commercial campaign slogan for a mutual fund investment program that Hyundai Securities put in the market in 1999. Emphasizing that the Korean economy was devalued due to the financial crisis, the campaign spoke to the Korean public to “invest in Korea” with “firm belief in the Korean economy.” In the quote above, “Buy Korea” was not used in relation to this specific campaign, but to emphasize how to attract foreign investments and attention to Korea.

born out of the Park Jung-Hee regime, and its “neoliberal” variation in which the nation-state takes the form of corporation and seeks the “future growth engine” (Kim 2006).³ But, what moved President Roh was not just its profitability or potential for growth; it was the magical power of biotechnology that suddenly presented him the vision of the new era, the opening toward another era that he (or Korea) has never anticipated. He, in other words, finds a new promise from Hwang for a New Korea.

It is not simply the promise of “national growth” that excited so many Koreans at the time, but also the kind of imagination about the future that Hwang opened up. For instance, Jeong-ok In, a popular Korean TV drama writer, commented in 2005 on Hwang’s breakthroughs as an event that brought the “future” to Korea, made Korea as a place where the future is now being produced. While distancing herself from chauvinists or nationalists (those ideologies are just ‘blah,’ she said), she emphasized how the fact that this future technology is being made in Seoul, Korea made her imagine the future differently—as something within her reach. Future is being made alive, and it is, for her, a matter of imagination, or the limit of imagination posed by Korea’s place in the world. Hence, she writes, “the future was not something that I would dare imagine [before Hwang]. [If it had not been Hwang,] I might have been sitting in the corner today, just like that time when the future was so distant. Imagination would expire not being able

³ Much has been discussed on the nationalist impulse in the public reaction to the Hwang Scandal in Korea. See the articles featured in the special issue of EASTS on the Hwang Scandal (Hong 2008). Looking at Hwang’s fans who actively supported Hwang after the Scandal, Jongyoung Kim (2009) has drawn attention to the nationalist sentiment in the “public feeling for science” in Korea. Charis Thompson (2010) has discussed Hwang Woo-suk as an emblematic figure of Korean nationalism compared to Singaporean internationalism epitomized by the figure of Biopolis. Herbert Gotweis and Byoungsoo Kim (2009) have situated the Hwang Scandal in a larger trend of “bionationalism” in which ethnicity is biologically and scientifically reconfigured. Instead of looking at the Hwang Scandal as a specifically Korean phenomenon, Choon Key Chekar and Jenny Kitzinger (2007) analyze the media coverage on the Korean hESC research and Hwang to point out the pervasiveness of the discourses of national culture. Sang-hyun Kim’s analysis of the hESC debate in Korea (2014) highlights how the technoscientific imaginary in Korea has been shaped over the goal of national development in terms of industrial competitiveness, and how activists have challenged it with an alternative vision of democracy and social justice. These studies point to an important aspect of the Hwang Scandal embedded in what Kim (2014) calls “national sociotechnical imaginaries.”

to fly in the sky [...]” It is not simply a promise of the national growth, but a promise of a New Korea in which one is allowed to imagine, speculate, and hope for the future that is qualitatively different from the present. Hwang embodied, to In, a promise of the future-oriented vision itself, not a threat, but a promise—a promise that one can now become a promisee, someone who can be part of this enterprise of producing future (rather than repeating what has already been done).

It was the time when Koreans were seeking new futures, possibilities of change, hope, and/or dreams for whatever reasons. What Hwang offered was not just the promise to produce economic, therapeutic, and scientific value in the future with stem cells. It was the future itself, the promise itself that will unfold from Hwang himself and “his” stem cells. Even more—he also was the figure of old Korean promise of hard work. Hwang and his stem cells could *engage* people who were seeking promises, openings toward the future. Hence, it is not surprising that, when the suspicion about the facticity of Hwang’s claim was raised by investigative journalists and substantiated by professional and amateur biologists online, it became a national scandal that upset the majority of Koreans. It was the time when “everyone was talking about stem cells.”

Some opening and closing remarks of evening news shows may show the intensity of the scandal. On December 15, the MBC NewsDesk opened without usual greetings, but with an anchorman’s quivering voice begging the audiences to mentally prepare: “Oh, my fellow people, how should I deliver this news to you?” He quickly moved onto the headline news: “It is said that there is no stem cell of Prof. Hwang Woo-suk.” The report necessitated reactions from Hwang and his former collaborator to have back-to-back press conferences next day. The back-to-back conferences and contradictory testimonies discredited Hwang immensely; made his claim over the successful establishment of hESC lines suspicious. The closing remark of NewsDesk on the day was made, quoting “foreign” news, stating “because of the stem cell

controversy, our country is now in a state of ‘national depression’.” It was the loss of a moment of “great hope” (or in retrospect, one may call it hype), promises, and futures with the hard evidences that Hwang’s stem cell promise might have been just fabricated.

Through this national hype and scandal over Hwang and “his” stem cells, stem cells has entered the vocabulary of ordinary Koreans, as cells “that can become anything” and something that is incredibly promising to cause such intense responses. It does not matter so much what stem cells “exactly” are. While stem cell researchers in Korea were worried that the public associates stem cells with Hwang (and fraud), the intensity of the Hwang Scandal and heated discussions on “stem cells” have taught many Koreans that stem cells are something of significance, are something very promising *whatever they are*—otherwise, why people would have spent so much time on a scientific paper? The Hwang Scandal left traces to life of people who took the promise of stem cells seriously. Wi, the woman who donated eggs for Hwang’s research, was one of them—you will soon meet her words, I promise.

PART I:
THE PROMISES OF BIOLOGY

CHAPTER 1

Giving My Little Life

Dear Professor Hwang Woo-suk,

Not knowing what to say first, I have been hesitating for a while. Your haggard face in the sickbed is still lingering before my eyes. Yet, some press portrayed you as just being clever “making up your image.” Even though it is now revealed that most of your achievements, including those articles, were fabricated, I still wish I could return to the time when I was calling you “professor”, no, rather, “*sönsaengnim*”. What went awry, since when, and why? I believed you were the one who had genuine and unconditional passion for life; now, however, my faith in you turned into an empty one that no one would believe. The situation now came to be irreversible—any word that comes from you cannot reverse it.

You said you would “resign from the commander position, and return to a commoner” in the press conference to apologize to the nation for the egg-supply problem. Indeed, I was glad that you said it more than anyone else. For I was feeling something like pity for your move that appeared to become more and more political, rather than staying committed to your own duty as a researcher. How come you, who appeared armed with modesty and diligence, become a protagonist of a swindle against the nation, obsessed with ambition? Any word is not good enough to express how much I was shocked and devastated. My feelings would be different from the patients of incurable diseases or other ordinary Koreans. Such a misery of mine involved the pain of observing my personal trust broken.

Moreover, where and for what did you use my precious eggs that you had retrieved? Although I had never given birth to a baby, I realized what affection for *salbuchi* (close kin) is like, thinking “oh, it is exactly what life is”. It might be the case I was able to endure whatever pain and side effects afterwards, because donating my eggs was the first occasion for me to feel proud of having been born as a woman. I gave my little life to aid the work of saving life, but now I lost the warmth of life. Is it just the case that blood and tear of quite a few women would be swept away this way? Is it the same case for the incurable disease patients and their families?

Mass media coverage is misleading people, and other involved parties are busy trying to get out of the situation—they are also hurting me, distressing me. Prof Hwang, it’s still okay, so please restore the broken trust with your honesty. You should admit your wrongdoings, and make a more serious decision than “returning to a commoner”. And, if you can do it, please make your best efforts in stem cell research to make achievements. That is the only way to save me, many others, and you. The weather is very cold. I really wish my heart to be warmed.

December 23, 2005

A woman who donated the eggs with wishes to overcome incurable diseases

The letter was written by a woman, known by her last name Wi, who signed not by her name, or as “an egg donor,” but as “a woman who donated the eggs with wishes to overcome incurable diseases.” The letter appeared in a weekly magazine *Hangyeore 21* as a supplement to an article titled “The ‘Saintly Woman’ Is Groaning,” which covered Wi’s painful experiences of

egg donation and its emotional and bodily aftermaths. According to the coverage, Wi was inspired by Hwang's book *My Stories of Life (Nauŭ saengmyoŋg iyagi)*, and contacted Hwang to help his research by donating her eggs. Donating her eggs, however, was more than simply giving out eggs *as if* she had already had them as her properties. It involved her work to cultivate, maturate, and release the eggs in her bodily interior. She also suffered severe complications following the extraction procedure, which she could endure with the sense that she made an indispensable contribution to the life-saving enterprise. In the midst of the Hwang Scandal, she decided to speak out about her experiences to inform others about the risk of egg donation, and her letter was written and made public in this particular circumstance when the promisor's credibility collapsed. The letter is dated on December 23, 2005, which is the day when Investigation Committee confirmed that most of Hwang's data was fabricated. In the letter, she pronounces her "incommunicable disappointment" by saying "*now* I lost the warmth of life"—now, not earlier when she was suffering from the complications, but now when the promise turned out to be an empty one.

The way she recounts her story to Hwang to whom the letter was addressed draws attention to her experiences as an egg donor are inextricable from the promise of regenerative medicine. Eggs substantiate her deep and unceasing bodily and affective engagements with the promise of regenerative biology through which she has become a donor-woman, a female participant in the enterprise of saving life. It is particularly evident in the way she talks about eggs as "life." In the letter, eggs are portrayed as "life" not simply as living cells that have biological life of their own, but as some fragments of her vitality ("giving my little life") which could connect herself to other people's life ("warmth of life") and also as her kin that she herself bore ("affection for *salbuchŭ*"). While eggs might have appeared just as raw materials for

research to Hwang, the recipient (except that they were hard to obtain and central in his experiment), Wi, the donor, *conceived* these eggs as her kin through her affective and bodily engagements with the promise of sharing the warmth of life with others. The way she felt about her “little life” in the past shows one of the possible ways life is conceived and felt by people whose bodies are implicated in the promise of biology.

In this chapter, I attend to the multivalent language of “life” in Wi’s letter and the few stories she told the media as it offers an insight into “egg donation” for the promise of stem cell biology that exceeds the languages of “gift” and “informed consent.” The language of “gift” can be misleading in the context of tissue donation as the act of “giving” often involves more than the simple exchange of things between two parties. It is not only in a sense that the “gift” becomes a “commodity” that anticipates commercial values (Waldby and Mitchell 2006), but also that the “gift” itself has to be produced in order to be “given,” which may require certain bodily and affective labor on the part of the “donor” which exceeds what is implied by the word “donation.” “Informed consent” poses another problem as the affective engagement that the promise garners can exceed the limit of “knowing.” While the “informed consent” is supposedly a liberal individual subject which could make one’s decision autonomously on the basis of individual risks and benefits of one’s participation (Callahan 2003), the object of “promise” (or promisee) is different from the subject of informed consent as participation takes her into the promise’s own narrative and temporality that goes well beyond the moment of “donation” and the scope of “informed consent.” A corollary problem that I will address is how the principle of “informed consent,” somewhat problematically, becomes an important element in Wi’s story as a victim that “groans” (rather than making an articulate voice), when it is narrated in the media, feminist discussions, and court. Wi’s story was often rehearsed to address the exploitation of

women's reproductive bodies in stem cell research by technoscience, capital, and the nation-state. In this discursive terrain, it was constantly emphasized that Wi was not well informed about the consequences and she therefore had to go through enormous pain that she had never anticipated. Her pain and ignorance would speak for her in the court, to the state, and to the public to make a case against the shameless exploitation of women's bodies. In this context, Wi's letter was read as an evidence of her therapeutic misconception (Magnus and Cho 2005, Cho 2006), vulnerability, or ignorance. As she was made into a "witness" to the violent exploitation of women's bodies by biotechnology, her own account of "life" remained as a kind of surplus.

Rather than taking Wi's story an exemplary story of an egg donor, I read her story as her own theory of "life" that she developed as a promisee who came to conceive and problematize "life" through the promise of biology. It is situated in her experiences of living with the promise of biology, becoming the body that accommodates the promise, and living through the scandal of broken promise. Her own conception of life allows us to shift attention from the body itself—enveloped with skin and conceptualized as a site for an individual's sovereignty—, to the processes that are accommodated by her bodily and affective investment in the promise of biology and her hope for giving life to other people. Wi's letter, particularly when she writes how she felt about her act of donation before the scandal, vividly describes the conception of life that could be garnered by the promise of biology. When Wi, the egg donor, was attempting to account for her incommunicable experiences, she was speaking not merely as a victim who was deceived, exploited, and alienated by the irresponsible promisor, but also as a significant participant in the research who could make a claim on the broken promise, drawing on the various cultural scripts available to her. "Life" in her story is not only a simple category to designate a certain quality inherent in living things, but rather it is an animate force that affects

her in diverse ways (“warmth”), which she also animates as she relates and attends to it (comparable to “giving birth to a baby”) in her engagement with the promise of biology.

Her story of “life” is not out of naiveté. Rather, it appears as a response to the discourses that cannot see that eggs are her little life, her kin, her gift to the world, and product of living processes. Her eggs are the products of reproductive/regenerative labor (Cooper and Waldby 2013, Dickenson 2001, Waldby 2008, Waldby and Cooper 2010), but they also exceed the language of “productivity” as she related with them in a quite intimate way. Wi’s experiences tell more than how the female body is being objectified and exploited by technology, capital, and the state. Her account of “life” urges us to consider how the promise of (re)generation of “life” works in the contemporary bio-economy that problematizes the notion of an autonomous individual and the narrow focus on the “property in the body” (Dickenson 2001). Implicated in the problematic relation between biotechnology, state, and capital, which has begotten a peculiar life form, eggs as the raw materials for stem cell research, her body has lived through the promise and hope of stem cell technology as her own. Her account of eggs as her little life suggests a different mode of “mattering” (Barad 2007)—eggs not as things that are alienated at the moment of donation, but as part of her person that will keep her intimate with the promise of biology and to the enterprise of saving life. As I will discuss later, the egg is not simply a given substance that can be alienated, but a thing that “matters” in the phenomenon of stem cell promise and in the bodily phenomenon, whose meanings and materialities were realized when Wi became an egg donor. What was really scandalous and exploitative was not the physical harm or extraction itself, but the collapse of the promise.

Her story has a certain ambiguity. Her agency as an active participant of the stem cell enterprise is closely tied to the “objectification” of her body and “alienation” of herself from her

body part (eggs). This ambiguity is, however, negated at some moment. My goal in this chapter is to dwell on the ambiguity. In the following, I will first recap Wi's story as it is presented through the media. Then, I will introduce an occasion in which the ambiguity in her story is observed, but carefully quarantined, if not ignored, by a feminist scholar and situate it within the political struggle over "reproductive rights" among Korean feminists. Then, I will move into the quarantine to attend to how Wi has experienced the giving of life—not simply as a donation of eggs in an already objectified form— that necessitated her to explicate the experience in a manner that the languages of "bioethics" or women's "rights" would hardly grasp. Inhabiting the story she tells about egg donation, I problematize the idea of "egg donation" that focuses exclusively on the traffic of eggs *as if* the egg were self-evidently a "thing" that can be easily detached and transferred. In Wi's account, the relation between the donor and her eggs appears more than one between a person and her body part. Rather, Wi and the eggs came into being as a "donor" and her gift through the donation procedure, and could animate each other within the vital promise of stem cell biology. The "relation" was not terminated at the moment of "alienation" of eggs from her body. Indeed, when the promise turned out to be broken, it became clear that what she did was not "donating eggs," but was a deep and affective commitment with the promise of biology, which instigated her to do a kind of bodily and affective labor that was extended well beyond the procurement procedure itself.

The story can still read as a story of deception and exploitation of women in which she was once a victim, and became a "survivor" (Tsuge and Hong 2011), and there are reasons for this kind of narration. If we focus exclusively on deception, however, we may miss a point—the power of promise that garners affective investments from the promisees. The promisees are

simultaneously invited to the promised future and exposed to the potential for the scandalous future.

FROM INSPIRATION TO DISENCHANTMENT

Wi,⁴ a 27 year-old woman happened to pick up a book titled *My Story of Life*. It was a collection of essays that were independently written by two prominent Korean biologists—Hwang Woo-suk and Choi Jae-cheon (2004). In this book, Hwang weaved his fable-like personal life stories with stories about his thoughts about life as a biologist. The book inspired her to participate in stem cell research as a donor in January 2005. She called his lab, met up with Hwang in person, had another meeting with Curie Ahn, a female physician and Hwang’s collaborator, and signed an informed consent form. She went through two medical exams to determine if she could donate her eggs. There was some concern raised in the first exam, but the second exam confirmed that she could donate her eggs. She started injecting hormones for superovulation. Like many women going through the IVF procedure, she did it everyday on her own since she had no time to go to the hospital for an injection due to her work schedule. While administering the hormone, she recognized some discomfort in her body. She had some fever, an uneasy feeling in her abdomen, and some mental pressure. Within a few weeks, she went through the surgical procedure to extract oocytes from her body.

After the procedure on one Saturday morning, she came back home, exhausted. So groggy, she slept through the weekend. Two days later, she got a phone call from Hwang. He appreciated her “effort,” and informed her the eggs were “good.” She asked *how many* eggs were

⁴ Wi’s story that I am recounting in this chapter and her words quoted are based on the news coverage, mainly “The ‘Sainly Woman’ Is Groaning,” and “After the Egg Donation: The Story Told by the ‘Hwang Woo-suk’s Angel’” (Shin and Lee 2006).

extracted, and was told that the number was “a little over twenty.” In the meantime, she was suffering from the aftermath of the egg donation procedure. She had significant swelling in her abdomen, found it difficult to move her body and even to breathe. She called Hwang, who he referred her to Ahn, because he was “a vet who studied with focus on animals, so [didn’t] know much about human body, especially a woman’s body.” When heard from Wi, Ahn was astonished, and sent her to the ER in the hospital where the eggs were retrieved. She was hospitalized a few more times. In severe pain, she didn’t make it to a family gathering for the lunar New Year’s Day—her family did not know about the donation at all— and she was too ill at the time.

While she was suffering from health problems after the procedure, she was also happy to hear the great news about Hwang’s 2005 paper published in *Science* on deriving patient-specific stem cell lines. Hwang himself made a phone call to her in May 2005, after he published the second paper on SCNT-hESCs, and she congratulated him for his great achievement. Hwang said to her, “I am greatly indebted to you. I wished I could address your name in the public venue. You know whom I am thankful to the most,” as an acknowledgement of her contribution. Hwang further promised to show her the experiment in his lab, which she had never got to see. To thank her, he also sent her a personal gift, a set of dishes and bowls, which she would happily use until the Hwang Scandal. She kept in touch with Hwang until the early December 2005. When the suspicions about illicit egg procurement and data fabrication were raised, she felt the situation was somewhat serious. On the day that Hwang appeared in the media, lying in the hospital bed as a stressed-out, fatigued patient, she tried to call him to cheer him up, but he would not pick up the phone. She left a text message to express her support, and he called her back later to say he was not guilty and all the doubts would be resolved.

The doubts were finally resolved by the investigation committee—but not in the way Hwang suggested, as it disproved all the claims he had made. Having learned that there was no stem cell made, none of Hwang’s promises were based on the reality, Wi once again tried to talk to him on the phone. No answer. She wanted to ask about where the eggs went, what the eggs were used for. She wanted to know. She wanted to be informed. But this time, Hwang would never get back to her.

In late December 2005, Wi decided to speak about her experiences to inform other people about the risks of egg donation. When illicit egg donation became an issue, there was a movement organized online for “voluntary egg donation” to support Hwang. In the early December, more than a thousand women expressed their intention on an online forum. And, on December 6, there was a ceremony to “deliver a thousand women’s intent to donate their eggs” at the Seoul National University where Hwang held a professorship. The spectacle of “voluntary egg donation” might have alarmed her. However, it was not until Hwang’s promise collapsed that her experience was made public through the media.

Throughout the year, she was suffering from the aftermaths of egg donation. Her depression worsened, she couldn’t sleep well, she lost weights, and she kept getting sick. She could not keep up with her job due to the health issues. A Korean medicine doctor that she was seeing shared her suspicion that her illness might be the result of the procedure. With the support of feminist organizations and a lawyer, Wi, with another woman who donated her eggs hoping to cure her brother, filed a lawsuit against the hospital that was responsible for the actual retrieval procedure and the government that was responsible for the oversight of ethical conduct of research. In the press conference, she pronounced her “fear,” or indeed “fears” about uncertain futures. She said, “I fear that my body and mind won’t get better, and that what I am saying now

might not generate universal empathy and support from many others. What is more is the fear of infertility. There's no way to confirm whether I am infertile or not. It's said that I will be able to know after I get married—within a year of normal marital life. Since sterility is a big flaw in a patriarchal society centering on blood relations, my biggest fear is that I may not conceive another life” (Anonymous 2006).

However, the plaintiffs lost the case. The court rejected their restitution claims on the basis that physical and mental damages were not considerably significant. The judge pointed out that the side effects were noted on the informed consent form, and reasoned that they were not uninformed. Although the explanation in informed consent practice was not sufficient, the court reasoned, it was not significantly insufficient to lead them to a wrong decision. The court also denied the plaintiffs' claim that Hwang's data fabrication affected them. The decision was held in the court of appeals. The court would only consider the “complications” directly related to the egg donation procedure and the formality of informed consent. But, if there had not been the promise of saving life, reaffirmed by Hwang's fabricated paper, would Wi have acted the same? If Wi had not trusted Hwang and his promise, would she have felt so disappointed when his wrongdoings were unveiled? The court was not willing to ask these questions. What matters is only the intention and direct consequences. Hwang might have not intended to deceive donors, so the donors might have not been deceived. Yet, he promised, not in a contractual sense, but in a way that committed these donors, without needing to take the responsibility himself. Anyway, Hwang's promise was only a generic one, not a personal one, which concerned the advancement of science. The court could not listen to the promisees' voice outside of the formality of informed consent through which the uncertainties were informed.

The court decision reveals the problem of informed consent, conceived as a “discrete act of choice” (Corrigan 2003:787), as well as the limit of informing of the uncertainties (George 2007). While it is assumed as a legal and ethical “gatekeeper” that allows patients or research subjects to have control over the decision-making process, it simultaneously shifts the responsibility regarding risks and uncertainties to the patients or research subjects (Ikemoto 2009:766). Furthermore, the concept of informed consent that is largely based on the model of rational choice can hardly accommodate the intuitive and emotional aspects involved in the decision-making processes (Little 2008). Wi’s case highlights the power of promise that involved very strong affects of hope and pleasure, and regret and pain that exceed what is assumed in the calculus of risk-benefit and rational choice. It begs questions about the viability of informed consent based on the model of rational choice and a peculiar temporal imaginary in which the moment of decision-making is singled out as the privileged endpoint of the deliberate informing practice rather than one of many moments of an on-going and potentially unceasing process.

However, the ethico-legal language of informed consent, rather than being challenged, was to prevail as a conceptual framework that shaped the discussion on egg donation. While the court did not listen to the plaintiffs’ claim that they were ill-informed and deceived, Wi was constantly portrayed as somebody who was ill-informed about the risks and deceived by Hwang in the media and feminist discussions. She herself also emphasized she had not known much about the medical risks of the procedure. The only way in which her experiences could be spoken about was to highlight the pain and her lack of knowledge about it, since she was a “voluntary” egg donor. The very “voluntariness” takes her decision out of a usual metric of

“coercion” and violence. Deception or inadequate informing, as well as suffering had to be staged in order to give her a place to speak out.

FOOTNOTING, OR REMOVING FROM THE MAIN STAGE

In the midst of the Hwang Scandal, eggs suddenly became a feminist “thing” in Korea. While many social critics discussed the nature of the Hwang Scandal in terms of nationalism, the place of science and technology in Korea, and the relation between (real) politics and science (Kim 2006, Hong 2008), Korean feminists looked into the gender politics of SCNT-hESC research in Korea as it is embedded in the expansion of IVF market since 1980s, technological infrastructure for research using gametes and embryos, and circulation of eggs in the IVF market in Korea (Paik 2006, Ha 2006). The disclosure that a large number of eggs used for Hwang's research were procured not through “voluntary donation” but purchased from egg vendors has become an important part of this discussion that connects IVF and stem cell research with emphasis on the trafficking of eggs. Feminist discussions in Korea that emerged from the Hwang Scandal were very generative and productive. Centering the IVF technology as a precursor or infrastructure for the stem cell enterprise in Korea, feminists in Korea have argued how women's reproductive bodies have been constantly rendered as an object of technological and medical intervention by the family, state, and capital from population control to stem cell research. The Hwang Scandal is construed, in a sense, as a reiteration of the state-capital's exploitation of women's reproductive bodies but now in a more explicit manner in the name of “national (economic) interests.” Hence, the feminist discourse at the time has focused much on the issues of women's health and reproductive rights *against* the state, capital, and technological interventions.

The main concern among feminists at the time was the question of women's rights over their reproductive body. "Surplus" embryos and eggs that were accumulated in the IVF clinics could exist there only because there are a number of women who subject their bodies to IVF technology's intervention due to the strong emphasis on patrilineal blood ties. From the perspective of reproductive health, this is construed as evidence of the medical practitioners' negligence of women's health as they care more about increasing success rates than conducting the procedure in a less invasive manner. The lack of regulations or guidelines on the number of eggs procured or embryos implanted in the context of IVF is construed as additional evidence of the state's lack of interest in women's health. All together, the problem of eggs, through the Hwang Scandal, offered an opportunity for Korean feminists to engage with the politics of new reproductive technologies, but in terms of women's rights *against* the state, patriarchal family norms, masculinist medical technologies, and capital.

The ways in which eggs and egg donation (and stem cell research in general) were politicized by feminist activists and scholars at the time are situated in the long-standing critique of the patriarchal family and the nation-state. While women's bodies were long conceived as the "womb" of the nation, an inexhaustible field for reproducing the nation's future that is subject to state control and mobilization, feminists have tried to liberate women's bodies from the control of the state and family. Women's bodies in this sense are in an antagonistic relationship with state power.

The presence of voluntary egg donors, staged through a spectacular "voluntary egg donation" campaign, was a disturbing problem, as these women put their bodies at risk of exploitation "voluntarily" for the "national interests (*kugik*)." And, Korean feminists responded to this situation by pointing out the patriotism behind the campaign and the possibility that egg

donors were not well aware of the risks of egg donation—problematizing the ideology behind the campaign and the potential malpractice of its execution. Indeed, patriotism was an obvious problem. The egg donation campaign which appalled feminist activists and scholars, as well as leftists, attracted more than a thousand women to sign up to be listed as potential egg donors responding to the criticism about Hwang’s illicit egg procurements. The campaign organizers staged the event as a patriotic one. When a woman signed up for donation online, *mugunghwa*, the national flower of Korea, would show up on the screen. An offline event to “deliver the intent for egg donation” that took place at the university campus where Hwang's lab was in was even more spectacular. The participants made a flower road from the building entrance to his office, and put, once again, *mugunghwa* flowers with messages on the ribbons. In response to the obvious patriotism that called for women’s “saintly” acts of egg donation, feminists have raised their voice against patriotism that exploit women's bodies for the national interests, and concern about the egg donor’s possible ignorance of the risks.

Hence, women’s bodies now appear to be a site upon which the power of state, capital, and patriarchal family is exerted. Then, the question became how to establish the means to protect women's bodies from the external forces. The subject of reproductive rights, then, was characterized by the rights to self-determination with the capacity to make a free choice over their bodies and reproductive processes without being coerced. In this discussion, the voluntariness of “voluntary” donors itself was interrogated as the product of ignorance, misconception, and patriotic ideology. Do the “voluntary” egg donors really know what it would take to get their eggs extracted? Do they really know that stem cells are not curing anyone yet? Can we say it is voluntary when they do not really know the consequence? Aren’t they really coerced by some other cultural factors—like their obligation as sisters or mothers of family

members with incurable conditions? It is not to say that feminists ignored the agency of egg donors all together. It can be seen as a strategic move to make room for the claims of “voluntary egg donors” even after the fact. If voluntariness means that the subject of the decision, the egg donor is solely responsible for the action and its consequences. Then, problematizing the voluntariness itself could be a way to protect the subject after the fact. When Wi's story is rehearsed in the media, in the feminist venues, and in the court, it was constantly emphasized that Wi had not been well informed about the consequences and she had to go through enormous pain that she had never anticipated. While this narrative of the donor's misconception, vulnerability, and ignorance, of course, conveys partial truths, Wi's letter also reveals how the “promise” of life was at work in a way that troubles the figure of liberal subject and the language of informed consent. This troubling aspect of donor's position as a promisee, however, was put in the background, if not removed.

Something that cannot be captured in the language of misconception and ignorance can be read from Wi's letter. Her active and affective engagements with the promise of stem cell research show both the power of the stem cell promise and the cultural imagination in which vitality is something that is able to circulate and connect people as biological kin. There is a certain overflow of affects that grasped my attention in the letter. Ju-hyun Cho, a Korean feminist sociologist, once recognized it in her article “Egg: Politics Structured Around the Vision of Biotechnology and the Touch of Women's Embodied Experience.” Cho's article is one among many scholarly and activist writings produced by feminists on the issue of egg donation in the aftermath of the Hwang Scandal. In this article, she grapples with the technofeminist question of how to take novel technologies that inherit the legacies from past injustice, yet are open to different futures. The whole article oscillates between the desire to appropriate technoscience

and the need to address what is happening on the ground. A passage from Wi's letter is quoted in this article as evidence of "therapeutic misconception" that led an egg donor to an ill-informed decision.

This woman says, while she did not know exactly where and for what her eggs are used, that she provided eggs for "the work to save life," i.e., help "curing" incurable diseases. In addition, she *construes (ihae)* her eggs as life, and that making stem cells is saving life, and, by saving (bigger) life by means of little life, her eggs could sustain life through connecting life. However, there is currently no "cure" that is based on embryonic stem cells whether they are from cloned embryos or surplus embryos from IVF cycles. To foreground what is hoped for in the future as the objective of research causes the egg donor woman to have a *misconception (ohae)* that her donated eggs are used for therapies. (Cho 2006: 19, emphasis added)

This excerpt follows a passage from Wi's letter, the third paragraph, where Wi asks Hwang where her precious eggs were used, says that they were really precious ones, which felt like her kin, and once again asks if hope for the cure is gone. The passage is full of vivid images of life that Wi experienced through the process of egg donation, and also of her disappointment that leads her ask what he *did* with the eggs if everything that he claimed was simply fabricated. Even though Wi might have assumed that the eggs would directly be used to cure patients, it is hard to say whether it was indeed therapeutic misconception or not. If stem cell lines had been established from Wi's eggs—which turned out to be not the case— they might have been used for therapeutic means, or as research tools. The consequences are still open-ended, and "misconception" might not be the apt term. These are inferred rather than observed; Wi never mentions that she thought that those eggs would be used directly for cures.

However, what is also apparent in Wi's paragraph, and throughout her letter, is her emotional attachments to her eggs and to the patients and their family members that she thought she would help. Her imagination that her little life connects her to other people seems to capture

an emergent imaginary of biosocial relatedness⁵. Cho also touches on this point (“she construes”), but it is placed between “while she did not know” (lack of knowledge) and “a misconception” [that the therapeutic promise could entail], which renders this peculiar imaginary rather trivial. It is not to say that Cho could not observe this point, or ignore it. She indeed discusses this matter in her *footnote*, not in the main text, that the connection the egg donor perceives resonates with what is observed in many experiences of maternal relations. Cho further suggests this kind of embodied experiences that are not “translated into ‘[reproductive] rights’” or narrowly defined as “woman’s ‘rights to self-determination over her body,’ or ‘rights to bodily integrity,’” based on the notion of property ownership should be given more attention. Here, Cho acknowledges that Wi’s experiences have the potential to open us up to a different imagination about “reproduction” than it is pronounced through the notion of “reproductive rights” in an attempt at politicizing reproduction. However, the suggestion to extend our imagination and language about reproduction is only left in the footnote, an ancillary, rather than a “main” point. What should stay in the main stage, under the spotlight, and what should be put in the background are clearly determined. But, why does it have to be so clear?

To do justice to Cho, the article pays close attention to the tension between the bodily experience and the segmentation of body, and she notices the significance of “my little life” in Wi’s account. The article opens with a discussion of the representation of eggs dissociated from women’s body and magnified under the microscope onto the screen as an experimental object.

⁵ In the wake of new genetic technologies, Paul Rabinow (1996) has introduced the term “biosociality” in order to highlight the collapse of nature/culture dichotomy and the remaking of nature to be modeled on culture through which our social life will be reshaped. For instance, biological “facts” about certain diseases increasingly shape people’s identities and practices creating new norms, actions, and collectives (Rapp 1999, Novas 2006). Here, I use the term “biosocial relatedness” to draw attention to how the donor made sense of her act of donation not simply in terms of giving out eggs, but as sharing life through the notion of tissues (here, eggs and stem cells) that contain the potential for life in themselves which can be transferred, cultivated, and expanded.

She contrasts the (scientific) “vision” that sees the egg as an alienable object to the (women’s) embodied sense of “touch” that feels the egg as part of the body. She could have proceeded to discuss what the “touch” means, and how to envision a new feminist subject who senses through “touch” (Haraway 2008, Barad 2013, Myers and Dumit 2011, Puig de la Bellacasa 2009).

However, Cho reorients the discussion back to the sociological exploration of how eggs could be obtained with relative ease in Korea, and the rest of article reads much similar to other Korean feminist writings at the moment. The path the article finally takes, which emerged in a discursive terrain framed in terms of “women’s reproductive rights,” is politically engaged and significant. What disappeared is the question of “touch” which could open an interesting avenue to reconsider how the power of promise (and desire) makes it possible for Wi, the donor, to tolerate the pain she sensed in her body—the affective aspect of the donor’s labor.

Proposing “touch” as a feminist sense opposed to “vision” that assumes the distant observer, Cho cites an eco-feminist and theologian’s response to the emblematic figure of SCNT. This highlights the discrepancy between egg as a public object and egg as an intimate thing to a woman. The eco-feminist and theologian quoted in the article describes her experience of watching the scene as a “violent” one in which she felt as if her womb was shrinking. Cho interprets this as a woman “feeling through the touch.” The sense of “touch,” however, is present not only in this feminist theologian’s account, but also in Wi’s letter. While she does not necessarily mention touch as a sense per se, her use of the term “*salbuchi*,” a close kin related through flesh, suggests certain “touch” involved in the process—as a sense, affect, and doing at the same time. It has the potential to take us to the deep, intimate, and sensuous, yet not always pleasant moments of touch that happen in the process of nurturing and sending away one’s own

fleshy kin, which I will return to later. In this article, however, these touches appear only in the margin, if they appear at all.

Within the template that is intended to highlight the oppressive social structure and injustice in the egg procurement, it can be a strategic choice to emphasize that the donor was actually misled by the hype, hence the donor did not make an autonomous, informed decision. Paradoxically, for women to speak against the exploitation in the idiom of rights, they need to represent themselves as previously uninformed and innocent victims. The damage speaks for her. Her voice is to be heard when she is “groaning.” In an attempt to claim women’s rights over their body, it conjures up vulnerable, uninformed, innocent, and damaged victims as the subject to be protected *from* the violence. In doing so, it appeals to legal discourse that privileges the liberal, autonomous subject who is (and should be) able to make a rational decision.

Yet, is there anything in the story that is left ancillary, if not forgotten, that offers feminists to think with? If Wi’s account, even in passing, highlights a certain resonance between the practice of egg donation and gestation, one may ask what this resonance reveals. Wi draws an analogy between the pregnancy and egg donation. Feminist historians have documented how the medicalization of pregnancy has changed its meanings and experiences through which the continuity between mother and fetus, felt through quickening and other bodily experiences, was rendered insignificant. In this process, the fetus increasingly became an autonomous being and a public object of investigation that could be properly approached by medical professionals.⁶ However, mundane senses of fetal movements as well as mother’s bodily change are still significant in the women’s experience of becoming mother. Following Wi’s analogy, we may

⁶ Barbara Duden (1992) particularly focuses on the problem of disembodiment in the process of medicalization of pregnancy. On the medicalization of pregnancy, also see Ehrenreich and English (1973). On the politics of visual culture and reproduction, see Petchesky (1987) and Morgan and Michaels (1999).

think of the relation between Wi and eggs in a similar manner. What then does it mean for an egg donor to compare her experience which could be seen a kind of objectification to the experience of pregnancy? And how could she pronounce the eggs as “my little life”? What does this analogy do for Wi to make sense of her unique experience that is more than an act of giving her eggs away for the advancement of science? And, what does her story tell us about the ethics of egg donation, and feminist futures?

BECOMING AN OBJECT OF THE PROMISE

Wi’s letter poses a problem as it tells a story that is different from the template for victimhood. While the letter can still be read as a story of a victim of a risky procedure without being aware of it, the letter can also be read as an account of a woman who was giving her “little life.” While the former narrative only allows Wi a subject position as an egg donor whose body was intensely exploited and objectified, the latter narrative offers room to consider Wi’s story as an object to whom the promise of stem cell biology was made. Yet, her story that starts with an inspiration, which in retrospect could appear deceptive, must have been promising at the moment.

She was inspired by Hwang’s essays in *My Story of Life* (2004) in which Hwang writes that “life” means to him not only the wonder of nature that causes curiosity and admiration, but also something that holds the promise for better human life such as feeding people. His own inspiration comes not from cells in the lab, but from cows that feed people as they plow fields, bear calves, and are eaten. The stories of “life” Hwang told in the essays are not stories of life in abstract, but life that is felt in concrete circumstances. Accordingly, Hwang’s “passion for life” that Wi has read from the book, is a kind of care for life like the farmers’ care for their cattle and plants they grow. Despite the instrumentality of “life” in Hwang’s account, there is a sense of the

mundane care for life, and life's own capacity to make things and people vital and alive. Wi's trust in Hwang's "genuine passion for life" resulted not only from his fame as a cutting-edge stem cell pioneer, but also from his own story of "life" as it convinced her that he really cared for life, cared for patients, and cared about biology. In Hwang's autobiographic account, he is portrayed not as a typical biologist in a lab coat, but as a peasant's son in a rural village who befriended cows—a biologist who feels the warmth of life. Another thread of Hwang's story is his constant emphasis on the "community," and specifically the nation itself to which one should make a contribution. He does not shy away from patriotism, but his is not a simple idea of the nation. Hwang writes, "to me, patriotism is not the abstract. Like affection for life is not the abstract" (156). Everything is based on the concrete reality that one experiences in the mundane life. The nation is not an abstract thing, but the land, the people who bore him, helped him, taught him, and sacrificed for him, through which one could grow. All these stories about "concrete" love for life and the nation presented in Hwang's autobiographical essays renders him a scientist who has a "genuine and unconditional passion for life," which adds to the credibility of his promise to save life.

Wi's eggs were given to the enterprise of saving life, not to the enterprise of the "national interest," and it was personified by a biologist with a passion and affection for living things in their most mundane and concrete forms. She herself cared for life. She says she learned to appreciate "life" through this strange, artificial process realizing that things that appeared simply "natural" and "given" are indeed a product of sophisticated processes. It is an interesting moment because "nature" in the body comes to be felt through the artificial, technical process. Her femaleness was also appreciated in this "man-made ovulation." Here, I borrow the phrase "man-made ovulation" from Gena Corea's *The Mother Machine* (1985). Problematizing reproductive

technologies, Corea weaves the stories of (human) reproductive medicine and (animal) reproductive science. Highlighting opposition between men and objectified and exploited female humans and animals, she shows how masculine science renders women as an ovulating machine. Yet, the man-made ovulation in Wi's story curiously becomes a moment when her femaleness as a capacity to bear lively things is acknowledged. In this intensified mode of objectification of body, Wi actively sought her femaleness and felt proud of it. While her body was objectified by the reproductive technology, she herself became an object of promise as part of a life-saving enterprise as her little life would extend to other lives. The episode of egg donation was to be incorporated in the narrative of saving life, the story of regenerative medicine, but in the way Hwang authored it.

Charis Thompson's theorization of agency through objectification (2005) is insightful here. Problematizing the moralizing discourse that connects objectification to deprivation of agency, she shows how patients going through infertility treatment let their bodies be objectified to become agents—the subjects of their own long-term narrative toward becoming parents. It is through the promise of becoming parents that they willingly become the object of biomedical intervention. The agency of the promisee, the object of biomedical promise, is conditioned by the objectification of body itself. The agency is gained or deprived not simply *in* the process of objectification, but rather *through* the narrative that demands objectification. For the egg donors, donation could be a way to gain agency—by participating in biotechnological enterprise of saving life, the economy, and/or the nation (Leem and Park 2008).

Yet, the agency that is dependent on the promise is vulnerable to its failure. The promissory narrative of saving life failed when it was disclosed that its central event, derivation of patient-specific stem cells, was already fabricated. The episode was taken out of the story of

promise, and was redeployed in the story of failure, betrayal, fraud, deception, and suffering. When the narrative failed, her story of egg donation would not be read as a story recasting her agency. The decision Wi made is now cast as the result of deception that brought all the complications. Within the failed narrative, the subject position allowed to her is to speak as a victim, or rather “groans.”

The news article, “The ‘Saintly Woman’ Is Groaning,” is full of vivid description of how much she suffered after the procedure. She must have been speaking in pain, but it does not mean that her voice has to be the inarticulate sound of pain. While her painful bodily experiences and disappointments are still important, there is more. When she pronounces her disappointment, she is not simply speaking as a victim who was deceived, but also as a voluntary participant who had faith in the promise of biology. She also distinguishes herself from egg sellers, or coerced egg donors who were forced to supply their eggs. In her interview, for instance, she mentions how the gynecologist and Hwang’s collaborator, Sung-II Roh, was acting rather cranky while probing her body. She suspects that Roh must have been thinking she was one of the egg sellers for whom he was paying money, and she thinks that a woman selling her eggs must have “felt dirty” about his conduct. Articulating the unpleasant experience this way, Wi positions herself as a “voluntary” egg donor, the object/subject of the promissory stem cell enterprise, and as a free agent, although the procedure had various problems, and the promise that had granted her agency was broken. Yet, she leaves this ambiguity in her agency vital by refusing to be someone who was coerced to sell or donate her eggs. The promisee had faith, although it can retrospectively be seen as blind faith. There was hope, dream, pleasure, and care—the warmth of life.

While the promise was alive, the physical pain she tolerated was part of larger narrative that would lead to the success of life-saving enterprise. Hwang’s 2005 paper seemed to assure

her that the episode of egg donation was part of the narrative of regeneration, and she gained her own agency through the act of egg donation, a kind of vital gift which also involved various types of labor. The labor involves administering hormones, watching her bodily changes, getting probed by gynecologists, and dealing with the aftermath. The labors were “voluntarily” undertaken and endured due to her commitment to the promise of life. Her story is not only a story of a victim, as much as hope, dream, care, and her labor were *not nothing* although they did not produced the effects that she had hoped for. She did not simply *give away* the eggs that she had already had, but she sent away her “little life” that she *had cultivated, nurtured, and delivered*. She gave “her little life”: one may take this statement as euphemistic language, but her account of “giving life” also highlights how the donor’s experience is shaped in the practices of labor involved in the process within the subject position that she wanted (and needed) to occupy while being incited to speak as an altruistic egg donor, not as an egg seller.⁷

GIVING MY LITTLE LIFE

What was given and received in her “egg donation”? If we take her claim that she gave her little life, what does “life” mean here? And, what does it mean to say that an egg is life? From the perspective of the recipient-researchers, the egg appears simply as a biological object, which was already “donated” by the donor who has no claim on it. It has already been established by informed consent procedure that not only informs the donor of the risks and benefits of research, but also marks the complete transfer of ownership over the materials to from

⁷ In a different context of (paid) IVF egg donation, Anne Pollock (2003) has observed how the egg donors would accept the altruistic narrative not only as a means to alleviate the problem of their “unfeminine motivation” (pursuing their interests) but also through the donation procedure that constantly incite them to pronounce their altruistic intention, as the paid donors are constantly asked to state what other motivations than monetary gain are involved in their paid donation. Pollock’s account offers an insight on how the question (what motivated you...), already shaped within the anxieties about commercialization of reproductive tissues, constructs the donors’ subjective experiences.

the donor to researcher-recipient. If informed consent marks the moment of legal alienation of eggs from the donor-person, the surgical procedure for procuring the egg physically alienates the egg from the donor-person. In the particular instance of SCNT, the donor-person's trace is once again removed, as the nucleus is removed from the egg and replaced with someone else's. Going through these three moments of alienation, the egg becomes a legally, physically, and biologically different entity from the one that resides in the female body. This process of "disentanglement" of the egg from the context of the donor occurs simultaneously with its "re-entanglement" within the research and commercial network (Waldby and Mitchell 2006). However, it can be only from the perspective of recipient-researchers that alienation is completed. The way Wi speaks of the egg suggests that the egg is not a simple object that can be alienated from the donor, even though it has "already" been given.

Then, what are the "eggs"? There are many places in Wi's comments on eggs that help us rethink what eggs are, and how "donation" can be theorized differently. I now turn to the language she uses to talk about the eggs that she donated, as they suggest a different mode of "mattering" eggs. Rather than taking the egg as a simple object, she contemplates on what it actually is to account for her experiences. Here, I borrow Karen Barad's term, "mattering," to think through the different ontological possibility that Wi's account of eggs opens up. Barad (2003) has proposed to look at the reality as it is composed of not things-in-themselves, or things-behind-phenomena, but "things"-in-phenomena focusing on the constant processes of mattering. Rather than conceptualizing "matter" as a discursive construct or a primordial given, she sees matter as a "substance in its intra-active becoming—not a thing, but a doing, a congealing of agency" (822). It is more than that the egg is "disentangled" from its original social relations, or "extracted" from the body of its origin. The egg donor herself emerges as a

particular kind of person and subject in the processes of “intra-active” becoming through “donation.” The mattering of eggs as a life form occurs simultaneously with the becoming of a donor-woman as a person who embodies the promise of biology. In other words, eggs matter as an alienable substance through her affective and bodily engagements, while they substantiate her engagements with the promise of biology and with other people.

When she says she has “now lost the warmth of life,” it suggests that the exploitation happened not at the moment when her eggs were taken away or her body was suffering its aftermaths. The exploitation occurred rather at the moment that she lost her faith in the promise that connected her to other lives that she wanted to share her life with via her eggs. The eggs were already alienated from her physically and legally, but they were not completely isolated from her as they still remained as part of her donor-person through the connections with other people’s life that was imagined and promised. Here, I am thinking with Marilyn Strathern’s discussion of “dividuals.” She writes that in Melanesia, “persons are frequently constructed as the plural and composite site of relationships that produced them” (1988:13). It is a very different conception of personhood than the model that takes the individual as an in/divisible entity on its own and the cause of actions and their effects. In Melanesia, she notes, it is through the reformulation of relations into partible entities of the whole that a person is individuated. The individual can then be seen as an effect of relational cuts, which resonates with the notion of mattering as “cutting together and apart” (Barad 2008:394). This conceptualization of individuation could challenge to the model of individual human agency, and further helps me attend to the enduring relation between the donor-person and the eggs (and the future world) that was once established by the cutting together and apart of the donor’s body and eggs.

Stem cell biology may conceive an egg as a biological object that contains the vitality in itself that can be transferred and manipulated. However, Wi sees the eggs in relation to her own body that not simply possessed, but rather nurtured them as if they were her kin. The eggs finally came into being as a life form that can be transformed and transferred, when they became partible from her through her engagements with the promise of stem cell biology. It is at this moment when the eggs become partible that they turn out to be an inalienable thing. It is because the donor's agency is enacted by the eggs that substantiate the relation between her and other people. The legal-bioethical (informed consent) and surgical (egg procurement) cut did not stop her from living as an egg donor who would care about stem cell research and its progress, and who would be disappointed by the scandal in the field or happy with the realization of the promise. It suggests there should be more than the protection of the research participant's body and her autonomy in bioethical discussions. She never ceases to be part of the stem cell enterprise in a sense. Furthermore, we might also think of her "femaleness" which enabled her to ovulate and donate the eggs as the effect of the donation. It is not simply that she was already a woman who could become an egg donor. She has become a particular kind of "female" in the process, one who was once connected to the machinery of stem cell enterprise via her eggs, then re-connected to the feminist struggle over reproductive rights and health in Korea. Her conceptions of women's body, eggs, and life can be read as an account from the position marked by the agential cut. Her account then questions how this cut between the egg and the woman's body is made and naturalized, and offers a possibility to reconceptualize the egg donation without retreating to the notion of "property in the body."

In the following, I look at three occasions in which she pronounces eggs as life with different emphases. I will dwell on the agential cut, parting and relating, which constituted her

difficult position. In these statements, it is clear that she was not using the word “life” to simply mean a living thing. She adds a certain moral value to eggs as living entities that need to be respected. In doing so, she draws on familiar cultural scripts, bioethics (do not destroy life), mothering (mothers have affection to her babies), and body as a machine (body has a complex mechanism). When put together with her own bodily experience of artificially induced ovulation and its aftermath, they generate an intriguing account of eggs as life that should be taken seriously along with the women's body without which those eggs cannot emerge.

#1. Eggs Are a Precious Vital Phenomenon In Itself

When I offered my eggs, I thought so [eggs are simply wasted anyways]. It naturally is made once every month, but there's no use for me. I didn't think that it is an act that destroys life, if eggs are used to save other lives, even when they are artificially discharged. However, I think differently now. I realized the menstruation that occurs once a month is an amazing 'bodily mechanism', and got to know the fact that an egg is a life. If somebody thinks that egg doesn't matter, it is because the person is too ignorant to take women's body or eggs seriously. We should be aware that eggs are not the 'means of procreation' to give birth to babies, but rather a precious vital phenomenon in itself.

There is a lot of going on in her comments regarding other people's views on eggs. The moral language that life should not be destroyed is backdropped. Yet, her thoughts are much more sophisticated. Eggs are life that should not be destroyed. And, she is correcting her previous conception that eggs are “simple things” that would be wasted anyway, that are no use for her as she was not married and was not intending to procreate at the time. Eggs, at the time, were simply seen as means of procreation to her, defined by its use value and residing in her body latent. If there was no potential for the eggs to become a human baby, then this means of procreation would simply be wasted. If the eggs that might have simply been wasted could be used to save life, there will be no problem as there is no destruction of life. One thing that interests me is her remarks on “destroying life” which was given as a response to the reporter's

question on her opinion regarding the view that eggs are simply wasted, so they could be used for research without any “ethical problem.” The term “ethical problem” pronounced by the reporter seems to have induced her response on eggs as life that should not be destroyed.

The leap here that Wi makes from the “ethical” to “destruction of life” illustrates how “ethical issues of stem cell research” often subsumed in the language of “bioethics” is easily interpreted as a matter of “saving life,” or “not destroying life” where life is conceived as fully human and individualized. A “bioethical script” that is prevalent in stem cell research discourse is at work here. As the bioethical script centers “life,” with its imperative of protecting life from any coerced destruction or damage, “ethical” in this dialogue quickly invokes a question in Wi’s mind about the use of eggs, which can also be seen as life. The dialogue shows not only Wi’s own conception of eggs as life, but also the power of bioethical script in which ethics is equated with the protection or preservation of life. Life, at least in the mainstream bioethics discussion in Korea, is often equated to life of a human individual. And how to define “life” in the context of hESC research is always intertwined with the question of personhood (or the beginning of personhood, which is based on the line drawn between human and nonhuman). Another issue raised in “bioethics” discussion is the issue of protection of egg donor. In both cases, bioethics discussion is mostly based on the premise that life should be protected in which life is equated with human dignity. The *Bioethics and Safety Act* in Korea, indeed, directly addresses its objective as “preventing violation of human dignity and value, or damage on human body, and providing conditions for biotechnology to be developed and used to prevention and cure of human diseases to enhance people’s health and quality of life.” “Ethical” discussion on stem cell research was shaped within the notion of bioethics as a means to prevent violation of human dignity and value—within the notion of life that is only allowed for human individuals.

In the bioethical script, an “ethical” issue that the reporter was trying to address is about Wi’s own dignity rather than the dignity of eggs as life. Instead of responding within the common bioethical script of protecting life, her attention is directed not to herself or the cloned embryos that might be generated from the donated eggs, but to the eggs themselves. She would never address another issue that is favored as an “ethical” question in the SCNT-hESC research regarding “cloning.” What “ethical” means to Wi is not so much about protecting “life” as a quality of living things, but rather respecting it, the vital phenomenon, as an achievement that is made through her bodily living processes. An ovulating body here is not simply “discharging” eggs, but is maturing the eggs in their complex *in vivo* environment, while giving certain life force to the eggs. Wi considers eggs within the bodily phenomenon, rather than as discrete substances that are kept in women’s body for future fertilization.

She directly relates the abstract question about the “ethical” to the concrete ethics of “eggs” which are equally seen as “life” to her. To make her point on eggs as life, she draws on the language of bodily mechanism. While the image of body as a machine producing eggs has been bothering feminist scholars as it is an example of medical objectification of women’s body (Martin 1991), Wi utilizes the script as a way to demonstrate her labor involved in ovulation. Her grasp of eggs as “life” can also be related to the temporarily extended suffering she had to go through because of the side effects, as the wound that the procedure actually left on her body affected her life after the donation. Hormones that were injected to stimulate her ovulation for egg retrieval intervened in her bodily time, the natural cycle of ovulation. Eggs were artificially matured: it is not only that the latent vitality of the oocyte is harnessed to stimulate ovulation in this process, but also her own vitality was harnessed in this process that interrupted the bodily mechanism.

#2. Eggs for Two Years and Five Months Were Extracted At Once

When asked by an interviewer when she learned that twenty-nine eggs had been taken, she says:

Two days after the surgical procedure (for egg retrieval), Hwang called me to say ‘thanks for your efforts’. He told me that he brought the eggs to the lab to see their conditions; he said they were ‘good’. I asked how many eggs were retrieved, and heard they were a bit over twenty. Recently I looked at my medical record to learn actually twenty-nine eggs were retrieved. As eggs for *two years and five months* were extracted at once, it would be rather unusual if my body doesn’t feel wrong.

She already knew that more than twenty eggs were taken, and recently found out the number of eggs was actually twenty-nine. “Over twenty eggs” already sounds a lot, but almost thirty eggs were taken. She now has a number that is accurate and larger than what she had been told by Hwang. What matters here is not so much the discrepancy between two numbers as what the two numbers meant to her. When she first asked Hwang how many eggs had been procured, the number would have meant her great contribution to this life-replenishing research. She does not mention how she felt about his answer, a bit over twenty, so it is hard to say what it would have meant to her at the point. But it seems that it was significant to her to ask how many eggs had been retrieved. It is not that she asked about it because she had some calculus of the value of each egg; rather, the number of eggs could be seen as a measure of her contribution, the measure of her life that was given. For eggs are numerable objects, and each of them was supposed to be used for deriving stem cell lines, the number could be a proxy with which she could find out something about her contribution. The number of resulting eggs is not something she could have control over; each body responds to the hormones differently, which would determine the number of mature eggs to be retrieved, then the number can hardly be a measure of her contribution. However, she wanted to know if what she has been going through actually generated something valuable. Hwang told her about the quality of eggs “good,” but it might

have been not enough. The sense that she was actively participating in this enterprise for humanity was underpinning her question. At this point, eggs could be seen as crystalized forms of her hope, efforts, bodily transformation, care, and life. Unlike all these subjective, or intimate experiences and feelings, those eggs could be reckoned. By reckoning of eggs, her work could be recognized by her and by others through the number in an “objective” form.

What would the number of eggs mean, when she learned that actually twenty-nine eggs were retrieved looking into her medical records? This time, the number is not sought to recognize the value of her contribution to the research. The number is now used to account for the loss in her health and to the harm that has been done to her body due to the invasive procedure. Twenty-nine, or rather a lot of eggs were retrieved from her body. The excessive number, then, is now translated into a temporal term. “As eggs for two years and five months were extracted at once, it would be rather unusual if my body doesn’t feel wrong.” Interestingly, it is not simply that twenty-nine eggs were retrieved. But rather it was “eggs for two years and half months” that were extracted “at once.” She now not only speaks of her suffering, but relates her suffering to the artificiality of the procedure that disrupted her bodily time which regulates the phenomenon of life. If a woman normally ovulates one egg per month, then twenty-nine eggs would be equated to supply of eggs for twenty-nine months, two years and five months. By translating the number of eggs to the duration of time that would normally take to ovulate the same amount of eggs, she shifts our attention from the objects that were extracted to the bodily process through which they came into being. In doing so, she highlights that what is happening is not a simple “extraction,” but rather the manipulation of the bodily process that can be seen as *fast-forwarding* of bodily time. Rather than seeing eggs as means of (re)production already produced, she grasps that eggs are produced through a potentially laborious process. The pain

she experienced is not simply a side effect that may or may not happen, but rather a consequence of acceleration of the pace of bodily labor to produce mature eggs. As we live through time as fleshy beings, her transposition works at an intuitive level. Her account foregrounds how it is not simply that the hormones work only on the ovaries to induce ovulation as if they were discrete organs, but they affect the body itself by manipulating its own rhythms and processes.

The translation is possible within the script of body as a machine that regularly discharges one egg per month. But rather than conceiving body as a machine whose productivity matters (Martin 1987), Wi uses the analogy to make sense of how the machine could be overworked well beyond its capacity with the superovulation procedure. It does not simply take away what already exists inside. In order to be extracted, the eggs should have been grown which naturally takes a certain amount of time. When she conceives this procedure in a temporal term as fast-forwarding of bodily process through which too many eggs are produced. She counts the number of eggs, and accounts for her extended suffering. By reckoning the number of eggs, she makes the labor of her body recognizable. Here, the physiological connection between her eggs and her body is counted in a number, in a seemingly objective form. She says not simply that she gave many eggs, but that her body did a lot of work during and after the procedure.

#3. Affection To Flesh-sharing Kin

In the letter, she says, through donation, she felt what affection to fleshy kin (*salbuchi*) would be like, “although she never gave birth to a baby.” Analogizing what she felt through the egg donation with maternal affection, she suggests that, for her, egg donation is more than simple transfer of eggs. With the image of maternal body that is attached to and detached from a baby, she presents an intriguing way to think of eggs. During the pregnancy, a maternal body is linked to a fetal body and those two entities share metabolic processes. When a baby is born, the two

entities are physically separated, but as long as the mother cares, there will be an enduring bond. Even though the two bodies' flesh is not physically connected, the memory of connection endures as a bodily and affective experience. When Wi analogizes the process of donation to pregnancy, she highlights that her endurance of the procedure was a condition for the individuation of eggs, as in maternal-fetal relations. Injecting hormones everyday on her own involves certain discipline of body as well as hormonal change. She would have felt something through her flesh, possibly in an unpleasant way as many women going through an IVF procedure complain. However, with the promise of saving life, she could endure the process and even further take it as a process comparable to the labor of pregnancy. Hence, for Wi, it was almost like giving birth to new life, not through a baby, but as eggs that would be made into stem cells to help others to live new lives.

The donor's body is not simply an object from which eggs are extracted, but a body that brings something into life with its own labor. Interestingly, she uses a word *salbuchi* to talk about her affective engagement with the eggs, instead of *pibuchi*. In Korean, *sal* and *pi* each means flesh and blood, and *buchi* is a noun form of *butda* meaning "to be attached." While both words can be interchangeably used to refer to very intimate kin relations, *salbuchi* is relatively rarely used in everyday life. *Pibuchi* as a more commonly used word for close kin foregrounds the relationship tied by blood; the flow of blood through lineage. On the other hand, *salbuchi* emphasizes the bodily intimacy, living in proximity and holding each other, or a kind of bodily mingling. One can imagine the emotional linkage between her and the eggs that involves flesh and touch, as she and her eggs were intimately connected through the flesh. The affectionate feeling is not necessarily inscribed in the form of lineage (as in blood), but it is felt through the flesh, the process in which fleshy entities *touch* each other, and one feeds another and enacts not

only the other but also oneself in this relation. It emphasizes the process and time through which two entities come to be individuated. The linkage of flesh does not designate the relationship between two individual entities, but rather describes the relation through which both are individuated in their bodily intra-actions. While what once had been a part of her became a separate entity, their tie is not broken with their shared history.

Wi says she, without actually giving a birth, learned to feel for *salbuchi* through the process. “Oh, it is exactly what life is!” She thought. What she felt during the process in her flesh, enduring bodily changes to grow latent oocytes and taking care of her own body for it, is significant here. Eggs at this point cease to exist as mere “things,” but as a life form that she could feel for. In the process and coping with the side effects afterwards, she learned further that eggs are not simple things, but a “precious life phenomenon itself.” They are only felt in the bodily processes by which she, her person, is affected. They are not objects that are separate from the bodily situation, but entities that emerge in the processes. When she talks about the eggs—her “little life”—, it does not imply that she sees the eggs as the potential living organisms in the way “life” is contested in bioethics debate over the question of “the beginning of life”. There is no beginning for the “life,” or the “beginning” does not matter so much in this account since “life” is not about the individuality of the living thing, but about the lively relations of feeding, nurturing, and touching.

It is not to romanticize Wi’s story as if there had been no violence, exploitation, or suffering. Touch was involved in the process of becoming a donor including not only her bodily interior touching the eggs, but also the violent touch of the probe onto her body for the retrieval of her eggs, which was privileged in Cho’s article through the quote from an eco-feminist theologian. Also, speaking of relations is not to appeal to the connectedness as if being

connected were a desirable state and there were something more authentic in the wholeness (see Weiss 2012). Wi's own speculation on the eggs as her fleshy kin does not make it any less exploitative, but rather the opposite. Her affective and bodily engagements with the eggs made eggs more than simple objects, which made the Hwang Scandal more unbearable to Wi. There were material consequences to these engagements as she nicely put it in terms of fast-forwarding of the body. However, thinking with Wi and her languages of relatedness and touches, it becomes possible to rethink what the "donation" entails beyond the idiom of bioethics or science, and through the power of promise.

CONCLUSION

Let me briefly go back to the place where I started, between the two statements on the donor's "understanding" and the possible misunderstanding caused by therapeutic misconception. The donor's understanding is rendered as a peculiar view that more or less resonates feminist conceptualization of the mothering experience as a continuous one, yet is not really relevant to the main thread of the discussion. Wi's story is presented as a mere episode that shows the discrepancy between what's actually happening and what the donor, misguided by the therapeutic promise, sees. It is not so much that the sociologist misconstrued her account, as that was what the feminist sociologist was supposed to do in the face of exploitation of women surrounding the sourcing of eggs. Yet, the footnote, a note that is often ancillary and does not necessarily anticipate being read, still occupies a space in Cho's writing, suggesting that the donor's account draws certain attention that exceeds the language of an informed decision. Hence, Cho could not simply omit this note. The note had to be included because the figure of eggs as her "little life" could not be taken as a dull cliché. The phrase "my little life" that portrays eggs she begot (like babies that she never had) as an entity that transmits life from the

donor to other people, is vibrant enough in itself to generate a footnote that has a different texture from the statement in the main body. While her language is employed in the main body to exemplify Wi's "misconception," the vibrant language itself would not be fixed within the template of misconception. The footnote briefly brings in the similarity between Wi's unique experience and the "universal" women's experience of mothering where mother, fetus, and eggs are not discontinuous entities. This quick move does not appear awkward, since it is a footnote where awkward footsteps are generously allowed. Wi's letter is there like "cinders" (Derrida 2014). Cinders are a figure that Derrida has proposed as a paradigm for "traces." Cinders are what remain after the burning—they have been consumed but not entirely and still keep the warmth within themselves that constantly vibrate. It appears to be an appropriate figure for the traces of promise and its scandal, which can be read in Wi's letter. Cinders are a figure that keeps lingering within and beyond the intense moment of burning that produces not only the heat, but also the cinders from which the remainder of the heat (and the burnt material) can be felt or remembered. Her language is still not dead and it takes its reader, with the remaining warmth, to oscillate between the necessitated move to use it as evidence of injustice, and the desire to feel for and mourn the lost warmth of life that Wi herself mourns while writing the letter. The paradox of Wi's embodied experiences that involve both exploitation and affective investments might not be contained in the text, but is still open to another interpretation as evinced in the footnote.

Dwelling on the space between two statements in the main text and the footnote, I have followed where Wi's remark—"my little life"— can take us. The statement takes us not necessarily to more intimate experiences of Wi or a "genuine" account of egg donor based on those experiences, but also to the ways in which the donor tries to conceive herself as an active

and free agent, yet with the aid of vital eggs and promises that have animated the eggs. While Wi wanted to present herself as a voluntary egg donor to some extent, her account was to be taken with an emphasis on the misunderstanding, misconception, or lack of information within the discursive field set against the exploitation of women, and violation of women's rights. Her own "story of life," her commitment to the promise of life and contribution to it, through the vitality of eggs that she has begotten, is rarely to be heard without the premise that she was misguided. The template given as a response to the argument that women should be able to donate their eggs voluntarily might have been effective to establish a new policy to protect the women from the potential exploitation in the "tissue economies." When the tissue economies work by appropriating the biological capacity of tissues, there are economies not only of exchange (whether commercial or not), proprietarization, and technological manipulation of tissues, but also an economy of affects that enable the bodies to endure certain labor of getting tissues out, and take the precarious and uncertain future of one's own tissues as a promise. In this chapter, by closely reading the account of a donor who took the promise wholeheartedly, endured a demanding process, suffered its aftermaths, and decided to speak for the eggs, I attempted to illustrate the affective element of tissue economies. In Wi's story, the promise of life and its imagined transmittability appear central.

While the egg donation assumes and involves objectification of women, it is more than simple objectification of women's given body. As a woman endures the procedure that takes her body as an object from which eggs are to be extracted, she also becomes a donor-subject who relates herself to the promissory tissue economies with her vital contribution. Without eggs, the SCNT enterprise would not work; without donors like her, tissue economies would not be vital. Here, the donor-woman, eggs, the promise of stem cell enterprise, and tissue economies,

connected through the vitality of eggs, animate one another. The donor, with hormones and her own labor, animated the eggs that were anticipated to re-animate other sick, degenerated bodies. Yet, in the process, the donor's femaleness was also animated by the promise, as a donor, as a woman who now feels proud of being a female. Going through the invasive procedure that interrupted her body, she could stay vital, as the promise was still alive. The eggs were also alive as the promise was still alive. The scandal that disclosed the promise was not viable de-animated the relation itself. As the donor phrased, the warmth of life is now lost. Then, her effort to speak for herself, and speak for her eggs to the public after the scandal can be seen as an attempt to re-animate herself, and the eggs. Instead of boxing her in the given position of the deceived donor whose "voluntary" decision does not hold, as a victim who had been taken away her eggs, health, and time, one can attend to her lively account as a story of an animated and animating cyborg body. This cyborg story would not stay vital without developing language that goes beyond the idiom of "rights" designates. When the story loses its life, we may lose the insight Wi offers to us.

By conceiving eggs as life, and organizing her story in terms of "life," this woman urges us to attend not only to the decisive moments in egg donation, but to the processes through which the donor and eggs come into being as a donor-subject and gift-object, and further to the future unfolding of the act of donation. Just as life is not static, but constantly changing in its interaction with other things and forces that surround it, the donor and eggs are to be constantly de-animated and re-animated. How to keep them vital, rather than ignoring it in the name of "women's rights," is a question that Wi's little life poses to feminists.

Potentiating Objects, or Writing Curriculum Vitae of Things

Whether it was a medical “waste” or somebody’s “little life,” the living tissues donate to the labs will gain their new “life” as biological objects. They turn not only into objects of biological inquiries, but also, and increasingly, potentially biovaluable objects with certain utilities or even capacities. In this chapter, I will look at how this new social and biological life of living tissues as the biovaluable is intertwined with the scientific life of researchers. Let me move to the Placenta Research Lab (PRL) at the Hope Stem Cell Research Institute (HSCI)⁸.

The PRL was one of 23 labs in the Hope Stem Cell Institute (HSCI). The HSCI started off with the efforts of some researchers at the IVF lab in the GHH, famous for its high-profile ob-gyn department. The enthusiasm among researchers about human embryonic stem cell research followed James Thomson’s report in 1998, and the availability of surplus embryos made it possible for the Hope Medical Group (HMG) to which both the HSCI and GHH belong, build one of the major stem cell research centers in Korea. The head of HMG began actively investing in this area and expanded the scope of research to include adult stem cell research and clinical studies. The HMG recently launched a “power-aging” program targeting upper-middle class Koreans as well as wealthy tourists with programs such as stem cell banking and cosmetic care services as well as luxurious medical check-ups. Women’s reproductive labor in the IVF, not economically motivated, played a vital role in this new business area for the CMG in creating and maintaining its infrastructure.

It was a usual day in the PRL except that there was an argument between Inae and Yoonseo about repeating an experiment that did not produce a satisfactory result in the previous

⁸ All names of researchers and institutions that appear in this chapter are pseudonyms.

attempt. Yoonseo was an employed researcher with a master's degree, and she was helping the postdoctoral fellow Inae with preparing cells for the experiment to compare different degrees of differentiation potential among stem cells from diverse sources. They had tried once, but the outcome was not good enough to demonstrate what they hypothesized. Yoonseo, always very calm and nice, was not very enthusiastic about the idea of repeating the experiment. Yoonseo explained that she already invested much time and labor in this experiment, how time-consuming and difficult it was to manage to prepare all these cells for Inae's experiments. Trying to persuade Yoonseo, Inae asked "Do we *want to* say that the stem cells from placental tissues have no better potential than others? I don't." The experiment here is not only a means to prove a hypothesis, but also a way to demonstrate a certain outcome that was desired and anticipated—the potential of stem cells derived from this specific tissue, placenta.

Sociologist of science Harry Collins (1985) has interrogated, in a Wittgensteinian fashion, the idea of replication that is crucial in experimental science and its method of inductive inference. How do we know that repeated experiments guarantee that the fact induced from them is indeed true? The question is even more complicated considering that in practice experiments do not always succeed. Experiments are not a method through which scientists come to learn something, but rather a "difficult and time-consuming" procedure, which is mostly done when it is anticipated to result something "useful." "Nevertheless," he writes, "experiments have to be done to convince others, or perhaps to 'certify' a finding for those who are ready to be convinced" (41). It does not imply any disingenuousness on the part of experimental scientists, but rather it asks how, regardless of genuine, laborious, and time-consuming efforts of scientists, science tends to continue producing certain kinds of knowledge. However, this argument reveals that something different than the "order" is at stake: the finding that Inae "wanted" to produce is

the greater potential of placenta-derived stem cells. It was not meant as a simple “comparison,” suggested by her assessment of it as a failure. It was also not necessarily to confirm or to dispute an existing set of “facts” on the potential of stem cells from various sources, but rather to demonstrate the potential of placenta-derived stem cells, and accordingly the biological quality of placental tissues that would make placenta a more vital resource for stem cell research and industry.

The use of this experiment, if successful, is to *potentiate* placentas as a promising source of cells. The disagreement between Inae and Yoonseo suggests the different stakes they have in this experiment. For Yoonseo who identifies herself as a researcher who works for the lab in which she was employed, the stake of success or failure of this particular experiment is not as high as for Inae. For Inae, who came to be interested in placenta as research material and as an avenue to develop her expertise, demonstrating the potential of placenta-derived stem cells was a more significant task. Here, an experiment is an anticipatory practice—anticipating certain useful data to convince others not only of scientific facts, but also of the values of certain projects, materials, and one’s own expertise. By generating data successfully, Inae may add potential to her own research material, placentas, and add value to her expertise and experiences of working with placentas. What the object can do is, to some extent, linked to what the researcher could do. If the object gets a selling point, the researcher would find another selling point, too. Through experiments, value could be added to the object. With the added value of the object, the technical knowledge on the object that researchers have might also be added value. In this process, they are both put to use, or made useful. Researchers refashion objects with the potential, and technical knowledge gained in working with the objects refashion the researchers.

In other chapters, I discuss how the bio-value is conceived in relation to the new promises of “life” within the idiom of biotech, and regenerative medicine in particular. Yet, it is not simply that the biological materials are newly valorized as the raw materials for stem cell research combined with the new promises, but also that the materials are put to work within a different arrangement of objects and resources. There emerge different opportunities and possibilities to move into novel and promising markets for these objects, researchers, and other actors with certain capacities to work to produce the anticipated outcomes. This chapter draws attention to researchers who try to grasp the emergent opportunities refashioning their technical knowledge and objects, potentiating both. To the researchers, the biological materials are not necessarily one among many available resources. The materials are something with which they develop their techniques and “expertise,” and navigate their careers as researchers. Since each researcher has invested much time and labor in specific objects, they often hold scientists with their specificities that have already shaped researchers’ possible trajectories in specific ways with their previous investment in training that result in technical knowledge. They shape researchers into specific researchers by providing them with habits of doing things, and ways of navigating their careers claiming their expertise in such and such fields.

It might still appear that the researchers whose stories I tell here are simply using “tools” to navigate their career, but I would stress that these tool-like objects are integral to their life as researchers, and their research practices are integral to the life of these objects. The social “biography” of objects is linked to the researchers’ personal biography. If we could think of these objects as job candidates, considering they are employed in the technoscientific network to “work”, the resume we may read should be written by researchers whose resume is also filled with the outcome of object’s works. Reading Donna Haraway’s cyborg as a figure that illustrates

a different possibility of partial connections, Marilyn Strathern (2004) writes, “the notion of a machine connected to an organism in the way a tool extends the body suggests a connection between entities based on the fact that each realizes capacities for the other: each makes the other ‘work’”(39). In a similar vein, we might say that the researchers and biological objects make each other work, but in specific ways. It does not necessarily imply that there is no instrumentality in this connection, but even when researchers use them as “instruments”, they are working for the objects to exist as valuable things.

While it has been much discussed how nonhuman actors gain certain significance in the process of “translation” that posits them as an “obligatory passage point” (Callon 1999), the stories I tell in this chapter would add another layer to the story of scientists mobilizing the nonhuman actors in order to establish, lengthen, and strengthen the network. Instead of focusing on researchers’ efforts to build their “scientific” claims mobilizing various scientific and social resources, I look at researchers as scientific “workers” who struggle to maintain their “job” as researchers, and whose career opportunities are closely associated with the market conditions. If we focus on the researchers who are navigating this marketplace with their specific technical knowledge, we will also see how the social concerns and interests shape the research trajectories for them as they respond to the “demand” from the market. It would then provide another perspective on the “commercialization of science” at the level of individual strategies to cope with the situations utilizing tools available for the jobs. Moreover, we might have another view on the production of biovalueables in the field that is not only driven by ideas, but also by pragmatic and strategic works of researchers to sustain their life as researchers. Yet, to speak of strategies is not to reduce researchers’ work and their trajectories to a set of calculative choices

and outcomes. Rather, it is to situate their work which they still do with enthusiasm and passion in the scientific marketplace that constantly demands they find the “right” job.

CURRICULUM VITAE OF THE BIOVALUABLES

Drawing on anthropologist Ivan Kopytoff’s idea of the cultural biography of things (1986), Lorraine Daston (1999) has proposed to write “biographies of scientific objects” to attend to how novel scientific objects come into being (and how they fade away). The biographies of scientific objects situate their life courses in socio-cultural and politico-economic concerns in a particular historical moment. How they become fascinating and how they lose their attraction is related to what these objects promise at a specific historical moment. In this chapter, I will write about how the biographies of stem cells and other biological objects as biovaluables intersect with the biographies of individual scientists. Indeed, the life courses of biological objects such as embryos, eggs, placentas, and cord blood have changed as they are reinvented as biovaluables, particularly with the emergence of stem cells as an object of interest that anticipates biological, therapeutic, and economic values that will be produced. The refashioning of biological objects into a particular type of biovaluables, as a reservoir of vital capacities, could happen as the stem cells also emerged as a valuable thing, or rather a thing that is capable of doing a lot of different things.

Indeed, stem cells have a long list of *what they can do*. They can differentiate into various cell types, and they can expand in culture without differentiating into other cells. Some of the stem cells are said to be able to produce “bioactive materials” in the body to repair damages. These capacities, which make stem cells a promising object of investment in academia, industry, and health market, are made real by scientific data. The enormous list of publications on the potential of stem cells could be seen as a curriculum vitae (CV) of stem cells as they delineate

what they can do and what they promise to do for their potential jobs. For instance, the paper that Inae would eventually write, if the experiment succeeds, will constitute one line in the CV of stem cells. I use the word “CV,” although it may sound awkward, to highlight the “capacity” for doing various works that makes this object valuable. If the biographic approach in Arjun Appadurai (1986) and Kopytoff’s works is to highlight how the thing’s “value” changes as it circulates in different domains of exchange, my approach is to draw attention to the recognition of value of the thing in anticipation of use, and in investment in and speculation on its capacities. As most job seekers and their potential employers know, a CV is not simply the record of what one has done —as most job seekers would know— but the demonstration of what one is capable of (based on the record), what one could infer from the past course of works what the future would likely be. If Datson’s proposal of biographic approach on scientific objects highlights the value of things recognized in the social domain as well as scientific one, the “CV,” if read together with the biography of objects, could give an account of the practical circumstances in which the thing is made to work.

They are “mobilized” in the double meanings of the word “mobilize.” They are organized and prepared for certain actions as resources in the “network” of humans and nonhumans in the stem cell enterprise. At the same time, the tissues are made mobile to move across different places. Instead of being disposed as medical waste to be burned, for instance, reproductive tissues are taken to the labs and processed to yield stem cells that could be used for experiments, or banked for future usages. There are a lot of things that are needed to transform “medical waste” into biovaluables. Documents are generated: informed consent forms to assure that the materials are procured in an “ethical” manner, some records of the donors to preserve some information about the tissues’ bodily origins, and records on the transfers of materials for the

bookkeeping of these resources. Machines should work: freezers to preserve the tissues without decaying, incubators to keep cells alive and various experimental equipment to produce data.

And, people should be working, too, to derive stem cells, produce data from them to show that they are biovaluables rather than simply medical waste. Researchers should be working to demonstrate that it is worth investing in biovaluables. By showing that it is possible to differentiate stem cells into other functional cells and that stem cells are effective to treat currently incurable diseases, researchers reproduce the promise of stem cells through which the medical waste is refashioned as biovaluables. Of course, what scientists do is more than simply demonstrating what stem cells can do, which is from the outset an explicit premise of the stem cell enterprise. They examine how they work, how their potential can be effectively harnessed, and how they can be controlled. However, these studies are, from the perspective of the potential of stem cells, filling in the gap of knowledge in realizing the potential, through which the potential comes to appear more real and promising. Researchers produce knowledge about the potential, and in doing so, they reproduce the potential in more tangible forms. Here, the CV of the biological objects intersects with the researchers' CV. The knowledge they produce becomes the capacity of the biological, while the capacity of the biological object becomes the basis of researchers' projects that build the researchers' CV. Technical knowledge about the specific objects could become part of one's specialty. As the object's CV is built, the technical knowledge is likely to gain more value.

TRANSLATIONAL MEDICINE IN REVERSE?

Let me introduce one instance that illustrates how items are added (or removed) in the CV of objects over time. One of the interesting things that occurred in the stem cell research field is the change in the concept of mesenchymal stem cells (MSCs) that recently happened. MSCs

were, under the label of “adult stem cells”, mostly discussed as an alternative to human embryonic stem cells to get access to the differentiation potential of stem cells without using (human) embryos. Recently, MSCs have been studied as a therapeutic agent not necessarily due to their differentiation potential, but rather due to their in vivo activity to secrete cytokines.

Commenting on the controversy surrounding proposed clinical trials in Italy in 2013 using mesenchymal stem cells (MSCs) on neurodegenerative diseases, Paolo Bianco, Italian stem cell researcher, lamented that MSCs are the prime example of “translational medicine in reverse” (2013:255). He writes, “commercial interest has profoundly influenced the definition of these cells (and of their clinical potential) within the scientific community”—in other words, “commercial products have been converted into scientific concepts.” He is concerned with the tendency that promotes MSCs beyond their “biological limits” due to the commercial interests tied to them. Bianco observes that MSCs, once promoted as the “ethical” alternative to human embryonic stem cells (hESCs) in the heated debate on hESCs, have suddenly become “pluri-effective” as “veritable injectable drug stores” after its “selling point” was lost with the new method of obtaining pluripotent stem cells without using human embryos. One might recall an article that Arnold Caplan (2011) who had coined the term “mesenchymal stem cells”, published recently in a prestigious journal *Cell Stem Cells*, “The MSC: An Injury Drugstore.” In the article, Caplan proposes that the view on MSCs should be expanded to include not only their multipotent differentiation potentials, but also their role as a cellular modulator that could “establish a regenerative microenvironment by secreting bioactive molecules and regulating the local immune response.” Bianco’s criticism is not directed toward this particular researcher, but rather the environment in which the concept of MSCs is rapidly shifting and becomes the rationale for the clinical trials and stem cell treatments that he sees premature and dubious because they lack

more rigorous experimental verifications. Instead of moving scientific concepts that are verified at the bench to bedside (“from bench to bedside,” as the famous slogan of translational research tells), the market is encroaching the experimental site to convert the (potential) commercial products into scientific concepts.

The changes in the concept of MSCs, Bianco notes, reveal the “dark side of commercialization of science.” Bianco’s observation would not surprise most students of STS. The social interests do not stop at the door of laboratory, and commercial interests cannot be the exception. Moreover, it has been long been discussed how scientists themselves translate their research program to others’ interests to enroll other actors. If there is anything striking, it is that it is not simply that scientists translate their concepts to interest others, but the interested actors, here industry, seem to be translating their interests into the scientific concepts—converting commercial products into concepts. Bianco attributes it to the “creation of commercial enterprises within academia” due to the outsourcing of pharmaceutical research and development. Yet, to reduce this problem of commercialization of science to the apparent encroachment of for-profit, corporeal entities into academia might again normalize “academic science,” in its ideal sense, and reproduce the “scholastic” image of the scientist as a “modest witness” as Steven Shapin and Simon Schaffer (1985) have termed in their work on the early modern scientists. Indeed, Bianco’s concern brings us back to a more fundamental question of whether it is possible to imagine disinterested science that would only be seeking the truth about how things work without presuming the future product, whether commercial or not. In the stem cell enterprise that has been formed around the “potential” of stem cells and that already anticipates the future products as the realization of the potential, it is extremely difficult to dissociate “science” from the products. Rather, the “scientific” enterprise appears to be the race

toward the fixed endpoint, here, stem cell cures. The stem cell enterprise is, indeed, a model of “translational medicine in reverse,” which Bianco criticizes. Anticipations and pre-conceived target products precede research processes and shape research practices and modes of engagement with research materials. While the encroachment of commercial entities in the academia, “commercialization” of science in a narrow sense, is definitely an important context for this phenomenon, the “translational medicine in reverse” seems to highlight the specific temporality of “neoliberal paradigm” in the contemporary science and technology field that Philip Mirowski (2011) has strongly critiqued as “just-in-time science” (289). If stem cell technology, with their capacity to promise translational medicine, can become a good commodity in the neoliberal “marketplace of ideas,” the researchers who tell stories about stem cells and make them work could be seen as a kind of intermediaries.

If we see this matter from the perspective of mutual CV building between researchers and the objects, the question is not simply on the encroachment of commercial interests by corporate entities in the academia. There can also be the interests of researchers who are working with MSCs or are starting to work with them and holding onto their biological capacities that would create more jobs that MSCs could do. While it has been suggested that the differentiation potential of MSCs *in vivo* could be limited, and that their engraftment inside the body is not as satisfactory as it was anticipated, the researchers see certain therapeutic effects from the MSC-injected bodies and try to account for how they were possible. Formulating the concept through the anticipation of “product,” which may imply the future commercialization within the given organization of biotech production, does not necessarily mean that the “commercial” interests are getting in the way of doing academic science. If we consider how research investment constantly requires certain justifications in terms of its value, not only “academic,” but also economic and

social, the “product” is already there in the way researchers conceive their projects. It is also plausible to imagine researchers are disposed to keep the potential of their research material — the biological object— open, which would allow multiple avenues for them to explore. The multiple potential of objects indeed offers researchers more opportunities in getting jobs and joining collaborative projects. Their technical knowledge on the objects would have more currency than before when the potential of the object is multiplied. Even the same technique could gain multiple values when the new potential of the object is discovered. If we are still to speak of “commercialization of science,” we might also expand the scope of what we call commercialization. It may involve more than selling scientific knowledge to corporations. If the commercialization of science could refer to the production of scientific knowledge in a form that is well-suited to commercial production, we should also consider the scientific marketplace where the commerce of skills and knowledges to get opportunities is taking place, and the strategies that researchers use navigating this marketplace.

Now, I return to the argument between Inae and Yoonseo about repeating the experiment. If we focus on the commercialization of science in a narrower sense, we might see the connection between this particular experiment and other works that Inae was doing at the time, and the institutional drive toward commercialization. For instance, the successful outcome of this experiment could be used to promote the tissue-banking program that her institution is promoting. It could be used as “scientific support” for persuading potential clients to store not only umbilical cord blood, but also placental tissues. Just as cord blood banking marketers now promote it as a way to store stem cells for variety of diseases that stem cells can possibly cure (not only cord blood cells that can help when affected for leukemia), it may make placenta as a more valuable thing to be banked. Working in a team for the tissue-banking program promoted

as a “bio-insurance” (see Chap 6), Yoonseo might have taken the showing of the value of placental tissues as a task for her. Yet, there might be something more that was driving Inae to this project. The disagreement between Yoonseo and Inae on repeating the experiment suggests that it is not just the institution, but Inae herself was invested in the project of demonstrating the potential of placenta-derived stem cells, and placental tissue. When Inae said she did not “want” to say that placenta-derived stem cells had no better potential, it implies she was acting not only upon the institutional demand, but also her own desire to show the potential of this material. The moment Yoonseo and Inae disagreed, brings to the fore the different stakes they had with the potential of placental tissues as the source of stem cells.

Inae was a postdoc who would like to build her own lab sometime, while Yoonseo has no prospect of pursuing a doctoral degree and building her own lab. Inae, who had been working on immunology in the graduate school then moved to the field of placenta research in her post-doc with immunology as her specialty, is now working on placenta-derived stem cells. While placenta research may not be the only avenue for her future career paths, it is one of them, one of the means to claim her expertise in a promising area. If she started working on placenta in relation to the immunology work she had done before, placenta has opened a new avenue for her to explore, not only in terms of scientific inquiry, but also in terms of job market and research funding. Promoting placenta as a promising source of stem cells may not greatly benefit her future, but at least she would be able to claim her technical knowledge about placental tissues. In a sense, Inae’s experiment is to potentiate her research object. Placenta is to be turned into a more promising object, or resource. The experiment compares stem cells that are derived from different parts of placenta. What she wants to show is the potential that placental tissues have. She was trying to potentiate the object and in doing so, to add value to her expertise to work with

placenta. Knowledge about placenta, when she thinks about developing her own project, could become an edge added to her knowledge in immunology and cell biology. Expertise in a special area can be her own resource, her own asset that has certain value, or currency in particular circumstances. The potential of placental stem cells is a surrogate for her career potential as a researcher with special technical knowledge about placentas.

Yoonseo's job in the PRL covers a range of lab work that includes carrying out experiments that the PI assigned, clerical works related to lab supplies, and the preparation of retrieved placenta for the other researchers. She does most of the work that graduate student researchers do, but she does them as an employee. It was her job, while to others, it was a temporary stage of their career paths. Since she did not necessarily consider developing her career as a researcher to a different stage, she does not have much personal commitment to the research materials like placentas or placenta-derived stem cells. Because what employers want from "master's level researchers" is their mastery of routine skills to conduct experiments, Yoonseo may not see the research material as being particularly important. The mobility as a researcher for her is not only related to her special knowledge about specific objects. Rather, her fingertips, or the skills that are learned with her fingertips, in addition to her knowledge about experiments would matter equally.⁹ Hence, while she has been working in the placenta lab for years, indeed longer than any other lab members, she is not particularly invested in stem cells or placentas. It does not mean that she doesn't care about research, or is simply there to do whatever is assigned to her as her job. She cares much about the problems and tasks at her hand.

⁹ Here, I am repeating a problematic distinction intellectual and manual labor in the scientific knowledge production to emphasize the significance of manual labor. However, as I discuss in the following chapter, manual labor is not simply a counterpart of intellectual labor that simply executes what the intellect orders. It is an indispensable element that (re)produces the condition of scientific knowledge production, and it further shapes scientists' subjectivity. Deborah Heath (1997) has pointed out this ambivalent status of manual labor in the scientific knowledge production.

She cares a lot about what she is doing, but she does not care much about presenting placenta as a promising thing. What matter to her are her skills obtained in the molecular and cell biology field. Within her career path, they are what were asked for from the master's level researchers. The success of this particular experiment does not matter to Yoonseo much. It would be good if they succeed, since the time and labor that she invested in the project would yield something.

Positive data on the biological potential of stem cells derived from specific tissues may provide more mobility to Inae and other researchers in the lab by increasing the potential value of technical knowledge of this tissue with its own increased value. In a sense, Inae might be anticipating that technical knowledge, or her “expertise” in placentas, gains a kind of currency in the scientific marketplace. It may influence the course of her life as a researcher. Lengthening the list of what placentas can do, building the CV for the placenta, is one of the ways to build her career.

THE RIGHT JOB FOR THE TOOL

In the scientific marketplace, more jobs for your tools would bring more opportunities to you who have the tools. Then, why wouldn't you be happy with creating more jobs for the tools, your research objects, or at least keeping them multiple, if there is no evidence yet to conclude they are not possible? To make this point clear, I will tell a story of Park, who was first trained in animal reproductive science, then moved to IVF lab, and finally moved into the stem cell enterprise. He first worked with bovine eggs, then human eggs and embryos, and now working with induced pluripotent stem cells (iPSCs) in addition to the other materials. His workplace has changed from the animal reproduction lab to the embryology lab in (human) infertility clinics to the stem cell lab. This trajectory is not unique to Park. It is not difficult to find researchers in the stem cell field with a similar trajectory. Yet, the moves that he has made throughout his career

are still curious since these three areas seem to have different objectives, deal with things with different ontological statuses, and belong to different modes of (re)production (Cooper 2008a, Thompson 2005). At the same time, his CV illustrates the technological kinship between these three seemingly distinct areas of research, which has been well documented in other contexts (Clarke 1998, Franklin 2008; 2013). Here, I draw attention to the significance of technical knowledge that has made this transition possible for him and other researchers, and how the continuity and break between these areas of (re)production can be rather trivial at the technical and practical level, while they appear very significant if we frame it as epistemological shifts.

His career trajectory that I recount in a bit highlights the continuity of these areas made by the “tools.” In *The Right Tools for the Job*, sociologists of science Adele Clarke and Joan Fujimura (1992), with other contributors, have highlighted the significance of techniques, skills, and instruments in research practices in life sciences. They argue the right tools for the job are not given, and it is not that scientists simply select a certain tool for a particular job because it is the right tool. The job, tools, and rightness are always in a “situation” constructing one another, as they are made, tamed, and tinkered in a concrete situation. The chapters in this volume describe how scientists try to find “doable” problems with given tools, how they modify and arrange the tools in concrete practices, and how these tools are “disciplined” to produce the rightness, continuity, and stability. In doing so, they show a different configuration of jobs, tools, and rightness from the usual depiction of research practices. Taking the material practices seriously, this approach helps us grasp that tools and rightness are not given, jobs are not identified solely based on ideas, and scientific research is made by the constant work of tinkering and crafting in each situation. Park’s story adds another layer to it as he constantly finds the “right jobs” for himself with the “tools” that he has.

Here, I would like to extend the notions of “tools” and “jobs” a little bit further to consider how they work not only in research practices, but also in the trajectory of individual researchers—to include tools written on their CVs and the jobs they apply for with them. Tools are not only the material things that are made and tinkered with in the laboratory. They include skills that are embodied by researchers, and technical knowledge to work with/on laboratory things. Jobs can be a set of specific tasks that need to be done like a set of research problems. But from the perspective of individual scientists who indeed need to find jobs in order to sustain their lives as “researchers,” it is also important to consider jobs in the ordinary sense of jobs, as paid positions, since without them research cannot be done. Research practices, especially in the contemporary life sciences, are hard to be done outside of institutional settings. To conduct experiments, one needs a lab composed of instruments, equipment, and other people’s labor. Reagents and raw materials should be supplied, too. Having a job is not an option, but rather almost a requirement to exist as a researcher. Hence, when I say a scientist finds the right jobs for the tools, it is to highlight the significance of the “tools” in his/her life as a scientist. Tools shape not only research problems, but researchers themselves as they explore the market for jobs. As Clarke, Fujimura, and other contributors have asked questions about tools and jobs in terms of the relation between mundane scientific practices and valued research problems, the “rightness” is also tied to the rightness in knowledge production process itself. As they insightfully point out, “right” is not only a matter of truth or falsity, but also a matter of practicality, suitability and acceptability of a particular option in a situation. The situation can be extended to the world outside of laboratory where researchers try to find and get jobs in limited markets with the tools they have as the resources. The markets are also related to the social interests that make certain technological interventions on life more important and valuable than

others. Researchers like Park would refashion their tools in response to the changing market conditions, and in doing so, they may find more “jobs” for the objects that they are specialized in.

Park was one of the researchers who jumped into hESC research while working in the IVF clinic. He was also one of the first researchers who got PhD in animal reproductive science who ran a research lab in the private IVF center. Park made his career as a “stem cell researcher” out of his techniques and technical knowledge that were developed in his training in animal reproductive biology working with cows. In graduate school, he chose to work on cow reproduction as he thought it could be a “blue ocean” and his familiarity with bovine eggs brought him to a bovine cloning lab in his postdoctoral training; then, his technical knowledge regarding reproductive tissues attracted a head of infertility clinic who was looking for a specialist in that field; he was hired and got his laboratory where he would soon start his career as a stem cell researcher with surplus embryos. In his case, it is obvious that his technical knowledge and familiarity with the reproductive tissues (eggs) are deeply involved in his career transition. It is not to say that his scientific inquiry or other interests do not matter in this process; rather, it is to say that the techniques and objects he was already familiar with in a specific context directed his way, positing him as a different kind of scientist than before and assembling him as the biological potential and value of the object, eggs, he had been working on has changed.

In his doctoral research, the techniques to manipulate oocytes for in vitro fertilization were crucial. The animal species he worked on was cows. While bovine species, given the industrial interest in mass-producing good quality calves of desired sex, appeared to be a promising area, it also needed some extra work on the part of researchers. “It is a difficult

animal. I chose a difficult animal. In order to get bovine ova, you need to go to slaughterhouse, get ovaries from the butchered cows, retrieve immature oocytes, and mature them in the lab. It's different from mice. You can simply have your mice in the lab, inject hormones to superovulate them, get eggs, and do your work." In choosing the cow as his research animal, he already had in his mind the possible return. Cows were a difficult animal for a practical reason, and he anticipated his specialty in bovine reproduction would be rewarding, since not many people work on cows. And, it did help him make his next step—he could get a nice postdoctoral training opportunity to work on bovine cloning in the United States under the supervision of one of the pioneers in the field, because he had the technical knowledge to work on bovine oocytes and embryos.

However, his first job offer did not have much to do with his specialty in bovine species, but with his technical knowledge on working with reproductive tissues such as eggs and embryos. In the mid-1990s when he was still doing his postdoc in the cattle-cloning lab, he was offered a job in a Korean IVF clinic as the director of a lab. It was the moment that the IVF market was rapidly growing, and private IVF centers started competing with each other by increasing success rates. There was an occasion when he advised a technician in the IVF lab that he knew from his grad school to change the recipe for the culture medium for embryos based on his experience of culturing bovine reproductive tissues. This led the head of the IVF clinic to learn the necessity to invest in research and hire Park as the head of the research unit. Park recounted it was applying the same technique while *just* switching the species. The applicability of technical knowledge on reproductive tissues across species may not be as obvious as implied in "just switching." One may even recall the gruesome picture portrayed in Corea's *Mother Machine* in which the objectification of animals in animal reproductive science is extended to

women's bodies (by men). Yet, a more interesting point from the perspective of tools is that his technical knowledge was directed toward the eggs (and embryos resulting from them) already detached from the organisms (eggs gathered in the slaughterhouse and collected by the gynecologists), so species differences appear rather redundant to him. Technical knowledge, through practices, shape the vision in which he grasps the reproductive phenomenon from the perspective of germ cells, particularly eggs.

While he was at first hesitant to take this offer since he still wanted to get a research job in universities or government-funded research institutions, he finally took the job because his family wanted him to do so. Further, he saw it as an opportunity to “create a market” for other researchers to work as “researchers, not mere technicians.” If he and his lab could show that investing in research and hiring researchers is indeed beneficial for private IVF centers to do well in the market, the clinics would hire more PhDs trained in animal reproductive biology. Indeed, major private IVF centers have hired researchers trained in reproductive biology and molecular biology, made investments in developing methods to increase success rates and expand the markets. Private IVF centers were one of few places in Korea where “first in Asia” or “world first” claims were constantly made. Technical knowledge on reproductive tissues was explicitly directed to the clinic's competence in the market. Within the expansion of IVF market and needs of research to promote individual IVF centers, technical knowledge on reproductive tissues has gained new currency.

Another opportunity came in 1998 with the arrival of fascinating report from James Thomson of the successful derivation of hESC lines. It inspired him and other researchers in the IVF centers who have developed the specialty in the culture of human embryo, and the facility to experiment with reproductive tissues. With the availability of human embryos and technical

knowledge on embryonic development, hESC research was seen as an exciting new opportunity and “doable” job. Park started working on hESCs, developing and modifying methods to derive and culture hESCs to utilize available resources. He also tried to work on therapeutic cloning, applying the techniques from his previous training in animal cloning. In 2006, he left the IVF lab to take a job in the university that newly launched a stem cell research center with prospect of branching out his research. He has been working on animal cloning, hESC research, and iPSC research.

He had tools to work on reproductive tissues. His jobs have revolved around the method to create embryos from oocytes—growing, fertilizing, freezing, and thawing eggs in vitro. The main foci of his work has been how to manipulate fertilized or unfertilized eggs to serve the needs of market such as mass (re)production of animals, reproduction of family, and production of stem cell lines in different circumstances. When Park first learned the techniques to fertilize eggs, it was for mass-production of bovine embryos for selection to make the cattle industry more efficient, while the same technique in the cloning context is utilized for tailoring reproduction to get the “best” cattle—the technique is situated in the quality control, or to enhance the quality of reproduction rather than in the efficiency in mass-production. When it is taken out of the context of agricultural industry and moved into the IVF, his technique is situated in a quite different context where its value is attached to the heteronormative ideal of family, a kind of “therapeutic” value where infertility is rendered abnormal, and genes are what seem to be most important in making family. The value of reproductive technology itself is added with the moral imperative of “treating” people. His techniques were closely associated with “reproduction,” while they have different stakes and imply different modes of reproduction. In stem cell research lab, his technique takes another meaning as a step toward finding a better way

to obtain hESC lines whose therapeutic values are still speculative. In a sense, his technique is deployed not for the present productivity, but for the future promises—embryos become different things than before as they are now open toward pluripotent futures. One might say it is a kind of speculative mode of (re)production. This implies shifts in temporal reorientation, epistemology and political economy of life sciences as well as ontological shift in the statuses of biological object. Yet, the differences in these distinct domains of (re)production are not quite present in Park's own account. He sees himself utilizing his tools to do the right jobs. And, he also tends to find right jobs for the available tools.

An egg, as a unit for reproduction, can be used for various ends upon circumstances, and the technology to work on an egg can also be directed to different goals. Since the value of reproduction differs in different contexts, the value of eggs, how they are valued, or what the technology of manipulating oocytes means might differ in the contexts. Yet, he has always been working on eggs, and one may say that the researcher's job is to engineer eggs. The kind of work done by this researcher is to reinvent eggs as a thing with which one can produce a new life form—whether it is an organism like test-tube baby, test-tube female cow, and cloned cow, or cell lines, the eggs are manipulated to produce these living things in different circumstances. Eggs are reinvented as a technical object with which Park, with his technical knowledge, can grasp different opportunities in the business of engineering life. Through this reinvention that repurpose the object into various directions, the object is given more jobs, added value. The reinvention of biological object into biovaluables also adds value to the technical knowledge that researchers have. As Park gained the mobility to move into different domains of research through this reinvention of biological object into biovaluables, he could leverage his scientific capital.

LEVERAGING SCIENTIFIC CAPITAL

Analyzing the power relations and reproduction of the orthodox in the scientific field, Pierre Bourdieu (2004) conceptualized scientific capital as “a set of properties which are the product of acts of knowledge and recognition performed by agents engaged in the scientific field” (55). He draws attention to the hierarchy that exists in the scientific field, which influences how scientists are recognized and how scientific knowledge they produce is perceived. It is not simply “scientific” or “social” significance of research that brings recognition to a scientist, his/her lab, and the knowledge produced there. Bourdieu speaks of micro-sociological dynamics of the scientific field, which works through recognition and perception within and outside of the scientific field. The concept of scientific capital sheds light on the practical concerns, actions, and consequences that are at work in the scientific field, which is quite obvious but does not gain much attention in the social studies of science—the role of recognition which privileges the existing institutional hierarchy for instance. Bourdieu tells us that scientific capital works since scientists, the agents engaged in the scientific field, already know how to “perceive” the value of research and scientists as a kind of habitus. He would see the working of scientific capital in the mundane act of recognizing the author’s institutional affiliation while reading scientific articles. Bourdieu writes, “to exist scientifically is to have a ‘plus’ in terms of the categories of perception prevailing within the field” (55). The whole economy of perception and recognition is central to Bourdieu’s analysis of the scientific field.

Further, it is notable in Bourdieu’s conceptualization of scientific capital that the recognition is not gained solely from scientific achievement itself or scientist’s strategic deployment of resources (Callon 1999, Latour 1987;1993), but also from the position where the scientist and his/her lab is located within the scientific field. The position shapes an individual

scientist's disposition, too. "Every scientific choice", he writes, "is also a social strategy of investment oriented towards maximization of the specific, inseparably social and scientific profit offered by the field and determined by the relationship between position and dispositions" (59). In a sense, Bourdieu sees individual scientists as entrepreneurs who seek to maximize one's own profit with given scientific capital and other opportunities. Yet, his emphasis is not on the investment itself, but the scientists' strategies of coping with the scientific capital that they possess, as "the space of positions [...] functions as a *space of possibles*" (59). The positionality of scientists linked to scientific capital makes Bourdieu's profit-seeking, entrepreneur-like scientists different from Latour's network-building scientists which he takes issue with. If Latour's scientist-in-action is made through expansion by constantly interesting others, creating allies, and struggling with enemies, Bourdieu's scientist is made through strategic allocation and accumulation of his/her own resources by making choices within the given "possibles." Yet, we may push it further, and look at scientists who are made to make these choices, we might also say that these entrepreneur-like scientists are also scientific workers who need jobs to do their science, and who do science as their jobs. And, we may say what could count as "scientific capital" might differ in different contexts.

Bourdieu's scientific capital is particularly insightful when we compare the central players and marginal, peripheral players in the field. Latourian actor-network approach, while acknowledging that the power is distributed in the network, is interested in how certain actors win in the battles over constructing facts. Bourdieu's approach is rather to ask how peripheral players are likely to stay at the margin, or need much more hard work in order to be recognized. Peripheral players are, indeed, difficult to be apprehended with the method of actor-network theory, since they are only the marginal part of network, if not excluded. Are they then captured

well in Bourdieu's analysis of scientific field? It is not clear. In both approaches, what matters is how the center is produced or reproduced (while sometimes challenged, which could be interesting events as they are unusual) rather than what is happening at the margin. In Bourdieu's scientific field, peripheral players are restricted in the resources and recognition, while holding the potential for innovation by challenging the orthodox. If the marginal players are simply staying in the dominant mode of doing science, while not being visible, they would not get much attention here, either.

At one point, Bourdieu writes, "The notion of *visibility*, used in the American university tradition, accurately evokes the differential value of this capital which, concentrated in a known and recognized name, distinguishes its bearer from the undifferentiated background into which the mass of anonymous researchers merges and blurs (in accordance with the opposition form/background which is at the centre of the theory of perception—hence no doubt the particular productivity of metaphors of perception, the matrix of which is the opposition brilliant/obscure, in most scholastic taxonomies" (55-56). Bourdieu reminds us the peripheral players are not paid attention to not only because they are "obscure" scientists in themselves, but possibly because they are restricted by the limited scientific capital that they own, due to, for instance, their training in low-profile institutions. While his conceptualization of scientific capital is not much based on empirical details, hence can be too abstract and over-simplifying (Sismondo 2011), attention to "scientific capital" helps us pay more attention to the different career choices and strategies of individual scientists that shape the scientific field, yet are often bracketed in the scholarly accounts of science and technology studies. In another place, Bourdieu (1990) problematizes what he calls the "scholastic point of view," or non practical point of view that "destroys its object every time it is applied to practices that are the product of the practical

view and which, consequently, are very difficult to think of, or are even practically unthinkable for science” (382). Thinking of researchers’ trajectories as well as the biographies of objects through the concept of scientific capital is to understand the proliferation of biovaluables and commercialization of science not only as the product of institutional and politico-economic shifts on a larger scale, but also as the product of strategic and practical actions. It draws attention to researchers and their practices that otherwise may appear (or not appear!) as an “undifferentiated background.”

Yet, if we look at the scientific field from the center, the notion of scientific capital would not tell much about the dynamics of the scientific field other than that scientific capital appears to beget scientific capital. It might only confirm the existing pattern—scientists with high-profiles would be more successful than others in the scientific community. The reproduction of the same order in scientific field might appear perpetuating. It is because Bourdieu is interested in problematizing the reproduction of the existing order where the mobility is discouraged by the insistence of habitus. However, when one looks at scientists at the “margin”, who have relatively less capital and are still struggling to accumulate more scientific capital in order to get mobility in the scientific world, scientific capital can work as a useful probe. Inae and Park’s stories, together, lead us to ask how the researchers at the margin creatively utilize the opportunities that are newly opened by the promise of biological potential of stem cells and its publicity. One may say that they are producing one among many, many papers on stem cells, but wouldn’t it also be the case that this new possibility is drawing in many, many researchers who would write *one of* many, many papers that reaffirm the potential of stem cells and the value of biological materials?

Leveraging scientific capital is a kind of struggle for individual scientists, and there are creative moves that researchers are making while coping with the institutional imperatives, and

availability of resources at hand. Interestingly, the emergence of stem cell research as a new scientific “bandwagon” opened new opportunities to researchers and medical practitioners who specialized in working on peculiar objects, particularly reproductive tissues. It opened another avenue for the researchers to envision their future differently, and for the tissues to do different jobs. The doubling of bio-value of reproductive tissues could be accelerated by the practical actions of researchers to capitalize on their technical knowledge closely associated with the objects. In the researchers’ attempt at leveraging their own scientific capital to gain certain mobility in the scientific marketplace, biological objects are made to do more jobs. Yet, there are also certain pleasures of excitement and dreaming that emerge in this process, as I will discuss in the next section. Indeed, potentiating objects could also potentiate the researchers not only in terms of their competence in the market, but also in terms of their prospects for the future.

POTENTIATING OBJECTS

I attended a talk given by a clinical pathologist gave a talk to graduate students in the college of medicine in a special semester-long seminar on stem cell research. During the talk, she said, “I feel that I am digging the waste to find gold!” Transforming biomedical waste into valuable resources is an oft-emphasized feature of “bioeconomy” (Cooper 2008a, Rose 2007, Waldby and Mitchell 2006), so the phrase itself could almost sound like a cliché. However, the excitement she was expressing when pronouncing the phrase was impressive. For her, as a clinical pathologist, cord blood had been no more than samples for diagnosis. Cord blood from healthy babies had not been much of interests. However, as she joined the stem cell enterprise, started seeing the potential of stem cells originated from cord blood, and conducted experiments using them—she came to see the biovalue of umbilical cord blood. Cord blood suddenly became a valuable like gold. Her talk was focused on her research on the potential of cord blood stem

cells as a promising source for stem cell therapy. Indeed, she is not simply digging up the valuable from wastes, but turning wastes into the potential valuables demonstrating the biological potential of stem cells originated from placentas. In turn, she also sees the “waste” from unused cord blood, from cord blood whose value was not discovered and put to use.

The biocapitalist imagery that sees the value as already being latent in the biological (Helmreich 2007) is present here, and her research practices can be seen as efforts that are driven by this imaginary. Yet, the excitement at the moment tells something more about how this works. The set of new possibilities that are opened to cord blood, the materials with which she had been familiar with from routinely done diagnostic work for newborns, opened up a new possibility for her to be part of the enterprise of creating value by exploiting the potential. Boring materials suddenly became exciting. Normal tissues, which did not tell good stories to the clinical pathologist, are now seen as a reservoir of exciting stories that would unfold in the future. Her job has also been multiplied—not only telling the truth of pathology that would negatively impact the newborn’s life, but also exploring new avenues of hope. The excitement might be about just doing something new and different, out of the ordinary work that promises nothing more than repeating the routine. For instance, a researcher who worked in the embryology lab in the IVF center said he chose to work on hESCs because it was different from “boring” work that he had been doing at the time. The desire to go back to “basic” research that creates something new drove him to the field. Medical doctors who were looking for something new and exciting also found the possibility of stem cell treatments as a fascinating new opportunity. While the excitement was in part generated by the general excitement surrounding stem cell science channeled through the vision of regenerative medicine, the personal excitement with the opportunity to explore something new seems crucial in the making of the “stem cell

bandwagon.” Leveraging of scientific capital often involves not only the calculation about the future possibilities, but also the kinds of excitement toward the future that is opened up by the potential. One could, at least, dream of somewhat different futures than the present.

Producing data for commercial purposes, or producing commercial products that are not necessarily “exciting” projects for researchers could be part of their jobs. Commercialization itself might not be the direct motivation for researchers, but it could also be one of the ways in which researchers show their own capacities, and the value of their research material and technical knowledge of them. It could be a way for researchers to keep their position that enables them to pursue exciting projects that they would be able to do. In the following, I tell two researchers’ accounts of their involvement in developing commercial products.

Heeyoung, a researcher employed in a biotech start-up, is personally interested in optimizing culture conditions for stem cells. Speaking about her interest in stem cell culture, she seemed very excited. While her research on culture conditions may be developed into commercial products (such as culture medium and dish), she knew that it could be very difficult. She had tried to reach out to other researchers in Korea with her newly developed medium, but it was difficult to convince people to change the medium. However, the project itself, learning about and crafting the in vitro milieu for cells, was an exciting one for her. I was curious, then, if the company was okay with her investing time and energy in a project that did not promise profit. At the end of the day, she was an employer, not just a researcher. “It doesn’t seem like your current project isn’t something that can make money right away. Does your company like it?” She answered, “right. But I have been working with other people on other things, too. I gave a talk yesterday to explain about some commercial product. I think I’ve been earning my keep (doing my *papkap*) for the company in doing those works.” She used a Korean word *papkap* that

means the expense for the meal, and doing *papkap* for the company means that she was paying off to the company for their investment in her work. I asked what she did, but she refused to answer. She said it was not important. I did not want to bug her more and make the conversation awkward, as it was obvious she didn't want to talk about it much.

After a few weeks, I came across a video clip in which she was featured that promotes a new “stem cell cosmetics” sold by a multi-level marketing company. She also seemed to have given talks in the promotion event for the product. Web pages that introduce the product contain her name and her profile as a stem cell researcher who developed cell therapeutics for burnt skin, and applied the serum free culture medium that she developed in culturing hESCs to cosmetic products. It is not clear whether she had the cosmetic product in her mind when talking about unimportant work that pays her *papkap* to the company, but it was highly likely that she was, without naming what it was, mentioning this commercial product as what she was doing as her *papkap*. It might be just because it was a “side” project that was not very relevant to her own scientific inquiry. Yet, it was still a way to pay off the company for the expenses of her research, to prove that the company was not spending money for nothing.

Later, I learned Seungmin, the PI of the PRL, also participated in developing “placenta cosmetics” that contain several recombinant proteins that are found in human placenta. She told me about it as one of important achievements she made. She was mentioning the commercial side with pride. Is it just because she is more commercially oriented, or interested in business? Or, is it because she is not so interested in “pure” science? Does she really think cosmetic products, while teaching her students that we're biologists work to contribute to humanity by finding therapeutics, an important achievement? The questions that occurred to me were already charged with my own value judgment about good scientific research. Hence, when I uttered, my

question sounded quite awkward—indeed, it did not form a question before Seungmin formulated a question for me. “You know, people expect, when ordinary people like me hear about stem cell research, that scientists like you will provide cures...” While I was stammering and looking for a better way to phrase my question, Seungmin grasped what I was trying to ask. “So, you’re asking how I think about making things like cosmetics instead of developing therapeutics?”

She proceeded. “Let me tell you. As I said before, I am interested in placenta as my research material. Stem cell research is one of the tools, one of the areas that I can show the potential of my research material, placenta to others. Cosmetic product is one of the ways to get others interested in placenta.” She laid out her future plans to move forward. While placenta research is not quite popular among researchers, she thinks various works she does would help more people get interested in placenta as research material. She wants to make her own bandwagon, or at least, she knows how bandwagon works. It is a kind of “interest” that people have. Since her future career plans are anchored in the placenta, and its potential, she would assign more and more jobs to the placenta, testing various usages of it, so that people would need placentas and her to work with. Interested in the role of placenta in fetal development, she wants to build a community of placenta researchers. Stem cells from placental tissue have offered an avenue toward her goal, because those cells would possibly interest other researchers interested in regenerative medicine and tissue engineering. Her future plan is centering placenta as the area of her expertise. Since not many people recognize the value of placenta, however, she is making various efforts to present placenta as an attractive biological object.

To the commercial entities, consumer products like stem cell cosmetics are a way to gain short-term profit. Stem cell cosmetic products are sold thanks to the stem cell bandwagon. To the

researchers, participating in this type of project could be trivial work that she does only to make money. To Heeyoung, it is merely work to pay for her research, to sustain her life as a scientist. Her scientific work is distinct from it, but at least she needs to ensure that she is making profit for the company. It may be “unimportant” to her at least in a conversation with an anthropologist on stem cell “research” in Korea. The unimportant work to make profit is, for her “scientist” self, a superfluous one. Yet, the work that she feels unimportant in explaining her “scientific” work and life is indeed a necessity to reproduce her life as a scientific worker. She cannot simply pursue what she finds interesting as a biologist, especially when employed by a commercially oriented small biotech venture. The company expects her research to make money, to make profit, if possible short-term profit too. Heeyoung’s company cannot simply bet on commercializing the culture system she wants to develop and possibly make into products. The company is paying her, and it expects certain returns from it. In this exchange between an employed scientific worker and a company, a scientific worker’s labor is not necessarily measured by the time that was invested, but by productivity of the scientific labor. There are various means to measure the productivity such as the number of academic publications, patents, or funding records. In the private company that suffers from precarious financial situation, the short-term profit can be also an important element for the worker’s productivity. Heeyoung is well aware of the nature of the exchange, and she made efforts to commercialize stem cell culture medium in the form of cosmetic products. It is the necessity, the productivity that the company anticipates as a return to the payment to her, and it is also necessary for her to maintain her job so that she can conduct other experiments that she finds interesting. Yet, to explain her scientific life, she does not need it, she does not want to mention it. It is just work to produce the value the company wants to gain. It has no value to her except for simply reproducing her life as

a scientific worker. Yet, in this process, the culture medium she developed, although it was not her goal, gained another job as an ingredient of cosmetic products in her attempt to cope with the needs of the company.

In contrast, Seungmin considers the cosmetic product as one of her achievements. It is not simply because she is more interested in commercial application than Heeyoung does. But, in order to do her “basic” research, she, not unlike Heeyoung, needs to make sure that her work is seen as worthy of investment to others. Seungmin pushes it further to utilize it as an opportunity to leverage her scientific capital. Her technical knowledge on placenta would not be valuable, would not take her far, if there were no one interested in placenta. She is trying to utilize various opportunities to show that “placenta has the potential”. It is similar to Inae who also wants to “propose” placental tissues as good sources of stem cells. The stem cell bandwagon opened them an opportunity to propose others pay attention to this potent and valuable tissues. Seungmin has distributed research projects to her lab members in a way that enables her lab as a unit to explore various avenues that placenta would turn out to be valuable. In addition to studying the basic mechanism related to the function of placental stem cells, the lab was working on testing out the efficacy of placental stem cells and placenta extracts on specific diseases. She would say that even though “stem cells go out of fashion”, as other biological concepts had been after some time, her expertise on placenta would still be valuable, and she is working on making placentas more interesting materials. She actively adds what placentas can do to the CV of placentas. Exploring the diverse usages of placenta, Seungmin runs the lab to potentiate the research object, placenta, and capitalize on her own technical knowledge.

BIO-VALUE AND BIO-GRAPHIES

In this chapter, I proposed to look at, in addition to the “biographies of scientific objects”,

the CV of scientific objects, along with the CV of researchers, which helps us look at how “what they can do” is multiplied as researchers try to add value to their technical knowledges. As STS scholars have long pointed out, techniques are more than mere tools as they shape the research practices in specific ways and form the knowledge that researchers would gain. What I discussed in this chapter adds another layer to this discussion by pointing out technical knowledge on how to work with specific objects that are also a kind of assets or scientific capital that could be leveraged as the CV of objects is built up. Following Strathern (1992), we may say that these biovalueables are “enterprised up”, as “the natural, innate property and the artificial, cultural enhancement become one” (39), as researchers’ own personal enterprises intersect with the stem cell enterprise, or other types of biotech enterprise in a way that emphasizes the potential futures.

As I explore the field of “stem cell research” and look for “stem cell researchers”, it becomes more and more confusing what they mean. It is a heterogeneous field in which researchers from various disciplines (e.g. molecular biology, genetics, cell biology, developmental biology, chemistry, material engineering, medicine, etc.) are forming a “community” around the technical object called “stem cells.” Even the concept of stem cells itself is quite peculiar as it refers to different kinds of stem cells that originate from different developmental stages, but share certain “characteristics,” or capacities by “definition.” Then, it also implies that people from different disciplinary backgrounds and different technologies join this heterogeneous enterprise. What all these different researchers share might be a specific temporal orientation of stem cell research—realizing the biological potential.

Technical knowledge offers an entry to observe the changes in scientific fields to some extent. It draws attention to what researchers do, how they are trained, and in what circumstances they face the market—in a different way than what the focus on “scientific inquiry” does. What

appears at first sight as a simple response from each actor to market situations, indeed, opens up stories of social changes, if attention is paid to how the techniques and objects gain different saliences in each circumstance. How scientists and institutions move into different domains with more funding, investment, publicity, and opportunities utilizing their technical resources can be viewed as simple as a rational response to market changes. As many do, as rational economic actors, they would try to join a more promising enterprise, get a better income, or simply get a job. This way, the unprecedented connections among different fields can be explained sociologically showing what one called “ecology of knowledge.” However, if we attend to what technologies do in different circumstances, how they are made sellable in different contexts, we might trace how different social concerns direct researchers and institutions in specific directions. In doing so, by tracing how the same objects and technologies, in this context regarding reproduction, are utilized differently, it also illustrates the differences in the ways reproductive processes are “harnessed”. The continuity now becomes less obvious—we might reconsider what “reproduction” means, or “reproductive science” means in each historical context.

The snippets of biographies of reproductive tissues that I presented in this chapter are stories after the reproductive tissues were born again as bio-valuable things. They have different pasts in the context of reproduction. I only highlighted how, with the stem cell bandwagon, these reproductive tissues are now rendered as a resource to be utilized, which is otherwise to be wasted. In this story, their reproductive past is only alluded as the source of their vitality and generativity. Commercial needs, desires, excitements, and entrepreneurial interests are part of the potentiated objects. The bio-graphies of bio-valuable reproductive tissues that I presented here are related to a specific mode of grappling with life that foregrounds vitality contained in entities,

generative force of lively tissues. At this specific moment in the “age of biological control” (Franklin 2005) where technical knowledges are added value with the lively potential of biological materials, the enterprised-up nature would tell different stories about life than before. Placenta studied in the stem cell bandwagon is not a deficient placenta that failed gestation. Cord blood that interests the clinical pathologist now is not cord blood of sick babies. Embryos do not necessarily provoke questions about development. Oocytes only matter as a facilitator of reprogramming of somatic cells. Interestingly, these technologized and potentiated reproductive tissues might be losing their potential to guide researchers to other questions. At least on the stem cell bandwagon, “reproductive” tissues are only meaningful as they are capable to supply stem cells. Life itself, or the promise of life itself, contained in the cells only counts here.

Labors at the Fingertips, Lively Cells, and In Vitro Ecology

“You make a hypothesis, take good care of cells, and they grow well, they *smile*. Then, to test your hypothesis, you treat something to the cells; you observe those cells that were smiling now cry. You repeat, observe cells smile and cry. You are proving your logical hypothesis with your fingertips. *If they don’t smile when they are supposed to smile, it can’t work.*” (Seungmin)

Do cells smile? Seungmin, a cell biologist who constantly emphasizes that one should learn how to make cells happy to be a good cell biologist, sees cells smile. It is not her goal, of course, to keep cells smiling all the time. She wants the cells to smile so that she could recognize when they eventually cry after being exposed to some procedures that she hypothesizes do harm to the cells. The goal is to prove your logical hypothesis, which could generate data that could lead to publications in peer-reviewed journals, preferably with higher impact factors, and possibly other uses such as patents and other commercial purposes. Observing the smile of cells may be only to replenish the labor force of cells, life itself, in order to set them in motion to produce data that promise her something else. Yet, keeping them smiling is not trivial in producing anticipated data about the logic of “life itself,” since their “cry” might manifest only with the backdrop of their lively smiles. To make them smile, however, one should have good “fingertips.”

As I talked with cell biologists about the details of their work, I became fascinated by the way they talk about cells as living beings that can sense, feel, and respond to the circumstances. They talk about cells as if they were little babies that require a lot of attention, and they explain why cells go wrong comparing the circumstance to everyday human experiences. They say that they should take good care of cells to keep them happy. They are not simply the cellular form of

life itself in an abstract sense, as we could see from Seungmin's concern about their *liveliness*. Throughout this chapter, I use a term "liveliness" to refer to the vitality of living things that emerges and is cultivated in their living milieu.

I use the term "liveliness" to highlight the living things' life in concrete circumstances and relations, while distinguishing it an abstract image of "life itself". The reconfiguration of life as a reprogrammable, transformable, and controllable through biotechnology is marked as a momentum in the history of "life itself" (Franklin 2000, Rose 2007). Nicholas Rose (2007) has, within this reformulation of life itself or human "vitality", proposed somatic politics of "life itself". This particular formulation of "life itself" begs questions about fetishization of biological objects as "the guarantor of life itself", "an auto telling thing in itself" (Haraway 1997:147). Critiquing gene fetishism, Haraway writes, "[l]ife itself" depends on the erasure of the apparatus of production and articulatory relationships that make up all objects of attention, including genes, as well as on denial of fears and desires in technoscience" (1997:147). Marx's discussion of "commodity fetishism" (1976) highlighted how the commodity form substitutes the social character of labor in capitalist relations of production with the objective characteristic of commodities themselves (value). In a similar vein, Haraway's critique of "gene fetishism" asks how the object of "life itself" substitutes the social character of "life," our desires and anxieties, with the biological fact of life itself. If "stem cells" are promising as a life form, it is associated with certain desires and anxieties about the passage of time that are articulated with their potentiality that may allow people to have control over biological time as well as the promise of regenerative medicine. To do so, however, the stem cell needs to first be established as an "object" with an ontological certainty that "has" the biological potential as its intrinsic property.

Life itself, as construed in the fetishistic discourses on biotechnology naturalizes the imaginary of biotech (Helmreich 2008) that sees biological properties that would revolutionize our biological life. What gains the ontological stability is the biological “property” of living tissues that is subject to human control. Inspired by Haraway, Natasha Myers (2007) develops the notion of “liveliness.” Interrogating the dichotomy between mechanistic view of biology and vitalist view of biology, she conceptualizes liveliness in terms of “a performance that taps into the excitability of all kinds of bodies (human, nonhuman, and machine) that are swept up in the act of crafting compelling narratives of life” (89). Myers’s notion of “liveliness” helps us consider the practices and processes through which (what appears to be) “life itself” emerges. My use of the term “liveliness”, while building on Myers’s conceptualization, draws attention to the relations of care through which things (and we) are made lively. As vitality in process, affectivity in practices, and generativity in relation, liveliness is always more than life itself.

In order to produce something valuable, their liveliness should be cultivated and maintained. While it is possible to see cells as little workers whose “untapped labor power” (Franklin 2013:96) is cultivated for the production of biovalue, what the researchers say about “keeping cells happy,” their liveliness is to some extent dependent on the condition of their living of which researchers’ care is no trivial part. Indeed, Seungmin’s talk on “observing cells smile” was made while she was talking to her students and researchers on the importance of good care in cell culture. The commentary on liveliness of cells in culture is often accompanied with the discussion of how to take good care of cells. Taking good care of cells is more than just putting them in the culture medium that is supposed to provide nutrients and placing them in an incubator that is supposed to maintain the optimal gas concentration as well as temperature for the cells. Checking the cells everyday to see if they are growing well, changing the medium that

has been used up by them, and replaying them when the culture is too populated—all of these constitute a daily routine for researchers who work with cells. Further, taking good care of cells means that researchers pay due attention to the cells when working with them. All these manual labors are directed to keep cells happy. In order to do so, researchers should learn to see cells smile. One should know about “one’s” own cells and their specific characteristics. One should learn about them by taking care of them, figure out how to work with them, and attend to them on daily basis. If one could do this well, others would say that she has good “fingertips.”

Taking seriously the researchers’ comments on “keeping cells happy,” I explore the peculiar *in vitro* ecology in which cells dwell in the stem cell laboratory and of which researchers as well as machines are parts. *In vitro* ecology may sound oxymoronic, as the laboratory often appears a place where the environment is artificially made and maintain to keep the living things under control. Yet, given the propagation of the *in vitro* life forms with the advent of tissue culture technologies and increased interests in capitalization of the biological “properties” of living tissues (Landecker 2005, 2007), it is plausible to consider laboratories as a novel and peculiar kind of living milieu for these *in vitro* life forms. *In vitro* life forms grow and propagate in the labs not because people love them like babies or pets, but rather because they promise to tell us something about biological life, provide technologies to further control life itself, and create biovalue in terms of both health and wealth. Taken out of their natural habitat to the *in vitro* world, these little workers demand much labor and resources towards their own maintenance. The assemblages of humans and machines are required by and created for the cells, “living tools” for the “untapped labor power” of the biological is to be harnessed (Franklin 2013). Looking at the stem cell lab, Franklin (2013) provides a fascinating account of the relationship among humans, tools, and substances, as “newly hybridized historical kinships of

biological connections and living tools” (100). Drawing on Marx and Haraway, she proposes examining the increasing technologization of human substances in terms of “complex biological relations,” and “specific modes of reproduction and denaturalization as technologies of kinship” through which cells are recruited as “labor itself” (96). What I propose in this chapter is that the fingertips could be a site to observe how these emergent biological (and affective) relations, as they coordinate the condition of reproduction of liveliness which in turn appears as “life itself,” and “labor itself” as the labors *at* the fingertips—concrete, sensuous, material, and imaginative practices— are erased. A lot of work is done to get these living tools work, which are enacted at the researchers’ fingertips.

Without labors at the fingertips, cells would not survive to produce desired data.

Without cells’ being alive, the researchers would not be able to produce something that has a currency in the scientific or commercial markets. Fingertips do the work of coordinating various elements that constitute this *in vitro* ecology by working on the machines and looking after the cells. However, while they primarily refer to the manual labor of researchers required for routine maintenance of cells, they include more than a set of mechanical tasks that are done on the protocols. As Seungmin suggested by asking her students to learn how to “observe cells smile,” the labors at the fingertip may involve attention, care, and certain feeling for these living things.¹⁰ Attending to the fingertips that attend to the cells, I highlight the salience of care in the making and maintaining of the *in vitro* ecology and liveliness of cells. This chapter specifically focuses on the practices of cell care and the mode of attention that cell biologists learn through their care

¹⁰ Carla Hustak and Natasha Myers (2012), problematizing neo-Darwinian reading of evolution, have proposed to seek openings when thinking of ecology and encounter between species not simply in terms of an “economy” of maximization, but also in terms of “an affective ecology shaped by pleasure, play, and experimental propositions” (78). In doing so, they suggest, we may tell different stories about science pervaded with a specific logic in the present, and find different modes of ethical encounter with other species.

practices¹¹ that I touched upon in the previous chapter. While the labors at the fingertips may appear simple, routine, and rather mechanical, they are also works that highlight the pragmatic, yet affective relations that emerge in the lab, as researchers work with cells that are sensitive and have their own characteristics (like humans do have different personalities).

I am speaking of fingertips, not hands. Another backdrop for my interest in fingertips is Hwang's appraisal of "chopstick technology" and "Korean" dexterity when explaining the reason for his team's excellence in SCNT-hESCs research. While he was also talking about the significance of material labor in the scientific knowledge production that is often rendered invisible in the privilege of "mind" or intellectual labor in science, the image of nimble fingers he alluded privileges only one aspect of scientific labor—of hands that execute what one's mind orders with precision, of hands that are able to meticulously manipulate the object—like the hands that are able to "squeeze" out nucleus from eggs. This kind of hand has long been a privileged organ in explaining human, culture, and technologies. As Tim Ingold (2004) discusses, hands are seen as the organ that marks the boundary between the human and nonhuman, culture and nature, as they "deliver the intelligent designs or conceptions of the mind upon it," for which nature "presents itself as a surface to be transformed" (318). Yet, fingertips, tips of finger, do not only grab and transform things. Rather, fingertips contact with other things, touch them, and sometimes are touched by those things. Fingertips in the lab tend cells, rather than simply exerting mastery over cells. What are done at the fingertips highlight not the transformative power of technology (in the opposite pole of nature's vitality, reproductive agency, or labor force), but the arduous labors of care and co-ordination to maintain the vitality

¹¹ Puig de la Bellacasa (2011)'s call for attention to "care" recalls the resonance between longstanding feminist engagement with care, and emergent interest in mundane laboratory practices. For her, care is a method to attend to the "neglected" things and practices (Star and Strauss 1999).

of laboratory life forms in their *in vitro* ecology so that they can work to produce desired outcomes.

And, I call them labors *at* the fingertips, not *of* fingertips. I consider fingertips as a *site*, rather than simply as part of a human organ, where cells are “cultured” in double sense: “cultured” by being fed and nurtured to grow *in vitro*, and “cultured” as a material-semiotic object that stands in for the bearer of vital potentialities. To do so, ideas of life, living matters, technologies of tissue culture, and ethico-legal technologies should be put together. If we could say that stem cells are a kind of assemblage of all these different elements, following fingertips—what they do, what they touch, and how they are touched—is a way to attend to the condition of *in vitro* life form of stem cells. If the laboratory is a site where a human-machine assemblage is animated to create cells as “living tools” (Franklin 2013), fingertips are a site where the elements in this assemblages are coordinated and made to work so that these *in vitro* life forms come into being and are kept lively, not merely alive but indeed vital and healthy.

Fingertips mediate the contact between cells and their *in vitro* environment, while sustaining this living milieu for cells to maintain their liveliness. When following the lead of researchers who draw on the cultural scripts that relate fingertips not only to the manual skills but also to the labors of care, liveliness is brought to the fore. It highlights an aspect of “living” that affects and is affected by the circumstances. Yet, as the fingertips are removed in the discussion of biotechnology when they are staged in scientific journal articles or news reports, “life itself,” the abstract form of vitality, replaces the peculiarity of living—liveliness in the circumstances.

HOLDING A PIPETTE IN A LABOR-ATORY

“The lab must be different than what you imagined.” When I first started staying in the lab five days a week from 10AM to 6PM, following each lab member to observe their experiments, they often asked me if I was not bored, already assuming that I was bored. To them, there was nothing very exciting to a non-biologist. And even more, they thought that the lab is not as fancy place that a non-biologist like me would imagine based on what is shown in the media. The images include: a scientist in a spacesuit-like lab coat in a clean room surrounded by expensive equipment, or shiny visual images of cells generated by immunofluorescence after a day’s work, fancy machines, fast-paced work, and so forth. Even when I said I was so excited to wear the lab coat that was depicted as a “spacesuit-like” one in the media reports on cutting-edge hESC research in my visit to another lab, I was told, “oh, yeah, but we usually say we look like women workers in *kimchi* factories.” Youngmi, a grad student in the lab jokingly told me that it was more like a “cottage industry (*kanaesugongŏp*).” What she meant by “cottage industry” was the manual labor that involves quite a lot of repetitions and time—not speedy, not fully automated, but rather slow while demanding a lot of manual labor that often feels tedious. The words used in their jokes about labs such as cottage industry and *kimchi* factory also added a certain “domestic” tone to the lab work.

I spent most of my time in the lab following researchers from the lab to another lab, watching their routines, chatting with them while they were conducting experiments, and sometimes helping them with miscellaneous tasks such as internet searching, crafting English sentences for journal article, cleaning glassware, putting pipette tips in cases, and so on. As the researchers were concerned that there was nothing extremely interesting to a non-biologist, they were wondering what I was doing. It was not so clear even to me that what I was doing, but I

found myself constantly drawn to the researchers' busy hands as they were doing stuff eloquently and carefully on the lab bench. Even when researchers were bantering around while working on routine experimental procedures, their fingertips were always attentive to what they were doing. In my interviews and conversations with researchers, I became interested in how they make sense of the mundane and repetitive manual work that they do with fingertips. What particularly grasped my attention were the ways researchers, mostly women, analogized cell culture with "domestic" and "reproductive" labor at home.

The analogies, as I will discuss later in this chapter, add another layer to the discussion among STS scholars on the significance of material practices in scientific knowledge production. While it is often rendered invisible in the official account of scientific innovation, the manual and mundane labor is essential in the experimental science. Challenging the view of science that privileges the ingenious mind as the locus of innovation, STS scholars have long shown how the production of scientific knowledge requires more than the work of mind in Cartesian sense, and knowledge is indeed a product of messy and mundane works that are orchestrated in peculiar ways. When focusing on the practicality of science, we come to see the "invisible technicians" whose labor was indispensable to make the spectacle of virtual witnessing (Shapin 1989); the "mangle of practice" in which human and nonhuman agencies emerge through resistance and accommodation (Pickering 1995); "tacit knowledge" as embodied knowledge that is not explicated like "explicit knowledge" (Polanyi 1958); and science as "craft" work that requires a series of tinkering, which shapes not only daily practices of science but also scientific problem itself (Fujimura 1996, Bourdieu 2004). Deborah Heath (1997), while observing the division of manual and intellectual labor in the lab, hands and brain, embedded in the organization of laboratory, proposes we consider various bodies that are gathered together around the labs. STS

engagements with manual labor have brought the “body” back into the scene of scientific knowledge production, and lead us to ask about the politics of erasure of body in the portrayal of science. These mundane works are salient not only because they are necessary to produce knowledge, but also because through the practices, scientists, science, and the things they research are made and remade. Hence, researchers’ fingertips are one of the places where we start seeing how these bodies of researchers, science, and living things are made and remade. Furthermore, when they describe their manual labor in the lab with analogies to other kinds of labor, they also shed light on what kinds of bodies are produced other than “skillful” hands that are good at specific tasks. I will return to this point later.

One object that is always present in the lab is a micropipette that researchers use to measure and transfer a micro-volume of liquids. Each researcher had her own pipette with one’s own name on it¹². Although the pipettes belong to the lab, one would only use one’s own, since each pipette, used for a while, would feel different. While it is used to achieve a certain degree of precision, it is not possible without researchers’ “good” or “clean fingertips. Since the results of the experiments can be greatly affected by a slight difference made in handling the materials, hands should be very attentive to what they are doing right now. A simple practice like releasing the plunger while pipetting requires a certain skill. Simply releasing the plunger when pipetting needs training. It should be in a gentle, yet swift manner. When I tried pipetting with my “shit hand (*ttongson*)” (another vernacular people use referring to a person who often messes up

¹² A pipette is an object that epitomizes what these researchers do on the bench. One’s pipette is one’s identity as a researcher as it is a thing that everyone working on the bench uses to conduct experiments. In the debate over authorship, for instance, some researchers who argue that a researcher who actually conducted the experiment should deserve the first authorship. For instance, an anonymous biologist wrote on an online forum on this issue, “a researcher who actually worked with a pipette in his hand should get the first authorship.” While I do not want to discuss more on the politics of scientific authorship in detail here, I would like to note the significance of “holding a pipette,” the manual labor, in research practices. Here, “holding a pipette” is used almost synonymous to actively engaging and working for the production of data. It is not the act of pipetting itself, but the work of the mindful body that handles the pipettes.

experiments by handling things in a clumsy manner), Youngmi told me that I was releasing it *too* rapidly. I got the words, but was unsure what “too rapid” means. She would show me how to use pipette correctly, “watch my hand carefully. See? Release the plunger like this, gently.” I tried, but it didn’t go well. “No one can do this well from the beginning. Just practice with water, not actual samples. Then, you will finally get it.” What I learn from reading protocols and observing the experiment was apparently not enough. Something should be learned through the body, by practicing it constantly, getting the feel, and being able to do so. Michael Polanyi (1958) would call it “tacit knowledge”, and I would add attentiveness and care here. It is not only that the skill is acquired through practices in an explicable form, but also that she was paying particular attention to develop the sense. “I can now chat with you while doing this, but if I were a newbie in the lab, I should have not been chatting with you like this. I should rather be more careful, concentrating all my mind on the pipette.” Her body now is a kind of “mindful body” as Heath (1997) calls it.¹³ Through deliberate efforts of practicing seemingly simple techniques repeatedly, her body is disciplined in its double meanings—trained to conduct certain things in a habitual manner, and trained as a biologist for whom a “pipette” is a primary means to do something with micro-scale materials.

Even when they were not working with pipettes, their hands sometimes manifest a habit probably gained from pipetting—holding a pen like a pipette, tapping the pen on to the desk or their palms as if they were attaching tips to the pipette shaft just to focus one’s mind. Similar habits in hand. It might be just coincidence that people in the lab shared the same habit, or that

¹³ Nancy Scheper-Hughes and Margaret Lock (1987) used the term “mindful body” in the context of medicine in order to interrogate the Cartesian model of body that has been prevalent in the modern western medicine. Problematizing the dichotomy of mind and body, individual and collective, and sociocultural and biological, they suggest clinical practices should consider mindful body seriously. Heath (1997) borrows this term to capture the politics of scientific knowledge production in which “body” disappears within the division of labor tied to Cartesian mind/body dichotomy.

people just picked up somebody else's habit and mimicked it. Yet, it can also be the case that time and energy that they spend with pipettes in their hand has shaped a similar habit in their hand even when they are not working with pipettes. A researcher's hand or her body, when she is not necessarily doing manual pipetting works, might be imitating the gesture that it makes when her mind requires concentration. It seemed like a habit to set one's mindful body in motion, or maybe keep the mind in motion with a particular mode of concentration. When a researcher's body whose mind is supposed to be working might be imitating her body that does a manual job which does not seem to require much "mind" work, the researcher's mind, if we still hold onto the distinction between body and mind, could be seen as being affected by the bodily practices that require precise, attentive, careful, gentle, and yet swift fingertips. As the researchers learn it from observing others doing things with their hands and learning how to do so by repetitive experiences, they might embody a specific style for doing/thinking things as lab biologists. What they learn by imitating other people's gestures is not only a set of skills to have control over the research materials, but also a mode of care for things at hand. Through the imitation and repetition of habits, the mode of care is also reproduced. What Tarde (2000) called "imitative rays" might be at work here, when not only skills to conduct scientific experiments, but also ideas about biology should be done are spread through repetition.

While one may focus on the pipette as an instrument for extraction of life itself, what interests me is the fingertips that gently release the plunger, not too rapidly, not too slowly so that the pipette could work. In turn, I became quite sensitive about the ways researchers talk about fingertips—"good fingertips," "flavors from fingertips," or "clean fingertips." They seem to say something about how they *do biology*. If a pipette is a significant instrument in the lab where the careful handling of micro-scale materials is a significant part of their work, fingertips

are a kind of connective tissue that extend researchers' bodies with tools, and allow them to relate to the materials that they work with. The fingertips appeared more significant in the occasions they talked about cell culture, the practices to take care of cells, to make cells *happy*.

TO MAKE CELLS *HAPPY*

While fingertips are doing important things in almost every step of experimental procedures (including preparing experiments), they seem to have a greater significance and presence in the context of cell culture. What these researchers' mindful bodies do, once the researchers get used to the tasks, are often seen as rather mechanical. As the body is disciplined, the tasks are performed without any contemplation of how "gentle" is gentle enough, when releasing the plunger in pipetting. There should be no "mistake." At this moment, it appears that the fingertips that are "clean" and do the jobs precisely appear to be no more than a part of machinery that produces scientific knowledge by extracting knowledge about "life itself" from the biological materials. Yet, when they see cells, the fingertips are more than the tools that are capable of doing the jobs precisely and skillfully.

"Cells are living things. That's why it's difficult." Heeyoung said to me. She was a cell biologist who studied gastric stem cells in her PhD training, then switched to hESC research when hESC research was getting more attention and offered a better chance of funding. The institution she was affiliated at the time had not been working on hESCs, so she had to figure out how to work with them from the scratch. Getting used to the difficult hESCs required a lot of work, and she moved to a hESC lab tied to an IVF center to work better. The difficulty she faced in hESC culture led her to her current research interest in bettering the culture condition for hESCs. Since she was interested in developing a better culture system, she was keenly interested in cell culture as a practice. "Sometimes the same cells grow faster than other times. You should

diligently look after them. The protocol says this, so I mechanically do what it says: that is *not* the way to grow cells well. You should be really sensitive to how they grow.” If cells are not mechanical things, the researchers should not be doing jobs mechanically. Cells have their own lives, and sometimes they behave differently from what was promised in the protocol.

Responding to the contingencies is what she thinks as the important virtue of cell biologists by “diligently looking at and looking after cells.” Diligence and attentiveness are required to take good care of cells. The attentive researcher would speculate, if the cells do not seem to grow well, why it is the case, what makes cells uncomfortable, unpleasant, stressed out, or unhappy. The meticulous fingertips can make differences as they attend to what cells need. And, it is not solely the physical work that “fingertips” do that is involved in the practices of care.

Although cells could appear one of many raw materials for research, stories about care of cells present them as “living” things unlike other “non-living” research materials such as DNAs and RNAs, and fingertips are more present as they do more than “precision”. I would like to add here that the difference between living and nonliving is not categorical, but rather situated in the works of caring for and feeling for the things at hand. For instance, in Myers’s ethnography of crystallographers (2007), her informants would see molecules as a living thing that “breathes”. Learning the structure of protein through body-works, developing “feeling for” (Keller 1983) molecules, and imagining them dwelling in the molecules, they would rather feel that proteins are not simply nonliving things. In a sense, being aware that cells are living things is not only a matter of biological truth (“cells are the basic unit of life”), but also a matter of care as researchers try to cope with cells as they grow, get awry, and die in culture with their fingertips. Researchers who talked about the fingertips told me that there are various “know-hows” that a researcher comes to gain through the experiences of care. They repeated that the sensitivity and

meticulousness in researchers' fingertips matter a lot. While her work is to develop a standard system for cell culture, she would not say it was enough. "I've been making and developing SOPs (Standard Operating Procedure) for researchers, but they are not as useful as one might imagine. What matters is the fingertips of researchers—how they respond to the cells' needs and growth makes differences."

It is because, Heeyoung says, "cells are living things." Cells are living things taken out of their natural habitat, an organism's body. Inside the body, cells live, grow, and die upon the organism's metabolic process. Oxygen and nutrients were provided as the organism maintains its life. Temperature and humidity are kept more or less stable inside the living body. Now in the lab, all these things need to be taken care of by artificial means. There is a whole package of technologies and things to maintain cells' life *in vitro*. Incubators do certain jobs—they keep the temperature, humidity, and the level of CO₂ stable, as long as they are not out of order. Culture medium is mostly purchased from well-known companies. Cells are accompanied with protocols when they are purchased or given. There are machines and words to provide cells with standardized conditions of living. Yet, it is not enough. The whole package does not automatically work without human hands. Cells should not be left starving, while they are confined in a dish with limited nutrients and space. "Unfortunately, the word 'weekend' means nothing" to cells. Somebody needs to feed them. Feeding means—in the cell culture practice—not only providing them with nutrients, but also clearing up the culture dish so that debris do not affect the growth of cells. Every now and then, the cells should be re-plated to avoid the dish being over-populated upon cells' growth. All these things are noted on the protocol. The routine care of cells is essential in order to keep cells alive, but there is more.

That cells are living things means more than that they need nutrients and oxygen to keep their life. It also implies they are things that change over time responding to subtle changes in their environment. They are complex and sensitive things. They are things that can be “stressed out”, that can sense the external changes, and that can also change their life course. They would lose their “liveliness” which matters to get whatever valuable things out of their living processes. That cells are living implies not only that they do metabolic processes, but also that they are sensitive and can be vulnerable to their environment. Cells “sense” other things, and they change. Since researchers’ fingertips are what mediate cells and external environment, the fingertips should be attentive to how cells grow, and please the cells—or, make cells *happy*.

When asked what she meant by “growing cells well,” Heeyoung explained:

When I said growing cells well, I meant I am interested in figuring out how to make cells happy, not stressing them out. Everything can be stressful to them. Let’s say you change the culture medium, I guess there would be some scent that the cells are familiar with, so it’d be stressful to the cells if you replace it in a precipitous manner. Scent may not be an appropriate word here. But, anyway, various know-hows are involved there.

What I was trying to ask her was what might be the criteria to assess the good growth of cells—for instance, the number of cells that are harvested, the quality of cells that are obtained, or both combined? Instead of answering in these terms, she gave me another phrase to think with—making cells “happy.” Rather than exclusively focusing on cells as a kind of “products,” she talks about the practices of cell care at length. Perhaps, she might have thought that technical answers would not mean much to me. However, it is telling that she instantly answered my question in terms of the practices of care, interaction between researchers and cells— that lead me to a different direction from what I had expected, to a direction that matters to her as she cares for cells themselves.

Do cells feel? The language she used to answer my question was charged with the affective tone. She could have explained to me, for instance, that abrupt changes in its environment might cause damage in cells, and it is necessary to keep the environment as stable as possible. Instead, her explanation implies cells sense something as we do, even though they are subtle changes, and get stressed out when they feel something strange. Rather than describing cells as simple objects, she maintains that cells are living, sensing, and feeling things. The example she offers here, the possible stress caused in the process of medium change, is interesting in this sense. The medium is the nutrients for the cells in culture, but at the same time, it's their chemical environment where they are fed and they excrete metabolic waste. In terms of the metabolism itself, the "precipitous" handling would not make any difference. Yet, there is something more. Heeyoung, the researcher speculates that cells sense something that is happening in their environment, and fingertips should work gently with the cells in order not to disturb them. Fingertips are, in this speculation, made present as a component of the living environment for in vitro cells.

Heeyoung's passing comment on the "scent," which she immediately retracted from what she said, may not be an explanation for why cells do not grow well. Yet, it illuminates the way she cares about cells as living things whose liveliness is dependent not only on the nutrients (like the force of engines generated by fuel), but also on the intricacies of their living milieus and how they "feel" about it. While these cells "feel" would not necessarily neatly fit to "scientific," or biochemical explanation, it highlights what "living" is, and how a human researcher tries to make sense of the liveliness of living things through their experiences of working with them and accommodating them best with their fingertips. Interestingly, while she withdrew the word

“scent” since she thinks it does not sound right, she did not retract other words that are related to feelings and emotions, “happy,” “stressed out,” and “familiar.”

We may say that it is an attempt at accounting for the subtle differences in the conditions of cells in culture that are not completely explicable biochemical and physical factors (as they are supposed to be stable). She might have thought that there must be something happening other than mechanical metabolism in the culture dish through experiences with cells that defy her expectations, and learned that she had to sense how they were doing in the dish. Her use of emotional words for cells could be understood as her attempt to deal with the conundrums cells pose to her with their growth patterns. These words suggest that Heeyoung sees the cells as being in relation to the external world, and respond to it. In particular, the way she says cells that get “stressed out” when the “familiar” environment is interrupted adds cells a particular character who adapts to the place they dwell in, makes it familiar to them, and feels comfortable in the particular dwelling—feeling *at home*. In a sense, the researchers are making and taking care of the *home* for cells, like domestic workers. While it is still plausible to say that researchers are working to domesticate and control the cells to extract life itself, “domesticating” cells requires labor to make a home for them, make them feel at home, which can be compared to domestic labor.

Committed in figuring out how to grow cells better, Heeyoung acknowledges that the petri dish might not be the best place for cells to live, to feel happy. She is now interested in developing better physical environment for cell culture:

Embryonic stem cells are the cells that were supposed to grow in a mother’s womb—soft, warm, and dark. The dish we are using for cell culture is firm plastic. I think that they would grow better if the physical environment becomes more similar to the maternal body. Other cells too. That cells from different parts of body mean they are familiar with different physical environments. They would grow better in similar physical environments.

Her speculation is again based on the idea that cells sense something, and cells feel that the dish is different than the fleshy environment that they came from. Her interest in the physical environment for cells, and her efforts to reduce the discrepancy between their natural habitat and the laboratory environment could be related to her feeling for cells, and her sensory experiences that emerged while taking care of cells—touching the firm plastic dish with her fingertips imagining cells touch it, and how they would feel about it.¹⁴ They are not necessarily touching the cells directly, but as they touch the dish surface that cells get to touch (or be touched by), the dish, seen as dwellings for the cells, mediates their interaction, or rather intra-action (Barad 2007) at their fingertips. A good researcher, Heeyoung thinks, would sense how cells are doing by simply looking at the slight change in the color of culture medium, or in its smell. Various sensory organs are involved in the practices of care. And, there are also speculations on the reasons for poor growth of cells.

Researchers try to please cells that are exposed to a somewhat strange environment, different from home. The culture dish is an *in vitro home* for the cells. How do we feel when the home suddenly gets filled with strange smells, how do we feel when we have to move home too frequently, and how do we feel when the home is packed? And, doesn't it feel great when the color of wallpaper, the texture of carpets, and the sunlight that comes through the window in the house is what we have always missed? When researchers draw analogies between everyday human experiences of dwelling and cells' living environment, they imagine the experiences of

¹⁴ Recent interests in STS on touching have proposed it as an alternative mode of knowing about, thinking through, experimenting with, feeling for, and engaging the world (Barad 2013, Haraway 2008, Hayward 2010, Myers 2007, Myers and Dumit 2011, Puig de la Bellacasa 2009). Instead of “vision” that has been privileged in the history of science, these scholars propose touching as a method of encounter with the intricate texture of the world. Attention to “touching” helps us pay attention to the capacity to be affected by while affecting an other; have more sophisticated understanding of embodiment, and stay “in touch” with the neglected, less visible events in the world and politicize them. As Hayward (2010) and Barad (2013) emphasize, “touching” is not purely about the haptic sense, but rather a mode of ethical engagement.

home. They feel for cells, the living things that are made to dwell in the laboratory, the culture dish. While researchers do not necessarily know with certainty how much the physical environment or different handling of cells affect cells' growth, they make sense of the condition of in vitro living by imagining their own dwelling. Nutrients that the standardized culture medium provides, and air-conditioning in the incubators might not be everything, if cells do not always grow as they were predicted. Researchers tinker with and think through unknown factors that make differences, which involve this feeling for cells. As one imagines a cell as a living thing that has certain senses, the work of fingertips gains another significance as they are attended to the living milieu of in vitro cells. Fingertips are the organ that translates what they know, feel, and sense into the actual practices of care of cells, and with which human researchers make cells happy, please cells.

IT'S LIKE COOKING

Pleasing cells requires more than following the protocols as repeatedly stated. To some researchers who see the job of cell culture in terms of “making cells happy,” the work of fingertips should be more than carrying out what is explicitly written in the protocol. In the previous section, I drew attention to the analogy between people and cells in terms of dwellings. In this section, I draw attention to another analogy of cooking and cell culture that researchers draw by using an everyday vernacular “*sonmat*” (flavors from fingertips). This analogy interestingly coincides with the Korean term for “culture” in the lab context, *paeyang*. “*Paeyang*” in Korean is a combination of two Chinese words: *pae* and *yang*. Earth, the semantic element for the word *Pae* points to the similarity between (agricultural) cultivation and cell culture. What interests me more is the second word, *yang*, which means to rear, to support, and to feed. *Yang* is a compound of a semantic element that means “to eat” and a phonetic element of

yang, which actually means “sheep.” If there is an act of eating, there is also an act of feeding. The word *yang* could be used in a range of activities (or indeed relations) that involve nurturing: breeding, raising children, nursing of the elderly, supporting someone who cannot subsist on one’s own, teaching people. The word *paeyang* is also used in another context of cultivating capacities (of people) by teaching and nurturing. *Peayang* then highlights the practices of feeding and nurturing as a significant element of culturing, cultivation. At the same time, the word *yang*, which derives its meaning (nurturing/feeding) from eating, reminds us that, on the other side of eating, living, and growing are “feeding.” Hence, it appears not coincidental that the analogy between cell culture and cooking is made. But, when cooking and cell culture is compared, it implies that both are not simply providing necessities of life, but also pleasing the parties to whom the product of labor is offered. Both food and culture offer more than nutrients—they also offer pleasure. Pleasure to the eater, pleasure to the cells. More importantly, the pleasure here is not simply about the subjective experience of the person who eats, or the cells that are being cultured; and it is not simply about the standardized quality of food or culture condition. This analogy highlights the labors at the fingertips.

Biologists in many different places have similar idioms for researchers who are good at certain manual practices in the lab—‘golden hands’ (Clarke 1998), ‘good hands’ (Heath 1997), or ‘green thumb’ (Franklin 2006; 2013). All these idioms center the role of hands in certain practices. “Flavors from fingertips” and “clean fingertips” are the idioms that I heard many times in Korea during my fieldwork. Considering experimental procedures demand many manual works as I discussed above, it is not surprising to see various idioms for skillful hands used in laboratories in different places. However, each idiom points to different ideas, as they are metaphors imbued with slightly different values. Anthropologists of science have taken these

idioms as a way to approach the material arrangements through which contemporary life science came into being. “Good hands” in Heath’s ethnography allows her to understand scientific work as a specific form of embodiment, and further the division of labor in biology lab between brains and hands, as they are “good” hands, docile bodies, for the brain to materialize its ideas. “Golden hands” in Clarke’s historical account of reproductive science in the United States makes it explicit how the techniques are also significant in the researchers’ career which is often closely related to job and funding opportunities. Somebody who has a “green thumb” in the UK stem cell lab reminds Franklin of the linkage between agriculture and cell culture (2006). Hwang’s own allusion to the dexterity of Koreans could remind Koreans of the docile (female) Korean factory workers’ body (c.f. Ong 1987). Yet, there is more to learn from the idiom of fingertips. Instead of taking the idiom for fingertips as a local variation of the same idiom for people with good manual skills, it would be helpful to delve into how this idiom from cooking makes sense in the laboratory setting.

Talking about mundane lab practices, Seungmin asked me, “have you heard the term, a good *sonkkŭnmat*, or *sonmat*?” I knew the word used in the context of cooking, I answered. The word *sonmat*, or *sonkkŭnmat* is hard to translate into English, but its literal translation could be flavors (*mat*) from/by hands (*son*), or fingertips (*sonkkŭt*). In everyday life, it is most commonly used when referring to good flavor of a dish prepared by a specific person that is distinct from what others make. Seungmin explains its laboratory meaning to me. “We also use the word in the lab. With the same cells and protocol, for example, there are people who grow them really well, while others do it poorly and make them die. When talking about the ones who grow cells much better than others, we would say, they have a good *sonkkŭnmat*.” With the same protocol, some would grow cells well, while others do not. They do the same thing, but the outcomes are

different. And the vernacular “flavors from the fingertips” suggests that there is something more than the recipe that makes tasty food. It is rather the sense one learns through experiences, a set of embodied techniques that are not “taught” by words or transmitted through the recipe. The vernacular “flavors from fingertips” also points to a certain affective element in cooking and eating—pleasure and devotion. There is no secret ingredient, but devotion, attention, and embodied techniques.

Talking about Korean cuisine, Koreans often say that *sonmat*, or *sonkkŭnmat* is crucial in making great Korean dish. In the context of cooking, the distinct flavor does not necessarily come from a unique recipe, or secret ingredients that the cook secretly owns. What perfects its distinct flavor is the cook’s hands, or fingertips. The image that would often come to mind of Koreans when they hear the term, flavors from fingertips, is an old woman, the mother or grandmother, seasoning wild vegetables in a bowl with her bare hands in her humble kitchen. The woman does not have a fancy kitchen, read nice cookbooks, or dream of becoming an expert cook. It is not the flavor from the best ingredients available, the most precise and sophisticated recipes, and a chef who mastered the world cuisine, but flavors from devotion, experiences, and care. While they do not use measuring cups or other equipment for precision, they simply know how to do it with their senses developed in the long history of cooking. Oftentimes people talk about mom’s *sonmat*. One feels mom’s *sonmat* from the dishes that are prepared with care, love and her warm hands. Indeed, Seungmin was not the only one who analogized cell culture to cooking. When telling me how “it’s like cooking. Actually, I took cooking classes. Even with a really famous cook. I could cook, but I couldn’t make that same flavor. That’s probably what the flavors from fingertip is.” Heeyoung could cook, but the flavor was not the same—there is something special that needs to be learned and done with fingertips. It is more than the recipe

and ingredients. In the context of cell culture, written protocols and raw materials are not enough. You can grow cells, but you cannot grow cells well if you do not have the fingertips.

As researchers borrow the term *sonmat* from the everyday vernacular for the inexplicable quality of good cooks, they suggest how the practice of cell culture involves more than conducting what is written in protocols with the materials that are already standardized. It is partly about skills, but also, and more importantly about devotion and attentiveness. Also, the term highlights a certain personal quality that is learned through repeated experiences¹⁵. The figure with *sonmat* does not necessarily know how to articulate the secret quality, but she just knows. It should also be noted that the flavors from fingertips are, in the end, about pleasing other's tastes. It is different from precision, or more than precision. Good flavor cannot exist on its own—somebody should taste it, and be pleased. There are qualities shared by the works of fingertips in domestic labor (cooking) and research labor (cell culture)—the attentiveness, embodiment, and relationality. As such, fingertips are not simply about dexterity or precision, but also about practices of care that coordinate different senses of one's own in order to please other beings' senses. Even cells need to be pleased, be happy, researchers say.

Fingertips attend to the cells and please them, not to stress them out but to keep them feel at home. But, it does not mean that it is only for pleasing cells. As taking good care of cells is part of their job through which they secure good raw materials for their experiment and also is part of their training as cell biologists, cells that are pleased and growing well could be part of the biologist's pleasure. Another usage of *sonmat* in a quite different context such as fishing or

¹⁵ Recent studies in neuroscience suggest that mindful movements can enhance attention and cognitive skills. Rather than seeing attention as a cognitive capacity that can direct bodily movements, some neuroscientists recognize that mindful bodily movements can rather enhance conditions for attentive engagements in learning (Clark, Schumann, and Mostofsky 2015). Similarly, we may consider researchers' attentiveness not simply in terms of the virtue that is constantly emphasized by supervisors, but also in terms of the capacity that has been developed in the mindful engagements with the experimental procedures.

gaming might help to make this point clear. In these cases, the translation can be different—“the taste felt in hands.” For instance, among anglers, the same word is used to describe the sense felt in hands holding a fishing rod at the moment big fish bites the bait. The users of video games also use this word to talk about the pleasure of seeing the desired responses on the screen when they take some action on the device (which, for sure, would differ among different users depending on the “taste”). *Sonmat* here refers to the pleasure of having a grasp of the object, having mastery. However, it is still about senses and attentiveness. The objective might be different—as the cook would aim at pleasing others, while game players and anglers aim at having pleasure for themselves. Even in this case, fingertips point to the pleasure that is associated with attentiveness, repeated practices, material interaction with others, and responses from them. Even an angler needs to be careful and attentive to lure fish. At this moment, the fish might be actually luring the angler with a promise of being a skillful angler, shaping the way the angler moves one’s body and attends to the changes. Hands and fingertips are not simple tools to skillfully master the object, but rather the media through which one relates to the objects—where one feels and senses in order to interact the objects, and shapes one’s own body for better outcomes. As much as researchers are culturing cells, cells also culture researchers making their fingertips as part of their *in vitro* ecology.

WE SHOULD BE GARDENERS

To emphasize care of researchers is not to deny that the relationship that merges at their fingertips is not instrumental. Researchers take care of them in order to exploit their living processes to generate valuable facts, materials, and other things. In this sense, the care of cells can be seen as a quite instrumental practice. Yet, in the process of care, in the efforts to make better home for cells, cells appear more than raw materials that are simply manipulated to

produce valuable data. These little nonhuman workers are also living things that require attention. They make researchers imagine what living is—not only in the purely biological sense, but rather in terms of dwelling. It points to the complexity and relationality in the living process that urges researchers to appreciate and be attentive to it, while being at risk of reification as certain knowledge-object. There is certain kind of ethos in the researchers' care of cells, and there are thoughts that the care of cells provokes.

In her article that analyzes different temporalities and ethos of life science “Living Differently in Time,” Hannah Landecker (2005) introduces an analogy made by her interlocutor, a specialist in cell culture on different modes of doing biology—“gardeners” and “shoppers.” She quotes her interlocutor, a cell culturist who emphasized cells are living entities that should be taken care of and looked after if they are “happy” in a similar manner that gardeners look after the plants. The cell culturist contrasts her view of cells to that of the molecular biologists in her department who think as if cells were the “re-agents on the shelf” that can easily be shopped. Landecker stresses, “this was not some abstractly moral or empathetic or caring thing to do, but was in her eyes simply the *right* technique as opposed to sloppy technique, an attitude to cells that was not separable from a definition of good science.” Delving into the analogy, she discusses the implications of different methods of doing research and material arrangements enabled by mass tissue culture in our conception of life as well as the capitalization of biology. I introduced this article in the lab journal club meeting along with a brief introduction of what STS is in general because they wanted to hear about what a social scientist like me wanted to do in the lab. I chose this article simply because, at that point, I learned that everyone was spending some time in the culture room, and Landecker's work on tissue culture might interest them as it is linked to their daily routines.

However, the story, in the lab meeting, was taken as a moral tale about what it means to be a cell biologist, or rather a good cell biologist—*we have to be gardeners, we have to have gardeners' mind, not shoppers*. Instead of Landecker's argument, the cell culturist's account fascinated Seungmin, the PI. "That was a great analogy, the right one." If Landecker is interested in situating her interlocutor's analogy in the shifts in the material infrastructure of doing biology, which are again linked to different modes of doing biology and ethos, Seungmin takes her interlocutor as her comrade who shares her concern about taking good "care" of cells. As a PI concerned with what the students should be like, what biologists should be like, and what she expects from her researchers, she took it as an opportunity to teach her students a lesson. "Since cells are alive and very sensitive, we should care for them very nicely like babies. We should not become shoppers, we ought to be gardeners." It is not an option, but an imperative to become gardeners. Again, as Landecker emphasizes, it is not about an abstract moral idea, but the "right" way to do biology—and more precisely, it is about the practicality of doing biology. Below, I quote what Seungmin told her students at length because the languages she uses precisely show how care of cells is both instrumental yet affective at the same time—indeed, she says what practicalities are about:

It's important to do *QC* (quality control) when you conduct experiments. When you do molecular work, things are static, say, the RNA level is fixed since RNA is a thing that is *already dead*. But in doing cell work, because cells are *living things*, they change depending on how you grow them, how you respond to them. The difference can be very huge. You cannot say that you maintained the character of cells [if you grow cells poorly]. For a better QC and better care of cells, I think one needs not a *shopper's mind*, but a *gardener's mind*—like a gardener who wants to grow plants well, *the feeling* that you want to grow something well. *Affection* for the thing you grow is necessary. Different from the ones doing mole biology, cell biologists are people who grow living things. Hence, indeed, one should have affection for them [cells]. You go to see the cells everyday, say 'hi' to the cells. You are thinking that I'm joking, right? No, I am not. Just do it, then the cells will grow better. Say hi, observe them with great attention. Don't treat them tough, but treat them with great care, cautiously, like the way you treat babies, or handle glassware that is fragile. Depending on how I treat them, their responses differ.

Then, the result of my experiment would differ, too.

She speaks of quality control, QC, a notion that suits well with manufacturing or mass production. The quality of cells needs to be controlled in order to assure the quality of research data. What needs to be controlled here is the “character of cells,” the capacity of cells to behave normally, hence to demonstrate the validity of experiments. Not growing cells well is not only about expanding the numbers, but also about maintaining their “normal” qualities, their liveliness to work well in experiments. Assuming that cells in a good condition maintain their normal characteristics, she emphasizes that “the resulting data” is dependent on the quality of cells, which is dependent on how they are treated. Here, care of cells is directly linked to “the care of the data” (Fortun and Fortun 2005), as the data would be generated from the cells. While this statement can be applied to other experimental procedures in the lab, there is something peculiar, from her perspective, in the care of cells. It is that cells are not lifeless things like molecules, but living things that respond to their environment. What researchers do constitutes part of the environment. They demand care, monitoring of the environment, and their “conditions.” Note that she uses the word “living” and “dead” not to distinguish life and death, but to highlight liveliness—the potential for changes, contingency and variability in their interaction with their living milieu. And how researchers treat them is crucial in controlling the living things and their quality.

Cells in a lab are a peculiar kind of living thing. Discussing the genealogy of the word “milieu”, the philosopher of biology, Georges Canguilhem (2008) highlights the interaction between the milieu and the living being as a central characteristic of “life.” It is characteristic of a living being to dominate and accommodate the milieu—the living being makes its own milieu. It is not to say that the living being has a complete mastery of the external environment. There is

a practicality in the living being's life that finds its niche—its place in the milieu. The living being determines the scope of the milieu and inhabits it. It is not the globe itself that the living being takes as its milieu. The milieu is made in the practicality of living as an external environment that accommodates and is accommodated by the living being. The living being is the one that makes its own milieu. Yet, as Canguilem stresses, the relation between the living being and milieu is not antagonistic, not one of struggle, noting that the conflict or struggle is indeed a pathological relation, not a healthy one. In making his point clear, he mentions that the living thing whose life is commanded from the outside, whose life is completely dictated by and subjugated to the milieu, is not healthy living being. From this perspective, it is rather a pathological relation against the “vital law” of living beings. In this sense, cells *in vitro* are a very peculiar life form. Their relation to the milieu is highly controlled for another objective, their life is dependent on their milieu called a laboratory, their milieu is designed for the other's purpose, not their living per se. However, the *in vitro* ecology emerges as cells make researchers care for them. They shape researchers' daily practices, intervene in their daily routine, make them care for cells, coordinate machines and materials for them, and dwell in cells' living milieu. Cells actively *create* their milieu, making the collective of humans and nonhumans as their living milieu instead of the bodily fluid and structure *in vivo*. The milieu not only includes a specific culture dish in which cells reside, but also the machines to keep the conditions stable, the manufacturers of the supplies for *in vitro* cells, and people who take care of cells. They are coordinated by labors at the fingertips.

The living milieu for *in vitro* life forms is a technologically mediated one. Whereas these *in vitro* life forms may appear not as a normal life form, if one looks at life only from the “natural” or “organic” state, we may see them as an “artifactual” life. I borrowed the term from

Haraway (2004) who finds the peculiar conditions of living in the technoscientific world, where artifactual life, laboratory rabbits, mice, and tissues find their niche in the “belly of local/global monster in which [she is] gestating” (65). Problematizing both hyper-productionism of biotech and transcendental naturalism, Haraway is interested in looking at the emergence of these technologized life forms as a kind of relationship, an achievement among many actors, not all of them humans, not all of them organic, not all of them technological” (66), which involve “radically historically specific, always lively” (67) bodies that take us to different modes of engagements and interventions, and train us to have different optics and visions. Taking both Canguilhem and Haraway seriously, I am interested in looking at the peculiar life of *in vitro* cells not as a self-evident entity that is simply transported from inside the body to the laboratory containing the secret of life itself, but as a kind of “artifact”¹⁶ that urges us to ask different questions about life, science, and life science. Culture is the milieu for this artifactual life form and cells are taken to this strange milieu called “culture.” The milieu is constantly taken care of by the labors at the fingertips, fingertips are indeed part of the milieu. If the liveliness of cells in the laboratory, by making people do the labors at their fingertips, shapes the ways humans live as researchers the relation between humans and these artifactual life might include humans as *in vitro* cells’ living milieu. While cells here might not be actively making their milieu, they

¹⁶ In *Art and Artifact in Laboratory Science*, Michael Lynch (1985) discusses the specific use of the term “artifact” in the laboratory research context. In the lab, artifacts are something that “appears” in laboratory accounts of naturalistic phenomena, often described as intruding or distorting the “observability” of the “natural” feature. Lynch writes, “Artifact accounts exhibit the ‘unwitting’ work of science in descriptions of a field of natural entities. In lab science the manner in which the world of, for example, neural phenomena, is actualized as an instrumental accomplishment remains unspecified in talk of axons, dendrites, glial cells . . . i.e., a world of “natural constituents.” Such naturalistic references do not specify how the detailed presence of those entities to description—their concrete visible shapes, textural contrasts, size, extension, i.e. their tangibility—is a technical accomplishment in laboratory work” (82-83). Objectivity, natural entities and their tangibility, Lynch argues, is a social achievement and instrumental accomplishment. Artifact accounts, by sorting out the intrusions from the natural, for Lynch disclose the works that take to produce the “natural” phenomenon. Here, “artifacts” are also a reminder of “nature” as we know it from science is an achievement, and the “artificiality” begs us to ask the works taken to the making of the “nature” itself.

accommodate and are accommodated by human fingertips in culture. If the vulnerability of cells in the lab leads us to question what it means to study “life” in the laboratory, the ethos of cell care epitomized by the talks of fingertips shows the efforts to alleviate the problem posed by these artifactual life forms.

Yet, Seungmin also speaks of quality control while talking about cell culture. If cells are so delicate that they “lose” their characteristics by a slight change in their environment, or by a minute mishandling, what does it mean to research cells in the laboratory? If we take the cells’ changes in response to the external changes as the central characteristic of the living, cell culture could be seen as an effort to keep them in the most lively condition, to maintain them in the condition to produce anticipated data to tell a particular type of truth on “life itself.” Cells in the culture are interestingly not dead, but not “naturally” living, either. The loss of “liveliness” while cells are prepared for further experimentation is the problem that researchers try to cope with. Researchers keep track of it by constantly checking if there is any chromosomal mutilation that occurred in later passages. There is a gap between cells as living things (and vulnerable to change) and cells as things that should be maintained over time. If the labors at the fingertips are erased, “life itself” of cells, the vitality of cells as their innate property emerges. The labors at the fingertips suggest that the living cannot be completely under human control, and liveliness requires attention and care. Yet, the language of “quality control” highlights there is something in their characteristics that the researchers want to maintain. The properties of cells matter in the context of stem cell research labs. In the end, they should “work” well. Maintaining their normal characteristics is important in keeping them happy so that they could work well.

OBSERVE CELLS SMILE AND CRY

Cells should “work” well to generate valuable things in the life science market. Cells in culture are specific not only in terms of biology, but also in terms of culture. Technologies of cell culture have rendered cells as autonomous living things to be grown in the culture dish in researchers’ pursuit of new knowledge about life. In a sense, these cells cultured in laboratories can be analogized to the workers in capitalist mode of production. A worker’s health matters because it is linked to their labor force. In a similar vein, reproduction of cells in the petri dish matters as their living process, how they react to certain experimental treatments, will generate data. As Marx notes in his discussion of “simple reproduction”, replenishing workers body is necessary to maintain capitalist machinery to keep working. Marx’s discussion of “reproduction” of labor force enables us to see how maintenance of life itself, mediated by the wage regime, is a decisive moment in the capitalist relations of production (1976). Marx’s analysis highlights that this organization of labor and wage is historically specific and exploitative, yet appears to be self-evident and unquestionable. In this organization of labor, or capitalist relations of production, a worker’s body and “life itself” takes on a specific significance as an object to be cared for and managed in a good condition¹⁷. At the population level, worker’s health would be managed through public health programs and other measures to maintain a normal, functional body. At the individual level, one’s health requires routine care especially in the family which has been conventionally undertaken by women. As feminist critics have pointed out, the capitalist mode of production has been gendered, and reproductive labor in the domestic area has not been recognized as “productive”. Women’s caring labor indispensable for capitalist relations

¹⁷ Here, I draw on Foucault’s analysis of political investment in individual bodies (1977) alongside with Marx’s observation of the anxious call for workers’ welfare not only from workers, but also from capitalists in *Capital Vol I*.

of production has been devalued, or unrecognized as it was thought to be women's virtue tied to their biological function, while being considered routine and mundane.

The capacity of cells to *work* is what researchers want to exploit. The ongoing capitalization of biology and exploitation of reproductive processes of living organisms (Franklin and Lock 2003), or “biomaterial labor” of the biologicals (Thacker 2005) requires “reproductive” care at the fingertips. While tissue culture technologies enabled staging cells as an autonomous living entity, what cell biologists face in culturing them could differ from the figure of an autonomous entity. For they are artifactual living beings, what was once naturally given to them in the organism's body now needs to be taken care of by researchers. In culture, they are fragile like glassware, or vulnerable like babies—they are, in practice, not autonomous, but in need of a great deal of care. If cells in culture can be analogized with workers, one can also see the similarity between women's domestic labor to take care of the male breadwinner and their children as future workers, and researchers' labor to take care of these cells. Cell culture is considered as a routine work, and this type of routine work would not be considered as a “creative” scientific work as it does not “produce” any novelty, but only “reproduces” the conditions for production of novel knowledge. This type of mundane labor of cell care is, however, crucial in the cell biology lab.

When Seungmin tells her students that cells should be cared for like “babies” and fingertips are more or less associated with domestic labor (via the idiom of *sonmat*), it suggests that the labors at the fingertips are a peculiar kind of reproductive labor that would be erased in the official discourse, which presents “life itself” of cells as an obvious scientific truth. It appears that the emphasis on “affection” for these artifactual life as “living things” that are “sensitive” “like babies” moralizes what one can simply take as instrumental, manual labor, as the

discourses on “motherhood” and feminine characteristics have done with reproductive labor in the family. Yet, it is not simply a moral glossing over for arduous instrumental labor that is not acknowledged as productive work. Indeed, the affection is something that is felt in practices, made real to the practitioners of care, and from which we could learn about the conditions of living, and the peculiarity of “life itself” that appears in the official discourse of “the age of biological control.” The affection towards cells may not be the reason for good care, but is the product of care itself—labors at the fingertips. And, it can be said that labors at the fingertips are done as researchers see promises from the cells. For Seungmin, care of cells is what a researcher bases one’s logic on. The logical hypothesis here is the anticipation, and the experiment itself is an anticipatory practice.¹⁸ Hence, she says, “care is the basis of your logic. Without the experiences of care [of cells], you cannot make a logically sound claim.” As long as one wants to have cells that are in a “good condition” that could work well, taking good care of cells to maintain them as lively is necessary.¹⁹ Care of cells anticipates care of data. Cells are not ends in themselves from Seungmin’s perspective, but rather a means to produce new scientific claims. While cells appear to be an instrument, or something like a manufactured product when she uses the language of quality control, there is also affection and feeling for cells in this seemingly instrumental relation.

You observe cells smile and cry. It coincides with what Heeyoung said about growing cells well—make cells happy. They personify the state of cells. The emotional languages can be seen in terms of the pleasure of researchers felt in the practices of care. The smile of cells, or

¹⁸ As Harry Collins (1985) has pointed out, scientists do not conduct experiments that are often arduous and time-consuming, unless they do not expect certain outcomes to come out. He makes this point to discuss how it affects to the way scientists see the failure or success of experiments, which often confirms the existing set of knowledge.

¹⁹ In this view, the quibble between Yoonseo and Inae over repeating experiments that I introduced in the previous chapter (“Potentiating Objects”) could be read as a moment when the quality of cells is considered to be related to the successful experiments.

happiness of cells might be what researchers project their feelings to the cells. When cells are growing well, it is a good signal for their future experiments. At least, they do not have to spend more time expanding cell populations for the planned experiment. A researcher might see them smile as she herself smiles. But, those languages would also offer one way to understand how researchers would relate to their research objects. There can be many different ways to describe how cells are hard to grow well being to sensitive or vulnerable to changes, demanding a lot of work to maintain their life, easily dying or changing their characteristics without care. One can say, for instance, that cells are unaccommodating, intransigent, or irritating. If one feels this way, what a researcher should do is to struggle with them, to control them, or to overcome their peculiarity. But these researchers who use emotional languages here would “care” for them like babies. And for the care of these babies, one cannot simply have the mastery just as a mother would not expect to have mastery over her baby but make efforts to respond to the baby’s needs. One’s own feeling cannot be regulated from the outside, but the other person, a caregiver, would try to please the one by paying attention to the circumstances. One cannot master the other person’s feeling, but one can try to accommodate the other by paying attention to it. When the other smiles, one finds that her effort was effective. When they say they see the smile of cells in the culture dish, instead of a bunch of viable cells, they are talking about the affective element of care practices—the efforts to please cells, attention and care taken to the cells, and pleasure of being able to provide good care. In other words, they are pleased to provide good flavors from their fingertips to cells, and to keep their research practices going. It is not necessarily some unmediated feeling for cells. Rather, it is mediated by the discipline of cell biology, the promise of healthy cells, the care of data demanding the care of cells—the ethos of cell biology in which cells are what matter most.

Cells can also be a medium through which researchers see the promises. Taking care of cells could also be taking care of promises. Sunray, a researcher I briefly talked with over lunch, jokingly said that working with stem cells make her young. She compared it with her previous work with cancer cells, which were “just ugly” and made her sick. It might be the youthful cells imbued with their nascent potentiality that inspire her in day-to-day care practices, and the promise of stem cells might make her feel hopeful, young, and potent. In contrast, cancer cells reminded me her of the patients she encountered in the hospital on her way to pick up cancer tissue samples. The gloomy air in the hospital was captured in the cancer cells that she worked with—she may fight with them, but care of cells was not so pleasant for her. “Now, I feel much better as I work with these young cells with great potential.” Growing cells well, making them happy, and seeing their smile may not always please the researcher. The smile of cells shows a kind of promise to a researcher that something good, something that she cares about will happen. Sunray’s excitement about stem cells is telling that the researchers’ emotional investment in care of cells might be also situated in a network of different promises and hopes. Yet, it is through cells that she sees the promise. Cells are the medium for researchers to engage the promise of “life itself,” while researchers themselves are becoming the medium for the propagation of *in vitro* life forms and for maintaining the liveliness in culture.

LABORS AT THE FINGERTIPS

Laboratories are where new life forms emerge and proliferate. Tended by the fingertips that coordinate various elements of this living milieu, *in vitro* life forms increasingly propagate. These *in vitro* life forms are taken care of in anticipation of producing valuable knowledge about life itself, and therapeutics and other products that would enable humans to intervene in and improve life itself. The promise of technologically transforming human life by intervening in life

itself which scientists are learning in laboratories is central in the vision of bioeconomy. Life itself, however, does not exist in this abstract form in laboratories. It is abstracted through the quality-controlled and standardized experiments that are made possible by the works of maintaining liveliness of *in vitro* life forms—the labors at the fingertips.

We may see *in vitro* cells as little workers, in the way Eugene Thacker conceptualizes the emergent form of nonhuman, “biomaterial labor.” Then, the works to sustain their liveliness may be called as “biomaterial reproductive labor.” Given the domestic analogies of researchers that informed this chapter, biomaterial reproductive labor may not be too much of stretch. Women’s reproductive labor that reproduces population and replenishes workers’ labor power has long been rendered invisible within the boundary of “domestic sphere” and naturalized as “love” for the family and feminine virtue. In a similar manner, we may say biomaterial reproductive labor is rendered invisible within the division of labor in the laboratories and the distinction between experiments and preparation, and the ethos of cell biology that naturalizes it as the virtue of cell biologists. Yet, this analogy might miss a point: if the biomaterial labor of cells is not possible without biomaterial reproductive labor of researchers and if the researchers’ biomaterial reproductive labor would not be done without the prospect of biomaterial labor of cells, if both forms of “labor” would not exist without each other, the researchers and cells are indeed in a symbiotic relation. They make each other work within the promissory enterprise of generating and transforming life itself. They make each other lively, while they also animate other actors with the promise of life itself—the industry, patients, speculative markets, and so forth.

Labors at the fingertips appear trivial and mundane, but without them, things would not hold together. Fingertips are the site where cells and people are made in contact with each other thanks to the work done by all the machines and other living actors. If the laboratory is a site

where a human-machine assemblage is animated to create cells as “living tools,” fingertips are a site where the elements in this assemblage are coordinated and made to work and keep these *in vitro* life forms lively, not merely alive but indeed vital, healthy, and promising. The moment at which this liveliness is translated to life itself, as an innate property of cells, would follow. Yet, labors at the fingertips remind us of that liveliness takes care and attention to be maintained, and maintenance is not necessarily easy work.

CHAPTER 4

Promise, Incorporated

The market for stem cell treatments, mostly unapproved and unregulated, is one of the sites where stem cell promises appear highly problematic and potentially exploitative. Stem cell research community, doctors, and the regulatory agencies are alarmed by the proliferation of unauthorized stem cell treatments that are commercially available to patients while their safety and efficacy are not proven. Stem cell research community in particular has been keen on warning patients as the failure of offshore treatments²⁰ may harm not only patients' health, but also the future of stem cell research field. While patients are constantly told to wait until the safety and efficacy of stem cell treatments are proven, the market has been flourishing around the world. Scientists, doctors, and bioethicists have been concerned with this trend, and making efforts to protect patients from those treatments whose safety and efficacy are said to be “unproven.”²¹

As a salesperson of Promise, Inc., a Seoul-based stem cell company, that offers unauthorized, offshore stem cell treatments, Jisook said she could convince the potential clients with “living evidence,” or, indeed her own experiences of improvement from lupus. This cheerful woman in her mid-forties had been suffering from an autoimmune disease involving

²⁰ The phenomenon is often called “stem cell tourism” in the media, since they often involve travel of patients who live in countries where stem cell treatments are not offered to several destination countries. Instead of “tourism” that assumes the subjects of travel as leisurely consumers, Priscilla Song (2010) has proposed a notion of “biotech pilgrimage” to draw attention to the relation between faith, technology, and the political economies of health care and research. In this chapter, I use “offshore stem cell treatments”, since I am mainly interested in the business aspect of travels for stem cell treatments.

²¹ There are many studies concerning “stem cell tourism” and “direct-to-consumer” marketing of stem cell treatments offered by the offshore clinics. To see a constellation of various concerns about stem cell tourism and strategies to deal with the problems that range from scientists' and doctors' responsible actions to transnational governance, see the discussion featured in *The American Journal of Bioethics* (2010).

severe pain and has been receiving stem cell treatments in China through the company since 2009. Now, she is not only a client/patient, but also a “Health Coordinator,” a kind of salesperson for Promise, Inc. When asked about her condition, she started off by talking about her painful past since she was diagnosed with the disease, then moved onto the successful stem cell treatments which returned her to a “quite normal” life. She is still struggling with the debt that she owed for stem cell treatments, but she is hopeful and happy since she regained health, and she is capable of working and helping others out by introducing stem cell treatments mainly through her personal networks. I asked her if she told her potential clients about the risks and uncertainties involved in the procedure she was selling. “We tell them for sure. It is patients that take the risk.” Then, how could she convince them to take the risk, especially after all the upheaval against Promise, Inc.’s procedure following the reports of two patients’ death in 2010? She said, “People who have known me for a while cannot but believe that stem cells worked. They remember my swollen face from the side effects of medication that I had to take. Now, they see my face back to normal. I am living evidence of stem cells’ efficacy. They cannot but believe.”

“Living evidence”²² is a marketing tool for Promise, Inc. Many clinics and companies that offer unauthorized stem cell treatments tend to feature patient testimonials as evidence of their success (Patra and Sleeboom-Faulkner 2011). Promise, Inc. pushed it a little bit further to

²² “Living evidences”, as Jisook phrased, are the bodily changes that patients are experienced, recognized and made visible by patients. Stem cell researchers often warn that these are only subjective experiences, and patients should be skeptical of clinics that are primarily rely on the testimonials as the evidences of their success. Living evidences are only meaningful, in terms of “evidence-based medicine”, when they are accompanied with “objective” data (often numbers) and expert interpretations of them. Indeed, in “science” proper, living evidences are not taken as an “evidence” as they cannot authorize assessment. Yet, the “living evidences” should be taken seriously as they affect patients’ decision for pursuing treatments, and the stories of improvements could offer insights on how to provide better care to the patients. For the problem of evidence-based medicine, see Adams (forthcoming); for the discussion of expert evidences in the legal cases, see Dumit (1999).

hire the “Health Coordinators” among the clients who can serve the role of “living evidence” like Jisook. While stem cell research community would not take those stories of success as primary “scientific” evidence of the efficacy and safety of the treatments, living evidence works as part of the package with which its promise appears to be credible. Living evidence of people who have “experienced” the efficacy of stem cells is made to speak in person, on the internet, and through other people’s mouths, for the promise of Promise, Inc. While there are also many people who tried stem cell treatments and have not observed any significant improvement, Health Coordinators would amplify the voices of living evidences about the efficacy of stem cells, success, and life changes. The stories of successes are amplified as the Health Coordinators move around, talk to potential clients about the patients who got improved, and sometimes put them in touch with potential clients. The stories are also told in the promotion sessions, published in a book, and posted online. Bodies of patients, in retrospect, become a site where one of the raw materials that Promise, Inc. capitalizes on is produced: living evidence of the efficacy.

This chapter looks at how the “efficacy of stem cells” is produced through patients’ hopeful endeavors to regain health, which Promise, Inc. utilizes as evidence of the future that it promises. Since the only evidence of success would survive and be reproduced by the company while evidence of ineffective treatments or complications is neglected or left untold, it is not a straightforward process. Patients do the work of producing and spreading the word about living evidence in the context of self-experimentation for cure in their hopeful ventures. Promise, Inc. captures it as one of the elements that constitute its commodity, “promise.”²³

²³ Charis Thompson (2005), in the context of assisted reproductive technologies, has proposed that biomedical mode of (re)production is characterized by the nature of capital. She writes, “whereas in capitalism, capital is accumulated, in biomedical enterprise, capital is promissory”. She particularly draws attention to how the value of gametes is dependent on what they promise, the future that may unfold from the quality of gametes. In doing so, she highlights that the value of commodity lies not in its present use value, but in the possibility that it opens up. Approaching

While the work of producing living evidence is done not in the conventional labor-capital relation, I conceptualize patients' hopeful endeavors as a kind of labor drawing on the discussion on "free labor" that blurs the boundary between labor and play, production and consumption. Patients' labor is done "freely" not as labor but as a hopeful endeavor toward a "better" life, but is integral to the operation of Promise, Inc. as an enterprise of selling the promise of stem cell biology. I focus on the hopeful work that patients do, and the work of hope that may effect healing. Here, patients are not necessarily vulnerable, desperate, and gullible consumers who pay for hope, but rather hopeful, creative, experimental, and caring people who work constantly to produce the efficacy, hope, and possibly cure. Drawing on the conversations with patients, and conversations among patients that I came across in the online patient forums,²⁴ this chapter explores the affective economy based on the work of hope in the marketplace of promises, highlighting how it grows by capturing hope and anchoring it in the promissory thing. I will also discuss how the "efficacy of stem cells" is indeed the product of these patients' work of seeking, discovering, and taking care of hope while enduring and coping with the everyday pain of living in illness. In the marketplace, Promise, Inc., as a purveyor of promise animates hope in patients, while extracting profits from the very hope and its efficacy that patients produce in their efforts to make their lives more livable.

offshore stem cell treatment markets with this notion of promissory capital helps us look at what is actually exchanged in this market is not simply "treatments" or "stem cells" administered, but rather the future possibility of health.

²⁴ I have followed several online patient forums where "stem cells" occasionally come up as a topic for discussions. I searched postings that contain "stem cells" on *Daum*, one of the major web portal sites in Korea where many self-organized patient groups are located. "Stem cells" occasionally came up in discussion entries in a range of patient groups with diverse chronic conditions. I did not include the name of specific diseases to protect the privacy of individuals.

PROMISE, INC.

Promise, Inc. is a name I give to a Seoul-based stem cell company that has been quite successful in the offshore stem cell treatment business despite the controversies. The company has been offering stem cell treatment options abroad to patients in Korea and the United States. Unlike other anonymous names that I given to individuals that are quoted in the dissertation, this naming is meant not to avoid disclosure of the identity of the company, but rather to remind the readers that the company’s operation centers on selling of the promises of cure and better future. Its “proper” name is not given also because, while my analysis is limited to the stories that surround this specific company, the work of promises is not specific to this company. The suffix Inc. is added to draw attention to the corporate form that issues stocks (another derivative market for its promises). Further, I would also suggest you read from “Inc.” another meaning of “incorporate”—take in or contain (something) as part of a whole. Companies like Promise, Inc. yield profit by incorporating the stuff of promises that are produced elsewhere²⁵—scientific promises that have been made in the “official” domain of stem cell science, patients’ desires that make promises appear promising, experimental labors that they do, and vital capacity in living bodies of patients that respond to something (maybe stem cells, maybe promise, maybe something else that we don’t know) as well as stem cells (that may or may not work).

Promise, Inc. has offshored the actual “treatment” part by partnering with clinics in China and Japan where the regulatory environments were rather murky. Patients who receive stem cell treatments by Promise, Inc. make a series of one to three day trips to the partnering clinics in China and Japan to get stem cell infused in their body. The company extracts a little bit of fat

²⁵ My use of “incorporated” here is inspired by Hélène Mialet’s *Hawking Incorporated* (2012) in which she looks at the network of people and things that are coordinated to make Stephen Hawking’s in/corporeal presence.

from the patients, derives stem cells from fat tissues, cultures and expands them in vitro, and sends the cells to the partner clinics for use in treatments. The cells are infused back into patients' bodies through the vein. The price for this service varies upon the number of cells that a patient wants to secure and the length of storage period. While neither Promise, Inc. nor the clinics provide follow-up medical care, patients are followed up by Health Coordinators about the improvements after stem cell treatments. Patients, who "experienced" positive changes while watching their bodies for themselves, would be further put to touch with potential clients that Health Coordinators are trying to recruit, which was once scandalized in the media as a dubious multi-level marketing scheme.

Promise, Inc. has been scandalized for a number of occasions. In 2009, there was a report on the deaths of two patients died after the treatments, which were suspected as the side effects of stem cell treatments. At the National Assembly hearing, one patient who had been working as Health Coordinator testified she developed lymphoma after the treatments. In addition, the former CEO has been accused of embezzlement, stock price manipulation, bribery, and several court cases with its former clients (as being fraudulent) and partner company, which suggests the neglect of business ethics in the operation of this specific company. While these scandals seem to provide a reason to be suspicious of this business entity and its promise, many patients continue receiving through it, and some patients also passionately support the company.

THE MARKETPLACE OF LIVING EVIDENCES

When the controversy about Promise, Inc.'s offshore operation was raised again in 2012 due to the Japanese media's report on the company, a businessman whose disabled son has been treated through the company ran an advertisement on major newspapers, with his own money. In the ad where he and his son appeared, it was said: "My son and I are sure of the safety of

Promise, Inc.’s stem cell technology from our experiences of thirty recurrent stem cell treatments.” The businessman was accused of advertising medicine without medical expertise (Kim and Lee 2013). The man and his son, appearing on the ad as living evidences of the safety and efficacy of stem cells, were speaking for Promise, Inc. from their “experiences.”

“Experience” is crucial in the operation of Promise, Inc. Jisook once mentioned that what she tells people about stem cell treatments is not only as a salesperson, but rather as a patient, is “the differences that my body experienced, that I experienced, after putting stem cells into my body.” Her body is here conceived as a site where experiences are produced as the result of infusing stem cells in the body. Here, she provides a vivid imagery of transfer of vitality through the infusion of the substance, stem cells. The language of “experience” emphasizes the authentic and corporeal quality of the stories that she tells about stem cell treatments. When telling how stem cell treatments worked for her, she would not necessarily use any medical or scientific term, but rather give how the details of her daily life has changed to allow her to do things that she could not imagine when she was extremely ill. She would talk about how she “felt” that her body was gradually healed, and how she now “feels” about her life that has changed thanks to the stem cells. The “experience” highlights the changes in her body, which in turn changes the quality of the patient’s life.

In some of the company’s documents and promotion materials, Promise, Inc. uses the term “experience” in an interesting way—“stem cell experience cases (*chulisepo ch’ehöm sarye*).” Mostly narrated in the first-person voice, or in the third-person voice yet in the form of conveying the first person’s experiences as a story, the cases are full of the details of everyday life, the hopeless feelings, struggles, and hardship of pre-stem cell treatment life, and the changes that stem cell treatments have brought to the patient’s life. The Korean word *ch’ehöm* used here

highlights the bodily quality of experiences through which one comes to learn something.

“Experience” for Promise, Inc. is the means through which the efficacy of stem cells is materialized. Patient’s bodies, in the stories of “experiences,” are rendered as a site where stem cells actively navigate, work, and regenerate. The stories are told as how patients felt the efficacy of stem cells in their real life.

As they tell stories of their experiences of healing, the patients serve as a spokesperson for stem cells and their efficacy, like scientists who “speak for” the things (Latour 1987) with their “discovery.” However, there is a twist. Stem cells have already been spoken for in the official scientific field. Yet, through the experiences of patients, they are now able to speak what they could do in the body, or their “efficacy,” and how they would change people’s life in an intimate language. As the stories center the stem cells as the miraculous thing that effect all these changes, the body appears to be the surface where their efficacy makes effects. The stories, as real life evidence of stem cells’ efficacy, are circulated among patients who actively seek information about promising treatment options. They give a kind of credibility to Promise, Inc.’s promise of improvement through stem cell treatments. At this point, not only stem cells, but also and more importantly, Promise, Inc. is made to speak through speaking bodies of patients, as they tell about their experiences as “living evidence” of cure. Here, Promise, Inc., like the scientist-as-spokesperson, comes in as a custodian of stem cell promises. Accordingly, patients’ bodies and the stories originated from them become a part of package of the commodity that Promise, Inc. sells—the promise of better life.

Feeling, sensing, and getting to know about the efficacy of stem cells still requires bodies that are capable of feeling, sensing, and learning about it. Patients’ bodies are the site where living evidence is produced, but they are not an inert surface onto which stem cells leave the trace

with their efficacy. Rather, it is a site where the efficacy is actively made, sought, and discovered through the efforts of patients and furthermore circulated through their stories. In this sense, patients and their bodies work as the medium for the promise of stem cells. When experiences are told by patients, they often address the changes in mundane details of everyday life which would give the audiences, the potential clients, the sense of sharing experiences and authenticity of stem cell experiences. For instance, a thank-you letter from a patient who had been suffering from rheumatoid arthritis posted on Promise, Inc. website reads:

In the past, my limbs felt really heavy, just standing up was difficult, and I could barely walk three meters. My left arm felt too heavy to lift, so I used my right arm to life the left one. ... I was like a robot before it became a human. ... [After the second treatment] I could walk much faster, and swiftly. My body is much less swollen. My hand feels stronger. My handwriting is more solid, and I don't feel pain in my wrists when I am typing on the computer. My elbow feels less stiff—I can freely move my arms up and down, and I can lift a huge water container. Hurrah! I became a human! My friends who came to see me told me my face looked really not swollen. They were also surprised that I could use my chopsticks really well.

The language in patient testimonials highlights the quotidian practices in daily life. If the same patient's self-report, assuming that there was an improvement, had been used as "clinical data," the language might have been quite different. Pain, swelling, and activities are, in clinical data, often translated into indexical numbers by physicians who observe and consult patients. In contrast, patient testimonials highlight how patients actually experienced and felt the changes in their terms. Anecdotal reports foreground subjective experiences of patients in mundane details of everyday life, like how it feels when typing, writing, lifting stuff, using chopsticks, and looking good to patients—they are what matter to the patient who try to cope with the seemingly minute everyday tasks. Narrated in the first-person voice, but also involving her friends as the witness, the testimonial also highlights the authenticity of the experiences and the tangibility of changes. While this kind of detailed account of change in everyday life may not constitute strong

evidence of efficacy in clinical trials, but its corporeal quality fleshes out the promise of Promise, Inc., the future that stem cell will have brought to patients.

All these, of course, are not done without efforts. In the context of clinical encounter in traditional Chinese medicine, Judith Farquhar (1994) notes how patients learn and adapt to the ways in which mundane symptoms are supposed to be reported. Farquhar helps us understand that talking about illness itself is not a simple and natural act of expressing complaint, and they require specific modes of attention. The language and attention to describe and observe “subjective” and mundane experiences is what the patients came to gain in their practices of coping with and taking care of inflicted bodies. If they have not been watching their body vigilantly, if they have not paid attention to small details of everyday life in which they would find something that they lost in the course of disease progress, how could they tell the difference? As patients look for evidence of their own improving, the minute changes in their everyday life that they pay attention to could be registered as evidence that appears to prove the efficacy of stem cells. The details provide concrete “stuff” to fill in the promise enabling other patients to imagine the improvements that stem cells promise to bring about through the similar bodily experiences of illnesses, which may offer hope to these patients.

In other words, whatever stem cells do in the body, their efficacy would not be noticed, or even produced, if the body does not respond to it, or the patient attends to it. In this sense, the positive “experiences” do not naturally occur from the vital capacity of stem cells, but rather made possible as patients do work on their body to make stem cells work. In this sense, living evidences do not simply emerge. They are produced as patients attend to their bodies and efficacy of stem cells in their routinized self-care and everyday experiments with their own bodies. Patients actively experiment with their body and promises, observe the changes that seem

to have something to do with the promises, and share stories with others. If those activities make possible production and reproduction of promise that Promise, Inc. sells, their work can be called “experimental labor.” If Promise, Inc. appears to offer hope, it is through the work of patients who seek, produce, and share “evidences” of hope.

Melinda Cooper and Catherine Waldby, in the context of clinical trials and donations in the official domain of biomedical research, have developed the concept of “experimental” or “clinical” labor (2013). In accordance with the recent studies on clinical trials (e.g. Sunder Rajan 2006;2007, Petryna 2009), the concept of experimental labor highlights the “groundwork through which value is created in the bioeconomies” (Cooper 2008b:76, see also Waldby and Cooper 2008). Cooper describes the characteristics of experimental labor of clinical trials subjects as “experience of self-transformation—commodified” that is placed “somewhere between passive and active participation” that includes experiences of exposure to drugs and performing of a number of tasks related to generating data (Cooper 2008b:76). The concept of "experimental/clinical labor" draws attention to the practices (or “services”) of experimental subjects that are traditionally not captured in the conventional category of labor and highlights the corporeal nature of this emergent form of labor. Taking this insight, I further extend the notion of experimental labor to include the work done by patients in the offshore stem cell treatment market to produce the stuff of promises. If clinical trial subjects are supposed to produce clinical data while being experimented on, these patients of offshore stem cell treatments produce experiential evidence while experimenting with stem cell treatments.

Yet, the work of producing “living evidence,” just as the work of donation, does not take place in a commodified labor exchange relation. Rather, what patients do becomes productive in retrospect as its products —living evidences— come to add a kind of credit to Promise, Inc. with

the profile of successes. Further, as patients share their experiences with others, stem cells could remain as an object of attention among patients. Promise, Inc. might see the patients both as a consumer who buys its promise, and a worker who produces evidence of efficacy of stem cells to which it can anchor its promise. If Promise, Inc. cares about cure to some extent, it is not simply that they aim at producing cure, but rather that they see the future profit from it since cure can bring more hopeful patients into this market. Improving patients' health can be, in a sense, the means to its growth rather than an end.

I might say that patients are doing a kind of “free labor” for Promise, Inc. Discussing the changing configuration of capital and labor, production and consumption in the context of digital economy, Tiziana Terranova conceptualizes this emergent form of labor as “free labor.” Free labor marks the “moment where this knowledgeable consumption of culture is translated into productive activities that are pleurably embraced and at the same time often shamelessly exploited” (Terranova 2000:37).²⁶ It is free labor in its double senses: they do it for free without being paid, and do it freely without being forced to do so. The notion of free labor then highlights not only the question of value distribution (unpaid/paid), but also the question of the subjectivity of the workers participating in the new form of labor. Unlike the conventional notion of labor which often leads us to focus on the alienation and visible exploitation of (or rather violence toward) workers, the notion of “free labor” helps us understand how affects, desires, and relations that were not necessarily produced in commodified labor relations are captured by capital in the circuit of value creation.

²⁶ Her conceptualization of “free labor” is in line with the autonomist Marxist’s endeavor to conceptualize new forms of labor and workers’ subjectivation in the post-fordist society. The concepts of immaterial labor (Lazarrato 1996) and affective labor (Hardt 1999) have been proposed to account for the form of labor that produces and manipulates affects, desires, and (social) values.

Here, “hope” is simultaneously the motivation for and product of those practices of producing the efficacy. Thinking through the notion of labor is useful to see the linkage between the practices and the flow of money. Yet, the analysis can be pushed further to consider the peculiarity of this work. Patients do not “work” in order to produce evidence. Rather, they come to produce evidence as they endeavor with hope and desire for better future. When they tell about their experiences to others, they do not do so necessarily to promote Promise, Inc., but to share their experiences and hope. The work they do is primarily the work of hope. Furthermore, it should be noted that what they do only counts to Promise, Inc. only when the treatments worked, only when the “efficacy” is evinced through patients’ bodies. Stories of failure would not be reiterated, while the success stories are constantly repeated not only by patients, but also on the company website, books, and press releases. Exploitation rather happens when the efficacy was not produced—in other words, exploitation happens when the work cannot serve as labor, when the patients found themselves as consumers deceived by the fraudulent marketing scheme.

The work here is done in a different register of value from the profit motive of Promise, Inc. Even when Jisook shares her experiences to sell the service recognizing her job as a salesperson, there is a certain tension that she senses between the company’s overt emphasis on profit, and her motivation to help other people. The enterprise of Promise, Inc. is indeed driven by hope that patients constantly seek and produce. As soon as we start thinking about the work of patients that becomes the avenue for Promise, Inc.’s profit-seeking as the custodian of the promise of stem cell cure, the question of work/labor allows us to attend to the productivity of hope and care. It is helpful to recall how Deleuze grappled with the question of work that should be thought beyond the optic of “social division of labor” that naturalizes the existing mode of

conceiving (and exchanging) labor both capitalists and leftists with “vaguely Marxist” politics share.

In an interview on Jean-Luc Godard, Deleuze (1997), problematizing the conventional notion of labor, says, “the very notion of labor arbitrarily sets one area of activity apart, cuts work off from its relation to love, to creativity, to production even. [...] It’s to the extent that work might be distinguished from the productive pseudoforce of labor that very different flows of production, of many disparate kinds, might be brought into direct relation with flows of money, independently of any mediation by an abstract force” (40). With idiosyncratic questions raised by Guattari (shouldn’t analysts whose unconscious is at work be paid as well as analysts?) and Godard (shouldn’t TV viewers who are engaging real work be paid?), he urges us to attend to the different kinds of flows that are indeed productive and creative. What is produced and what produces this flow may not be only money—the calculus of monetary value often comes in later to capture the affects, creativity, and desires immanent in this field. “Free labor” could be a product of this type of capturing of the work by capital that produces and is produced information flows and pleasure. Here, value can be produced only when it is “[given] ‘a place in life’ [...] and [allowed] to live and evolve” (Lazarrato 1996:145) by the actors that inhabit in this field. In the case of Promise, Inc. it is hopeful patients.

In this sense, it can be said that Promise, Inc. is parasiting on the economy of hope. While Promise, Inc. acts as if it were the custodian of hope, as a provider of experimental stem cell treatments, it profits from patients’ hope, their desire and efforts to find and maintain hope, and the efficacy of hope that is materialized in the body of patients as “living evidence.” In the following, I explore how hope is productive of the efficacy and hopeful patients, and it is simultaneously produced and sustained by patients’ endeavor of seeking hope and different

future. It will be highlighted that hope as well as promise is produced as patients engage with stem cells as a material-semiotic entity that is anticipated to produce effects in the body, change one's life.

JISOOK'S HOPEFUL JOURNEY

It was in October 2011, when about twenty members of online patient group, including Jisook, were heading to a small village in the valley for a two-day retreat where they would socialize and share information about the progress in stem cell research with an invited speaker. The patient group was organized in the aftermath of the Hwang Scandal to support stem cell research in Korea. Unlike most online and offline-based patient groups in which members share the same kind of medical conditions, its members have diverse medical conditions. What hold them together is their hope for stem cell research which would provide cure for the currently incurable conditions that all of them suffer from. The group is a particular kind of “biosocial” community that is organized around stem cells, not an inherent biological property that they share (Rabinow 1996), but a promissory thing that summons differently conditioned people with hope for cure. The members gathered for the retreat in a big city nearby, which took two hours from Seoul by express train, and shared some cars to the place. I was sharing the ride with Jisook and two other people. In the car, we came to listen to Jisook's story about dealing with her illness: how she was first diagnosed with a painful autoimmune disease, how painful to living with it had been, how stem cell treatments changed her life, and how she is now enjoying her life that was given like a “free gift (*tõm*).”

When she first became ill, her doctor did not tell her that affected her was “incurable”. She thought that she would get better if she observed what the doctor said. A year later, she came to meet a new doctor, and was told that her condition was incurable. The doctor might have

meant well, but she broke down. The fact that she would not get better at all made her life rather messy, hopeless, and painful. Growing pain and fatigue made everyday life quite difficult. Staying most of her time in bed, she felt sorry for her kids of whom she could not take good care. Sometimes, she would think of committing a suicide: “I even thought of suicide—if I died, I would be able to leave my family at least death benefit from insurance companies. It seemed much better.” Jisook was extremely distressed not only because of the physical pain, but also because of the guilt that she was a burden rather than a caregiver to her children, and people’s ignorance of her condition. The experience of chronic illness is often aggravated by the changing sense of self and necessity to restructure one’s own biography (Charmaz 1983;1991). The chronicity of illness, coupled with the sense of losing time to live up to her potential and to her and other people’s expectations, rendered her life superfluous. No future was promised.

It was when she heard about the possibility of stem cell treatments from somebody whom she trusted that hope reappeared. Interested in this new possibility, she did some online research on stem cells, and read somewhere that stem cells could turn into cancer within five years. She might have mixed up some statements on the risks of stem cell treatments, but anyways, she took this possibility seriously: what if I die of cancer in five years? “If I die of cancer after five years, but if I live healthy five years, I am actually earning five years! Then, I thought about cancer occurring in one year, yes, I’m earning one year. Only one day? It’s the same. It’s like earning time.” The sense of “earning time” here, presuming that she would regain her perfect health for the time being, points to the sense of (already) lost time with her chronic illness. The cure would return her the time that she had already lost—it was the future that she had never lived through.

While the outcome was not knowable and not decided, the undecidability,²⁷ in opposition to the certainty with which the chronicity was pronounced, indeed offered an opening that could be explored rather than an uncertainty that should be disclosed.

Hence, she started receiving stem cell injections in China through Promise, Inc. After three or four injections, she started feeling some changes. Immediately after the first injection, there were some negative changes that she experienced temporarily such as nausea and fever, which she later interpreted as *myŏnghyŏn* reaction, or “healing crisis.” Drawing on the language from alternative medicine, she accounted for the negative bodily reactions as the temporary symptoms that signal the efficacy of stem cell treatments and the coming of positive change. After repeated treatments, she indeed started feeling better. Her face, once much swollen due to the side effects of her medication, now returned to the normal shape. While not entirely disappeared, her bodily pain was significantly decreased. She felt less pain, and she gained more energy to keep up with everyday life now. While getting stem cell injections, she also changed her lifestyle, trying more exercises and healthy food. She continued receiving stem cell treatments through her “life-long membership” ensured thirty cycles of injections (and travels) for 100 thousand dollars. She started working as a “Health Coordinator” for Promise, Inc. She also started taking courses on alternative medicine through a university extension program. While she still needed to settle her debt and while she was still on medication, she was lively and cheerful. One may ask whether it was really the efficacy of stem cells or of other factors that improved her, which I will discuss later. For now, she was happy to come to the retreat, which

²⁷ Meditating on the peculiarity of “promising,” Mike Fortun (2008) distinguishes undecidability and uncertainty. He writes, “Uncertainty mobilizes efforts in knowing, which can ameliorate the condition, and even cure it. Undecidability calls for promising, and there’s no resolution in sight. Only a responsibility for a decision, a responsibility shared in different ways by promisor and promisee” (107-8). Uncertainty does not impede the work of promising, since promise works as it opens up the undecided future. Unknowability is not necessarily the threat to the work of promising, since the unknowable promises a future that is open, though without any guarantee.

was the first trip that she made to stay the night away from home (except for the trips for her treatments) since she fell ill.

AWAKENING THE SLEEPING VITALITY

We arrived at a humble, but cozy guesthouse in the valley. The program was pretty informal. The only relatively formal program was a talk given by a well-known Korean stem cell researcher. He gave a general overview of lab studies and ongoing and upcoming clinical studies on stem cell treatments in Korea. At one point, the researcher briefly made a caution to the patients about unauthorized stem cell treatment, which disturbed Jisook. “The effects of adult stem cell treatment, recent studies suggest, appear to be mostly ‘paracrine effects.’ Stem cells injected in the body, rather than directly turning into new cells, secrete various substances that are useful for other cells to grow. It seems that most stem cells directly injected in the vein [like the company does] would not really survive and go to the injured parts. Most of them simply die when they are injected. Some would survive and flow through the vein. But, one thing that you should be aware of is that the fat stem cells are quite big, and these chunks of cells, while floating in the blood vessel, could get stuck in the lung. The death of the patient from pulmonary embolism after stem cell treatment offered by this company, we suspect, may have been the case.”

After the talk, when we were setting the table for drinks, Jisook asked me what I thought of the talk. She was asking my opinion about a very specific part of his talk with which she was not so convinced—his remark on the possibility of stem cells getting stuck. I was not sure how to answer her question, so asked her back what she meant. She said, “To the extent I know, there’s a ‘homing effect’ made when stem cells get into the body. They find out the damaged part and move there...” In what she said, stem cells were much more active, mobile, and capable than

what the researcher just presented. Stem cells, when infused in the body, would move to the injured parts, instead of simply floating around, disappearing soon, or getting stuck somewhere in the body. Stem cells, in her imagination, are vital and active enough to swim to the area in need of them and turn into functional cells to regenerate injured parts. In the researcher's talk, however, stem cells appeared to be rather passive matters, not as a capable agent that *can* do what she was expecting them to do. Jisook seemed not satisfied with the explanation that reduced stem cells to passive stuff that merely floats around and dies easily. The conversation was interrupted as people all sat at the table for a toast to the future of cure. We never got to have a chance to talk about it more.

After a month, some of us who went to this gathering got together for a dinner. The conversation topic moved to, not surprisingly, stem cell treatments. This time, she made several interesting comments on stem cells. To sum up in one sentence: stem cells have the potential to “awaken” the dormant vitality of the body, make paracrine effects, and make differences that the patient “experiences” in her body, but to make it effective, stem cells should be “smart” to be able to “swim” to the destination to be awakened. She incorporated what the researcher told in her version of stem cell story. “Stem cells, when they are infused into the body, are just like kids thrown into the water. If the kid is smart and knows how to swim, it will be fine. If not, it will be drowned. What matters is how to get smart ones infused into the body.” In this new version, stem cells appear as capable as her previous version, if they are aided with the right technology. The “smart” cells that could navigate the body may not simply turn into new cells to replace the damaged ones, but rather “awaken” the vitality that was dormant.

Jisook's old and new accounts of the mechanism of stem cell treatments are both based on concepts of homing and paracrine effects that are also discussed in official stem cell

science.²⁸ Crafting “scientific” concepts into an intuitive story, she has developed her own story of stem cells through which she could make sense of and imagine how improvements take place thanks to the vital capacity of stem cells. The vital capacity of stem cells that can actively effect cure is where the promise of Promise, Inc. based, where the cure is expected to emerge, and where her hope is anchored. The active, vital stem cells and the story of their regenerative capacity is a story that does more than explaining how it works. It is a story that enables one to imagine how it would work in the body, and how the body would change as the result. It is also a story that provides a template with which patients who have gone through stem cell treatments would account for the outcome. In this story, the semantic value of stem cells as the agent to cause positive changes with its own capacity are opposed to the inert, passive body that is to be awakened. It is something that patients receive and incorporate in their body, to be cured. And, this type of story that narrates the efficacy of stem cells might help patients to have and maintain faith in the treatments they are receiving. We might imagine it could actually work like a “placebo” as long as patients take it seriously, and believe the external agent to be able to cure their body when incorporated. Even though it is putatively a “scientific concept,” it may do something similar to what Daniel Morenman (1979) called “symbolic healing”²⁹ in which the cultural beliefs about body and the therapeutic agents produce cure. Or, we might rather say that, from her active, yet intuitive imagination of stem cells, scientific medicine might make a case for

²⁸ One could easily find “scientific” theories that correspond to the narrative that Jisook provides in prominent journal articles (e.g. Phinney and Prockop 2007, Gneccchi et, al. 2008, Karp and Leng 2009, Bianco, Robey, and Simmons 2008).

²⁹ The term “symbolic” might be misleading, if one sees “symbol” not as a “real,” but purely representational. Here, I want to emphasize “symbolic healing” occurs when the symbol is taken not as an opposition to the “real” thing. It works because it is made “real.” Moreover, thinking of stem cell treatments through the discussion of “symbolic healing” is to keep a distance to the premise that the efficacy of stem cells should emerge from their “real” “biological” property that only science can witness.

a biotechnically embraced version of symbolic healing.³⁰ If “the emotional transformation of symbolic healing can only take place if the symbol is experienced as having external agency; if it seems authentically to the person experiencing the pain” as Tanya Luhrmann says (2013:710), the “external agency” authorized by the official stem cell science, crafted with the language akin to the ones from alternative medicine, may have the potential to improve the patient’s life to some degree.

The faith in the capacity of stem cells can work both ways. It can help patients to produce the efficacy by providing them a material anchor for their hope as will be discussed in the next section. At the same time, it can also work as a template with which the improvements are accounted for. There already exists the official promise of stem cell science for regenerative medicine, and living evidences that found cure in this informal market. Working together with these stories, the faith in stem cell treatments could give reasons for patients to invest in this rather expensive and controversial treatment option. Yet, what produces the improvements might not be just stem cells, but also patients who respond to the promise of stem cells. While Promise, Inc. appears to provide stem cell treatments as a service to patients, it might also be the case that patients are indeed producing the efficacy, although the faith in the capacity of stem cells may obviate these patients’ bodies at work. This might not be a pressing question to patients whose bodies are put to work for and by hope that newly emerged with the promissory thing. However, it is a question that helps us navigate the market where hope becomes the source of profit.

³⁰ Analyzing the clinical narratives in American oncology, Mary-Jo Delvecchio Good (2001) draws attention to the “affective and imaginative dimensions of biomedicine and biotechnology [that] envelop physicians, patients, and the public in a ‘biotechnical embrace’” (397). The enthusiasm about new biotechnologies and experimental treatments embrace and are embraced by the clinical narratives as well as the wider social discourse on medicine. While she addresses it particularly American, it is becoming more widespread as biotech is increasingly embraced in other countries.

PRODUCING THE EFFICACY

Jisook's story is definitely a success story, and it is not surprising why she could call herself as a "living evidence" of the efficacy of stem cells. Yet, one may still ask, with some skepticism, if it was actually what stem cells did. I myself kept wondering if all these positive experiences were "really" originated from the efficacy of stem cells. Indeed, there were too many things. She might have been too stressed out and depressed to take good care of herself after the "no-cure" sentence. The lifestyle changes that she made along with stem cell treatments might have helped her. It could have been simply "placebo effects." Indeed, the International Society for Stem Cell Research (ISSCR) advise patients: "Just because people say stem cells helped them doesn't mean they did" (emphasis added), and "there are three main reasons why a person might feel better that are unrelated to the actual stem cell treatment: the 'placebo effect,' accompanying treatments, and natural fluctuations of the disease or condition."³¹ The way this advice is written highlights the presumed efficacy of stem cells both among scientists and patients, and the power of stem cell promise.

It is not unusual that researchers and doctors react to this business of selling the promise of stem cells by pointing out the lack of evidences of the efficacy and safety of the treatments, since Promise, Inc. sells is the promise of stem cells based on their biological capacity to make effects in patients' bodies. And, it is true that Jisook's story, or other patients' stories cannot be simply taken as an evidence of efficacy of stem cell treatments, if one construes efficacy in the same way with the epistemology of modern scientific medicine. However, if "efficacy" is

³¹ The International Society for Stem Cell Research (2010) provided a guideline on choosing clinics for stem cell treatments on the website they launched to educate the public on this issue. The quotes in this section are exerted from a page "Top Ten Things to Know About Stem Cell Treatments" that gives a list of "10 facts" that) one should know about stem cell treatments.

located elsewhere, not in stem cells, we may tell a different story. Considering what mattered to Jisook was not only the physical symptoms, but also the minute details of everyday life through which her illness came to challenge her sense of self, the efficacy here may include not only lessening of the physical symptoms, but also increased possibility to better cope with her everyday life. The desired result is, of course, health and cure, but it could be, broadly conceived, a little bit of enhancement of the quality of life, too. Even though Jisook had thought she would become perfectly healthy after the treatments, she was not disappointed by the fact that she only became “quite normal,” not perfectly healthy. She rather thinks that she had set the expectation too high at first. She appreciates what has happened to her, since she now is able to do things that appeared impossible in the past such as making a trip like this. Whatever it is, the change that pleases the patient could be seen as the evidence of efficacy in this regard, as long as the patient identifies it as the positive change that enriches life. Seen this way, the efficacy is identified, in retrospect, through the patient’s interpretive and sensory work in the process of responding to the treatment, often within the template given with the promise of efficacy.

While the promise of efficacy instigates the act of trying out stem cells, patients also produce the efficacy as they find out the changes in their bodies. Moreover, it is through the patients’ bodies that the effects are produced—the efficacy of stem cells can be identified only as patients’ bodies respond to stem cells. By responding I refer to both the “physiological” response to the material entity of stem cells such as paracrine signaling, and other types of response to the semiotic entity of stem cells such as hope and faith. While the mechanisms in which stem cells could possibly cure the damaged tissues are still investigated, studies have suggested that stem cells infused in the body are made to work upon the other cells’ signals. The cell-to-cell communication between cells inside the body and stem cells that are newly infused is, at the

level of cellular physiology, one of the moments in which patients' bodies are at work responding to the stem cell treatments.

Yet, Jisook's responses to "stem cell treatments" involve more than the physiological response. The newly offered promise of stem cell cure has given her the vigor to try more exercises and seek various other methods that might be good for her health. She became more enthusiastic about life, as she could see a possibility of cure. She responded to stem cells, or the promise of cure that was given with stem cells, by taking better care of herself, and experimenting with various methods of self-care. Or, maybe her response was having hope, which enabled all the changes. What if the improvements are a "placebo effect"? They could be. However, it does not change the fact that her life has been improved. While the label "placebo effect" tends to be associated in the modern medical science with quackery or deception and with the work of psychology distinct from the actual biology, placebo effects are nevertheless "real" as patients experience, and have the potential to improve their lives. Instead of looking for the efficacy from the "body" that is not affected by the mind, Isabelle Stengers (2003) suggests the question of efficacy could be sought for in the mutual fabrication of body and mind in responding to a treatment.

Did stem cells really do it? Were stem cells really effective? If one only cares about the efficacy of "stem cells" as a biological entity and its physiological function, Jisook's story would not give any clear answer to this question. However, we might say stem cells really did, and were really effective at least in some cases, if we consider what stem cells did not as a purely biological material, but also something that is loaded with the promise of cutting-edge science of regenerative medicine, which in turn invokes hope in the mind of patients who were told that there was no existing cure. The efficacy here, I want to emphasize, lies not simply in the

biological capacity of stem cells, but also, or rather, in the patients' responses to stem cells as a promissory thing that speaks to patients to imagine different futures.

At this point, we might hypothetically consider stem cells as something without an actual, substantive biological function, but as a kind of placebo for the moment to think more about the nature of efficacy. The historian of medicine, Anne Harrington (2006), grappling with how the meaning of placebo effects has been historically changed, suggests it is unlikely that we will reach at the consensus on this issue. What she provides here is not a claim on the epistemological impossibility to get at the "truth" of this issue, but rather an opening toward the possibility of productive engagement with this question to get insights on improving the quality of care (Mooreman and Harrington 2005, Spiegel and Harrington 2008). Then, even if the positive experiences of stem cell treatments might be concluded as placebo effects, there is something we can learn from them. If stem cells could work as a placebo, stem cells could make an effect, albeit not necessarily in a strictly "biological" sense, through the imagination in which stem cells appear vital and lively in contrast to the chronic, degenerative state in the backdrop. Stem cells, then, work as the material anchor for patients' hope which might harness patients' own capacity for healing. In this sense, we may say stem cells "really" did work, but not without the work of patients responding to them. If we take patients' work of "responding" seriously, the epistemological question of the efficacy also leads us to ask questions about hope and care.

THE EFFICACY OF HOPE

Jisook's story, while it is narrated in a way that highlights the changes that stem cell treatments brought to her by comparing her pre- and post-treatment life, also draws attention to hope that has inspired her to take better care of herself and produce the efficacy. Hope is a force that inspires patients to try whatever they could do, which again keeps patients' hope alive.

While we often easily assume that “desperate” patients would try whatever is available to get better, often falling prey to charlatans, the actions would not be done without hope. Hope makes and is made by the imagination of making a difference in life, opening people up to the promise of future, different from the present. With the promise of stem cells, for instance, Jisook could rather find hope not to prove stem cells’ efficacy, but to take good care of herself, since there was an escape, or rather a promise of escape, from the chronic condition now which had not existed before.

Being a patient does not simply mean that you are ill, but you are managing everyday life with your body that is different from the one that you had before, coping with your disease by patiently paying attention to what your body tells, and trying various methods to improve your conditions. Many patients do not simply subject their bodies to the doctors. They may seek alternative medicines, diets, and exercises that are told to be good, while some would seek supernatural power in religions. In doing so, patients are not simply “desperate,” in despair, but also hopeful, or trying to be hopeful. Another patient, Mija, who had been suffering from chronic renal insufficiency wrote in her testimonial after the stem cell treatments, “I had faith that I could return to the normal state, and I was determined to take care of my health very rigorously by managing things like my habits and diets. After five injections, a miracle happened.” Mija was a physician herself, and she could have taken rigorous care of herself even without the promise of stem cell treatments was offered. However, it was only after the promise that she was firmly determined thanks to her faith in cure. Her research on existing medicine did not give much faith and hope in the possibility of cure to her. That might have not been enough to instigate the changes in her daily practices. As she decided to invest in stem cell treatments, she invested not only in the treatment itself, but also in other changes that may be beneficial. While, as a faithful

client/patient of Promise, Inc., she says that it was the miracle of stem cell treatments, her testimonial seems to tell more about the efficacy of treatment, as a package of faith, hope, rigorous care of self, and all sorts of different things that are unknown. And, I want to note that faith and hope are not something that naturally occur, but rather made and maintained in repeated actions, and inspire further actions (Miyazaki 2004).

Mija had faith. Like Jisook, who regained the energy to do exercise and take better care of herself better when she started receiving stem cell treatments, stem cells, or faith in stem cells could generate certain effects. We cannot exactly locate the efficacy in one entity in this situation, but rather look at the efficacy as it is produced and found in the patients' practices of self-care in their engagement with stem cells as a promissory thing. If it was made, it was also made within the patients' bodies. Stem cells might do some work, but their efficacy would not be made palpable without the interactions between stem cells and patients' bodies. The promise of cure offers patients hope, the power to cope with the present suffering and to pursue more experiments with their life, which might improve their life. We may call this the efficacy of hope—not necessarily by hope alone as the gospel of “positive thinking” preaches, but rather in the process that patients respond to the hope.

Hope here emerges at the moment when one actively imagines the possible future that could be different from the seemingly inescapable present. If Jisook took the doctor's assertion that there was no cure as a statement that forecloses any possibility of change in her present situation, the promise of stem cell treatments created another opening through which Jisook could imagine a different future. As soon as she started engaging the promise of stem cell treatments, efforts of self-care that appeared meaningless could have taken a different significance. But, couldn't the promise of official stem cell science do the same thing for her?

Couldn't she just wait until scientists prove that it is safe and effective? Or, should we say that she was too desperate to wait for a few years? It was in part because time means more than just a duration, but rather the possibility of living differently, living up to the person's potential. For Jisook, what mattered was not only that she was ill, but also that her children were growing up and in need of her care. Would her health mean the same to her and her family ten years later? It means not simply ten years of additional suffering, but also ten years of loss, evidenced by Jisook's phrase: "earning time."

Yet, there can be more in the venture of hope than this practical reasoning in the patients' immediate action of undertaking the promise. It could be a gesture of active waiting in Clara Han's term (2011). Discussing how care is enacted through gestures of care that anticipate difference to be made, without guarantee, yet with hope, Han points out how the gesture of care is an active waiting that enacts another temporality in which the difference could be made, another future, not in an eschatological sense of future, but a kind of "near future" (Guyer 2007). The gesture enables one to inhabit this temporal zone in the mode of "active waiting" without certainty. Active waiting, in her work, works to enact relations of care: although the consequence can become a bigger burden at some point, it does not cancel the gesture of care itself. The gesture itself makes time to wait and see what happens—the temporal space of hope. The gesture is made with hope, and simultaneously it enacts hope in this very gesture. Venturing to receive stem cell treatments could do a similar thing. One receives stem cell injections and waits with hope till stem cells actually work, while making further actions for stem cells to work better, like Mija who started rigorously watching her health. Hope might emerge in these efforts to occupy the space of hope. In doing so, the patients are also enacting their agency in their efforts of making different futures. It is a gesture of care of self. We might say Promise, Inc., which

occupies the temporal gap between official promise of regenerative medicine that has been around for a while and the future in which it will be officially realized, has found its niche in the patients' desire to occupy the space of hope and efforts to enact hope for themselves.

TAKING CARE OF HOPE

When Jisook mentioned about having an autoimmune disease, another person in the car said that she heard about it and how painful it was from the newspaper article. “Yeah, I remember that. It was the disease that, what was her name, the ‘Happiness Preacher’ had.” Mina was referring to Yun-hee Choi, who was found dead in a motel room a year ago. Choi, who committed suicide together with her husband, was famous as a top-selling author and self-help coach who always talked about hope and happiness. Since Choi’s suicide temporarily spotlighted this rare disease which brought “700 different kinds of pain” to her, Mina seemed simply to express that she had some understanding of the severe pain that Jisook has gone through. Yet, as soon as Choi was mentioned, Jisook raised her voice with discomfort. “Yeah, that she killed herself made me angry. How could she just kill herself? It’s so irresponsible. She shouldn’t have given up. She should have shown people that there’s hope.” What struck me at the moment was that Jisook herself had mentioned, in the same conversation, that she had thought of committing suicide, and, for that reason, I thought she should have been more sympathetic to Choi’s decision than being upset. Even though Jisook understood the hardship of living with severe pain, however, she felt it was not a responsible action. If Choi, the Happiness Preacher, could be said irresponsible, what or who was she irresponsible for? People—people to whom that she should have shown the hope. Jisook was saying that the suicide of the Happiness Preacher, while it raised awareness about the disease, could discourage people who have been suffering from the same condition, as if there were no hope, nothing to hold onto. In this section, I will briefly

discuss how hope is taken care of by patients themselves, as they see themselves as a collective of hope.

One patient has phrased, in his posting on an online forum for patients that suffer the potential loss of vision, that hope is a “signpost.” It directs one’s vision toward the potential future where he escapes not only from the chronic illness but also from the chronic fear of irreversible loss of the bodily capacity due to the disease. When discussing his attempt at stem cell treatments, he acknowledges that not only that it is still an experimental treatment, but also that because of the high cost, not everyone would benefit from the treatment at this point. Concerned if other patients would take his decision to get stem cell treatments as a message that stem cell treatments were the only and last resort and would be discouraged from everyday care of their conditions, he took great care in order to take care of other people’s hope. While emphasizing that the progress of degenerative condition could be slowed down by patients’ own efforts, he confesses that his life as a late-stage patient is shadowed by the fear of the complete and irreversible loss of his bodily capacity. While he himself has been living evidence of the possibility to defer the potential loss of vision, the negative potential has always been there with no promise of cure. If successful, his experiment that the patients did would provide a signpost for everyone from the chronic condition where there seems to be no escape except for managing it.

Then, the circulation of success stories can be seen as part of efforts on the part of patients to share and take care of hope. Patients are not simply naïve. And some of them inform other patients that offshore stem cell treatments or other forms of experimental stem cell treatments might not be very successful based on anecdotal evidences. However, successful stories are told and recounted with a sense of sharing hope, and further taking care of hope for

others. Some patients who are participating in clinical trials or sharing their experiences of stem cell treatments from the beginning often say that they are concerned with the results because so much attention is given to them by other patients in the hope of cure. For instance, a patient who was actively participating in the patient advocacy group and was enrolled in a clinical trial once wrote that she was worried if she would not be improved at all because so many other patients were interested in the result, and so much hope was invested in the clinical trial. She felt responsible for taking best care of herself during the clinical trials because she wanted not only to recover from her condition, but also to give hope to others. Not only the medical conditions are shared, but also hope is shared among those patients. One's body is not just one's own body. It is living evidence of hope that everyone in the community would share; the body that participates in the trials for stem cell treatments substantiates hope. In a sense, the body of an experimental subject is a shared substance in this collective of hope. For this collective bodily experiment, stem cells and their efficacy are not only about the individual cure, but also about the collective hope that needs to be taken care of. When the patient participating in a clinical trial was making effort to take best care of herself as possible, she was not only taking care of her body for her own improvement, but also of hope for others that they could recover as well. Successful treatments would offer inspiration to patients by offering a "signpost" of hope and a living evidence of the future to come.

What distinguishes the stem cell treatments from other types of alternative medicine that many patients in currently incurable conditions is the temporality of the stem cell promise. When researchers say its efficacy is yet to be proven, what is highlighted is not only that it is still in an experimental stage, but also that it is promising. Rather than simply "waiting for" the future to come, patients may rather engage with the promise by actively pursuing it whether in a clinical

trials setting or in an offshore stem cell treatment market. When patients share the experiences of successful or unsuccessful stem cell treatments, what they share is not mere information about the efficacy, but rather hope for the possible future. Patients would share stories of improvement to share hope with other patients. Stories of failure are often shared as a caution to other patients to manage other people's expectations and warn them against the potential loss of money and time as well as disappointment. Even when the stories of unsuccessful treatments are shared, they are shared in a manner that does not close off the promise of stem cell cures. In a discussion on unsuccessful stem cell treatments, a woman whose father was not much improved by the stem cell treatments wrote that she was actually persuaded by her father that his attempt was vain. Rather than taking the ineffective stem cell treatments as a failure that already happened, she and her father would take it as one of the moments in the sustained process toward the realization of the promise. Responding to another patient who was disappointed at his unsuccessful stem cell treatments, she wrote about her father's experience saying that her family has already lost "time, money, and the breathtaking feeling of hope," but they were still believing that all the things they had lost would come back as the company would perfect their technology from what they have learned through many (unsuccessful) attempts. One may be disturbed by her naive hope that denies failure and forgets how the company was indeed taking advantage of her father's desperate condition. It is possible that Promise, Inc. is not interested in perfecting the technology as much as she and her father hope it to be. It might only be interested in the profit, and it would continue to take advantage of patients' hope. Yet, what matters to this family whose life was affected by her father's condition is not what Promise, Inc. is interested in, but what stem cells could eventually offer to them. Whatever they lost from the unsuccessful treatment, as long as there is hope to benefit from the future development, it is not that they would lose it all. Speaking

this way, she is taking care of hope, for herself, her father, her family, and other people on the forum. Even though this might be too early to expect success, the promise is still alive, and hope is still there for all of them, for the biosocial collective who shares similar conditions that were deemed “incurable” at the present moment.

Another patient who did not experience any improvement after repeated stem cell treatments wrote on the patient forum that she would still try not to give up hope. While repeated stem cell injections did not turn out to be effective, she would rather imagine stem cells that were already injected in her body are still growing and waiting for the prime time to “run” fast to reach the injured body part. Even though the stem cells that had already been infused in her body did not make effects, she still anticipates the time when they finally live up to their promises. By actively imagining them as young cells that still need time to grow and run, by allowing time for them to do so, she allows herself and others the time to keep the faith and hope alive. It is not a simple refusal of failure, but rather a gesture of taking care of hope not only for herself but also for others. In the same post, she also mentioned how she was inspired by other patients’ efforts to take really good care of their own bodies, which are not only one’s own, but also all patients who suffer the same condition. Shared hope should be taken care of. As they keep the promise ongoing, hope in stem cell treatments could still be alive. Without trying, the future would not come anyways.

Jisook, who was upset about the Happiness Preacher’s suicide, is still selling the stem cell treatment options that researchers, doctors, and the media criticize as dubious, illicit, unproven, and risky undertaking. Stem cell treatments, however, are where she found hope to live on, and make changes in her life. It may not be stem cells that cured her by making very significant biological functions, but her hope, her determination to change her life that emerged with the

promise of stem cell cure. When she sells stem cell treatments, what she is doing might be sharing hope, while she could still make money out of it. The commission might be a bonus that follows her wish to help other people out, to show other patients hope, which may or may not betray them in the future.

AN UNCANNY SYMBIOSIS

Not only desperation, interest in health, but also hope leads patients to experiment with stem cells. And, there could be the work that this hope can do, and the work that patients do with hope. Within the marketplace constituted by the official promise of stem cell science which created a lot of “patient-in-waiting” (Sunder Rajan 2006), waiting for the cure to be found, and the deferred moment of its realization, Promise, Inc. is capitalizing on the work of hope. While it is constantly said that it still needs time to ensure the efficacy and safety of stem cell treatments, patients for whom time means more than a simple number of years are still paying a high price to experiment with stem cells.

Writing on the multi-level marketing scheme of Omnilife in post-genocide Guatemala, Diane Nelson (2013) expresses her discomfort with portraying them “as simply dupes.” While the scheme is manipulative, people who fell prey to the scheme “don’t seem any more concerned by it than the rest of us caught in late capital’s meshes of commodified subjectivization, military optics, and the boom in affective labor” (304). In a similar way, when we are quick to blame Promise, Inc. with selling “false” promises that would harm patients without paying attention to the affective economy of hope and patients’ stories, we may find ourselves caught in a particular mode of biopolitical subjectivization that privileges “life itself,” articulated with the mantra of medical ethics (“First, do no harm”), not situated in the intricacies of life, and the epistemology of the modern medical science. As much as the “prey” of Omnilife have their pleasure of helping

themselves and others out in an impoverished community, the “desperate” patients may be finding new visions of life through the hope that Promise, Inc. is selling within the fate of chronic suffering.

It is not to say Promise, Inc. is innocent. Promise, Inc. capitalizes on patients’ hope, desperation, and desires. It sells the promises of cure, better future, and different life packaged with the experiences from other patients. In a sense, it lives on the patients’ hopeful experimental labor which gives flesh to the promise that the company sells. Without them, the dubious offshore operations would not appear as promising as it is. Without the stuff of promises, the witnesses that patients provide through their hopeful experimental labor, the promises would not be corroborated as credible promises. Promise, Inc. capitalizes on, and parasites on this hopeful experimental labor that patients do. At this point, I am tempted to give another fake name to this company, Parasite, Inc. While “parasite” is a figure that is similar to vampire that Marx compared to capital. “Capital is dead labour, that, vampire-like, only lives by sucking living labour, and lives the more, the more labour it sucks” (1973:342), the figure of “parasite” can complicate the story by drawing attention to the relationality between the parasite and the host as Michel Serres (1982) has discussed. Parasites are different from predators—another figure that one may recall from Marx’s “vampire” metaphor. “The relation with a host presupposes a permanent or semipermanent contact with him [...] not only living *on* but also living *in*—by him, with him, and in him” (6), and in this relation, the “host is not a prey, for he offers and continues to give. Not a prey, but the host” (7). Like the vampire-like capital (or rather as its one instantiation), Promise, Inc., too, cannot live without sucking the hope of patients, their hopeful experimental labors, and their stories. It can survive as long as patients are willing to do “free labor” for the companies by actively taking seriously, experimenting with, and spreading the

promise of Promise, Inc. When patients share hopeful stories with other patients, they are sharing hope with other patients, the collective of hope. Promise, Inc. interferes in this collective as a parasite, and it lives *in* the collective of hope. At the same time, Parasite, Inc. is also Para-Site, Inc., as it is a derivative, unofficial enterprise that is adjacent or parallel to the official marketplace of stem cell promises. Especially because it sells the very promise that the official stem cell science has been selling without being “approved,” it might be seen as the noise that interferes in the official channel for the promise. According to Serres, “parasite” in French also means the static, the noise that interferes with the messages. While Promise, Inc.’s message is constantly criticized by scientists and doctors as a kind of noise, the noise is a byproduct of the official stem cell enterprise in which a specific aspect (faith in the vitality of stem cells) is amplified. Interestingly, the official stem cell science can send its own message that stem cells “will” do their work in the future and we should be waiting until then, while it is dealing with the noise in the system.

The parasite would not kill the host, for it knows all too well that it cannot live without hopeful patients. It rather captures patients’ desire, triggers their hope, and spreads the words of living evidences. It would rather wish that patients to be cured. It may do so not necessarily for benevolent reasons, but rather for its own survival and growth. Yet, it would constantly try to spread the words of hope for its own survival through the speaking bodies of living evidences. And, the words of hope would also give other patients some hope, opportunities to experiment with another avenue of cure. The outcome might be felicitous as in the case of Jisook, while there is always the risk of infelicitous unfoldings as in many other cases. One might lose money, hope, time, and/or health eventually when the treatment fails. However, until the point of failure when Promise, Inc. turns out to be indeed exploiting the patients, it could give patients hope, the

reason and power to experiment, albeit temporarily. In this sense, we might say that patients and Promise, Inc. are in a symbiotic relationship, albeit temporarily. But it is a strange symbiosis, which is always fraught with the possibility of failure and exploitation, as it is a relation based on the commitment in promises.

This uncanny symbiosis leads us to other questions than how not to do harm to patients. When we ask how not to harm, we are worried about the potential exploitation. Yet, if taking the risk of exploitation is part of living as a hopeful patient, we might rather ask questions about what are the conditions in which the possibility of exploitation becomes acceptable, or even welcomed. For instance, Marx did not only talk about the exploitation, which was already recognized and scandalized in the official reports of his time. He rather asked about the historical condition in which enduring exploitation was the only possibility given to the workers who was deprived of means of production, and had to sell their own labor force in order to survive. Patients, too, are led to find hope from what is said “unproven” treatments, as the existing medical practices do not leave much space for hope. What if Jisook had not been told that she would suffer from it for the rest of her life? What if doctors had given better care, instead of the diagnosis that it is incurable? Is it important to keep patients waiting until the safety and efficacy are both proven by real science? But, for what? Isn't it possible to ensure the safety first, do more research on the safe way to administer stem cells, and use it as an “affordable placebo”? (Murdoch and Scott 2010:20) Who would be against the use of stem cells as an affordable placebo? And, how would it become “affordable”? The real trouble with Promise, Inc. is that we do not know how to ask better questions about it. Promise, Inc., or Parasite, Inc. could find its niche in the space where those questions are not asked. As long as patients care about themselves and other patients, want to have hope for themselves but also share it with others, the living

evidences may proliferate. Interventions in this uncanny symbiosis, which always has the possibility of exploitation, demand more careful studies and pragmatic strategies that consider the ecology of promises, care, and hope.

INTERLUDE

Living with the Promise

While I was reading posts on a spinal cord injury patient group’s website, I encountered a post written by Youngmi. She was looking for participants for the survey to design a clinical trial for stem cell treatments for spinal cord injury. According to the letter to solicit responses, she stated the difficulty that her team had in coming up with a new research design. While there have been quite a few clinical trials (including investigator-sponsored trials for “academic purposes”), Youngmi’s team found it is difficult to get a good grasp of the therapeutic outcomes from the previous trials. There are differences in the conditions of experimental subjects, kinds of stem cells used, and methods of administration, which are relevant “for patients to make right therapeutic decisions.” However, “these data are not fully disclosed because they are linked with the sponsor organizations’ interests or trade secrets.” She writes, “so far, many people with spinal cord injury have received stem cell treatments or are undergoing the treatment. Through participation of patients who received stem cell treatments, it is expected to collect *objective* data for analysis, not each institution’s self-analysis. For this, we request your active participation for this.” She proceeds, “*While* being in a position of a stem cell researcher, *as a family member* of my brother, a person with a spinal cord injury, I *sincerely* hope to do research ‘for’ spinal cord injury patients.” In this short letter to patients, Youngmi proposes a different notion of “objectivity,” while highlighting the situatedness of scientific knowledge production (Haraway 1988), although what entailed her partial perspective is not so much of subjugation, but rather of care and promise. Her own situatedness captures the tension in the promissory enterprise of stem cell research, and further enables her to find out an innovative solution to the problem. And, her situatedness comes not only from the fact that she *is* a scientist who *has* a family member who

suffers from the spinal cord injury, but rather from the way she is entangled with the relations of care.

Youngmi was my best friend, or rather a teacher, when I was working in the PRL in 2010-11. She was the one who constantly reminded me how much labor and time takes to make stem cells work and knowledge to be produced. While replacing disposable pipettes, she would tell me that she felt uncomfortable with using all these disposable lab supplies, made of plastics. When she was working to extract protein from frozen rat liver tissues, she would remind me that it took lots of labor by another researcher to procure these tissues. She would tell me about the labor of taking care of the rats, sacrificing them, and preparing tissue samples from their bodies—all these things are important in the laboratory life, but are not very obvious when I was reading papers. There was nothing that simply passed her fingertips as the “given” object—everything had its own material history in which it was accommodated by and/or alienated from other bodies.

* * * *

One day, I was having dinner with Youngmi. We were chatting about the lab, personal life, and stem cells. At one point, she said, “in theory, it must be so simple like that: you differentiate stem cells into nerve cells, and connect the disjointed spinal cords with these new cells. Why should it be so difficult?” She knew that it was not that simple. She knew that our bodies are much more complicated than a car, and connecting disjointed nerves are not as simple as fixing a car. Indeed, if I had said to her what she just said, she would have probably told me why it would be difficult—such as the complexity of neural system, the traces that injury left over time, and other uncertainties regarding stem cell treatments—as a young stem cell scientist. She knew that laboratory studies themselves take much time and labor, and do not always

succeed; she knew that there are many “hurdles” and uncertainties in developing stem cell therapies; and she kept telling me about the problem of moving too fast, or giving impression to the public that it is moving really fast. But, at this moment, she was not speaking as a stem cell scientist. She was speaking as a sister of a young man who had been paralyzed for a few years.

Youngmi’s brother was paralyzed with spinal cord injury that happened a few years ago, in his honeymoon in Thailand. Before this tragic accident, she was a grad student in another university in a cancer lab. When he was injured, she had to fly to Thailand to take care of him for a while, then flew back to Korea. His bride left in the course of events, and Youngmi had to take care of him in Korea once again. When things were more or less settled, she came back to the lab but this time to study stem cells. There were not many labs in Korea working on stem cell therapies for spinal cord injury, and the university that she chose had one of rare professors working in this area. She got in, but the professor left the institution. She ended up in the placental stem cell research lab for some reason. As our life usually is, it was a series of coincidences and unanticipated events that had brought her to this lab; now, she was here to have drinks with me. While her current work was focused on the mechanism of hepatic regeneration of placenta-derived stem cells, designed and studied in accordance with the PRL’s long-term goals, her dream was to work on stem cell treatments for spinal cord injury after her doctoral training, although she was unsure about the future career. “There are few labs working on spinal cord injury in Korea. It’s probably because it doesn’t make a lot of money. I don’t know whether it can be a niche market or a dead market, if I work on spinal cord injury.” While she was much interested in the biology of placental stem cells, her focus was more on the stem cells as they are relevant to the regeneration of injured spinal cord, which might help her brother walk again—sooner, not later.

Stem cells are a promissory thing for her to hold onto not only her career as a biologist, but also her hope that her brother will be able to walk again. For somebody who has been looking after the paralyzed person, the image of cure can be different from what one sees in the Hwang Stamp (raising from the wheelchair to jump like Michael Jordan in Nike's Air Jordan logo). It can be much less dramatic, but much more significant. As a family member, she knows how minute details of our everyday life are made possible, or at least easy, by the possibility to rise on one's feet, and to use one's hands freely. Just a small thing like lying on the bed can be much more complicated. One day Youngmi told me about what happened the night before. Her sister-in-law, who was also injured in her spinal cord, fell down on the floor while climbing up the bed from her wheelchair. She tried really hard to reach her cell phone to ask help, because there was no one around that night. She finally talked to her husband who was away that night, and he called Youngmi to help her. Just the minute details of everyday life require a lot of work, which appears "natural" or "given" as they appear integral to the functions of bodily organs. Youngmi always guided me to pay attention to the background works that are needed to maintain what appears to be given—the labors of care.

* * * *

Return to the survey that Youngmi's team conducted. She now is a research fellow at a university hospital, and she could make a shift to the clinical research on stem cell treatments for spinal cord injury. To design a new experiment, her team wanted to have more "objective" clinical data based on patients' self-reports. The survey questionnaire contains many detailed questions about medical histories, therapeutic processes, and outcomes, which can be "objective." Yet, what really ensures the objectivity of the data from Youngmi's point of view is

that the data are based on patients' self-reports rather than self-reports from sponsor organizations that are skewed by the institutional or commercial interests. The problem of "objectivity" in the production and circulation of clinical trials data is embedded in the commercial orientation of clinical trials (Dumit 2012). Since clinical trials sponsored by institutions are not aimed at simply "testing" the efficacy but "proving" it, data that do not reproduce the stem cell promise can easily disappear. But, this is not the end of the story. When Youngmi mentions that these data on varieties of stem cell types, administration methods, and patient conditions are relevant when patients make the therapeutic decisions, she also considers that patients are actively seeking for stem cell treatments, while many details that might make differences in the clinical outcomes are unknown to them. In the patient forums as well as media, there is much interest in clinical trials and commercial treatments using stem cells without much specification. Sometimes they are specified as stem cells using "autologous bone marrow stem cells," "cord blood stem cells," or "embryonic stem cells," but the initial conditions of patients or the degrees of actual improvements do not appear in the news coverage. Patients are often left to rely on what other patients say, but there is always limitation. How far can the negative or insignificant results travel? And, how much can individual patients tell about the technical details of stem cell treatments that can be relevant to the therapeutic outcomes? And, what does it mean for a patient to make a decision with no access to those details, but only knowing that stem cell treatments worked for such and such diseases?

What she wants to do is doing research *for* patients. It is not to say that other patients are not working "for" patients. When Youngmi speaks of "research *for* patients," however, it seems to mean more than simply helping patients by developing stem cell cures. If the only data that are made public are the ones that show statistically "significant" improvements, the data might *speak*

for stem cells, but not necessarily *work for* patients. Patients may not *need* to know about the mechanism of each treatment in trial; however, it might be relevant information, when it is said that stem cells were effective for a certain condition. The improvement could be dependent on the initial condition of each patient, and it is already included in the design of clinical trials. However, when patients pursue stem cell treatments through various channels (including the offshore treatments that Promise, Inc. offers), this issue could be ignored. Then, it is not simply a matter of proving the safety and efficacy *of* stem cells *before* commercially offering stem cell treatments. It is rather a matter of learning how improvements are made, and how significant those improvements are to patients in clinical situations that involve administration of stem cells.

She understands the force of stem cell promise. Patients will anyway pursue stem cell treatments, as there is a promise. What needs to be done is not simply warning patients that it is premature and telling them it will take more time to fully realize the potential of stem cells. If the “objective” data are not accessible even to researchers, and the clinical data are produced only to reaffirm the promise, how can patients make an “informed” decision? Scientists say stem cells are not panacea, stem cell treatments are still premature, and their efficacy is yet to be proven—be cautious of hype. Yet, those cautions are often ancillary to the reports on successful lab studies or clinical case studies, which is already directed toward reproducing the promise itself. Further, the rhetoric that revolves around the potential of stem cells reinforces the stem cell promise. They are always “yet to be proven.” Failures are only episodes in the process of progress; successes are evidences of the future to come. If the promise itself is constitutive of the stem cell enterprise, and if it is generative of various ethical concerns regarding stem cell research and treatments (addressed in Chapter 1 and 4), those concerns should be addressed in a manner that acknowledges the power of promise. Acknowledging the force of promise, Youngmi

proposes to look at the actual details of stem cell treatments and produce knowledge about how to make improvements in patients' life rather than simply to prove the stem cells' efficacy in a given clinical setting. As somebody living with the promise, Youngmi could approach the problem differently. Asking patients to "participate in" the process, she asks them to be part of the stem cell enterprise. What makes it different from the labor of producing "living evidences" for Promise, Inc. is that the shift of focus from the potential of stem cells to patients' experiences, from the proof of the concept to the improvements of patients' conditions.

* * * *

However, the notion that stem cells have the potential in themselves has traction, as it gives people grip on the promised future(s). Youngmi was not an exception. One day when she came back from a conference, she seemed very excited. Telling me what inspired her, she suddenly mentioned a presentation about a start-up company: "There was a start-up that does a teeth stem cells banking; they presented how they could get neural cells from stem cells in teeth, which I actually haven't heard about it. I should talk to my brother about this, he might still have some wisdom teeth to store." Stem cells from teeth may or may not work in the future, but she has seen another avenue that her brother (and she) might explore and get hold of the potential therapy in the future. While the promise of stem cells is yet to be realized, stem cell promises are proliferating in various forms in the not-yet of its realization—like the teeth stem cell bank that excited Youngmi for a moment. What holds all these future-oriented investments and/or actions is the biological potential of stem cells—the not-yet-ness, which is built in the "scientific" definition of stem cells. If stem cells have an intrinsic potential to beget healthy cells (accordingly, tissues, organs, and body itself) in the future, isn't it just a matter of time? It may be premature now, but the future *will have come*. The promise of stem cells, as a future-oriented

life form, migrates to and proliferates in places where the future matters and promise is sought. In these sites, anticipations about the future feed the promise of stem cell biology, while the promise is grafted onto the anticipatory narratives about the future. The following chapters will look at how stem cell promises proliferate and mutate in different niches where the future matters.

PART II:
THE BIOLOGY OF PROMISES

God Has Prepared Stem Cells for Us

It is said that the motor and sensory nerves of a patient whose lower body was paralyzed for 20 years, after transplanting cord blood stem cells in her spinal cord, are now being resuscitated. It has shown that, though humble, the ‘miracle’ of the Bible in which a crippled man ‘walked in the name of Jesus Christ of Nazareth’ following Peter’s command is possible in reality. (Kim 2004)

Stem cells are cells that have the capacity to ‘differentiate’ various bodily tissues, undifferentiated cells that are yet to be differentiated. [...] Studying adult stem cells, I learned that the miracles Jesus performed are events that can actually happen. The blind and the crippled that appear in the Gospels suffered from conditions resulting from deaths of cells constituting specific organs. [The miracles] are just possible to be made, if you use adult stem cells to develop into new cells that can replace those injured cells. So, I sometimes talk to myself, while reading the Bible, “Lord, you must have differentiated the stem cells for that patient, right?” (Jeong Chan Ra, the former CEO of Promise, Inc. quoted in Bae 2007)

I have become a stem cell evangelist these days—when I meet sick and weak people, I evangelize them to get stem cells injected, stem cell injections renew your youth. I myself think that way. It feels like I will live up to a hundred years old with no problem. Dr. Ra, you did a great job for health and happiness not only of Koreans, but also of the human race. There are many new therapeutics, but stem cells that give us the great life of resurrection bring us the great happiness. (Rev. David Yong-gi Cho)

There is something “miraculous” about stem cells. Not every scientific breakthrough is portrayed as a “miracle,” specifically something that can be compared to the biblical miracles. The way the paralyzed woman, mentioned in the first quote, was presented in the press conference in November 2004 is noteworthy: she showed up to the venue in her wheelchair, stood up and made several steps aided by her walker in front of audiences and made the press witness the miracle of the crippled rising up of. When she later came to suffer complications from the operation, the news media once again called her “the witness of the miracle” who fell into despair. If there is an existing story that perfectly captures the promise of stem cell cures, a

generic promise of resuscitation that can put an end to all sorts of incurable conditions, it could be the biblical stories of the miracles of Jesus.

However, for Jeong Chan Ra, the former CEO of Promise, Inc., the miracles of Jesus are real, which can be replicated by another means of stem cell technology. Of course, he would not say that he performs the miracles like Jesus did, but he would say that stem cells are the gift of God which was “activated” by the words of Jesus, and can be activated by stem cell technology. Stem cell technology enables Ra to make good use of the gift of God, save people’s life, and spread the Gospel. He also emphasizes that it is God who works through stem cells and Ra. Narrating the stem cell promise through the language of “the gift of God,” Ra not only speaks of the promise of stem cell technology, but also confesses that he is one of the stewards of God, who is trusted within this community of faith. As a proper messenger of the gospel of a technoscientifically mediated miracle, he translates the stem cell promise into the “vernacular” of believers (Callison 2014). When he tells the story of stem cells alongside the biblical miracles and his own confession of faith, he renders stem cells as a proper thing to be sold through the church network, as they are congruous with divine will and God’s promise.

Furthermore, Rev. David Yong-gi Cho, the founder of Yoido Full Gospel Church, known as the world-largest Pentecostal congregation, once again translates the vitality of stem cells into the Christian vernacular of “the great life of resurrection (*k’ŭn puhwarŭi saengmyŏng*),” which not only alludes to the miraculous quality of the treatments for regeneration, but also its promissory quality. Particularly in Cho’s teaching that emphasizes this-worldly blessings, the “life of resurrection,” given at the Resurrection of Jesus to people, not only promises life after death, but also happiness in this world. “If you believe in Jesus, you are not only promised the

resurrection in the future, but also able to enjoy the life of resurrection in the present” (Cho 2014).

In *God’s Laboratory*, Elizabeth Roberts (2012) attends to what “assistance” means in the assisted reproduction to the participants of IVF in Ecuador. Highlighting the specific invocation of God as one of many actors who provide assistance to the IVF patients, she reveals the centrality of relationality in the social realities in Ecuador. In a similar way, I focus on the invocation of God as the one who “has prepared” in Ra and Cho’s discourses. They render stem cells as a gift of God that he “has prepared (*yebi*)” for people. In Ra’s narrative, stem cells are rendered an entity that can produce desired cures with its innate potency, which once again enfolds the Christian narrative of God’s creation and providence. This specific articulation illuminates the affinity between the stem cell enterprise and the enterprise of evangelical Christianity, particularly the prosperity gospel, in Korea as enterprises of faith in the immanent promise of happiness and in the efficacies of promissory things (stem cells and God). I particularly focus on how these two enterprises center on the notion of potency as their intrinsic properties and as the sources of efficacies, and how the promise of happiness appears to originate from the very potency in these discourses. Ra’s narrative captures the affinity between the figure of stem cells and of God as promissory things and objects of faith that are pronounced in the future perfect tense. The homology between words and technology highlights that the potency is central in the two seemingly different kinds of promises.

My use of the term “affinity” is inspired by Max Weber’s discussion of the elective affinities, or correlations (in Parsons’ translation) between Protestantism and capitalism. Weber (1992) uses the term “elective affinity” to illuminate the relations between certain forms of religious belief and specific practical ethics in terms of adequacy (27). Weber’s project was a

historical study of the development of modern capitalism in the West alongside with the development of Protestantism, as they find the most suitable expression/motive force from one another (28). The notion of “affinity” helps us attend to the resonances in configurations of values and meanings that make one discursive terrain a great niche for another discourse, rather than establishing the causality. In this chapter, I particularly look at how the stem cell discourse could be crafted as an affine discourse with the prosperity gospel, through the operator of “potency.” As Ra translates the stem cell promise in the vernacular of Korean evangelical Christians by amplifying the resonance between the two languages, the affinity becomes very explicit. If his narrating of the stem cell story creates a constructive interference, or resonance, between two different promises, one of biology and the other of religion, this chapter is an exercise to dwell on this resonance. The resonance is made possible by the peculiar and generative notion of the potency as it is formulated in the discourse of the stem cell enterprise, which almost appears homologous to the omnipotent power of God that “has prepared” everything that his believers desire in this world.

In Ra’s discourse, the gift of God (stem cells) is not simply a gift that could save human life, but also as a gift that everyone *has in one’s own body* and with which one could enjoy longevity and prolonged youth—in addition to saving one’s own life—that God has prepared. The vision of Promise, Inc.’s “saving life” with stem cells differs from the messianic promise of “salvation” of the human race as it is promoted by the stem cell enterprise in general, and of the national future in the Korean stem cell enterprise in particular. Instead of assuming the messianic time of radical change or rupture in human life that will come in the future, Ra privileges the here and now, God’s gifts and graces to be experienced in daily life, which resonates with Neo-Pentecostal eschatology (Cooper 2015) and the notion of this-worldly salvation in the

gospel of prosperity. With the stem cells, the miracles are made possible here and now thanks to God who has created stem cells *in us*. What matters is how to *activate* the potency to make good use of them. The notion of potency here not only renders two different technologies of healing—the religious miracles and the stem cell cure—congruous to each other, but also makes it possible to bypass the question of proving the efficacy by fashioning it a matter of faith. And, it is not Ra’s own fabrication: it is rather the characteristic of the stem cell promise, anchored in the notion of potency. Ra’s discourse is an instance in which the discursive potential of the “potency” is amplified when it has found a great niche in the evangelical Christian churches in Korea, in the community of faith in the promise of God.

The peculiar notion of potency, as the capacity of an entity that *will have* realized its promise, is an underlying theme in both the stem cell enterprise and the Prosperity Gospel. This resonance highlights the particularly promissory aspect of stem cell enterprise, which exceeds what could be accounted for with an analytic of “expectations.” While there are many similarities between “promise” and “expectation” in the account of biotech enterprises, I propose that the analytic of promise, which involves faith, desire, and pleasure, can offer a more nuanced understanding of the stem cell enterprise. Reading the discourse of the prosperity gospel next to the stem cell promise, my point will be made clear.

LIFE, PROMISED

I was completely exhausted. Exhausted. It occurred to me that I would not live any longer. For more than fifty years, I have circled the earth one hundred and fifteen times. [...] I felt sick about living itself. I have been injected with stem cells last year, and now I became a new person. I am seventy-five years old, but I feel the youthful energy as if I were in my fifties. Now, giving sermons doesn’t make me exhausted, I don’t feel tired, and what’s amazing is I sleep really well. I have become a stem cell evangelist these days—when I meet sick and weak people, I evangelize them to get stem cells injected, stem cell injections renew your youth. I myself think that way. It feels like I will live up to a hundred years old with no problem. Dr. Ra, you did a great job for health and

happiness not only of Koreans, but also of the human race. (Rev. Cho)

I had never anticipated that I would encounter Cho's name in a conversation about offshore stem cell treatments. It was a short conversation with an old man who attended a public forum on clinical applications of stem cells. During the Q&A session, the old man asked if there was any prospect to change the regulation on stem cell treatments in Korea. He disclosed that he had already been receiving stem cell treatments in China, and explained it was costly and inconvenient to fly to China for treatments. The experts on the panel—doctors and scientists—were alarmed and tried to convince him that he should stop the risky venture, but it did not discourage him from continuing the treatments. After the meeting, I asked him how he got information about offshore stem cell treatments. He answered: “I heard about stem cells at the church—I am a church elder, and I know lots of pastors, deacons, and deaconesses, who told me about stem cells.” He added that he knew that the CEO of the company (Ra) had a doctorate in animal sciences. While I was conversing with him what he had heard about stem cell treatments, he suddenly brought up this famous pastor's name. “Rev. Yong-gi Cho got stem cell treatments. You know, he had Parkinson's disease. But after the treatment, he now preaches actively. More active than any young folks would do.” Later, I came to watch a video clip of Cho's testimony as it was repeatedly played during in a sermon that Ra, the CEO of Promise, Inc., gave at a church service, and during his lecture in another Christian venue. As I quoted above, the charismatic pastor who had been “exhausted” after decades of evangelizing work testified that stem cell treatments renewed his youth, and he himself was now spreading the word about stem cells.

Cho's life was that of an evangelist. As a great evangelist, he had been constantly touring the world giving sermons and performing healing prayers, and spreading the gospel of threefold

blessing³²—salvation for the soul that brings good health and prosperity to believers; and the promise of God whose omnipotent power to bring material prosperity and good health, which he has prepared, as a response to believers’ faith. This evangelist whose whole life has been dedicated to leading people to God now says that he is a “stem cell evangelist” who would lead patients (also) to stem cell treatments. It does not mean that he stopped being a Christian evangelist—stem cell treatments have made him preach more actively without becoming exhausted, spreading the words of God that promise health and wealth as well as salvation for the soul. At the same time, he would also spread the promise of stem cell treatments that would “renew” one’s youth, just as Cho himself witnessed and felt. Later in the testimony, Cho also says that stem cells are, among many new therapeutics, something unique as they bring the “life of resurrection” and happiness to people. Witnessing the efficacy of stem cells, Cho also witnesses God and his gifts. Youth, health, and happiness—there is no reason to shy away from pursuing these this-worldly desires. They are gifts from God, and stem cells, in particular, were the gift of God that enable people to enjoy youthful life.

Ra’s company, Promise, Inc., is not only selling stem cell treatments to all sorts of desperate patients. It sells the stem cell banking service to prepare for the later years, and stem cell treatments for anti-aging purpose. Cho’s own testimonial does not necessarily bring up Parkinson’s disease that he was known to have been treated for, but rather the efficacy of stem cells to replenish himself, to return youthful energy to him. Rather than seen as an overt pursuit of desire for youth to enjoy beyond what is naturally given, it is construed rather as an obligation

³² A quick glimpse of the list of video clips of events posted on Cho’s website under the heading, “World Mission Today,” gives a sense how active he had been. His destination was not limited to any one continent. For instance, he held the Great Assembly (*daeseonghoe*) gatherings in Sydney (Australia), Hungary, Oklahoma, Yokohama, and Zürich. The next month, he would hold the Great Assembly in Kenya, which was followed by the conference for ministers there.

to live up to the potential that God has prepared. Illness and aging are not what God intended for. It is hard work, emotional distress, hatred, and all sorts of “sins” combined with various environmental corruptions that make people age and die prematurely. For instance, Ra would suggest that by “supplementing” one’s own stem cells before dementia breaks out, one might be able to prevent it. Here, Ra’s premise is that God “has prepared 120 years of lifespan” which most “modern humans” do not enjoy. The number, “120 years,” came from a specific line in the Bible (“... his days shall be a hundred and twenty years,” quoted from *Genesis* 6:3) which can be otherwise read as a line on human mortality or limitation on human lifespan rather than on the life expectancy that is promised. When Ra says God has prepared 120 years, it rather suggests 120 years of life is something that is already given to each individual, as a kind of virtual asset that can be realized in some ways. The maximum life expectancy, rendered as preparation, or rather as a promise of God, is not what most people live through. Ra has an explanation:

Modern humans have become vulnerable to diseases and degradation because of our lifestyle. We, as originally designed by God, were meant to enjoy long-lasting life and prolonged youth. But those of use who were born amidst all the sins of man live in a genetically and environmentally corrupt and impoverished environment. [...] The world we live in today is not like it was when God created it nor do we live the way God intended (Ra 2012:32).

One may then proceed by saying that we should restore nature, the environment, and a good lifestyle, as many followers of holistic medicine would do. However, for Ra, it is sufficient to recount the promise of longevity, since stem cells can offer a solution to this problematic gap between the promised years and the actual life span. The gap between the potential (promised, given, natural) and the actual (lived, man-made) can be, and needs to be filled or corrected by other means. He is not talking about life extension with technological means. He is talking about

fully enjoying what God has given to humans which technology just helps to enhance what one has already been given, rather than adding any “artificial” thing to it.

Note that the “120 years” in *Genesis* can be read in very different ways. For instance, one can read this “maximum” lifespan as a limitation God has set up, as a statement on the human mortality, rather than the promise of longevity in the way Ra’s reading presumes. In Ra’s reading, God’s preparation is always read through the promise of prosperity and wealth, which one is entitled to enjoy given that one has faith in God. The prosperity gospel teaches that the material well-being and happiness that originate from God’s preparation can be secured by faith. Cho (2012)’s analogy between faith and the property deeds captures this aspect. “Even though you don’t see it yet, the house is mine when I hold the deed in my hand. [...] To have faith is to have the deeds. It is to have the deed that things I wish have been realized. It is to have the evidence that I have things that I do not see.” Faith in the promise of God entitles one to the future happiness, to secure the future assets that God will have brought to the believer. Whatever one wants, it *will have come*, and it is the gift of God as the reward for one’s faith. One hundred and twenty years of life is also the virtual asset, which one will actually enjoy if one lives with faith, and does the acts of faith. Unfortunately, the modern human world has made it difficult due to its corruption. One prays in order to cleanse one’s own soil that God has given. Stem cells can help by offering the seeds of life to the renewed soil. And, it is “the grace of stem cells” as in the title of Ra’s book, which comes from the grace of God.

PERFORMING FAITH

Though no ‘proof’ is seen in these eyes / I will walk on with only faith
Though no sound is heard in these eyes / I will stand on the promise of God.
Let us walk on standing upon faith. / Let’s move on, move on, leaving all the doubt

behind.

Let's walk on standing on faith. / Though there's no 'proof' for these eyes and ears.³³

On a hot summer day of 2009, I found myself surrounded by hundreds of Christians who were chanting a hymn, "Though No 'Proof' Is Visible To These Eyes" in an auditorium at one of the mega-churches in Seoul. I was not attending a church service. I just came for an information session for potential salespersons ("Home Designers") for Promise, Inc. At the moment, I, as a student of STS, was baffled by the fact that the hymn directly addresses the question of "seeing" and "believing," privileging believing over seeing, or rendering "seeing" and other sensory experiences almost superfluous, while the meeting was for promotion of stem cell business, which I thought to be a matter of "science" in which "seeing" is a privileged practice. Wasn't this meeting about stem cells, a scientific object?

Indeed, it was indicated in the opening of Ra's talk that the participants in this meeting were different from most ordinary people who "believe only when they see" complaining about how people used to suspect that what he says about adult stem cells is fraudulent. While there are people who cannot believe what they cannot see, Ra said, "Christians [like us] are the ones who believe without seeing." Ra also told the audiences that, for this reason, Rev. Janghwan Kim, an evangelical pastor who came to give a sermon in Ra's company suggested that this hymn captured the company's vision perfectly well. It was not necessary to the audiences for Ra to explain who Kim was. Kim is the head of FEBC (Far East Broadcasting System)-Korea, an international Christian radio network, and has been well known for his great performance as an

³³ "Though No Evidence Is Seen in These Eyes" (*I nune amu chŭngkŏ ani poeŏto*) from *21th Century New Hymn* 545. The title of original hymn is "Down in the Valley Where the Mists of Doubt Arise" composed by Robert Lowry. The Korean version is, however, a translation of the verses recast by Japanese pastor Tanekiji Mitani. The verse above is my translation.

interpreter for Billy Graham in his 1973 Seoul Crusade, which included a mass-gathering of 1.1 million Koreans in Yoido, Seoul.

It was unequivocally a Christian gathering, and Ra himself made it even more explicit by interpellating the audiences as Christians, fellow believers who belong to the same community of faith who do not have to see to believe. He was going to talk about stem cells, not simply as a scientific object, but God's creation, or rather the gift of God. To speak of stem cells is to speak of God, and to speak of the promise of stem cells is to speak of God's promise. His vision was also not just about growing his stem cell business, but also to take part in the "holy war" against incurable diseases and aging with stem cells as the weapon, and spreading the words of God through medical services in other countries.

His talk started by explaining the concept of stem cells, analogizing stem cells to the mother in the family, the one who is presumably in charge of reproduction of the family. He then briefly introduced the difference between embryonic and adult stem cells, to emphasize that the adult stem cells the company is working on are derived from adult tissues such as bone marrow, fat, and placental tissues, not embryos that require destroying human life. In the body, cells live, age, get ill, and die. But, stem cells, with their capacity for differentiation into other cells, can replenish body as the natural healing mechanism of the body. Then, he showed his vision of how stem cells are the weapon for the holy war against every incurable disease, and how they can realize the dream of human race for a youthful life and liberate us from aging-related diseases.

Aging, or rather "time," is one of Ra's preoccupations. The miraculous quality of stem cells is not simply to "cure" diseases, but rather to fight against the irreversible passage of time. After the schematic explanation of the vision of stem cell research and treatments, a video clip of the case of a stroke patient was played. While showing some improvements of the stroke patient

alongside his wife’s testimony, the voice-over said, “Mr. Kim has made a *miracle*. Stroke and diabetes that lasted for eight years—stem cells have *removed* them all.” The captions emphasized not only that his condition was improved, but his biological age, assessed from the state of his blood vessel, has become younger than his actual age. What appeared to be irreversible, the disease/disability and biological aging, are now portrayed reversible with the potential of stem cells.

After the short clip ended, Ra picked up on the “miracle” stuff, bringing up the story of miracles of Jesus, one of his favorite stories that he repeatedly tells in various venues. What stem cells can do is very similar to what Jesus has done—healing the sick and disabled. Rather than taking it as a mere analogy that stem cell cures and the miracles of Jesus are similar, he confessed that he came to have a “scientific conviction” about the words in the Bible. Rather than saying what Jesus has done can be achieved with stem cells, he speculates what Jesus has done is to expand stem cells in the patient’s body with his words. He went on to say that “stem cells are the treasure that God has hidden in our bodies.” They can be used, once stored, for myself and for my family members. They do not harm others (like embryonic stem cells), and they are from things that have been wasted. The talk ended by presenting the future vision of the company that sounds quite ambitious, and by telling his personal vision of life as an “obedient steward” of God. Following two short representations that specifically address what “Home Designer” would do and sell, the information session ended as participants chanted the hymn “Though No ‘Proof’ Is Seen in These Eyes,” and said a prayer. It was a gathering of those who believe without needing to see.

Ra’s rhetorical strategy that he uses in the Christian venues is impressive. In this meeting, he first started by hailing people as fellow believers, and established himself as one of those

believers by presenting himself as a Christian researcher who learned and was convicted with the truth of the Bible. When speaking to Christians, he uses specific words that have religious nuances, or are exclusively used by Christians (e.g. “steward (*cheongjigi*)”), and referring back to the Bible, he effectively fashions himself as a proper Christian businessman. Boasting about his company’s success, he would say, “I am thankful that [God] is ‘achieving’ things quickly.” All these gestures can be called a performing of faith. While he might not need to show the proof of his claim, he himself constantly performs and presents his faith and narrates his vision through the biblical references. In doing so, he was translating the stem cell promise into the vernacular of Korean evangelical Christians.

In *How Climate Change Comes to Matters*, Candis Callison (2014) has analyzed how climate change comes to be articulated in the diverse “vernacular with shared idioms, terms, and modes of apprehension for expressing information and views about the natural world” (10). For instance, in their efforts to make “climate change” matter to their fellow believers, Christian groups translate climate change into the vernacular of the group by following biblical and moral principles of care of the natural environment and the poor. In Ra’s performing of faith, he translates the stem cell promise into the promise of God through the idiom of God’s creation and omnipotent power. At the same time, his use of Christian terms and peculiar syntaxes as well as reference to famous pastors assures his own commitment to Christianity. He is a proper messenger, and the stem cell promise is the gospel. Faith that Ra performs in this context is not an epistemological counterpart of “science,” but provides assurance that his knowledge of science is truthful and morally good in addition to adding moral value to the technoscientific enterprise. After all, it is God who is working through him and stem cell technology. The hymn finally gathered people together. As everyone was chanting the psalm, the participants would

find themselves in a congregation. The words in the hymn, resonating with the talk, would remind the audiences that Promise, Inc. is run by faith and serves God, which believers should trust and be willing to work for. By translating the stem cell promise into the vernacular of Christians, Promise, Inc. could find its niche in the already established network of faith.

When the stem cell promise is translated into the vernacular of the evangelical Christianity, it is also possible for the church members to engage with the stem cell promise through the idiom of faith. In a thank-you letter from patients that Promise, Inc. had posted on its website, a patient wrote, “it was an opportunity for me to *experience living God* once again.” Another patient, who was a pastor, said, “I think your business is the work of new creation (*shin-changjo*) of this epoch that God has lastly given. As many ministers and fellow believers, seeing me healthy, tell me that I have completely changed, I am promoting [your business] a lot.” The Christian vernacular of God’s gift, promise, and potency is now reinforced as the efficacy of stem cell promise is experienced. Here, Ra’s repeated use of the “miracles of Jesus” story in various Christian venues is not just a rhetorical device to fashion himself as a Christian believer—it comes to enrich the religious life with new evidence of God’s potency and promise. While Ra and his company gain credits and attention through the performing of faith within the community of faith, the community itself can take the stem cell promise as a resource to enrich its faith. What one can simply construe as a miracle of innovative technoscience can be an occasion through which the grace of God can be manifested. “Miracle” is not merely hyped rhetoric. It can really be the miracle that God has prepared.

STEM CELLS WITHOUT ETHICAL PROBLEMS

In 2011, the Academia Christiana of Korea (ACK) has granted Ra the annual Christian Scholastic Award. Another awardee of the year was Jong Nam Cho, a senior Wesleyan

theologian. Founded in 1988 by theologians, the ACK's mission is to promote theological studies and scholarship that contribute to Christian faith in Korea. Recognizing the importance of rewards to the excellent scholarship, it has been granting the annual scholastic award to "scholarship achieved within Christian faith." In the same year, he gave a lecture on stem cell research and treatments at the ACK seminar on "Life Theology and Medicine." In the invitation, the organizers asked: "In the end, are science and theology in opposition?" The answer from Ra would be "no, they aren't."

Let me note that stem cells that Promise, Inc. works on and promotes are mesenchymal stem cells derived from one's own fat tissues—“(autologous) adult stem cells.” The category of “adult stem cells” deserves attention. Before the advent of iPSC technology which does not require the use of embryos in deriving pluripotent stem cells, “adult” stem cells have been promoted as an “ethical alternative” to hESCs. What distinguishes adult stem cells from embryonic stem cells is their origin; they are found and derived from already differentiated tissues. While their differentiation potential is known to be limited unlike the ones derived from embryos (and iPSCs), they are still multipotent and hold certain therapeutic potential.

The ethical controversy surrounding human embryonic stem cell research has given a niche for the “adult stem cell” research and business. While the embryo debate in Euro-American countries has rendered as if there is a definite dividing line between science and faith which can be compromised by bioethics, it also has generated another discourse about “ethically free” adult stem cells that merges science and faith in an interesting way. The category of “adult stem cells” has been popularized and gained much attention as an “ethical” alternative in this debate (Bianco 2013). As adult and embryonic stem cells are seen two distinct “kinds” of cells but sharing the same name, they are constantly compared and contrasted in the discussions about

stem cell research. In this process, adult stem cells are often rendered as stem cells “free from ethical” problems,” and sometimes as ethically superior ones. For instance, the Catholic Archdiocese of Seoul decided to fund 10 billion won (approx. 10 million dollars) in adult stem cell research in October 2005, at the highest peak of the hype over Hwang and SCNT-hESC research, which is “in continuity of foundational philosophy of Catholicism and its tradition of respect for life” (Myung-Hoon Chun, quoted in Choi 2005). While the “bioethical” debate on hESC research was often portrayed as an instantiation of the divide between religion and science, adult stem cell research has found its niche in the heated debate. Similarly, the Vatican recently signed a deal to collaborate with a biotech company working on adult stem cell therapeutics to promote adult stem cell research. Adult stem cells, coupled with their counterpart hESC, have already been charged with the moral value of saving life.

While the Protestant churches in Korea did not make an institutional gesture on this issue, some individual scientists working on adult stem cells would make a bolder claim. For instance, Kang Kyung-sun³⁴, a stem cell researcher working on adult stem cells commented on the promise of adult stem cells in relation to God’s order of creation: “Isn’t it that God is today revealing the efficacy of [adult] stem cells obtained from cord blood or bone marrow, not from human embryos, because he has known all too well about the malice of humans who would even kill other’s life to cure their own diseases?” (Kang, quoted in Park 2004) In another place, he also said, “adult stem cells are recycled cells that we utilized within the order of creation.” In his remark, adult stem cells are posited not as a simple alternative to embryonic stem cells, but as a virtuous alternative, and the divine solution to the greed of humans that have been prepared in advance. In this logic, his job as a researcher is a modest, yet sincere servant of God, and the

³⁴ Kang was one of the founding members of Promise, Inc.

divine will work through his research, to be witnessed by humans. What is also important in his remarks is the way he links the efficacy of adult stem cells, or the agency of adult stem cells to regenerate bodily tissues, and to the omnipotence and omniscience of God who has created them. With the backdrop of the controversy surrounding hESC research, Kang presents adult stem cell research an ethical, and utterly Christian, enterprise. It not only highlights the omniscience of God that has already known human greed, but also articulates God's omnipotent power which was already evinced in Creation with the capacity of stem cells—their cellular potentiality to regenerate injured cells.

For Ra, too, these stem cells that are “free from ethical problems” evince God's omnipotence, not only as a moral alternative (as in Kang's commentary), but also as a gift of life that is therapeutically superior to hESCs because they do not cause “side effects” like its unethical and artificial counterpart. In his lecture at the ACK seminar, he said: “As many attempts are made with [embryonic] stem cells that are *artificially made, or are against bioethics*, lots of side effects are made. When stem cells were injected to regenerate muscle, not only muscle, but also bone emerged. Embryonic stem cells injected [in the body] caused cancer” (2011). It is well known among scientists that embryonic stem cells and cancer cells share similar properties, particularly self-renewal. Rather than simply explaining it in “scientific” terms, he attributes it to the ethical problem of manipulating the nature. The unnatural (artificial) and the unethical (against “bioethics”), connected by “or,” appear almost as synonymous. While Ra does not establish any causality between unethical origins of embryonic stem cells and unwanted side effects, the linkage between the quality of being natural (given, created), ethical value, and therapeutic value is suggested in this remark. The image of stem cells that not only grow muscles as wanted, but also bones, and that turn into cancer that proliferate to kill the

patient foregrounds the uncontrollable nature of human embryonic stem cells by humans that thought they could control them. With his opening announcement that the talk will be given from the “theocentric” point of view, not “humanistic” one, the “side effects” only evince the limit and problems of human agency. “Artificial (*inwijeok*)” here implies that it is unnatural, different from what is given, or from what has been created as God intended. Cancer then is fashioned as a result of human sin, or vice, to manipulate and control life at the cellular level, and evidence of the uncontrollability of life by humans.

Technology in Ra’s formulation is doubled. On the one hand, there is technology that “artificially” transforms nature as it is usually conceived in the modern world, as the manifestation of human agency that makes difference to the given nature. On the other hand, there is technology that is simply “discovered” in order to simply cultivate what is already given in nature, by God, without aiming to transform them. hESC technology that “artificially” creates a life form that is not given by God falls into the first category. What he does with adult stem cells belongs to the second one. What he does with stem cell technology is not transforming nature with human ingenuity to invent something anew, but rather is an endeavor in “*discovering* God’s great *inventions*” (Ra, quoted in Kim 2013). Creativity here only belongs to God, and human creativity is only secondary to it, only finds something that is already given. But, it does not mean that human ingenuity does not matter. It is the “talents” that scientists need to put to use as the stewards of God.

For the theologians at the ACK, Ra’s attitude toward science based on faith should have been a welcome one. As mentioned earlier, they have been concerned that there is not enough Christian scholarship, and the state initiatives that distribute resources for scholarly resources are not interested in rewarding or supporting faith-based scholarship. Seen from their mission

statement, many Christian researchers are working on secular scholarship that is not enough for their vision of advancing Korean Christianity through advancing Christian scholarship. The ACK hopes, by awarding scientists, to promote faith-based discourses in science, and to make contributions to the society as a believer for people to witness God at work. Stem cell treatments, by saving life, would do the latter, and Ra's active speech of faith would do the former. Particularly relating the safety and efficacy of stem cells to the order of Creation, Ra's discourse offers another instance for the theologians at the ACK to contemplate the order of creation, and the theological possibility to pursue biotechnological innovation without challenging the divine order.

In another place, Ra analogizes his work in stem cell treatments to the farmers' work of cultivation.³⁵ The seeds of rice, cultivated by the farmer, grow into rice crops that humans can once again eat to benefit people. Similarly to this, his work is only to cultivate stem cells, the seeds of life, given by God in our body, to *return* them to people without any pretense of his own ingenuity. His work is to just help people to live a "natural lifespan" that God has prepared for us without suffering from illnesses and aging. This fashioning of technology as part of enlivening the gift of God, and self-fashioning of himself as a humble servant of God who cultivates his seeds are part of Ra's performance of faith. In doing so, Ra brings an interesting (or strange) homology between stem cell miracles and the miracles of Jesus.

WITH WORDS, WITH TECHNOLOGY

[Q: What is it to be a life scientist as a Christian?]

Ra: ... In a sense, science is a field that enables one to feel the greatness and creativity of God. Many of the miracles that Jesus performed were about healing the sick—like

³⁵ A Special Rendezvous (*T'ükpyörhan Mannam*). "With Jong Yun Lee and Jung Chan Ra," FEBC, September 15, 2011.

healing the blind...

MC: Yeah, that's also the case with reviving churches. In its early days, the works of healing often took place...

Ra: Scientifically speaking, there was no way for me not to believe the power of God. Ordinary people [*ilbanin*] would not believe [the miracles], probably, how they would happen. I am working on stem cells. What we do is no more than extracting stem cells in the body, expanding it some billion times, and injecting them [in the body]. But, Jesus expanded stem cells some trillion times with words, with words. These stem cells healed all the damaged cells, which had effects.³⁶

“Scientifically speaking,” one cannot but have faith, says Ra. The question already anticipates an answer like this: there should be something unique about being a scientist with Christian faith, but what is it? Ra’s answer is not so striking as a statement: some biologists I have talked were sincere Christians, and they said the complexity of biological mechanisms has made them believe more and more in the existence of God and his omnipotent power that created those complex living beings. A tissue engineering specialist made this faithful statement into a kind of funny shit joke in a typical college classroom: “everyone in this classroom has poop inside the body, but we cannot smell it. No biomaterial that scientists have made so far works that perfect like our body.” Ra’s statement, which draws on the miracles of Jesus, is a little different from this tissue engineer’s joke. It is not meant to be funny, and it is spoken exclusively to Christian audiences, not “ordinary people” who may only take it as a mere analogy or a fable. It is his favorite story to tell as a Christian stem cell scientist to other Christians. He tells the same story in the interviews with Christian media, and in other venues where he speaks to Christians. His literal reading of the biblical miracles and attempt at explaining it through the existence of stem cells could be odd, but it makes sense to him and his audiences. If the story sounded too strange, this particular part of the interview would have been eliminated by editors.

³⁶ Minister San Woong Min Meets People (*Minsanung Changnoga Mannan Saramdül*). FEBC, November 9, 2008.

The miracles of Jesus to Ra are not just a story that can be analogized with stem cell miracles because of the images. Similarly many Creationists take the Bible as an evidence of Creation, he takes the biblical stories as historical records (Dein 2014), while his interest is not in defending his faith against science, but rather in adding/finding values to his own stem cell business in relation to faith. Through this narrative, he posits himself as a humble witness of God’s omnipotent power rather than just another scientist. What he says is not that stem cell research could make the miracles of Jesus into reality, but that it is only a minor emulation of the biblical miracles, which is made possible not by the ingenuity of humans, but by the omnipotent power of God. What Jesus did, Ra says, is to “activate” (*hwalsŏnghwa*) stem cells in their bodies with his words. Or, he would ask Jesus, “Lord, you must have differentiated stem cells [in the body] for that patient, right?” What stem cell science does is to activate stem cells so that their potency can unfold—not with words, but with technology. At this moment in Ra’s narrative, the miracles of Jesus and stem cell miracles cease to be an analogy as it is in the popular portrayal of stem cell cures, but rather a homology. When it is said that stem cells might make the biblical miracles real, it acknowledges these two healing events—one in the biblical record, the other in the vision of regenerative medicine—not as similar events in separate domains in science and religion, but as the events of the same kind that involves the potency of stem cells, of God. They are both events of resuscitation in which the presumably incurable patients are cured—events that are welcomed but highly unlikely. While they could be seen as different kinds of events, as read in the news article quoted in the opening, Ra takes these two healing events as homology—the stem cell miracle is evidence not of the human technological progress, but evidence of stem cells’ potency that evinces God’s omnipotence. They are events that are not simply similar and

comparable, but events that are made out of the same origin—the vitality of stem cells—by different technologies that activate/expand the latent vitality.

Stem cells, as the substance of vital potentialities or the entity with the biological potency, by virtue of being “created” and “given” by God, can hold together the two distinct miracles—miracles of Jesus and biotech miracles with stem cell cures. While this reading of the miracles of Jesus might appear somewhat strange, the end point of his story is not that both Jesus and his company are curing people by amplifying stem cells, but that stem cells can make the miraculous reversal of time/degeneration/aging possible because they are the gifts from God. What matters in this homology of two miracles is the potency of stem cells that is imbued with the vitality for regeneration, which God has prepared for humans. The figure of stem cells here curiously resembles the figure of God that is an omnipotent and omniscient being that “knows” everything and “prepares” everything for the ones that he loves (and that loves him). For God’s potency is not restricted by time, for his omnipotent and omniscient capacity transcends space and time, he can prepare things for people even before something occurs, and indeed, events that have not happened yet are already known by him. God that “prepares” has prepared stem cells in the human body to respond to the loss and damages of cells even before they happen. Healing itself could be seen as a miracle, but one can see from the miracles not the event of healing, but God’s omnipotent and omniscient power that has prepared things even before it happens.

This invocation of the miracles of Jesus highlights not simply that miracles are highly unlikely, yet felicitous events. He actually suggests similar things can happen with stem cells, although human capacities are limited. What is highlighted is that miracles are the sign of the potency of God that has prepared potentialities that promise better futures. Rather than simply being rare, supernatural events, miracles are events that can be reiterated in the name of the

entity that holds the potency to make miracles. The term “miracle” is casually used to refer to any incredible and welcome event that might involve some supernatural agency, and its dictionary definition emphasizes the unlikeliness of its happening. However, for believers, what makes an event a miracle is not simply the matter of probability.

An improbable event that somehow happens that brings happiness to the person experiencing it could be considered merely as great luck or a happy coincidence. What makes a miracle miraculous is that it has already been anticipated and is apprehended as a miracle that involves certain agency that has the potency beyond human capacity. The way “miracle” is pronounced in the contexts of both stem cell witnessing and religious witnessing points not only to the incredibility of the event, but also to the belief with which one can locate the source of efficacy in the beyond-human agency. The term miracle in this context appears rather similar to how early Christians conceived a miracle in relation to prophecy. A miraculous event is “essentially ‘sign’,” which “stands out because it is predicted” (Rosenzweig, 2005:104). Although our ordinary use of the term “miracle” often assumes the backdrop of the law of nature as its opposite, it can be conceived as a miracle only when it is codified through the grammar of miracle which narrates the event as if it is a realization of the claim about the future that has already been made, rather than an event that is contingent on the circumstances. Something should account for the miracle; or the miracles should be decoded.

Then, we may say that miracles are conceived through the retrospective reasoning—linking the prophecy to the event, or thinking about the event through the prophecy. And, it is not only the particular discourse of prophecy that makes miracles possible: the promise in general, as the statement about the future could do the same work when events are “witnessed” as miracles, as the events in which God works. In “Convicted by the Holy Spirit,” Susan Harding (1987)

analyzes the rhetoric of fundamental Baptist conversion, focusing on the speech acts of witnessing as a fundamental process to become a believer. The rhetoric of conversion that she analyzes is particularly interesting as she focuses on the significance of witnessing, speaking of one's own story of faith, that substantiates one's belief, the evidence that the believer has been saved. The Holy Spirit, in the world of fundamental Baptists that Harding analyzes, speaks through the believer and "rewords" the believer's life. Hence, Harding claims, "speaking is believing." In this article, she introduces an epiphany in which she asked herself, in a car accident, what God wanted to tell her through the event, as it made her realize crossing the thin membrane between belief and disbelief, via the language of fundamental Baptist Christians. The car accident could be just an "accident," but as she was crossing the membrane-like border between belief and disbelief, she has begun (or the Holy Spirit has begun) "rewording" this event. The event was conceived, at the moment, not just an epiphany that gave insights on belief to an anthropologist of religion, but also a kind of the "Epiphany" through which God manifested (or tried to manifest) himself to her. "Accident" becomes a moment in which God reveals himself—a believer is someone who would see God from his/her everyday experiences. One's life is "reworded" through the language of God's intention, his own potency to make things happen for people to make them realize his presence, his truth, and so forth. Articulating experiences through the divine work distinguishes believers from others. And, in the world of the Prosperity Gospel where God rewards believers to their faith through solving their this-worldly problems, the promise and efficacy of God becomes a heuristic device through which the events of happiness (and unhappiness) are accounted for. And, these accounts once again feed into the faith—the retrospective reasoning of the efficacy of God feeds into faith in the efficacy of God. This retrospective reasoning recalls the temporality of Fijian knowledge that Hirokazu Miyazaki

(2004) discusses as the “method of hope.” He discusses how Suvavou people’s struggle for compensation for their land is not simply a matter of monetary gains or identity claim, but rather a matter of their self-knowledge, for the effects of their struggle would assure the truthfulness of their self-knowledge (3). In a similar way, believers’ retrospective reasoning brings to the fore the truthfulness of God’s presence that could otherwise be treated as simply mundane, felicitous circumstances. Yet, there is a twist: the truth of God’s presence is tied to the promise of God.

This religious practice of retrospective reasoning or rewording of events might appear to be peculiar for religious life in which the template for the reasoning is already given, but it is only to the extent that this reasoning/rewording concerns God. The way Ra brings up the miracles of Jesus could appear odd as a discourse too much inflicted by religious belief. Yet, it could be seen as a retrospective reasoning that looks for what caused cures first from the efficacy of stem cells, then from the potency of stem cells, and finally from the potency of God that brought stem cells to the world, that has prepared stem cells as a “natural healing system” that has been given at the moment of Creation. Most scientific accounts would stop at the moment when one confirms the efficacy and potency of stem cells that scientists have hypothesized with the notion that stem cells can regenerate injured or damaged cells. Here, the “nature” of stem cells is presumed as the “cause” of effects. Ra only goes one step further: the efficacy of the nature is the effect of God’s Creation.

While the modes of reasoning in science and religion might appear much different, the difference becomes much less significant in the biotech mode of scientific knowledge production that is increasingly oriented toward developing therapeutic applications (dubbed as “translational research”) and dependent on public and private funding that anticipates “social impacts.” Especially in the stem cell enterprise where stem cells are already set as a beginning of the

endpoint in a sense that unlocking the potency of stem cells will lead to cures to incurable diseases, the experiments are already conducted in anticipation of the retrospective reasoning. In other words, the future is already enfolded in the present. The concept of stem cells is a kind of promise that, with commitments, stem cells could bring about the regeneration of tissues. When scientists and doctors see the experimental subjects and animals improved after being treated with stem cells, the results are not seen as a mere coincidence, but as an event through which the potency of stem cells is revealed. As the result of these experiments, the hypothetical candidate that is supposed to have certain potential to make certain effects become the agent that has the potency to do so. Within the tradition of modern experimental science in which “seeing is believing,” experiments are considered the practices that establish the nature of entities, including their efficacy, into an objective fact to be believed. However, the experimental design itself is a product of faith in the specific nature of entities, which is anticipated to be revealed through the proper method for scientific knowledge production.

Compare this mode of doing science to how Rheinberger has observed in terms of historicity. Questioning the notion of history, or “historicity” in the narration of science, Rheinberger (1999) recounts how “virus” has become “virus,” not as a linear and teleological history in which the virus was sought after, purified, and finally established as the virus, but as a historical process in which “an ‘epistemic thing’ that constantly escaped fixation” is tinkered with in the mode of “empirical roaming around” or “blind tactics” in the experimental systems (425). When the discovery is narrated in the history of science in retrospect, however, “the new becomes already present, albeit hidden, as *the* research goal from the beginning: a vanishing point, a teleological focus” (425). Interested in the question of the “novelty” in science, the

excesses that emerge in the experimental systems, he draws attention to the contingencies that emerge in the tactical moves in experimental practices.

In the stem cell enterprise in particular, or translation-oriented research in general, what scientists do is not so much producing the unanticipated as producing what is already promised or rather predicted. The temporal structure of the stem cell enterprise is significant. It starts with *the stem cell*, despite the ambiguity and controversy surrounding the concept, which already holds the potency to be unlocked. The vision has already proposed and what is being done is to find better ways to realize the vision. If Rheinberger's experimental scientists were meandering around the epistemic thing as the "signified" (an epistemic thing that scientists try to know about without knowing about it) that will be replaced with the "signifier" (the virus), the stem cell scientists' experiments start with the signifier (the stem cells) and meander to realize the promise associated with the signifier. Faith in the signifier is crucial here. It is constitutive of the experimental design and interpretation of data. Here, experiments themselves oscillate between retrospection and anticipation, as one anticipates the retrospective reasoning from the beginning of experiments, and the retrospective interpretation of data is already anticipated to prove (and have better knowledge of) the potential of stem cells. In a sense, the history is already written. What scientists do is already planned.³⁷

What Ra does is pushing it only one step further: if stem cells have that incredible efficacy and potency that already know what to do and are capable of curing diseases in a way that we, humans, have yet to figure out, how is this possible? That is God who has created the world, and has prepared humans for life. Stem cell cures are already in God's plan. And, his faith in the good of the offshore stem cell treatments might be understood in the same vein. If the

³⁷ It is not to suggest that there will be no unprecedented event. It is only to describe the mode of doing science when it is structured through the potency, and through the promise.

potency is already there, and if it is what God has planned and allowed for humans to use, why would there be a problem?

It is not to say that stem cells, or other scientific objects are “made up,” simply “constructed,” as much as I am not intending to say that God is made up. While these scientific and religious objects with their own efficacy could be compared to fetishes that appear in Marx’s *Capital*, when he discusses commodities as the product of human actions and labor that come to stand on their own within a specific relation of production, my point (and Marx’s point) is not that humans are the sole subject/actor whose agency is capable of creating them. Rather, it suggests how the objects are substantiated through the commitments with promises, and how they are ontologized as entities with their own efficacy. The search for and faith in the potent entity from whose efficacy things unfold is central both in religious and scientific witnessing, although the stakes may differ. But, in both cases, the ontology of potent entities can give people grips to the promises and accordingly the futures—God and stem cells, both promissory things, are the seeds for happiness. As they promise that things will have unfolded from their potencies in favorable ways, as they promise miracles that will have happened, they urge believers to commit. Believers will have been rewarded—that’s what the prosperity gospel in Korea teaches, and that’s what Promise, Inc. preaches. These promissory things are the seeds from which the futures will unfold: holding onto the seeds promises good life.

THE SEED AND THE SOIL

I thank God for creating stem cells in my body, the seeds that save my body. I think that it is our obligation to maintain our body healthy as it was given by the God. In order to do so, Dr. Ra advanced technology for stem cell culture, which I applaud. I hope Dr. Ra lead to restore health for humanity, and devote himself for glory to God alone. (Rev. Yong-gi Cho)

In the blurb commentary he wrote for Ra's book *Thank You Stem Cells* (2011), Cho thanked God for creating stem cells, the seeds to save life, in our body. While the book doesn't necessarily praise God, praising stem cells allows Cho to praise God for giving stem cells in people's body. Stem cells are, in this narrative, not only a techno-scientifically mediated form of salvation, but also God's Creation, and is made present in daily life. If Cho's work as a Pentecostal preacher has been dependent on the presumed vitality of God's words and God's being alive, Ra's work as a stem cell entrepreneur is dependent on the vitality of cells, which once again is an evidence of God's being alive. Under the banner of God's Creation and preparation, they have no conflict, but rather form a coherent narrative. Praising stem cells is not about fetishizing man-made technology for Cho, but about praising God's own capacity that has prepared this amazing thing for people. In this analogy of stem cells and seeds, it is highlighted that they both contain the kind of vital potentiality from which new life will unfold. The metaphor of "seed" renders the vitality as it is contained in the potent entity that causes the transformation with its own efficacy. Furthermore, this metaphor of seeds makes it possible to imagine the vitality as it is dissociated from the soil—although it cannot grow without the soil.³⁸

Ra also draws an analogy of stem cells with seeds, but there is one more. In his talk to the potential salespersons who were married women, he also analogized stem cells in the body to the mother in the family, which is in charge of housekeeping in response to the needs of family members. However, when it comes to the matter of extracting and manipulating stem cells *ex vivo* to return to the body, stem cells turn into the seeds that can bring new life to patients, and patients' bodies are analogized to the soil to which stem cells are (trans)planted. Stem cells,

³⁸ In a different context, Carol Delaney (1986) has analyzed the linkage between the monogenetic notion of conception and monotheistic worldview dwelling on the metaphor of seed and soil. She highlights the privileged, creative, and authoring role of the seed, the source of transformation and efficacy, which is set against the soil as an anonymous ground.

before they are taken out of the body, are still doing the work that they are supposed to do, like the mother, but what makes them really important and noteworthy is what they can do when they are taken out of their familiar environment and put into the technological manipulation to be “activated” for the work of regenerating life. This almost conversion-like process is mediated by technology, which is homologous to the words of Jesus in Ra’s story of stem cells. Through this activation (or conversion), stem cells become a potent entity that already knows what to do, which can do whatever to regenerate the old and damaged body.

It shows an interesting parallel between the stem cell promise that is promoted in the experimental stem cell treatment market, and God’s promise taught by the adherents of the Prosperity Gospel, or at least in the way that the CEO of Promise, Inc. conceives and one of his famous clients, Cho preaches. It is precisely this parallel that enabled Ra to speak of the “grace of stem cells” or “thank” stem cells while fashioning it also as a story of “faith,” and to speak to Christian audiences. What is central in the parallel is the potency of the entities that promise. Stem cells are, according to Ra, cells that can regenerate injured parts without much manipulation, because they have the “capacity” not only for differentiation and self-renewal, but also for homing and paracrine effects. Drawing on scientific theories of “homing effects” and “paracrine effects” of stem cells, the company presents stem cells not only as a chunk of cells awaiting the intervention of man-made technologies to be manipulated, but rather vital entities that know and are capable of healing with their own capacities. Ra, the man who realized his calling is in stem cell research, could make God work through him.

According to this simple therapeutic model, stem cells would automatically provide what the damaged body needs when they are injected in the body. One only needs to receive stem cells, which requires certain faith on the part of the receiver. What the company does as a biotech

company is not necessarily intervening in the latent capacity of stem cells. It simply extracts, isolates, and expands them from bodily tissues to return them into their bodily environment in which they now “know” what to do. As Jisook, the patient/salesperson of Promise, Inc., puts it, “one should really embrace [the efficacy of stem cells] and have firm faith in it, then it makes a difference.” This promising quality of stem cells is given from the beginning of our life. Since stem cells are naturally given and “designed” by God, they may have incredible capacities, which cannot be expected in the product of humans. The potential they hold is not something that can be made and that needs to be actualized by human hands, since stem cells always, already are able to heal by the design—capable of finding and migrating to the damaged tissues and migrating to heal them.

It is not unique for Promise, Inc. to invoke God in the technological manipulation of life. For instance, Elizabeth Roberts (2012) has documented that not only assistance from technology, but also from God is seen essential in Ecuadorian IVF clinics. In her ethnography, IVF participants’ invocation of God’s direct interventions in biological processes is analyzed as part of the social realities of assisted reproduction in Ecuador in which “assistance” from others is considered as the essential condition of being, and the agency is distributed in relations. The invocation of God in the context of Promise, Inc. illuminates a different cultural pattern as it is focused on the role of “seed” that contains the vitality to give new life to old and damaged tissues. God *has already prepared* in people’s body the seed of life from which life will have stemmed. The “life of resurrection,” as Cho phrased, is contained in stem cells as a biological form of God’s promise almost as an individual’s asset (“treasure”) that can be “activated” by technologies of promise.

TECHNOLOGIES OF PROMISE

Such a small mustard seed grows [a tree that is] as tall as 4 meters. [...] God has put in such a small mustard seed a program to become a big tree. Jesus likened faith to the mustard seed. [...] God has put great blessings as a program into [your] small faith. [...] Wonderful work of God will happen when you plant faith in the soil of your mind (Cho 2010).

Although our body has the natural healing mechanism, or natural regenerative mechanism, the one that heals the body's ailments, after all, is God—medicine that we take is just helping it. [...] After observing about 10,000 patients, we realized that it doesn't produce much effect, if the soil is bad—however good the seeds are. We have no statistics, but there's an interesting fact. When the pastors or church elders are supplemented with their own stem cells, we observed the effects are produced more surely and quickly. [...] We always emphasize that, to recover health, to recover from incurable diseases, we need not only the recovery of body, but the recovery of both spirit and flesh. To do so, I think, repentance and prayers are absolutely needed (Ra 2011).

Meditating on the parable of the sower in *Luke*, that concludes with a moral lesson “Now the parable is this: The seed is the word of God,” Cho preaches that one should cultivate the soil of one's mind to fully embrace the words of God, which is also faith in God. He teaches that faith only makes effects on the good soil, which can be cultivated with repentance and prayers. The parable also tells, Cho says, one should not be obsessed with worldly worries and anxieties as well as secular pleasures because, if they fully occupy one's mind, there is no way for the words of God to be rooted. Cho's reading of this particular parable is not so peculiar. However, the ways in which he conceives “the seed” of faith/God's words, and links it to the worldly desires make his sermon interesting. Seeds have the potential to grow into something else; seeds have the “program” for blessings, wonderful works of God within themselves. With this “program” from which the future works of God will unfold, it is made clear that the words of God and faith in God become the promise of futures. The “program” is not read yet, but like the tree that flourishes, it is about good things that will happen. The good soil is, first of all, the soil that listens to the words of God and embraces them. But, it is not the end of the story: “next, one

should have in mind the dreams built with the words of God.” One should have dreams in one’s mind to make it into a good soil. Indeed, “there is no faith in people who have no wish. God does not give faith to people who have no wish. Wishes make dreams, dreams make purposes of life, and purposes produce faith.” Cho himself “always sees dreams in my mind. What are the dreams? The first is health. God, give me health. It is my wish, which is my dream. Second, God, please make me give good sermons. [...] Third, God, let me help more people who are suffering through the Love and Happiness Sharing Movement.” Isn’t his first dream, health, a secular desire? Probably not. Actually, in the world of prosperity gospel, the wonderful work of God means not only one’s spiritual salvation, but also health and prosperity.

At the end of the sermon, Cho reiterates the promise of God once again: “The Lord has put in your account (*kyejwa*) the gifts that forgive your sins and that gives you the righteousness of God. It’s your Christmas present. He has deposited forgiving of your sins, and the sacred grace filled with the Holy Spirit. He has given on your name cures and health. [...] The Lord has prepared and deposited [blessings] so that you can live life without material scarcity, in abundance and blessing.” The words of God promises more than salvation of your spirit. God gives you an account in which happy life with health, wealth, and salvation are already deposited. The word for “account,” only used in financial context in Korean (as in “bank account” and “account form”), colors this gift of God as (virtual) assets *entitled* to the believer. As a reward to one’s act of faith, or to one’s being a believer/promisee, which is materialized through prayers and repentance, your (bank) account is deposited with the assets that will be available to you in the future. They are not free; they are rewards of one’s faith, dreams, and prayers. It puts the promisee in a constant relation of debt/credit renewed on daily basis (Cooper 2015), which require constant practices of making one’s faith visible. While your God-given

account is an unlimited source of future happiness, it is also a work that requires one's everyday accounting—for sure, praying and going to churches, plus paying tithe and making contributions to the churches. The dreams that are sought in the churches do not have to concern the spiritual salvation. Cho's characteristic threefold blessing sees that salvation for the soul will be accompanied with good health and prosperity to believers. One does not have to worry about secular matters, not because secular desires are contradictory to the salvation of spirit in themselves, but because there is a promise of God that they will have been fulfilled. God is a loving God that wants to give believers happiness. He only needs to hear the message from believers, who tell God their dreams in a concrete manner so that he can respond to them.

It is, Cho says, documented in the Bible that the atonement of Jesus has freed people from the curses, and blessed people with promises of all the good things in this and the other world. “[For the prayer of faith,] you should firmly grasp God's words of promises in your mind. [...] Only when you firmly grasp the promises documented in the Bible, you can stand firmly like a breakwater as you overcome the waves of doubt.” Firmly grasping God's words of promises—of health, prosperity, salvation, redemption, eternal life, and so forth—, everything one may desire has already been promised by God and recorded in the Bible in a generic form. According to Cho, faith is the fundamental condition for the realization of promises, because only with faith, we can overcome the limit of the sensuous world of the third-dimension, and get access to the miracles. Emphasizing faith, he acknowledges that the demon of doubt is the fundamental condition for a believer's life that makes it difficult to keep faith from time to time. When doubt constantly breaks in to it, the world of promises, in which believers reside, needs to be maintained from time to time firmly grasping those words of promises on the immanent future.

The future has already been promised. Cho's teaching of the "principle of visualization" captures the unique temporality of promise. While it resonates a lot with the self-help gospel of "positive thinking" that goes hand in hand with the optimistic faith in the market (Ehrenreich 2009), the principle of visualization stemming from the prosperity gospel preaches more than optimism. It preaches the promise of the (positive) future to come, which can be "activated" by faith. The principle of visualization is a translation of his Korean term, "*parabomŭi pŏpch'ik*." *Parabom* is an act of seeing the future *as if* it has already come and is present at hand. The "prayer of fourth dimension" is a method of prayer that Cho teaches and emphasizes to his followers that one should "visualize, believe, and speak" one's dream. If there are prayers mingled in this process, "God comes to work, the Holy Spirit comes to work, and the [divine] power is manifested" (Cho 2012a). Imagine the future in which the promise is realized in a specific form; keep faith in the potency of God to manifest; and speak with lips to activate the potency while strengthening the faith. Here, the "visualization" is a specific engagement in the generic promise that becomes the condition for the promissory thing to manifest its potency. When speaking of this "specific faith" in one's prayer, Cho teaches, one should "order" things to happen, as if things were already happened. It distinguishes the prayer of faith from the prayer of hope. The prayer of faith is to speak in a past or perfect tense such as: "I have received the [God's] response," "I have been healed," or "Thank God for having me healed." Just as Jesus did not speak in the future tense to perform the miracles, Cho says, one should speak as if things had happened in order to call things that are not existent into existence, and really believe that it will have been realized in the very way that one believes/hopes it to be. Cho's teaching that prayers should be pronounced in the present perfect or past tense highlights the temporality of promissory enterprises as well as the significance of promisees' commitments in those

enterprises. The generic promises are to be realized in specific forms, as believers engage with the promises and the potent entities—God and stem cells— respond to those engagements by turning their generic potencies into specific futures. As we have seen in the patients’ attempt at the “unproven” stem cell treatments and researchers’ efforts to make stem cells work, those engagements are made on the faith in the potency of stem cells. As the generic promise can hold together people with different concerns, desires, and interests, the potency of the promissory thing can be substantiated through the believers’ efforts to activate the potency and to find the evidence of its realization. As a technology of promise prayers work in both ways—they are acts of faith that activate God’s potency with believers’ faith, and they also speak to believers themselves to maintain and strengthen their faith in the promise. When the believers make claims on the efficacy of the potent entity, their speech might be doing something similar to the prayers that activate the potency of the promissory thing in anticipation of the future that is yet to come.

In Cho’s principle of visualization, secular desires for wealth and health are actively encouraged rather than repressed. The omnipotence of God that he is able to make anything happen (and indeed has planned it) is activated by the believer’s prayers of faith. It is already “programmed,” “prepared,” in each believer’s “account.” Happiness is already prepared, and the question is how to keep proximity to God and get him to work at every instance one needs God’s blessing. In other words, the future is already there in the future perfect tense, which the believer should visualize and speak *as if* the future is already there. The present moment is a moment of not yet, a moment for hoping and waiting for the time of miracle, but also with filled with firm faith in and actions of as-if to activate the given, yet unknown potentialities. In a sense, God is a kind of “happy object” in a sense that believers are led to “anticipate happiness will follow proximity to” God (Ahmed 2010:28-9) in Cho’s theology of threefold blessing and the fourth

dimension prayer. In Ahmed's discussion, happy objects that promise happiness always leave room for the possible disappointment that is conditioned by the orientation toward happiness. However, God differs from other happy objects that Ahmed finds in the daily life of consumers of happiness. God is a happy object whose omnipotent power can be *activated* by the one's own acts of faith. If the acts of faith renew the potency of God, happiness can only come to the believers who have and perform faith in God and his promise of happiness. The failure can be apprehended as the problem of faith, not cultivating the good soil for faith. The constant renewal of faith is required to make God work in response to it. Disappointment can only be spoken when one completely leaves out of the world of faith, moves into the world where God does not exist as a happy object. God can exist as a happy object only to the promisees, the believers who can reword any happy circumstances in daily life as "miracles." He is an absolute happy object, a promissory thing, whose being can be only promising because his being as the cause of everything is only recognized and embraced through faith and subscription to the promise.

Aware of the criticism about their pursuit of this-worldly blessings, Cho and his adherents distinguish their "blessing theology (*ch'ukpok shinang*)" from other kinds of belief in good fortune (*kibok shinang*). He maintains, "Faith in blessings [unlike from the shamanistic one] is based on the contract and promise of God" (Cho n.d.). According to Cho, one gains access to the omnipotent God and his promise through the constant exchanges with God, which can be compared to the "contract." The promise, like prophecy, is the heuristic device to account for everyday happiness as miracles; faith is substantiated in witnessing the everyday miracles, the evidence of salvation. And, as believers witness the realization of the promise in daily life getting responses to their as-if prayers, Cho argues in another place, experiential faith grows, God becomes living God, and believers learn the pleasure of praying, which is the secret of the

exponential, almost miraculous growth of Korean churches: “If faith grasps the substance and evidence in hand, one can now proceed with vivacity, confess it with one’s mouth, command [things to happen], and go on. Then, the miracle will definitely happen. Those that believe in Jesus believe in Jesus because of this pleasure (*jaemi*). We pray because of this pleasure. All of us can have this kind of experience. Experiences make our faith grow more and more” (Cho 2012b).

Cho speaks of the promise and faith, which is different from “expectation.” Here, I am thinking of how Cho’s teaching, his method of promise, can help us elaborate analytics for the “creatures of future tenses” (Selin 2008) such as promise, expectation, and hope. These creatures of future tenses are performative, as “anticipation *itself* constitutes economic and epistemic value, and speculative claims are fundamental to the dynamic processes that create new socio-technical networks” (Tutton 2011:412, emphasis added). The performativity of future-oriented discourses requires, however, sustained commitments and engagements of people with the promise. The credibility of a promise that cannot be verified at that moment, but can work as the truth for the moment (Sunder Rajan 2006), which urges one to bet on the undecided future (Fortun 2008) is central to the commitments of various actors with the promise. If sociologists of expectations have attended to how expectations are established and managed in case of possible failures (Brown 2003, Brown and Michael 2003), the analytic of promise has drawn attention to the specific mode of commitment with the promised future that involves faith and desires. And, the promissory thing substantiates and is substantiated by those commitments of faith and desires.

The offshore stem cell treatment market could be seen as an emblematic site of promissory market. Here, the promise of stem cells, anchored in the potency of cells, works in a

similar way to the promise of God, which is anchored in the very being of God that is omniscient and omnipotent. The efficacy of God has already been claimed, and there is the promise of salvation. If one decides to believe in God and his efficacy to keep the promise, the believer is acting as if the promise is realized. The future is already brought into the present rather than simply being expected and envisioned. It is made possible by the present tense of the efficacy, or more precisely the atemporal characteristic of the efficacy: God is an omnipotent and omniscient being. The promise, in this sense, creates the present not only as the “not-yet” (which hope and expectation both entail), but also as the moment of “as-if,” the moment of faith that is being performed. This faith, however, is not just something that one simply possesses. It is made through practices of faith, as one acts as if one believes in the potency, efficacy, and promise of the object of faith. In the promise, one comes to live in the future rather than simply looking out to it. The much-criticized business of offshore stem cell treatments works precisely within this logic of promise, based on the efficacy and potency of stem cells. Taken as a biological fact (by definition), stem cells’ potency is seen as a matter that transcends time. Time matters only when one considers the technological progress of stem cell treatments. And, if stem cells are seen to always already “know” what to do to regenerate the damaged parts, this technological time may not matter so much to the believers of the promise. The future is now, when there are stem cells and their potency at hand. Further, living in the future, the promisees will witness the miracles, experiencing everyday events as if they were brought to them by the potent entity whether it is God or stem cells.

Prayers and receiving treatments are both acts of seeking that are done on the basis of faith, and are also generative of faith. In Cho’s teaching, it is the act of prayers, prayers of faith which he calls “prayers of fourth dimension” in which one “confesses” as if the potentiality is

already actualized. In Promise, Inc.’s case, it is the act of receiving stem cell treatments in which one experiments with stem cells as if the promise of stem cells has already been realized. The affinity between these two stories of faith, in God and in stem cells, can be found in the promissory characters of both enterprises. The promises are anchored in the objects of faith, God and stem cells that are always capable of providing whatever is sought for. How they do is not as important as the fact that they can do, and there are living evidences that they have done so before. Failures of prayers or treatments rarely surface in these promissory atmospheres of the Pentecostal church and stem cell business. Instead of failures, the sermons and testimonials foreground successes, or happy circumstances. And, successes are often accounted for as a result of firm faith and sincere prayers, while the potencies of God and stem cells are kept intact. The metaphor of “soil” only comes back at the moment when Ra accounts for different degrees of efficacy in a talk given to Christian audiences, saying it was more effective to the patients who gave prayers of repentance passionately which effected their bodies and spirits, the soil on which the seeds of stem cells to be transplanted. The soil is needed to produce effects, but not because the soil itself is productive—the soil’s significance is only explained in relation to the productivity, the generativity of the seeds. The soil needs to be cultivated in order to make the seed work. But, the efficacy belongs to the seed, and by congealing the source of efficacy, the seed can promise that things will happen. Like the miracles that are done not only by Jesus himself, but also by his disciple Peter “in the name of Jesus Christ,” the miracle becomes an iterable event, and by this token, it is a miracle. God’s words and stem cells, the seeds, are the potentialities that promise happiness—the potentialities are at the center of the technologies of promise in both biotech enterprise, and religious enterprise.

POTENT ENTITIES, PROMISING ENTERPRISES

In this chapter, I have analyzed the way Ra articulates the stem cell promise to his Christian audiences and Cho endorses it through the vernacular of Christianity. While the explicit religious references and languages might render Ra's stem cell promise a peculiar one, it is not so distant from the official promise of stem cell science. Rather, Ra's faith in the potency of stem cells and God which he articulates through the language of the "gift of God" illuminates the affinity between the stem cell enterprise and the prosperity gospel as they both centers the promissory quality of the entity that holds the potency, transcends time, and can be activated by the practices of faith.

The notion that stem cells have the potency enables people to go to hospitals that they have never heard about—because what matters in this type of treatment is the potency of stem cells, the venue does not really matter. The potency of stem cells, as a scientific concept, appears to transcend time; it is a "fact" established and believed to be true. If the potency appears to be given, the question may not be so much of waiting to see what happens as making commitment to the future that it promises. Actually, it is a matter of faith. Interestingly, in Ra's articulation, the figure of stem cells here resembles the figure of God that is an omnipotent and omniscient being that "knows" everything and "prepares" everything for the ones that he loves (and that loves him). For God's potency is not restricted by time, for his omnipotent and omniscient capacity transcends space and time, he can prepare things for us even before something occurs, and indeed, events that have not yet happened are already known by him. In the Korean evangelical churches, it is taught that everyday events could be seen as miracles that God supplies people who he loves with things that we desperately need and pray to ask him. The promise is already there, and the future is immanent; it is only to be witnessed as the result of

prayers that generate the response from God. The temporality entailed in Ra's stem cell narrative is similar to that. Stem cells and their promise are already there, and they hold the potential in themselves; it is only to be witnessed as the result of treatments that would cause stem cells to respond to bodily ailments. What diverges Ra's stem cell story from the official stem cell story, if rid of religious allusion, is simply that the intermediate steps to "prove" the potential are (or can be) passed. While it could be just to make more profits by selling treatments without investing in clinical trials and other lab tests, it could also be the case that it can be justified in Ra's own faith in the potency of God that has provided stem cells as the reservoir of the biological potency. And, it should be emphasized Ra's faith is not a peculiar one. The potency of stem cells is the central premise of the stem cell enterprise.

Ra articulates the stem cell promise within the discourse on the promise and providence of God. The way Ra narrates stem cells as the gift from God highlights the salience of the notion of potency in the stem cell promise. The promise of stem cell enterprise, as highlighted in Ra's narration, is not only about the technological manipulation of biological processes, but also the discursive reformulation of biological processes and entities into promissory objects. It should be emphasized, while this articulation is peculiar, the discursive resources that it draws on is not completely random. Ra's stem cell miracle story is based on several premises that are not unusual in stem cell science such as: Stem cells have the capacities for regeneration—differentiation potential (they can differentiate into various cells to regenerate damaged cells); self-renewal (they can expand in culture while preserving their potential); homing effects (they can migrate to the damaged tissues following the signals); and paracrine effects (they can secrete various molecules to help repair damaged parts). Hence, stem cells have the capacity for regeneration.

The stem cell market foregrounds the vitality and potentiality of stem cells, or more precisely, presents stem cells themselves as entities that hold the vitality and potentiality—stem cells are at the center of the stage. Then, it can also be said that there is an interesting turn in the way we talk about health not only in terms of not having disease, but also in terms of having vitality. When the vitality of stem cells becomes a valuable commodity, what is foregrounded is the potent entity called stem cells that have the capacity rather than biological processes through which stem cells could work. Dwelling on the affinity that Ra brought to the fore between the stem cell enterprise and the enterprise of Christianity, I took it as an opportunity to think through the relation between promise, potency, and faith in the stem cell enterprise. It takes us to a different terrain than the world of expectations. If the world of “expectations” could be seen, similar to the public sphere in the Habermasian world, as a world of deliberations among various actors whose expectations on the future consequences, the world of “promises” is a world of faith, desires, pleasures, and scandals, the world infused with intimate feelings and affects. What Cho’s teaching of the Prosperity Gospel reminds us is that promising often involves the creation and maintenance of the capacity of promising entities through the acts of faith, as well as desires and pleasures among the promisees. Whereas an analytic of expectations draws attention to the dialectics between unknown and known, an analytic of promises highlights the affective investments that are generated by the promised opening, whether fulfilled or not. Furthermore, the analytic of promise can highlight the reciprocity between promisor and promisee—a promisor can give hope (expectations toward the future) to promisee, while the promisee enliven the promisor, driven by faith, desires, and pleasures. As both scientists and patients believe in the potency of stem cells, desire different futures, and have pleasures in witnessing the potency of

stem cells, realized in different venues, stem cell promises can grow, and stem cells can remain as a potent entity that is generative of promises.

The vitality of potent entities, or the capacity of nonhumans, which is not solely made by humans or easily graspable by human knowledge, could easily be assembled to a Christian narrative in a pragmatic way. The idiom of “gift from God” itself is an interesting combination of “scientific” conceptualization of stem cell as an entity holding potential, and “religious” belief in God’s preparation. But if stem cells were seen not as already existing entities that contain potency in themselves, but as a state in biological processes, the narrative may become very different, and the stem cell enterprise might not have the promissory quality. If the experiments, clinical trials, and patient testimonials about stem cell treatments are now directed toward witnessing the potency of stem cells, a peculiar ontology of stem cells, the view that sees stem cells as a temporary state in the biological process might be interested in the bodily processes and complexities. And, the business surrounding stem cells might have been very different than it is at present. However, when stem cells are conceived as the “seeds” of vital futures, their promise can proliferate wherever vitality is sought for, as a kind of asset that needs to be saved for the future. And, for the promise to proliferate, it is good enough to make good-enough stories.

Be Prepared, or Suffer Your Longevity

When you pick up a brochure of Cell Banking program, an autologous stem cell bank for adults, the first thing you would read is a question. “How are you preparing for the Centenarian Era (*baekseshidae*)?” Immediately, you get an answer: “Now, save your **100% health** with **Cell Banking**, the **foundation of one-on-one personalized medicine**, so that you can deposit when you’re healthy and withdraw to use when you’re sick.” In the next page, you are told that cell banking is “true life insurance for healthy life in the Centenarian Era.” Another company that sells a similar service called “BioInsurance” promotes it as “BioCare Technology: Technology to store youth for the healthy future”. These stem cell banks are in a sense personal repository for “100% health” or “youth.” Health and youth are portrayed as things that can be stored, deposited, and withdrawn in the bank, rather than states that are temporary and contingent in nature. The word “save” that came up in the Cell Banking brochure adds the nuance of finance to it, since the Korean word for it (*chöch’uk*) is almost exclusively used to refer to saving money for future use. In other words, in these advertisements, health and youth appear to be one’s own asset in the body, which could be put aside for the future use, and in doing so, their values are kept intact, if not increased.

How is it possible to “save” health and “store” youth, those temporary states, as if they were things, or even money? Of course, you cannot save or store health and youth directly. What you can do is to store your own stem cells, which contains vitality that could restore your health when you are old and sick in the future. Autologous stem cell banking for adults, which I call bio-insurance, following the phrase often used in their promotion (“biological insurance” or “true life insurance”), is growing business in Korea. The basic idea of bio-insurance is that one stores

stem cells that are derived from one's own bodily tissues—such as fat, bone marrow, peripheral blood, and so forth— in the cryopreservation system to use in the future when stem cells may be needed. The fee varies upon the contract periods, but it usually costs several thousand dollars to store stem cells for 20-30 years. There is a long list of diseases and conditions for which stem cells are anticipated to be useful for treatment, as stem cells are known to be able to differentiate into various cell types (not a specific one). The list includes diverse conditions that are related to degeneration of cells. It is anticipated to cure, to name a few, strokes, myocardial infarction, diabetes, Parkinson's disease, dementia, and so forth. Bio-insurance companies often emphasize that cell therapy is a novel medical paradigm that can overcome the limit of existing medical paradigm that is focused on eliminating damaged tissues or only alleviating the symptoms, by regenerating damaged parts from the body's own capacity for regeneration, and will become applicable to many conditions which cannot be cured by existing medicine in the near future. While most of them are still in an experimental stage, the list of ongoing clinical trials around the world is often offered as a support for the possibility to use stem cells in the future. Bio-insurance says: the future, given the intensive investment in stem cell research around the world and the number of clinical trials that are being conducted, is not too far away, but you may lose a chance though if you do not have your own stem cells available. It promises a chance to have a chance, an opportunity to have an opportunity when stem cell treatment turns out to be effective for the condition that might make one ill.

While most Koreans may not be familiar with bio-insurance, it is an expanding business. For instance, the number of subscribers to the Cell Banking program, according to the company, amounts to 20,000 as of March 2013. It can be seen as a business that sells a promise of healthy future on the promise of regenerative medicine. However, its promise is peculiar as it highlights

the necessity to save one's own cells "now" in order to "prepare for" the old age. While it constantly says that the future of regenerative medicine is not too distant, it simultaneously emphasizes a temporal gap between now when one has one's "youth" and "health" to store, and the future when you no longer have them. Time here not only promises the technological progress that will bring a whole new set of opportunities to keep you healthy, but it also subjects one's body to its degenerative force—aging of one's body, loss of youth, and degradation of health. It is not surprising that bio-insurance. Time is already multiple, even when it appears linear, here as time works differently to technology and living bodies. Cryopreservation of stem cells, by isolating a fragment of one's own vitality and keeping it intact from the force of time, appears to be a solution to the problem posed by the double forces of time—one promissory, the other degenerative.

Stem cell biology is a particularly interesting one, as "stem cells" give a grip on time, and articulates the promissory time of technological progress and degenerative time of mortal biology. And, bio-insurance translates the vision of stem cell biology into a personal control of biological time. Controlling biological time is one of main tenets in regenerative medicine in particular, and contemporary biotech in general (Cooper 2006, Franklin 2008, Hogle 2003, Landecker 2003, Romain 2011, Waldby 2002). As much as it technologizes biology, it technologizes time. The possibility of controlling time provides a particularly interesting avenue of capital's growth within the context of the aging of the population, a phenomenon that has been observed mostly in "advanced" countries, but is also increasing in other parts of the world. Melinda Cooper (2006), focusing on the peculiar way in which aging as a biological limit is problematized and reconceptualized in scientific and economic discourses, has noted that regenerative medicine finds its niche in the "points of *non-coincidence* between ageing in

general and the body's multiple reserves of renewable tissue" (3, emphasis added). Informed by the figure of immortalized stem cells that can constantly replicate themselves in vitro, Cooper situates the epistemological shift in biology epitomized by regenerative medicine in the larger problematic of "limits to growth" posed by the crisis of Fordist mode of accumulation that includes "the old age crisis." The discourse on aging of the population highlights the lowering of productivity and the unsustainability of welfare state as a suitable biopolitical form for most "advanced" nation-states, which has in turn accelerated financialization and investment in new knowledge-economy of which biotech is important part. Regenerative medicine (alongside with anti-aging medicine and biogerontology) is one of the fields in which epistemological shift in biology and restructuring of the political economy is articulated in a way to overcome the limit. In the backdrop of this fantastic vision, there are life forms, stem cells in vitro, that are not affected by the degenerative force of time.

Bio-insurance is a business that finds its home in this fantastic vision, yet with a little twist due to two practical issues to realize the vision of regenerative medicine. The vitality of tissues is always subject to aging in the body's reserve, and the tissues are marked by the body's own immunological specificity. From the first concern, it can be derived that procuring more nascent tissues from which the most lively stem cells could be derived. The second concern has been addressed in the efforts to generate patient-specific stem cells through "reprogramming," or to establish public stem cell banks in which matches could be found. A commercially motivated solution to these concerns is autologous stem cell banking to secure one's own ex vivo reserve of vitality that is not affected by the degenerative force of time and lives up to the promised future. Bio-insurance creates a point of non-coincidence aided by cryopreservation technology, within the contemporaneity of aging of body and the bodily reserves of renewable cells. If regenerative

medicine emerged at the particular juncture where the limits to growth were problematized both in terms of life itself and labor at the abstract level, bio-insurance, as a business model derived from it, translates it back to the concrete lives of people who supposedly share this vision but whose primary concern is their own aging not in terms of maintaining growth at the macro-level, but from the perspective of maintaining their own liveliness at the personal level. It brings to the fore that the ethos of “preparedness” for individuals that are living the “not yet” of the future through which not only anticipatory subjectivity is formed, but also capital is made to grow by colonizing the future and trading on the promises for a more lively future.

Taking up bio-insurance as an ethnographic entry point, this chapter discusses the problem of “aging” as it is pronounced through the idiom of “preparedness” and translated into marketable services in contemporary Korea. While the euphoria of overcoming the biological and economic limits to growth with stem cells has not yet been made real, it is already a significant part of the discourse on aging that orients people’s vision toward and urges them to take actions upon their own future, particularly in terms of managing their wealth and health. While it may be possible for capital to envision the future of unlimited growth by transforming and revaluing the matters such as waste and biological life that pose the limits to growth as objects of technologization as Cooper (2006) analyzes, it is not an easy task for each individual who live with/in specific body and in specific time to conceive life without limits.³⁹

As will be discussed in the following, the way bio-insurance is marketed in Korea as a preparation for the old age illustrates how to *manage* wealth and health to *prepare* for the old age to keep one’s life lively in the future is a matter of concern for each individual. By reframing the

³⁹ Tiffany Romain’s ethnography (2011) on the practices of cryogenics and egg freezing in the United States illustrates, while both are invested in “freezing time”, they diverge in their visions of future, as they are specifically situated in other concrete social relations.

problem of aging as a personal one and combining the euphoria on the future of longevity with anxiety-provoking discourses on personal and national crisis, the recent discourse on aging reframes aging as a matter of personal preparation which would immensely affect one's own future life, livelihood, and liveliness. In this context, aging population is increasingly becoming targets for the preparation markets for "anti-aging," "well-aging," or "smart aging," capitalizing on the anxieties provoked by the future scenarios, which simultaneously forms subjects of anticipation. As Vincanne Adams, Michelle Murphy, and Adele Clarke (2009) argue, anticipation is a politics of temporality and affect. They point out, while it shares with speculation the orientation toward the future, but anticipation differs from speculation, as it is "a moral economy in which the future sets the conditions of possibility for action in the present, in which the future is inhabited in the present" (249). These subjects of anticipation are interpellated to make actions, which often appear speculative, yet heavily charged with affects and values. Once again, the imperative to take actions on the future-to-come would provide moments for capital's growth.

Now I return to the first question that is asked in the Cell Banking brochure—"How are you preparing for the Centenarian Era (*paekseshidae*)?" *Paekseshidae*⁴⁰ is a neologism that has suddenly become popular in 2011 with the President's New Year's speech and a special feature from a news media titled "The Centenarian Shock: Blessing or Disaster." The term refers to the

⁴⁰ It has been increasingly translated to a "New Era of Homo Hundred" in the Korean news articles and policy reports on this issue written in English. "Homo hundred" is a term that is made popular in Korea after *paekseshidae* discourse became pervasive in the media, policy forums, and everyday conversations among Koreans. The journalist who popularized this term with the special feature in a newspaper titled "Happy Homo Hundred" says that he used this term instead of *paekseshidae* in order to emphasize living up to a hundred years old is becoming "new normal," for which we should be prepared. However, I use in this chapter my own translation "the Centenarian Era" to emphasize the sense of paradox and disjuncture that the word *paekseshidae*, or *paekse* shock conveyed by this discourse. *Paekse*, a hundred years old, is in Korea, like many other countries, considered traditionally as a blessing, longevity. By putting "*Paekse*" and "*shidae* (era)" or "shock", the discourse has emphasized the paradox of longevity while calling for a completely different view on longevity, as I discuss in the following pages.

new era in which most people are expected to live up to a hundred years or more. By deploying the buzzword, the company advertises the stem cell banking program as another way of preparing for the old age, and calls for attention from its potential clientele who are concerned with, or supposed to be concerned with preparation for their old age, while making it explicit that bio-insurance is for a relatively long-term, yet not too distant future. Another company which brands its bio-insurance program explicitly as “BioInsurance”, says it is “technology to store youth for the healthy future”, also highlighting that bio-insurance is a method of preparing for the future when one no longer has “youth” as one’s own asset. In both cases, aging, or more precisely the future of “aged you” is explicitly emphasized as a problem to be prepared for, which requires actions from you now.

Instead of focusing solely on bio-insurance, this chapter situates it within a recent discourse on aging in Korea (the “Centenarian Era” discourse), and an increasing emphasis on illness “prevention” over “treatment” in a boutique health market for “well-aging” or “power aging.” By juxtaposing them, I highlight the ethos of preparedness against the disastrous future of unprepared aging that has recently become pervasive in Korea, through which not only promises but also anxieties increasingly become sites for capitalization of life itself. The whole set of discourses and marketing campaigns are targeting aging individuals. Highlighting the surplus life years, the extended old age life without labor/wage, the Centenarian Era discourse calls the aging/aged population as the subject of preparation. Two opposite modes of living for the aged population are presented as the only alternatives. There will be luxurious consumer citizens whose aging/aged body is/should be taken care of by personalized medical care to enjoy surplus health; its counterpart the unprepared life of old citizens whose life is simply extended without meaning, while becoming costly for themselves and the society as a whole. In a sense,

the second class of citizens can be imagined a post-biopolitical bare life, life excluded from life proper in a liberal, consumer society, life that is only counted as a cost. The image of extended life without fullness of living that will be introduced in this chapter, in an odd way, reminds some of Agamben's images of "bare life" as the condition for politicization of life (1998), but in a consumerist version. With its counterpart of life that can be purchased and enhanced with wealth, this post-biopolitical bare life shows a specific form of economization of life.

I would like to note that this work of juxtaposition is already done by the marketers, as they use specific marketing channels and languages for this novel business of bio-insurance. For instance, Korea Stem Cell Bank that provides Cell Banking service has been partnering with A Plus Asset (APA), a company specialized in selling various financing plans such as insurances and pensions, and has branched out to a mutual aid business. Another service provider, BioInsurance, is located in Chaum, a luxurious anti-aging center that was launched by a stem cell company CHA Biotech in 2010 in Seoul. These may be simple executive decisions based on the demographics of target groups, but there is a certain synergy that these companies anticipate by utilizing these channels and languages to increase their salability.⁴¹ Hence, I look at how this constellation of discourses anticipates a certain form of life that is predicated on the ethos of preparedness in the moments of "not yet," and what kind of futures are imagined here. It is not to suggest that the marketing would determine how people behave, but rather to highlight how they interpret people's concerns while refashioning them into marketable services. By placing things

⁴¹ Comparing the work of anthropologists to other types of cultural mediators such as marketers and fashion designers, Marshall Sahlins (1976) writes they both, "like Levi-Strauss's famous bricoleur, [they use] bits and pieces with an embedded significance from a previous existence to create an object that works, which is to say that sells—which is also to say that objectively synthesizes a relation between cultural categories, for in that lies its salability" (217). While this approach may risk eliding the agency and dynamic process in cultural production as William Mazzarella (2003) criticizes, it is not to suggest that advertising and marketing are "mere" reflection of pre-existing culture, but rather to see them as an instantiation of configuration of concepts, ideas, and values at a specific moment. What I take from bricoleur is not the reproduction of the pre-existing social order in a strictly structuralist sense, but rather the creative use of bits and pieces at hand to increase "salability".

next to each other, they highlight certain aspects of them in anticipation of responses from their audiences or clients that they identify to have certain concerns, especially in this affective economy where anxieties, desires, and hope could create market opportunities in this “not-yet” of future.

“YOU MUST BE IMAGINING YOUR FUTURE THIS WAY...” (BUT YOU ARE WRONG)

Bio-insurance is a novel business that not many ordinary Koreans have already heard about. Unlike cord blood banking service that is now quite popular in Korea, and has been able to promote itself specifically targeting prospective mothers at various locations where they are busy to find out the best possible things for their newborns such as maternity fairs, online communities, or hospitals, bio-insurance sales requires more work to actively seek out potential clientele and convince them that this is a valuable investment, and it is not premature.⁴² Financial advisors who mostly sell insurances and pensions seem to be the ones well-suited for this job, for they are trained to do one-on-one marketing, and to talk about the future in terms of risks and the necessity to hedge against them. Of course, the overlap in the demographic features of their target clients, mainly middle- or upper-middle class men and women in their 40s and 50s who are supposedly concerned about their future, is another reason that the financial advisor network is useful. Yet, the similarity in the grammar they use and affect they have to convey in selling insurance and pension programs seem useful. In a promotion session I attended, APA personnel explained the necessity of bio-insurance comparing it to other types of insurance such as a car

⁴² It is not to say cord blood banking was suddenly popularized in Korea without the effort to create a market. Cord blood banking also needed to “create” markets in the beginning. Yoon-sun Yang, CEO of MediPost which opened one of the first private cord blood banks in Korea, recalls that she spent quite a bit of time at the ob-gyn clinics to meet doctors and patients there (Roh 2010). It almost required outreach education in its early days. The commercial “outreach” effort, increase of public interest in stem cells, and celebrity marketing made cord blood banking much popular later. There are more than 175,000 subscribers to MediPost’s cord blood banking program as of March 2014.

insurance. In his talk, he framed that stem cells would cure most diseases that the elderly in Korea suffer. In addition, natural killer cell banking that they provide additionally would help to treat cancer. Combining these two, he would say, the likelihood that stem cells would be useful is close to a hundred percent. Why wouldn't you get bio-insurance if you still subscribe to a car insurance for a much less probability? He would also talk about the future when stem cell treatments become available is also told in terms of "risk" of losing life while waiting for the (immunological) match to be found. Having one's "own" stem cells is presented as a way to preempt this risk. Instead of simply providing a vision of regenerative medicine which will make stem cells in the bank useful, bio-insurance salespersons would tell more about the "risks," actively directing the audiences' vision toward the future in which they are suffering from the consequence of not having their own stem cells available. This particular promotion session was for people who signed up for more information in their booth at the Anti-Aging Expo that took place a few weeks prior to this session, and the audiences were the ones who had already talked with the salespersons, who were already interested in bio-insurance to some extent. To persuade people who have never thought about bio-insurance would require more work.

Junho, an insurance broker at APA is known to be a successful bio-insurance salesperson, who also sells other financial plans such as conventional insurances, says that he sees himself as an "angel" that conveys the gift from the god to clients, and sales is a business of "passing on value" to potential clientele. "Value" here means the significance of bio-insurance in a person's life. Having been able to sell bio-insurance to more than ten clients a month, his advice to other salespersons is to think of selling not as simple sales, but rather as "saving life." In his team meeting, he says, he would remind the team members who succeeded in selling it that they "have saved" life, as if the promise has already been realized, as if the client has already been helped by

stem cells, in order to keep the value of bio-insurance in mind. He himself and his family members have also subscribed to bio-insurance program, which he feels grateful about. He says everyone could be successful if they approach clients with this grateful feeling. Here, Junho emphasizes that the salesperson him/herself should be convinced with the promise of bio-insurance. It is not simply about knowing what it is good for, but feeling how bio-insurance can change life, and committing oneself to its promise. What he constantly emphasizes is it is good enough to sincerely convey the value, which is intimately felt through one's own experience of committing to the promise. When he failed to convey the message, he would think that his "value" was not good enough to convince the potential client, and try again next time.

The way he tells about bio-insurance sales is quite similar to Rev. Cho's method of active visualization that I analyzed in the previous chapter. It is the commitment/faith of salesperson/missionary that makes this sales/conversion possible, and to make it work, the speaker rhetorically enlists a listener in the narrative (Harding 1987). To persuade a listener, the salesperson himself should have faith that bio-insurance is something to feel grateful about. To feel grateful about bio-insurance that can save life, or rather that has already saved life, to witness the promise that is yet to be realized, the salesperson should already be able to imagine disastrous situations in which stem cells in the bank are needed to save life. One should first be brought to the future, in imagination, where not having stem cells available is equal to losing an opportunity to save one's own life. As much as he takes the promise of bio-insurance seriously, he should take disastrous future scenarios seriously. He advises other salespersons to imagine, when talking to the clients, the future when one is old and sick. This vivid imagination would make it possible to witness the future in advance with the sense of desperation and regret about the "lost" opportunity.

Let me introduce some tips that a bio-insurance salesperson gives in his lecture to other financial advisors on how to talk to the potential clients. These quotes are from a note that a blogger, who himself is working as a financial advisor at APA, took in the training session and posted online with some of his own ideas that came up to him while listening to the lecture. He offers an example of how to approach that he uses with a video clip of a patient affected by Buerger's disease. He asks, "do you think that this patient wanted to get affected?" It is a rhetorical question. Then he would ask more and more questions whose answers are quite obvious. "Would you sell one of your legs for 1,900 dollars? How about for 100, or 200 thousand dollars? But, if you can keep your leg for 1,900 dollars, what would be your choice?" 1,900 dollars that this salesperson brings up here is the cost for stem cell banking. While it might sound quite a bit of expense for something that may or may not be useful at all. However, if something happens to your body, they will return as incalculable benefit in the future which is not comparable to 200 thousand dollars, for you cannot put a price tag on your leg and you cannot buy it, either. The present investment of 1,900 dollars may look quite a big investment, but the return promises something invaluable. Asking questions, while they do have obvious answers, is a rhetorical move to engage the listener in the dialogue creating an imaginary space for the listener to inhabit the future moment at which s/he is facing a problem. Being addressed as "you" as somebody who is at risk of losing an opportunity to save body parts and liveliness, the listener is enlisted in this story about the future. The listener is interpellated, to borrow Althusser's term (1971), by being given a place for "not-yet-old" subject, as a subject of anticipation who recognizes the present as the "not-yet" of the future, and subject that should be prepared. The video clip that shows the pain of losing a leg is anticipated to facilitate this imagining.

Marketing bio-insurance as a new form of “insurance,” its salespersons would also frame it as a preparation for the future, alluding to other preparatory practices such as pension funds. The successful salesperson gives another example to emphasize this small monetary investment in stem cell banking would make an immense difference in the future. He would say: “You must be imagining your retirement years would be luxurious days like enjoying golf trips with your wife, when you’re saving your money in pensions. But if your body does not allow, your retirement fund would be completely exhausted to treat it.” The premise here is that “you,” the potential client is already aware of the necessity of preparing for the old age. The promise of bio-insurance is to secure affluent and happy life that you will enjoy thanks to the savings you are making now. But, you cannot completely prevent your body from getting ill. The salesperson again brings “you” into this narrative. The story reminds “you” that you are already and supposedly envisioning your future in a specific way, but there is something absent in that vision. “You are planning to enjoy your retirement with the pension fund. But if you’re affected by dementia or cancer before living a happy and enjoyable life, you can’t enjoy—your life will be *no more than dying day by day*. What do you think about it?” (emphasis added) Here, health is portrayed as a capacity to live up to one’s potential. Without it, life cannot be good. Good life requires both wealth and health; if you are saving money, it’s time to consider “saving health,” for your money is of no use without health. The promise comes with a blackmail. It urges a potential client to imagine a future in which one has money, but not health. The future is rendered as a disastrous one—you might have prepared for your future with the pension, but it is not complete as you might lose your health. As he suggests with the “pension,” it is rendered as an investment plan to prepare for the uncertain future. Money reserved in pension is a resource for you to fully enjoy your life in the future, but there is something that cannot be bought with

it—your leg, your health, your vitality. You cannot be active and lively if you lose them. Without the health as a capacity, your life is simply “dying day by day.” This talking strategy is to interpellate individuals to be concerned with future health, but not necessarily in terms of mortality of biological body, but rather in terms of capacity to fully enjoy one’s life in an active and lively manner. It provokes an anxiety not about death, but about being chronically ill, not living properly for an extended period of time. This life is not a life, but a process of dying.

To live a life that you always have dreamed of, you might have been (and probably be at this very moment) work to secure the monetary saving—to live as a good consumer citizen with “free” time available to you. “Before living a happy and enjoyable life” conveys a sense that post-retirement, the old age, should be lively time freed from the required labor on which one’s livelihood is dependent. Although this dream now appears much more precarious as I will discuss later in this chapter, “before” this dreamy life seems to still suggest something about lively life that is deferred to the later years for the generation that bio-insurance targets. The present here appears as the past of the future, which is lived through in order to secure the future happiness. The promise of future happiness, however, cannot be ensured without both health and wealth. Hence, if one loses health, bio-insurance warns, one would lose not only money (for medical cost), but also lively future of which one is dreaming and for which the present is being endured, all together. The figure of having a degenerated body, or devitalized body for an extended period time is crucial in this talking strategy. When a chronically ill person is said to be “no more than dying day by day,” it is not death that one is supposed to be anxious about. Rather, it is this kind of surplus life for which life is not life—because it is lively, hopeful, and happy— that is expected to provoke anxiety, living a superfluous life in this scenario. When the salesperson says that your pension funds will be all spent to treating your incurable conditions,

the figure of patient is rendered as a person whose life is meaninglessly extended. The backdrop of this meaningless extension of life is the lively life that is only allowed to good consumer citizen subjects. This kind of life without liveliness to enjoy “happy and enjoyable life” is rendered, in this narrative, simply superfluous. Without perfect health, your life will be hopeless even though you have money. It is the liveliness or youthfulness of the cells stored in the bank that will enliven your life in the future in a way as you are dreaming of now. And, it is more than that, as it explicitly pronounces disability and illness as “cost.” Health and wealth are intrinsically connected, particularly in the language that is modified by insurance brokers.

To get a person interested in bio-insurance, the salesperson needs to make the person imagine him/herself as a promisee of the stem cell promise. It needs to persuade an individual to be a client who recognizes the bio-insurance as a promise for “me,” and for “my future.” It is a work of interpellation that involves in the marketing of bio-insurance, for it needs to be recognized by the potential clients first as a promising investment—investment in liveliness of stem cells for liveliness of one’s own life. If bio-insurance is passing on value that potential clients are not aware of, it could be the value of stem cells for one’s liveliness. Liveliness of stem cells is translated into “hope” or “opportunities” to get back to the healthy and lively body that is capable of enjoying good life, a kind of moral imperative, against life without liveliness, “dying day by day” which is still consumptive because of its costliness, yet is not able to make a good life. At this point, it is not only the promise of regenerative medicine but also the possibilities of disastrous futures to come that the salesperson should be convinced with, and s/he should convince people with. The audience of the model salesperson’s lecture would mark some parts where he could use his own materials to approach the clients such as the story of his friend who lost his brother, which might have been prevented. It is more than simply providing a plausible

scenario—it is to address issues that both the speaker and the listener could intimately and affectively engage with. In doing so, potential clients are taken out of the monetary metrics that cannot ensure the “quality of life” in its entirety since being sick means the loss of liveliness for an extended period of time. At the end, they would again be brought back to the monetary metrics to ask them to buy this service at a low cost compared to the cost of losing health, but “health” conceived in terms of normative body and as a promise of good life. The model salesperson happily says that bio-insurance indeed provided him an access to a new set of clients that he had not been able to meet before, as his client introduces him to others. After selling bio-insurance, he was often able to push it further to sell other financial plans, too. What he is selling is the ethos of preparedness.

Be prepared—otherwise, you are doomed to merely suffer for an extended period of time. You are not yet ill, but you will be. Save your health with stem cells—they will turn into anything you need in the future and regenerate your degenerated body. The regenerative future is yet to come. The present is the not-yet of future, you anticipate the future to come. But, it is through “preparation” that you can secure good life that is to come. For the good life, liveliness is necessary, which is easily lost as time passes. Take an action to preempt the degenerative force of time. The present state of your life does not guarantee anything about the future. And, you are damned—you will probably live longer than you expect, and your body will definitely have the chance to get sick for an extended period of time. To make it worse, no one will take care of you unless you prepare for yourself. It echoes with the recent shift in the discourse on “aging” that emphasizes “preparation” and planning for the uncertain future. The future might be different than you have ever thought, but anyway, be prepared. It is you who would suffer longevity in the end. That is the ethos of the Centenarian Era, a new era of longevity in Korea.

SUFFERING LONGEVITY: PREPARE FOR YOUR FUTURE IN THE CENTENARIAN ERA

The year of 2011, in Korea, started with a blatant announcement from the media and the president's new year speech of the coming of the "Centenarian Era" (CE). *Chosun Ilbo*, one of the major newspapers in Korea, featured a special feature "The Centenarian Shock: Blessing, or Disaster?" addressing the changes that may occur in the near future due to the demographic change, particularly aging of the population. Some contents of the articles in this special feature were not so new to many Koreans who were told about the problems of "aging" of the Korean society. What was really new, however, is not simply the "aging" of the population, but rather the estimation that life expectancy is prolonged well beyond previous predictions, and that it is everyone's problem. Some euphoric discourses on the possibility to overcome the limit of human life are coupled with the warning that everyone will be living much longer than before, while the national pension funds would be exhausted. On the same day, January 3, 2011, President Lee Myung-bak also emphasized that the coming of Centenarian Era would bring a revolutionary change in people's life:

"Now, we are facing the era in which we should live our life anticipating a hundred years' life. [...] We must, however, face the reality—after a person who has been employed for 30 years retires, s/he should live longer than that. [...] We ought to open up the windows of opportunity to people at each momentum and situation in one's life. We should also provide conditions in which one can develop the capacity for one's self-reliance and happy life." (Lee 2011)

It was a call for a revolutionary change in our view of life in order to prepare oneself for the future. It is different from a typical "population" discourse that have been repeated for a decade in Korea in terms of "low-birth rate and aging" problem that would lower down the productivity of the nation and threaten its own reproduction. Furthermore, the anxieties that the population crisis discourse entails concern the future of the nation-state as a whole (Paik 2010).

What characterizes the CE discourse is its grammar. While they both deal with a similar

problem, the demographic shift, the CE discourse addresses individuals more directly as a subject of preparation. The top news of “Centenarian Shock” series was titled: “More than a half of men born in 1971 will live up to 94 years or longer.” The article series directly and specifically addresses men who will turn into 40 years old that year telling them they will have 54 more years to live through. In another article, an illustration derived from a modified life table, which shows likelihoods of people born in different years to “face the Centenarian shock,” surviving to age 94-100 (see Figure 2). On the infographics page that the news media offered on



Figure 2 "The Likelihood That I Will Face the Centenarian Shock Is..." featured in *Chosun Ilbo* article on “Centenarian Shock, Disaster or Blessing?”

their website, the readers can also check their own life expectancies. The message is clear—you will live much longer than you might have thought to do. Instead of changing demographics, the “national” concern, it brings the actuarial life table to the readers to see themselves in the table focusing not on the mortality, but on the survival years. Statistics is deployed to make it a personal concern. The population crisis is still at the backdrop, and it does not go away, because the decrease of productivity is now made into personal concerns in terms of national pension funds to be exhausted.

Policy reports that followed also describe the Centenarian Era (CE) in a

somewhat different way than policies for “aging society.” The National Research Council for Economics, Humanities, and Social Sciences (NRCS), in particular, drafted a report titled “The Centenarian Era, How To Live Happily: How Prepared Are We for the Coming Centenarian Era?” (Jeon et al. 2011). The researchers explicitly distinguish their study of the CE from other studies on “low birth-aging” problems, or “aging society” question conducted in Korea and other countries as it, as a future-oriented project, is concerned not only with the elderly, but also and more importantly with the entire population in different ages. The report, pointing out the limitation of previous policy studies regarding “aging society,” proposes to include “the entire generations while mainly focusing on the *changnyŏnch’ŭng*” as subjects that require intervention. *Changnyŏn* is an elusive category, but is often used to refer to the older ones in the “productive” population (younger ones are often referred to as *ch’ŏngnyŏn*). Then, *changnyŏn* could refer to the age group who are in transition from youth broadly conceived to the old, perhaps in their forties and fifties. The focus of CE policy is not so much on supporting the elderly, the already aged population, but on preparing the not-yet-elderly for the new era in which they are supposed to live up to one hundred years. It goes hand-in-hand with neoliberal emphasis on self-reliance and responsibility (Seo 2005, Park 2008, Park 2009).

Coupled with the “low-birth rate,” aging society discourse has politicized life of the population within the framework of welfare society. In this “aging society” discourse, what mattered was how to manage the number of productive population among entire population within the nation. Hence, “aging society” discourse concerns the reproduction of the nation via maintaining its productivity and controlling its population. It has served as a framework to deal with the increase of old population as the decrease of productive population, decrease in economic growth rate, increase of public cost to support the old population, decrease in tax

collected, and conflicts between different generation related to the issue of taking care of old generation. From a political economy perspective, it is ultimately a population discourse that centers on the productivity and sustainability of the nation-state that signals the crisis of the productivist developmental state. Many studies and policy discussions on the demographic changes, hence, have been done to find out what causes low fertility, how to solve the problems of low fertility and aging of the population through welfare reforms.

While the CE discourse shares a similar problematic to the “aging society” discourse, the CE discourse differs from it as it explicitly foregrounds a temporal narrative for an individual. Rather than focusing on the rate of “unproductive” population, the CE discourse draws attention to the increased life expectancy of the presently productive population as the new fact of life. It is concerned with the duration of individual life after the retirement (or more precisely after an individual is dropped out of the “productive” domain). The CE discourse is not so much of the population crisis discourse—it is rather a discourse of (potential) crisis in individual’s life. While the CE discourse, similarly to “aging society” discourse, addresses the crisis of welfare system, it is not as much about the restructuring of welfare system as restructuring of individual’s vision of life. The CE discourse often presents the figure of individual who is aged—not being productive, not having regular incomes, and losing health. It warns that most individuals would live up to one hundred years, which means that most people would live too many years without regular jobs and/or healthy body. If you’re not prepared for this coming era, one would be damned to live a lifeless life.

Rather than viewing the society at large as a unit that needs intervention, the CE discourse notes that individuals’ life needs a fundamental restructuring. One now needs to rethink one’s own life strategy to prepare for the old age that is supposedly longer than one used

to think. One needs to be aware of the fact that one does not die so soon; one will become costly as s/he is not productive, but unhealthy. The old population, if not prepared, will be simply costly for themselves, for their families, and for the society at large. Hence, the CE discourse emphasizes individual awareness and planning—managing one’s financial resources and health to prepare for the old age.

It does not mean that the CE discourse entirely replaced the “aging society” discourse. Rather, the idea on which the CE discourse is based adds another layer to the “aging society” discourse—capacity building and future planning for the not-yet-old population. The additional clauses that were included in the law regarding low birth rate and aging problem in May 2012 tell that there is an explicit change in the government view on this problem. The practical solution of providing resources such as consulting service to people to prepare for the post-retirement years addresses that the “unpreparedness” as a problem in the Centenarian Era. The CE discourse emphasizes the importance of predicting and preparing for the future at the level of individual over the changes in social welfare system. At this point, it is not simply a discourse on how to manage the population size; rather, it is a question of conduct of individuals as a “capable” citizen. The consulting service to be provided in this new era is for capacity building, not simply building capacity like new skills to do something, but building capacity to manage existing resources, one’s own property—capacity to manage what one already has for the uncertain future. An author of one of self-help books on how to prepare for the old age in this era that burst out since 2011, gives a realistic advice for most people who would not have luxury of having much in the old age—“manage your poverty” (Kim 2014). One should still have one’s own reserve of wealth, but it may not be enough to maintain one’s own livelihood for forty years after the retirement. Something that should be done right now is to adjust your lifestyle in

anticipation of future poverty, reducing investment in unnecessary things. Then, one should build capacity for “poverty management”, to *hedge* the risk of old age. One of them is the capacity for solitude.

In the CE discourse on preparedness, the future is presumed to be determined by one’s own reserve of capacity, wealth, and health, and so forth, which will only be consumed in the old age. If one imagines the reserve as a limited one, as something that should be saved for oneself living in the future, one’s life appears to be already dominated by the future, or the future-self. Following Lazzarato (2012) who sees “indebted man” as an emblematic figure of subject in capitalist society, who enters a power relation in which he is dominated by virtue of being indebted, we may see here a figure of indebted person not only to existing creditors, but also to the future-me as a creditor. This indebtedness in relation to the future self is part of this specific ethos of preparedness. When somebody says, “I sometimes feel that I am working right now only to save my pension fund,” she is living “now” in order to live the future. As she is living the kind of “now” conceived as time for preparation for the unbearable weight of the future, her future constantly reminds her that she owes the future-her.

The characteristic feature of the CE discourse is that it successfully engages people with this particular type of near future whose duration is extended. It is not simply a futuristic discourse, but also a discourse that effectively creates, amplifies, and once again captures people’s anxiety about aging who are observing increase of old people living without appropriate care. The discourse is affective. Woo Jae-ryong, a financial expert who used to work as a financial advisor, speaks of his frustration about marketing “fear.” One of his clients, frustrated that they could not be able to save as much money for retirement as suggested, would say that it was “fear-based marketing.” The point is that even the client was suspicious of this type of

discourse, s/he would still check in with the financial advisor with the very fear (Lee, 2013).

Another journalist confesses in his column that he had a nightmare while he was working on a special feature on this issue. While he was trying really hard to provide a more hopeful vision than frightening prediction, the fear probably sneaked in his dream. He writes,

While I was writing for the special feature articles on the Centenarian Era, I happened to have a nightmare. It was a dream in which my wife and I, being old, are confined in a gigantic detention center, and live a gloomy life there. I opened the window only to see the dreary and dismal scene of concrete buildings, and people like me confined in small rooms that look like “cells (*sepo*)⁴³.” I shuddered while waiting in extremely long line to get food. A detention camp to reduce the economic cost for supporting the old people was built, and I was locked up in it. After I woke up from this dream, it also came up to me that people in the era of hyper-longevity that would come someday, might be living in the capsules filled with electrolytes as in the movie *The Matrix*, only dreaming. (Lee, 2012)

The special feature, titled “Happy Homo Hundred,” that came out later than the “Centenarian Shock” in 2011, focuses more on showing various ways in which this new era is dealt with in other places. This dismal imagery that came into his nightmare could have been a motivation for him to seek more and more hope from the positive experiences of aging elsewhere. Yet, the imagery itself that appeared with such concrete details and materiality of the concrete in his dream seems to show what he had to effortfully repress. Or, we may say that, while working on the future, he is already taken to the future, in the most possible gloomy way. It may not be only him. The prevalence of the CE discourse, has an effect. It is not hard to see the CE discourse is much welcomed and even supported by finance industry which will benefit from selling fear. The discourse itself is amplified in those venues where “retirement” becomes an issue. Yet, if a journalist who tries to find an alternative discourse to it has experienced, we may consider fear is more than a marketing strategy, and anxiety is not simply made up for the

⁴³ The use of this word “cell” is strange because this word in Korean does not have any connotation of confinement like prison cells. Furthermore, the journalist specifically used the Korean word for cells (*sepo*) which only is used for cells as a biological unit.

insurance companies and private financial institutions. It affects people by taking them to the future in which the old age is a problem that could cause certain sensation to make one shudder even in a nightmare. Even though people know that it could be a fear-based marketing, the financial institutions are selling promises on the fear that this discourse creates, it does not stop them from checking in with a financial planner. As we know, it is how ideology works at the psychic level while we practice it without necessarily believing it, while one hears the voice that interpellates a subject who recognizes it is hailing oneself and acts on it (Althusser 1971, Butler 1997). They are, while recognizing the “Centenarian Shock” is merely one among many possible futures yet to come, already in the discursive terrain in which one is supposed to link the longevity to the risks and their managements.

The discourse is not a mere hyped-up media discourse, as long as it provides an optic for people to see their daily encounters and circumstances from a perspective of the crisis of old age. It vividly manifests in the nightmare of somebody who is well aware of and critical of the discourse trying to craft a better, yet finds himself already affected by it in a visceral manner. It is telling that the journalist’s nightmare takes place in a detention center where he and other old people are confined in cells in concrete buildings, and his life outside of cells seems to be only shuddering in the waiting line for food. The image of this nightmarish world that the journalist proceeds with is the world made of incubators in *The Matrix*, where each individual is just dreaming without necessarily contacting other people. In this dystopic imagination, he is barely living, having lost contacts to the world, people, things, and their liveliness. These imageries capture life in which “one is not (really) living, while being alive”, which echoes with the phrase bio-insurance salesperson used “no more than dying day by day.” Not necessarily bare life in a sense Agamben uses the term, but barely living which could be the post-biopolitical form of bare

life, economized. The image of gloomy concrete-built detention camp that appeared in his nightmare, contrasting with the hyper-tech image of living without dwelling, strangely reminds of Agamben's camp, the paradigmatic site of the modern sovereignty. It is, however, only the appearance. The camp, as a paradigm of the modern politics, is a materialization of the juridical power that institutes its own exception inside itself, as a normalized site of the state of exception to the juridic-political structure of the modern nation-state. The journalist's nightmare of camp does not make any reference to the political power of the state, although it appears almost like a prison for the elderly not due to their political status, but due to the cost that they produces. The detention of the elderly in this nightmare could be seen as the temporal, yet indefinite suspension of the old population's rights to manage their life with minimal costs caused by their extended lifetime. The post-biopolitical welfare state cannot but keep them alive, but these unproductive, consumptive citizens are, in its own bookkeeping practice, counted as no more than costs. The success of biopolitical state in making people live and controlling its population ironically becomes its own failure. And, in one's own nightmare inflicted by the discourse of the Centenarian Era, it turns out to be not the failure of the state, but the failure of individuals that could not become a proper consumer citizen.

This nightmarish image is not peculiar to this journalist. A "scenario" of a disaster that opens *Chosun Ilbo*'s special feature (2011) on the "Centenarian Shock" depicts a day in the future, in 2040, of an old man, Chang. The story goes like this: Chang goes to the funeral of his friend's wife. But the friend does not know what is happening due to his dementia. Chang himself has recently been treated for his lung and gastric cancer. He is poor, but luckily is surviving on the pension money. However, since the society is suffering from enormous burden of low productivity, the pension fund is being exhausted. Chang goes to a protest for the

elderly's rights. During the protest, he gets a spam message on his mobile phone. 'Every old wo/man has the ideal to say goodbye to the world in reminiscence. *Die-agra* will let you go with no pain.' While Chang gets angry at the message, an old man next to him is peeping in his text message. The guy who looks dirty and ill would just glance at the advertisement as if a young woman stares at a fancy advertisement of luxurious purse. The figures of dement friend along with a cancer survivor left with poverty are personalized figures of the detention camp. The old man who is interested in the poisonous *Die-agra*, which may offer a better life choice than simply being alive, its termination, seems to capture the affective tone of the CE discourse perfectly well. When you are not prepared, your life is not worthy of living.

The power of this discourse lies in the way it evokes a paradox of longevity in the context of presumed biotech revolution and the crisis of biopolitical form of welfare state. Instead of "aging society" which presumes aging of the population at large as a problem, the CE discourse portrayed in the popular media emphasizes the two sides of prolonged life, or longevity. Longevity often expressed in the words like "centenarian", or "living up to hundred years" has been traditionally said to be the dream of humanity. The CE discourse does not dismiss that longevity is a human dream, but it can be only with health and wealth. Interestingly, longevity is to be suffered, unless one is prepared for. This discourse has been actively circulated and promoted by popular media, financial industry, and health industry. Financial institutions and health industry could exploit this discourse by emphasizing that the post-retirement years need plans and preparations. Unlike the "aging society" discourse that addresses the future of the nation, the CE discourse addresses the future of individuals. If you're well-prepared, you will enjoy the old age. If what is at stake was the shared future of the nation-state in "aging society"

discourse, the CE discourse, taking the crisis of welfare state for granted, advises individuals that their future could be different if they plan ahead.

Be prepared. Be aware. Be a manager of your own capacity that looks forward. In the Centenarian Era, one will see people suffering longevity: too little death, too long life, and too little security, unless prepared. The life after the retirement is a kind of surplus that no longer produces surplus value on its own (productive)—to deal with this life as surplus, one should also prepare surplus from now on in order not to be parasitic and hopeless. Scarcity of health and wealth in the future will certainly to come—one should be prepared for it. Productive years, or pre-retirement years, is time for accumulating for the consumptive years. The question is how to manage the resources within this time limit. Seen this way, the CE discourse is not simply a variation of “aging society” discourse. It is a discourse of management of resources in relation to the unfolding of time’s dis-abling effect over the capacity one has.

The first page of *Chosun Ilbo*, that opened the year of 2011 announced the coming of CE. Its title, “More than a half of men born in 1971 will live up to 94 years or longer,” was inserted at the last minute since the team of journalists that put together this series had to wait until the statistician, Yoo-sung Park, completed his calculation. They had all the articles written and organized. The only thing they needed to put in was the numbers that would strike people. Instead of using statistics that are offered by the National Statistics Office, they used data from Park, who was developing methods to modify the population data based on a premise that the development of medical technology would be much faster and its impacts on life expectancy would be bigger than it is reflected on the official statistics. It is hard to tell which data would be closer to what will happen in the near future, but the number has power. His prediction is constantly cited in the news articles and policy reports on the new era of Centenarians.

Biotechnological euphoria of extending human lifespan, the optimism about longevity becomes a part of this panic discourse. While extension of lifespan is presented as an already established fact through these numbers, the articles at any point presume that healthy life will be available to everyone. Indeed, in a hypothetical scenario they provide in one of the articles, it is imagined that discrepancy between two different classes is intensified—one with high-income, highly-educated, and healthy, and the other low-income, poorly-educated, and ill. Health and wealth will be ultimately connected more than ever.

BEING NOT-YET-ILL IN THE CENTENARIAN ERA

“Life Center” Chaum is a place where we may have a glimpse at the utopic future that will be available for the wealthy. Chaum has opened in 2010 in Chungdam-dong, one of the most luxurious neighborhoods in Gangnam, Seoul. Under the motto “The Power to Age Beautifully,” Chaum offers all sorts of fancy services to its members (who pay about 160 thousand dollars to join, and 4000 dollars for annual fees) that one may indulge in addition to the conventional medical check-up—spa therapy, palatable food, cosmetic care, and so forth. Chaum does not resemble most “hospital” from its interior design to its approach to health care. Stating that it pursues “prevention beyond treatments,” it promotes itself as a service provider that can find out the “Grey Zone, the state of neither health nor illness, where most people belong” to “ensure one’s healthiness, and filling in, taking care of, and taking responsibility for one’s unhealthiness, even though it is only one percent” (Chaum n.d.) Instead of diagnosing and treating diseases, it promises to take care of unhealthiness that has not turned into illness yet. Integrating practices and ideas from biomedicine, Korean medicine, and other types of alternative medicine, the center positions itself not as a typical clinic that only treats diseases but rather a “life center” that takes care of the gray zone in health to help people “age beautifully.”

The “continuous walls that ebb and flow, therapeutic colors and stimulating materials” fashions the center as a “healing” and “inspiring” place (KMD Architects n.d.). Conceptually designed examination pods called “cells” or “private hives” are where an individual client would stay for various examinations, while equipment, resources, doctors, and nurses are moving from one cell to another. Designed as a luxurious health care venue, particularly focusing on “power aging,” the center looks more like a boutique hotel with lavish amenities or a gallery full of art objects than a clinic filled with patients, doctors, and equipment. One may observe the birth of postmodern clinic here where not-yet-patients are coming to be taught how to take better care of themselves.

There is an artifact that does not necessarily go well with this meticulously designed luxurious interior appears as soon as you arrive at the second floor—a large canister for computer-controlled, automated stem cell cryopreservation system called BioArchive®. The canister stands out against the interior that emphasizes the fluidity and softness. And, it is not practically the best place to set up the cryopreservation system. While its appearance is a little bit obtrusive, it captures one’s attention as if it were an artifact in a gallery. If it had really been an art gallery, a docent would probably stop one here to explain about bio-insurance, and CHA medical group’s stem cell technology. The surface of the machine is embellished with the brand logo of the stem cell banking service for adults sold through Chaum—BioInsurance. Bio-insurance in the context of Chaum is a promise to take care of the diseases that might occur even with this constant and intensive care. If care provided by Chaum is focused on monitoring the trace of degenerative time on one’s body before it really turns into a disease, bio-insurance is to ensure that, even in an unprecedented circumstance, one still has the source of vitality to reverse

time via stem cells frozen in this canister that resists the flow of time. In addition, Chaum also provides anti-aging cosmetic care that utilizes stem cell technologies.

Chaum may not be representative of most hospitals in Korea, but it illuminates a certain trend. Its organization is rather future-oriented. While it provides “health care,” it is not registered as a medical institution, for it is by law prohibited for medical institutions to explicitly pursue profit to be used other than re-investing in the institutions so far, while there are ongoing attempts at allowing hospitals to make profits and allow capital flows between hospitals and outside (investors, for instance). Chaum seems to be an exemplary case of this transformation, referred as “the future that has already come” (Chun 2014). It is also a model for highly stratified health care provision. The move Chaum has made, while it has pushed it so far as to almost remove the notion of diseases from the health care, is not very divergent from the move that many hospitals are making—promoting medical examination as a “preventive care.” On the part of health consumers, there has been growing interest in early diagnosis through the exams. While the National Health Insurance Service offers low-cost check-ups for the insured, a growing number of adults are also seeking for more sophisticated exams from private hospitals at their own costs. Costly medical check-up has increasingly become an important source of profits for large hospitals, along with funeral service facilities attached to hospitals, as the fee schedule for treatments is kept quite low by the Health Insurance Review and Assessment Service. Recently, major hospitals in Korea have expanded the exam facilities, and are providing “premium” services at higher costs for “VIPs.” The check-up market is for not-yet-ill people, who may or may not turn into patients.

Chaum pushes this trend further by moving threshold for people who are in need of care by drawing on the concept of “*mibyŏng*” (“*mibyōu*” in Japanese; “*weibing*” in Chinese) from

Korean medicine, but modifying it into a temporal term. *Mibyǒng* is a word that combines two Chinese characters, *mi* and *byǒng* (pronounced in Korean). *Mi* stands for the state of incompleteness, or of not-yet, similar to the prefix *in-* in English, highlighting an indeterminate. *Byǒng* is a word for disease. It highlights the indeterminate state that is not necessarily illness, but still requires attention. This indeterminate state, the ancient Chinese medicine emphasizes, needs attention and care, as it is a state in-between order and dis-order, or order and chaos. However, the contemporary *mibyǒng* discourse in Korea utilizes the concept as a category to name the in-between itself, “gray health zone”, and refashions it similar to disease that can be diagnosed and treated as seen in the ongoing research project to develop “diagnostic categories” for *mibyǒng* in the Korea Institute of Oriental Medicine (KIOM n.d.).

Mibyǒng is a concept originated from ancient Chinese medicine. Describing the state of being neither healthy nor sick, the concept emphasizes the role of care before one becomes actually sick. Viewing disease as a kind of dis-orderly state, an old Chinese medical book, *Huangdi Neijing*, says, “using medicine after a disease already breaks out is treating [the body] after the dis-order already takes place. It can be compared with digging a well when you’re already thirsty, or fighting against a chunk of metal. How can one not say it is too late?” (Li 2010) Based on the philosophy that sees body as a set of energies in a process of seeking homeostasis in its interaction with external forces, for the state of order, the concept of *mibyǒng* highlights the virtue of constant care of body and attention to the balance between different forces. In a sense, it is related to a form of life that sees the body as a node in a complex network where energies constantly change and flow, rather than a distinct entity that is simply affected by external, pathological entities. The mode of self-care is not simply monitoring oneself, but also watching the cyclical changes in the energy flows, the natural law of world manifested in, for

instance, seasonal changes. One should, it teaches, act in harmony with the energy flow specific to each season (e.g. in winter when everything is supposed to rest, you too should take a break, waking up late, sleeping early) so that your energy naturally flows. It is a way of governing body as keep it in an orderly state. The concept of *mibyǒng* in ancient Chinese medicine, then, highlights the importance of governing body not as a biological machine, but as a part of worldly process. It is a virtue to follow the law of nature keeping the body in a state of order by allowing it to communicate well with the world. Only a foolish man goes against the virtuous way. Going against the virtuous way following the order of life leads to dis-order. Longevity in the ancient Chinese medicine was conceived as the outcome of living virtuously, following and responding to the order or nature and constantly keeping one's body in balance.⁴⁴

Renewed interest in *mibyǒng*, while inheriting the view that health and illness in continuum, highlights *mibyǒng* more of a specific state that should be identified and treated, highlighting it is the “not-yet” of the disease, and moreover something that needs to be identified and “managed” for anti-aging. The concept of *mibyǒng* is often said to be an alternative to the “limit” of biomedicine that only focuses on diseases without paying attention to complaints from patients unidentifiable to any disease entity. However, there is also a tendency to refashion *mibyǒng* itself as an almost disease-like entity seen in the KIOM's research project to develop standard diagnostic tools for *mibyǒng*. *Mibyǒng* clinics are already providing personalized care upon the characteristics of one's *mibyǒng* measured with diagnostic tools. While the practice of taking care of conditions that biomedicine does not consider as “diseases” is common in Korean

⁴⁴ The conception of body in Chinese medicine is ancient Chinese cosmology that puts emphasis on balance and resonance (Scheper-Hughes and Lock 1987).

medicine⁴⁵, and is familiar to many ordinary Koreans, naming it as *mibyǒng* refashions this type of care as a preventive measure on the potential diseases in order to achieve health. Health conceived in the *mibyǒng* discourse is not a state where disease is absent, but a state of perfection. Here, the threshold for health is set very high, not “normal” in the statistical sense, but rather “normative” (it is said less than 10% of Koreans are healthy), while the category of disease stays the same: *mibyǒng* fills in this gap, while portraying it as a critical moment of being at risk of developing toward actual “diseases.”

What the concept of *mibyǒng* does in this context could be seen as creating surplus health, which Joseph Dumit (2012) has developed in the context of pharmaceutical marketing. Particularly looking at the clinical trials designed by marketing and data produced by them, he draws attention to how moving thresholds (for instance, lowering the risk level for patients to be at risk) becomes means of adding more medications to people’s life, creating surplus health. In the context of *mibyǒng* treatments, the possibility to create surplus lies in the discrepancy between the normal and the normative, and the anticipation that not-yet-ill would eventually turn into diseases. Not-yet-ill people are similar to “patients-in-waiting” that Dumit describes, the subject of risk, while the category of *mibyǒng* which can encompass almost everyone who has certain complaints is much more flexible, and broad. Even the ones who are “normal” in biomedical terms could be *mibyǒng* patients who are at risk of developing diseases.

As such, naming of *mibyǒng* refashions discomforts of patients not just a temporary state of not feeling well, but rather as a moment in the process of bodily degradation. Instead of complaints that emerge in the bodily fluctuation, it marks a point of intervention that one should

⁴⁵ I use the term “Korean medicine” to refer to “hanŭihak” developed in Korea, which is mostly influenced by Chinese medicine, yet diverges from it as it is combined with other indigenous medical practices and ideas. It is proposed as an official English translation of hanŭihak by the Association of Korean (Oriental) medicine practitioners.

take action in order to stop the progress of bodily decline. The context in which *mibyŏng* reappeared in the Korean medicine discourse is also notable. Previously, *mibyŏng* has not attracted much attention in the scholarly discussion in medicine. One of few articles written in 1997 addresses *mibyŏng* as a general problem of the modern industrial society where most diseases are caused by “environmental pollution, life styles not favorable to health, and excessive stress” (Lee and Kim 1997:112), and posits *mibyŏng* research in continuity to the “preventive medicine” that has developed from the mass-health model that effectively dealt with the infectious diseases. More than a decade later, around 2010, *mibyŏng* reappeared in journal articles. It was also when the KIOM launched a research project on this matter. At this point, *mibyŏng* is explicitly connected to the national concerns about health and economy. For instance, a review paper on *chimibyŏng* (governing *mibyŏng*) sets up *mibyŏng* research as a method to solve the problem of “aged society,” demographic problems and increase of economic burden of health care for the elderly (Jin et al. 2012). *Mibyŏng* as a concept has also become a project that is oriented toward the future, as a preventive measure to the problems that would harm the health of population and economy.

Chaum approaches *mibyŏng* as a “gray zone” in health. In an interview with a news media coupled with an article on the “evolution of Anti-aging,” Se-il Cheon, a doctor who studied both biomedicine and alternative medicine, says, “if one is losing health but not yet diseased, or if one did not yet recover health although disease is cured, one is in the ‘gray zone,’” and “if you’re in a gray zone, aging comes faster because your own body’s anti-aging function such as immune capacity goes down” (Cheon, quoted in Kim 2010) If, as they assert, the majority of population is in this gray zone, avoiding degeneration of body and aging is rather an exceptional case. Since health is conceived not in terms of the “normal” in statistical sense, but

rather in terms of the norm, ideal, or perfection, it almost appears that our ordinary life is already lacking something, or indeed losing something—the natural capacity of body to resist aging. Here, the body appears to be a reserve of capacity, which however would only lose if there is no active intervention. While biomedicine has maintained certain optimism about conquering diseases by “locating” them in pathological entities (Canguilhem 1989), the concept of *mibyǒng* that Chaum promotes does not allow much room for this kind of optimism, but anxieties. Instead of the threshold that sharply distinguishes health from disease, or the normal and the pathological, there is a “gray zone” in which almost everyone falls between the ideal, normative state and the undesirable, pathological state. What makes this gray zone significant is the potential movement from it to the undesirable state. The notion of *mibyǒng* brings the undesirable future into the present health, calls for actions upon one’s life in its entirety. The idea that the body’s capacity to protect itself is weakened in this state signals that one can always slip into diseases without the very actions. The body’s reserve of vitality is not unlimited, and should be monitored, taken care of, and replenished, not because the person is sick right now, but because s/he is not yet ill, and will become ill without an action. It constantly says: change your lifestyle, otherwise, your body continues to accumulate the bad stuff from your life, and *mibyǒng* will grow into an actual disease. By bringing the future into the account, *mibyǒng* discourse creates “not-yet” as time to preempt future diseases. While it challenges biomedicine to some extent, it also works to create the surplus health market by asking people to suspicious of their own “health”. Health is an ideal to be achieved rather than an absence of disease. You cannot assume you are healthy because you have no disease. Your fatigue is a symptom of *mibyǒng*, the body’s signal that it is losing its capacity to deal with the degenerative force of time. Liveliness

is to be lost—without your own work of monitoring and managing aided by doctors who can advise you “personalized” methods to manage your *mibyǒng*.

Be prepared. Get examined. Monitor and manage yourself. You feel not well, but the doctor may say you have no disease. You are not ill, for sure. But, you’re not healthy, either. You are... *not yet ill*. Your body is accumulating risks while losing its capacity to cope with future problems. You should be suspicious of your health. What you have previously perceived as a normal distress, weariness, or discomfort is *mibyǒng* that indicates disease-yet-to-come. The rediscovery of *mibyǒng* discourse exemplifies how medical industry capitalizes on the temporality of “not-yet” by provoking anxiety over the future among the ordinary people. It is the “not-yet-ness” that is constantly foregrounded to create capitalize on people’s anxiety about the future.

In a luxurious “life center” where surplus health is actively promoted, a nitrogen tank, BioArchive® stands out as a promise that may hedge unforeseeable risks of losing the normative body despite the intensive efforts to manage future health. Young sports stars take photos in front of it for promotion. If we are always at risk of losing our body’s vitality for whatever reason, if we are almost always in the state of not yet ill, we should take actions. These young sports stars are not free from the degenerative force of time. Even though we could make best efforts to manage our not yet ill bodies, there is no guarantee. One solution, the canister seems to suggest, is to make another reserve of the vitality you already have. Another preparation to secure your lively body’s capacity... in the freezer.

SELLING THE “NOT-YET”

As a way of preparation, “bio-insurance” translates the matter of health into biological potential that one would lose if not taking action right now. It problematizes aging as an

inevitable loss of bodily capacity, and body as an aging thing in a linear fashion. It not only problematizes the future, but time itself, for the body is constantly aging at every moment. It implies that cells will also get old, losing their capacity and health. It is future contingency that is central in both existing insurance programs and bio-insurance, but bio-insurance adds another layer to it. Even though you're not recognizing it, your bodily cells are constantly aging. If you don't take action right now, your cells would become less valuable for future therapeutics. Insurance promotions attempt to generate anxiety about future by staging the risk as something one should be prepared for. If there is anything new in the language of bio-insurance, it is the value of the individual body and quality of life, which are rendered priceless, that need to be protected from the threat that increases upon aging. The loss in health cannot be reduced to monetary value. If you get affected by a degenerative disease and lose your leg, how can you measure the value of your leg?

When the salesperson explains what would happen if stem cells are not stored in case one is getting ill, what one does in the present (not subscribing the service) is a regrettable one, an unwise choice. The salesperson draws two pictures of future for the potential client—the promissory future of regenerative medicine utilizing stem cells for therapy for various diseases, and the unfavorable future of being affected by degenerative diseases for which stem cells need to be prepared. By presenting these two futures as imminent, bio-insurance marketing brings the future(s) into the present, and makes the present as the “not-yet” of future. Conceiving the present as the “not-yet” of future, one is urged to take action right now—not only for you, yourself, but also for your loving family; not only for your bodily well-being, but rather for the entirety of your future life. For the future is presented not as an indefinite one that is open to all sorts of possibility, but rather as a definite one in which one loses one's health, the action to be

taken in the present is obvious. “Save” health before you lose it. Further, save the youth before you lose it. Stem cell is a container of youth and health as you have now. As it promises to keep an opportunity open to the potential client, it is a promise on a promise of regenerative medicine, or stem cell therapy. In this temporal scheme, one is expected to envision the present in relation to the future, the present as a time for “preparation” for the future. The future is brought in to render the present as a moment to sign the contract for “bio-insurance.” The salesperson might not make any definite promise. It is not even promised if the stem cells would become useful. It only promises that one will have one’s own stem cells stored in the bank in the future.

Bio-insurance marketers explain that one needs to bank one’s own stem cells right away because the stem cells would lose their capacity when one gets ill, or even one simply gets older. “Healthy stem cells work better.” Quoting research data that relate bodily aging and the capacity of stem cells to proliferate, or differentiate, bio-insurance companies emphasize that it is better to store stem cells sooner than later. Here, the bodily aging related to the loss of cellular capacity makes the present, or “right now,” as a moment to take action. It is urgent because “now” is when you are healthiest and youngest. It is as if one’s body ages to lose its vitality in a linear fashion. While the occurrence of disease is contingent, its probability is supposed to increase in time, as one gets old. While the linear progress of time is supposed to leave trace on body in a degenerative manner, it is also anticipated to make real progress and development in science and technology. Banking stem cells is to utilize them for the therapy in the future. While many diseases are listed for potential candidate for stem cell treatment, most of them are still being experimented, and it is not certain that those treatments will be available in the future. However, the companies emphasize to the potential clients that there are ongoing researches around the

world that evidence the future availability of stem cell treatments. Here, the present is the not-yet of the future, the moment for preparation.

At first sight, it appears that what is being sold is the “hope” for cure, the opportunity to have hope in the future. It is a selling of promise on promise. However, to have hope with this particular cell banking service, one needs to imagine the unbearable future first. Rather than assuming that you will simply get old, it asks you to imagine yourself in a sickbed. Buying insurance policy is to hedge against future risks. When one gets sick, the insurance company promises, the costs would be covered. You never know if you will get sick in the future, but you are sure that your illness would cause financial burden to you, and your household. An insurance policy asks one to translate one’s life circumstances in monetary terms, and it is developed in a way that translates various possible life occasions into risk profiles whose economic “value” can be calculated. Rather than being a method to hedge against risk, but an insurance policy constitutes risk in financial term, accordingly a specific kind of future for which one needs to prepare financially. As various forms of care have been commercialized, not only medical care, but care for patients and seniors, it would not surprise us to hear an insurance company tries to attract you to buy a dementia insurance for your parents saying “if your mom gets affected by dementia, you will get money, the cost to take care of her.” Yet, to get attracted by this proposal, one should already imagine your mother in dementia as a costly burden, and contemplate whether the promised cost coverage for the uncertain event is a promise worth buying. An insurance policy is not simply about the future risk. Indeed, it requires a form of subject who can translate life circumstances in terms of cost, financial terms.

If the conventional insurance programs translate this health problem into economic terms, bio-insurance promises it will do what the traditional insurance cannot cover by replenishing

injured tissues. In a sense, “bio-insurance” requires a subject who links aging to degeneration of bodily capacity, which can be, to some extent, enveloped in an entity that can be frozen and stored. What makes “bio-insurance” a plausible business plan is the idea that stem cells can be isolated from the bodily environment and stored without losing their capacity. In doing so, it is expected that the biological clock that governs the cellular aging can be suspended. If traditional life insurance is an instrument that works because life circumstance can be calculated in monetary terms, bio-insurance highlights that it cannot be calculated, but needs to be prepared by storing the vitality that can restore bodily function with the cells’ capacity. If life insurance in general focuses on the money’s capacity that helps one deal with the life circumstances, bio-insurance brings back the cells’ capacity to replenish the body. Money comes in again in this picture as a capacity to buy and ensure that one would have the chunk of vital tissues in the future. The promise of vital capacity that will replenish dis-abled body, which is priceless, which will make the value of your investment incalculable. While it appears that biovalue as Waldby (2002) conceptualizes as the yield of vitality is at work quite literally here, its currency, in this particular case of bio-insurance at least, is heavily dependent on the potential loss of vitality in one’s own body imagined and anticipated.

Be prepared for the future of regenerative medicine. Be prepared for the degradation of your body. Be prepared for the decline of your vital capacity in stem cells. Look at Christopher Reeve, Muhammad Ali, and Michael J. Fox: once lively, more lively than anyone else, they show what would happen to you if you’re affected by incurable diseases. Bio-insurance promise to give a “normal,” or rather “normative,” lively life to you, who otherwise may struggle with those devastating conditions while not dying. Prepare for the future in order to live lively. Living with “unhealthy,” “dis-abled” body might be more deadly than dying itself.

BE PREPARED. YOU ARE INDEBTED.

The surplus vitality in stored stem cells whose potential is to be realized in the future, in the marketing language of bio-insurance, promises healthy life against surplus, superfluous life. What bio-insurance promises is not simply extension of life by treating some fatal diseases such as cancer. It rather promises the “quality of life” by curing degenerative diseases that would disable one’s body and make one dependent on others’ care. With the vitality of stem cells stored in the bio-bank, one will regain the capacity to fully enjoy one’s life as an active, healthy, capable, and self-reliant individual for which one should be preparing. Bio-insurance business capitalizes on the anticipation for the realization of the potential of stem cells. Indeed, bio-insurance can promise unspecified healthy future precisely because there is a temporal gap between the present in which stem cells’ vitality stays as unspecified potential, and the future in which it may or may not be applicable to specific diseases. The promise is sold to people who are still healthy, but anticipating degeneration of bodily capacity and degenerative diseases. If stem cells are seen bio-valuable in this context, it is because of this “not-yet-ness” of stem cells’ potential and people’s health. The creation of “not-yet-ness” itself enables the companies to accumulate surplus value. Then, the subject of this marketing is also urged to see themselves as “not-yet-ill” persons whose future would be bettered by the not-yet-ness of stem cells. By constantly emphasizing the uncertain future, bio-insurance marketing aims to speak to a peculiar kind of subject, or interpellates a specific kind of subject—a not-yet-ill subject that is anxious about one’s own future.

Of course, technologies of stem cell extraction and preservation are important infrastructure for this business. And a similar business model can be found elsewhere. For instance, cord blood banking has been popularized in many countries as a kind of “biological

insurance” for newborn babies. What bio-insurance business in Korea highlights is a specific articulation of surplus vitality and promise of regenerative medicine with anxieties about the future through bodily degeneration and the modality of self-care through preparation. Bio insurance people say that one should bank one’s own stem cells before they lose their capacity. Resonating with the discourse on aging, bio-insurance also asks people to “prepare” for the uncertain future with a promise of regenerative medicine. As I showed by comparing the CE discourse and the “aging society” discourse, it is again about the individual’s future—not necessarily related to the productivity of body envisioned in the industrial mode of production, but rather related to the capacity to enjoy one’s life. If stem cells are thought to have value, it is not simply because they have the biological potential to regenerate bodily tissues. One interesting site in which stem cells are valued is in anti-aging business that constantly posits time as a force that dis-ables body. Time here is not simply duration, but filled with everyday circumstances through which body will accumulate bad stuff. In addition to “natural” or “normal” aging, body also accumulates harmful substances and stress. The body, as it ages, anticipates degeneration. Stem cell technology promises, by suspending biological clock and maintaining the regenerative capacity, to restore bodily capacity, fight against the dis-abling force of time.

Bio-insurance sits in these double movements of time as long as both are taken for granted. Faith in technological progress and anxiety about surplus life years (without liveliness and livelihood) are both at work. Curiously, the social/political/economic/cultural appears ever more recalcitrant, while the biological appears ever more malleable. One should be prepared based on what one could predict from the given social circumstances, for the entirely different future that is to be brought by biotechnological innovations. And, in this discursive field of

“preparedness”, financial thinking is urged as I noted in the previous section, but in a twisted way. If capitalists would “deliriously” (Cooper 2008a) imagine an exponential growth without limits, or limits to be overcome and generate more value, the subject of “preparation” rather imagines the limited reserve of vitality, wealth, and time. For capital, the old age is another site for valorization through various means of creating the new norms for the old age through plans for financing and health cares as well as medical products and services for rejuvenation and longevity. For the subjects of preparation, those are not simply promises, but also instances that provoke more desires and anxieties.

Be prepared. But, for what? The future. But, what kind of future is it? Is there any other future available? The future envisioned in the three sites that I have explored in this chapter is a particular kind of future where one should rely on one’s own capacity, the reserve of health and wealth for liveliness and livelihood. It is a future where medical technologies and capital would both exponentially grow, and people would benefit from them as consumers. To paraphrase Jameson, it seems easier to imagine the end of mortality than the end of capitalism. Perhaps, that is why “preparedness” matters so much at this juncture. In this mode of preparation, how to manage this limited reserve of health and wealth, how to distribute it to the extended temporal zone becomes an important matter. To be prepared, take action for the future-you. You are already indebted to your future that will be much longer than you have imagined to be.

The Ants and the Stem Cells

Just do a quick search on the Korean newspaper database with the key word “stem cells.” The articles that mention “stem cells” are found most frequently in business newspapers, almost twice as much as general newspapers. These search results include not only extensive coverage of stem cells, but also brief reports that simply mention “stem cells.” Still, it is noteworthy that the business newspapers have become the most favored venue for “stem cells” to meet the public. Actually, the public that stem cells meet is a very particular kind of audience—personal investors called “ants (*kaemi*)” in the Korean stock market vernacular. Some news reports will be found only in business newspapers—for instance, a stem cell therapeutic X was extensively covered by the American media. One more: the articles on the business newspapers are read not only on the paper or the online news websites, but also on the news windows of the Home Trading System (HTS) that personal investors use to trade their shares. It is probably on the HTS window through which the ants meet the stem cells, where “stem cells” appear most promising. These news reports are regarded as the “raw materials (*chaeryo*)” for speculators, good or bad. “Raw material” is another Korean stock market vernacular. It refers to stories that might influence the share value. Calling favorable news reports “raw materials,” the term mostly used to refer to the things that are needed to produce something, indicates the materiality and productivity of those stories in the stock market.

Those stories are the stuff of “dreams.” In the Korean stock market, people often say, “stocks live on (*mökkö sanda*) dreams,” and more specifically “biotech stocks live on dreams.” “Dream” here highlights the overt future-orientation in the speculative stock market, and the necessity of dreamers who are willing to buy the securities, the right to have some shares in the

dreamed-of future. What is assumed as the opposite of the “dreams” in this phrase is the company’s actual earnings (*shilchök*), the records of the past, things that are already and actually achieved. The phrase, “stocks live on dreams,” is mostly used when explaining bubbles in the share values of companies that have not generated substantial earnings, but anticipate that it will happen. The *fiction* of the stock market that the company’s share value is related to its actual productivity is untenable, but some would conveniently say that it is the reflection of the future value, a kind of *fait accompli*. The value of the stock that “live on dreams” then is an imaginary reflection of the future based on the potential that the company supposedly has. The value of stocks then is not necessarily the value of the company as it is, but the value of the promise that it has made on its future value. The company’s prospect can be taken as a promise to the investors about where their money will go and how it will return something in the future. While the future has not yet come, the “raw materials,” news reports that are often based on the company’s press releases, about all sorts of things that show they are getting closer to the promised future give flesh to the present and future, and to the promise itself. Those news reports signal that something is happening, draw investors’ attention, and make them dream.

If the stocks live on “dreams,” there should be someone who “dreams.” The dreamer’s dream might be absorbed in the process of the growth of share values. The phrase “stocks live on dreams,” might simply mean that the value of stocks reflect the expectations about future, but it is not a simple “reflection” if we consider the flows of money and the movements of hands that are taken to assign a price to the expectations. Whether it appears to “reflect” the present earnings or future expectations, it is only possible when actual money is put into trading, somebody paying for the securities, the right to have shares in the company’s future. Of course, the “finance capital” could appear to be capable of moving without much restriction both in

terms of its directions and scales, and each company's stock may not matter so much to professional traders, the operators of the machinery of finance capital. However, for the small-scale personal investors, whom I will call ants following the Korean stock market vernacular, the stakes are higher. When they invest in the stocks, they invest not simply a certain amount of money as capital, but invest money on which their futures depend, money in which their dreams are invested. The money they put in the market has their future histories already, and the share value is not simply a reflection of expectations or supply and demand, but also a congealment of those personal dreams.

The dreams of shareholders of a Korean stem cell company, MediPost, who gathered online under the banner of the Ant Revolution, are congealed in its share value, while the share value constantly fluctuates. This “revolutionary army” of ants, who dreamed of becoming rich with their investment in MediPost stocks, once made a great spectacle of collective speculation. This chapter recounts a story of the Ant Revolution that illuminates the processes through which promises *enliven* and *are enlivened* by the promises' crowds—ants— as they take the promise seriously, trade on the promise, and create volatile movements in the stock market. Looking at the stories that ants, small-scale shareholders, who participate in the stock market, tell themselves, I will discuss how these meager actors, their desires and passions are absorbed in the larger circuit of constant movements and valorization of “fictitious” financial capital while giving flesh to the “fiction.” What kinds of futures are dreamed of among ants that invest in stem cell stocks? How does the dream come to feel “real” to ants, even when the promised future is constantly deferred? How do ants, and their active investments give flesh to the movement of fictitious capital? And, what do their dreams tell us about the fabric of social life in Korea?

Ants may not appear as “significant” actors as the actors that operate the machinery of finance capital. While social studies of finance have drawn attention to various actors that are involved in the financial market, these studies mostly focus on the upstream knowledge work of the financial market that becomes the “engine” of the financial market (MacKenzie 2006, LiPuma and Lee 2004), or the culture of financial experts who actually operate the machinery of finance (Zaloom 2006, Miyazaki 2013, Ho 2009, Lépinay 2011). They show how “finance” and its peculiar epistemology are made real through arduous knowledge and cultural labors that take place to make “finance” work. As the discussions on the “financialization of daily life” show, the logic and methods of finance do not simply stay in the financial market, but permeate everyday life of ordinary people (Martin 2002, Langley 2007). Ants are one of those everyday investor subjects who directly engage with the stock market in anticipation of high return on their risky investment/speculation. While they try to assimilate the techniques, knowledge, and cultural values of professional and successful financiers, their position in the market is different. Rather than working as the hands through which capital flows, ants are the ones from whom money is turned into finance capital and is absorbed into the capital market. While they appear as odd figures in the financial market, they are the ones who become the “fuel” for the market.⁴⁶

⁴⁶ The term “ant” first appeared on the newspaper in 1987, when the Korean economy was booming (with trade surplus) and newly emerging upper-middle class Koreans started looking into new opportunities for “investment.” The second stock market boom in 1999 which emerged out of the increased interest in personal finance (post-crisis), and speculative atmosphere in the Korean dot com boom, which made ants more visible than ever. Ants occupy a significant portion of the Korean stock market, especially in the KOSDAQ, a Korean benchmark of the NASDAQ exchange. As of 2012, 3.5 million personal investors, about 13.7% of the economically active population in Korea, were directly participating in the Korean stock market by actually trading stocks. They are not necessarily financially savvy, rich elites, as one might imagine from the word “personal investors.” They are ordinary people—the housewife sticking on her computer screen after sending her kids to school, the white-collar worker checking the stock charts on the smartphone during work hours, or the construction worker who just invested all his savings in the promising stock that he heard about somewhere. They might be handling only a limited amount of funds, but they as a whole occupy a large portion of the entire market—maybe not in terms of capital they own, but in terms of trading volumes they make. Indeed, the 90 percent of trading volume in KOSDAQ exchange is being made by these ants.

I discuss below how the dreams of these ants animate and are animated by the fictions of vitality—the liveliness of stem cells and the market. The promise of stem cells to revitalize old and damaged bodies is at the center of these ants’ speculation on the stem cell stock. The first stem cell therapeutics the company put on the market treats knee cartilage defects which are quite common conditions among the Korean elderly. The second in the pipeline—one that these ants are really looking forward to—is for Alzheimer’s disease. As the vital potential of stem cells unfolds with MediPost’s technology, it will have accrued enormous profits from the ever-expanding market of aged populations. Here, the vitality of cells is imagined as the solution to the problem of aging. Interestingly, the shareholders will constantly see the market potential of stem cell therapeutics from their daily life—the evidence that their future projection was valid, and that their investment will turn out to be successful. It is not only the promise of stem cells, however. The site where this promise is speculated upon is the stock market, and the wealth that they anticipate can only come from the market’s movement. The lively market where the share value can be raised is anticipated, and it is also remembered through the bittersweet memory of the Ant Revolution. I call them fictions not because they are made up, but because they are the works of imagination that craft and fabricate plausible narratives about the possible world or future out of the materials at hand. And, these fictions appear plausible with the details that give flesh to the narratives. The stock market, within these processes, becomes a site where the promise of stem cells is substantiated and proliferates. It is a site where the promise is partly fed by the dreams of ants. The bittersweet memory of the Ant Revolution that I will recount in a bit is an odd instance of this. But, let me start with “ants” and clarify how I approach their stories.

FICTIONS OF THE STOCK MARKET

“I’ve been investing in stocks. Stock [trading] is an amazing *window* to read the real world. We do not feel how the conflict between Israel and Palestine affects us in our daily life. It’s good that the influence becomes palpable when *doing stock*. It is a window through which the acute reflections of everything come to me as real things,” said Chung-joon Lee, a prominent Korean novelist (MK Business News 2002). After a year of intense experience of stock trading as an ant, for a year from April 1998, he wrote and published a short story, “The Time of a Poet.” It is a story of a poet and his stock trading experiences. It is a story about a poet who entered the world of stock trading after being fired from his job. Despite his wish to dedicate his forced free time to writing poems, he was somehow led to the world of stock trading by his sister, an affluent housewife, who was feeling pity for her brother. The account that she opened for her brother, the “poet,” opened a window to another world. He started reading business sections, learning how to trade online, and spending the market hours in front of the computer. In the end, the poet, like most ants, would learn that how the stock market, at least in Korea, is easily manipulated by the big investors and foreigners, when it became clear that it was not *his* game, but *their* game. The short story is apparently based on the novelist’s own experience who came to see the world and feel the world’s connectedness through the terms of finance.

In the beginning of the story, the poet’s sister persuades the poet to start stock trading. She says it would make his life more lively: “unlike gambling which is contingent simply on luck, you should carefully and deeply read the world to make money from stock [trading]. You should be alert and lively to do so. You will learn about the world and about people in that vigilance and liveliness (Lee 2000:166, my translation).” And, it was true—the poet started vigilantly collecting, analyzing, and assessing all the information to determine what to trade. The

information included not only things related to economy, but “things that do not appear very relevant—from political events in and out of the country, to big events like sports games and film festivals, and unpredicted weather changes and some rumors on the street (174).” For the poet, the stock trading is a kind of literary activity:

Ultimately, it was *reading* what’s hidden in people’s mind, and reading the world that is living and constantly moving. [...] Hence, the fruit of hard-won victory ([I had] proud perseverance and difficult tests [of temptation] no less than to any other task!) appeared to offer a much more safe and solid basis for the *productivity* of my life, and the sense of accomplishment and secret confidence seemed to guarantee the precious faith in the world and in myself—yes, it’s quite *living the world!* In a way that I can see [the world] in front of my eyes and hold [it] in my hands! (174-5, emphasis added)

It is telling that the prominent fiction writer, via a fictional character, has found the real world and real life within the world of “fictitious capital,” in the speculative stock market. The “fictitious” capital for Marx is capital that appears to be, and assumes itself to be dissociated from the actual expansion process of capital, such as the exploitation of surplus labor by industrial capital. The “fictitiousness” in Marx’s critique of financial capital (1993) highlights the insanity of its illusory conception in which “every definite and regular money revenue appears as interest on some capital,” in other words, capital always assumes “automatic self-expansion” as its own properties. Here, Marx’s notion of fictitious capital raises a question of capital’s imaginary, its automatic fetishism that sees itself as an interest-“bearing” capital, as if its reproduction and further growth were its own properties.

The fiction writer, Lee, has found the insanity in the stock market, too, albeit from a different place. It becomes clear by the poet’s brother-in-law. When he was asked if anyone would be able to predict the share value of his company, he says:

No, no one would know [about the value of the stock]. To borrow words that the literary folks like you often use, there is the market’s own desire that nobody knows in the stock market. [...] the information system of the stock market is a gigantic desiring body that nobody [...] can control—it infinitely desires the desires of every individual, [financial]

institutions, and foreign capital, and further the autonomous desire of the market itself. It will desire and control the whole world. So, even the spirit of the stock market would not know about the movement of the share value [...]. It itself is destined to desire its own desire and to be controlled by it (204-5).

Facing the almost insane speech about the insanity of the stock market from his brother-in-law, the poet thinks, but does not say, that the conclusion about the invincible mechanism of the market, the desiring machine, only makes one lose faith in oneself, one's own company, or the world itself. It is one of the moments of realization that what the poet himself considered as "living the world," while reading all the things about the real world to predict the movements of the share value, is not really living in the real world, but rather living in a strange fictive world in which anything can be fabricated by words and stories. The fiction that he was holding onto is the correspondence between the real economy and the stock exchange, the real world and the world of finance. It is a spectacle in which ants were supposed to be only spectators, while ants felt it very real as participants—like any good spectacle would do.

The power of fiction in the stock market is obvious, and the fictions are what ants live with, what enable ants to hold onto the promise of becoming rich through their investments. "Unlike gambling," the stock market can be productive if one is equipped with proper techniques and knowledges about the real world and economy. The fiction of good investors and the fiction of real economy connect ants to the world of fictitious capital in a particular way. It is true that most of them have already been connected to it as soon as they save money in their bank account which has been the most popular and reliable way of investment until the mid-1990s (thanks to the high interest rates). However, the more direct form of investment in the financial market, via stock trading and stock-related mutual funds in the volatile and speculative economy which became much popular since the 1997 Asian Financial Crisis (which is dubbed as the "IMF Crisis" in Korea) has added another layer to it. Money has the potential to grow on their own,

they should grow, and there are better ways to grow money—one should become smart, become a master of “*chae-tech*” (technologies of wealth management), and find good opportunities by closely reading the changes in the real world and in the market. What the poet, after living as a smart investor for a while, realizes is that he himself is not the “player” who knows how this game works, but only the spectator who is allowed to enjoy the market itself and has to pay the “fees” for watching it. And, the game is much dependent on the stories that are told to seduce the spectators.

Lee’s short story captures several important points on “ants” as speculators who try to read and craft fiction-like narratives about the market and the real economy in their trading activities. Written from the perspective of an ant, Lee’s story draws attention to the stories that are circulated in the stock market from which the ants try to formulate a meaningful narrative that might tell them something about the future of each company, stock price, and economy. In a sense, the ant is writing one’s own fiction, by “reading” people’s desires and feelings from the text of the real world. The poet was writing and reading a fiction of the economic game in which he could feel as if he were connected to the real world, and as if his active reading of the world promised a kind of “productivity” evinced by the numbers of his accounts. Yet, the productivity, it appears, is only a product of the market itself. And, in the conversation with his brother-in-law, the poet comes to realize his faith in the correspondence of the company’s value and the share value is not tenable, which was a convenient fiction that has rendered his imaginary productivity real. But, as his observation of ants as the “spectators” who are invited to the game of big speculators suggest, the place of ants in this market is strange—their presence appears not important in the market itself in terms of the scale, but they are actually needed for the players to make the game bigger and to realize their profit. Indeed, it is common knowledge among ants

that they “become the fuel for the market. The locomotive of market runs, fueled with the sacrifice of personal investors that are constantly introduced to it” (Park 2008). Yet, the fiction of smart investment works—as long as ants try to find good stocks and make good investments in anticipation of great returns. It is telling that the quote, ants become the fuel of the market, is from a self-help book on stock investment—ants know what it is, but they still do it. At the end of the short story, Lee’s poet sold off all his stocks and exited the market; Lee, the novelist, himself could not do so until his short story was published. While the stock market was anticipating a downturn, he was still seeing the potential to gain a little bit more.

ANTS AND THE STEM CELLS

As long as there are ants who search the potential to grow their own money, stories flourish. Stem cell stocks have been one of the places where ants occasionally swarm, given the attention that has already been paid to the potential and promise of stem cells. In the Korean stock market, “stem cells” has been one of the “themes” that attract investors with promising stories. After the first KFDA approval of Hearticellgram-AMI, a mesenchymal stem cell therapeutic for acute myocardial infarction in June 2011, other Korean stem cell companies also enjoyed the sudden increase of the share values for a few days. One business news reporter observes (Jeong 2011): “the fact that it was the ‘world-first’ ‘stem cell’ therapeutic approved by the government has stimulated the imagination of the market. The misleading image of ‘stem cells’ that emerged with Dr. Hwang Woo-suk is at work. There are representative images: it appears that the paralyzed patient simply stand up if they get stem cell injections, and we could easily make any bodily organ that we want.” The news reporter goes on to call for a more realistic assessment of the company’s fundamentals, and alarms the readers about the possibility

that the “stem cell bubbles” would collapse, as it occurred in 2005, the year of the Hwang Scandal.

In contrast to what scientists say about it (we should overcome the “Hwang Woo-suk trauma”), stem cells have always appeared to be promising to ordinary people “since” Hwang. The fact that the share values of three companies that are unrelated except that they all work on “stem cells” often move in the same direction is also telling. It is quite common in the Korean stock market, especially in the KOSDAQ exchange, that many different, unrelated stocks form one “theme” and their share values often move collectively. “Story stock” might be the closest English term to these “theme stocks (*temaju*)” except that the theme stocks can be much more inclusive and general—in a sense, theme stocks are much more speculative and based on quite liberal, sometimes random, associations. “Stem cell” is one of the themes, which has been quite popular since 2005. MediPost is one of those stem cell themed companies. The company is also been considered part of the “senior welfare” theme, “countermeasure to low birth-rate” theme, and “bio” theme, and so forth. The themes that MediPost were tied to address certain kinds of futures: the aging of population, the necessity of state intervention in the decline of population, and the promise of biotechnology to enhance people’s life. While many themes rise and decline, sometimes only lasting for a few months before the election that becomes a venue to talk about the future of Korea, the stem cell theme has been around since Hwang’s rise and decline.

Savvy at utilizing the media to get attention, stem cell companies have been releasing lots of news that is potentially generative of momentum for speculation in the stock market. And, anything can become news: not only news that appear to be closely related to the company’s fundamental values such as the issuance of patents, or successful clinical trials, but also news that somehow show the potential of the company’s future can become news. Anything, and

everything: publication of papers in scientific journals, approvals of the clinical trial applications, anecdotal reports on the improvements in patient's conditions after stem cell treatments. These news reports are called raw materials. They are promising stories out of which the share value can be built in the market. Not only company-specific news, but also news about the policy change regarding stem cell research and treatments are considered to be great raw materials. While those news reports often do not explicitly address what they promise, there is readiness among speculators to see the news as promising ones. For instance, when a researcher affiliated to one of those stem cell companies finally got an approval from the National Bioethics Committee for his team's "therapeutic cloning" research, which many news reports referred to as "stem cell research in Hwang Woo-suk style," the share value of the company went up in quite an impressive manner.² Not only the final approval, but also the submission and revision processes were all taken as great raw materials. While the media attention on the bioethics review process could be related to the memory of the Hwang Scandal and the ethical controversy surrounding SCNT-hESC research, it is noteworthy that it has worked to generate speculative momentums in the stock market, and the company's share value was multiplied by about ten times. While the news itself only addressed the possibility of starting a specific kind of research which had indeed failed a few years ago, it was perceived as promising. Yet, the stock market, with the readiness of ants to see certain glimpse of promise to utilize it, gains the force for its own movements.

For ants, stem cell companies, with the relatively high and sustained attention, appeared to be a good target for speculation. Although these companies often do not have good sales records and the stocks appear overpriced, their stocks are traded and priced upon the stock market axiom, "biotech stocks subsist on dreams." Stem cell companies, too, constantly feed

news into the market maintaining the appearance of impending success. For ants, stem cell companies, with the relatively high and sustained attention, appeared to be a good target for speculation. Although these companies often do not have good sales record and the stocks appear overpriced, their stocks are traded and priced upon the stock market axiom, “biotech stocks subsist on dreams.” The stories give flesh to the vision of stem cell companies adding to the credibility of the companies. When the news flickers on the screen, it anticipates ants that are sitting on the other side of the screen, watching the news, ready to find it promising. Some stories sound more promising, when they touch on the desires that are prevalent among ants.

FLESHY PROMISES OF THE ANT REVOLUTION

In the opening scene of *The Scam*, a Korean crime thriller movie, made in 2009, that takes place in the stock market, a stockbroker talks to his client on the phone and says that the Korean stock market, despite the global financial crisis, is a great place to invest in. He refers to ants as the reason: “People talk about the global recession and liquidity crisis. But, there’s no better *chae-tech* method than stock [trading] in Korea. You heard about ants, those folks who just listen to the stories other people tell and invest with *kam* (hunch)—as long as they exist, the Korean stock market will never collapse.” This scene illustrates the character of a cold-blooded elite stockbroker who takes for granted that these ignorant ants would always provide the sources of profit in the stock market. The movie, indeed, revolves around a scam team that manipulates stock prices by massive trading and garnering attention to a specific stock through the media, to take advantage of ants. While the movie only illustrates a scam that was orchestrated explicitly targeting ants from the outset, the opening line suggests that there might be something that ants do for the Korean stock market at large. They contribute to it by swarming into the market with their money and losing them somewhere in the market. While it is openly said that the Korean

stock market is “ant’s hell,” ants would still see that the stock market promises, while not guaranteeing, high returns as their money moves in the market.

Most ants in Korea acknowledge that they might always become prey to the big players in the market. Ants, if they are just normal ants, are destined to lose—not only because they are not good enough, but also because the market constantly seduces them by selling stories about the future. Many have seen how scams drive ants to the helpless situations, but those scams are also seductive in the speculative market. One can double, triple, or whatever their original investment within a few days, if there is an ongoing scam, which is much prevalent in the KOSDAQ market. But, it usually works in a way that trap many ants that buy the stocks at a really high price and get caught because the well-crafted bubble is over. To the observers of the Korean stock market, it appears that the stock market always tries to seduce ants when they need to raise the value of stocks, and takes advantage of them by making ants take up less valuable stocks. When Yurina declared the “Ant Revolution” by holding shares of the promising stocks of MediPost, it could speak to ants who know that ants have always been “prey” to the big forces.

“Today is the day when ants start a revolution in this stock discussion forum. I stake my all in this, I hope to bring about ant revolution. While I write this, I hope you to remember today, June 20, 2011,” declared Yurina. Yurina, or Captain Ant is an online persona. He had been posting his own opinions and analyses of the trend in the Korean stock market on daily basis on the open stock discussion forum. On June 20 2011, however, he made an intriguing move. He recommended a particular stock to invest in. MediPost was the one. He stated that the company just filed with the KFDA the phase-3 clinical trial report on CartiStem, their allogenic cord blood stem cell therapeutic for knee joint cartilage injury, which has great market potential considering the growing number of aged population, who suffer from this condition. He emphasized that this

is, different from other available treatments, “cure,” not just treatments, telling that cartilages in the knee joints that are “worn out” treated with CartiStem grew like those of “little babies” that are just born. This “miraculous cure” would come out soon in the market, which would generate an incredibly large profit, and increase the value of the company. In addition to this, “Invest in the companies that will grow in the future, guaranteed companies like MediPost which is not just a fad or bubble, and go out to play, then the share value will go up as day goes by day. Further, you will feel proud of becoming an owner, as a shareholder, of a pharmaceutical company that cures disease, rather than companies that make alcohols or weapon.” The value will grow, because the company has enormous value—CartiStem will be well sold to the ever-growing market of the old population, and the company has more therapeutics in the pipeline including treatment for Alzheimer’s disease (here Yurina said “dementia”), which will turn into the biggest medical market as the aging of society continues. The potential of stem cells for regeneration becomes the potential for the company, and for the growth of share value at the same time. Its backdrop is, of course, the aging/aged bodies.

Yurina convinced ants on the board that MediPost stock would make ants rich. The company’s stock, in his view, was undervalued at the moment, and it was great timing for ants to get hold of these stocks. Yurina emphasized timing: once big actors like institutional investors got interested, there would be “no seat for ants to sit in.” He continued writing on the discussion board, and whether it was coincidence or not, the share value started going up. The share value which was only 29,350 won on June 17, 2011, before Yurina’s prophecy/manifesto, went up to 42,050 within a week. At the end of the next month, the value doubled, even though there was no significant news during the time. Yurina became a leader of his followers, or the Crews, who would call him “Captain Ant” of the Enterprise Medi (*medi-ho*). In a posting (July 28, 2011), he

proposed to promote MediPost stocks to other people. He reasoned that a MediPost share is share for: hope, insurance, revolution, and value. Yurina’s posting was not written like an analysis report. What was characteristic of his posting at the time was the way he sets up his audiences as “ants” who have no power and not much money. “It is a share for hope through which [ants] dream the future. [...] It is a share for insurance that turns your anxieties into happiness.” And, ultimately it is a share for “revolution.”

Ants have never won institutional investors, foreign investors, and *seryŏk* (big/powerful agents in a Korean stock market slang), but we, people, the ant collective, could make a victory against them through MediPost. “Ants, who once were only waiting for the sky to bring rain, now dig the soil to make a fountain with water.” For the revolution, those ants were mobilized to trade stocks. Although Yurina framed the investment as a “value investment,” investment in an undervalued company, the way these ants were supposed to participate in the revolution was fighting in constant battles to raise and maintain stock price as high as possible. Inverting the image of Ants, Yurina made the practices that are quite close to stock price manipulation as a revolutionary act. If those powerful actors want the price to be down, ants are supposed to support the price. Everyday was a battle; each “crew,” following his order, was expected to make efforts to support the stock price. Buy more; if you don’t have money, sell your own stock to buy at a higher price. A lot of investment of time and money was demanded. When the ants recount each day’s battle, they use the language of belief, hope, and fraternity. What Yurina touched on is not only the desire of becoming rich among ants, but also the ants’ own exegesis of the market that the stock market is a battlefield between different forces, a money and psychological game in which ants are destined to lose. The big forces, investors equipped with large capital, manipulate ants by various means—by manipulating the trading trends, prices, and stories.

Against this big force, Yurina offered a vision, or rather promised that ants, if working collectively, could win: the credibility of Yurina's promise lies partly in that he touched on the desire of ants to win in the battles by using their personal investments as a collective means to win in the battle with the big forces of finance capital. The journey of the Enterprise Medi appears to be a pilgrimage toward a promised future with constant battles with enemies who prevent them from approaching the future.

Everyday battles were to create movements in the stock prices and trading volumes. Stories and movements both are seen as signals that something is, or will be happening. They give reasons to pay attention to the stocks *now*, because they signal attention from other actors. Wherever the attention is sparked, it creates *timing* to make an action. Whether the potential of the company is realized or not, the stories of potential and current investments in it makes it an object of attention. Stories and movements constantly punctuate timings for speculation. Even though there is no change in the company's asset or its "fundamentals," as long as attention is created, there should be fluctuation in its "value." The "fundamentals" of MediPost, for instance, might have not changed much: they had the same product in the pipeline for a while, and some people who saw Yurina's recommendation did not imagine that long rally, since all the stories were already told and people should have known about them before. Yet, the movement of price created more movements. It appeared promising because the promise constantly garnered more and more attention in the stock market. Ants who came in quite late were drawn to this stock because the stock price was constantly and intensely moving upward. The stock almost seemed to have the power to climb up on its own, and its movement was extremely lively. Observing the beginning of this rally, one of the users on the stock discussion forum said, "where is the strong force coming from [for this stock] to break through the long-term moving average line within

two days?” For someone who was not necessarily convinced with the promise of MediPost, the “strong force” may come across as an unusual happening. However, to the faithful Crew of the Enterprise Medi, it could appear as evidence that the promise was being realized, and that they themselves were making it possible through their engagements. If one takes the promise of MediPost seriously, it can appear that the stock is intrinsically valuable which will have eventually been recognized by the market. The force is created in part by the Crews’ faithful acts of stock trading, but the force itself could reinforce their faith in the potential of the company and stem cells.

The exciting crusade did not last forever. When the anticipated stem cell therapeutics finally got the KFDA approval, the stock price plummeted and most ants lost a lot of money, at least virtually. Yurina, Captain Ants, was heavily criticized as someone who misled gullible investors, and was even suspected to be a conspirator of a stock price manipulation scam. While many ants disappeared from the shareholders’ forum, a significant number of crews stayed in the forum. While the share value was cut into a half from its highest peak within three months from the point, members of the shareholder forum would constantly remind themselves of the promise of the stem cell company by sharing stories about the intrinsic value of the company and its stem cell products. The shareholders were caught up in the situation in which they had only two choices—they could either leave this community of promise while actualizing the loss, or stay in this community while keeping the potential for future gain. Holding onto the stocks without selling it prevents them from turning their virtual loss into an actual loss. If something good happens in the future and the stock price goes up, the stock price would go up; they would actually gain some money. Caught in the moment of the virtual loss, ants who were still staying with the MediPost stocks were reminding themselves of the value of their investments by sharing

promising stories. In their collective effort to maintain hope, not only the economic potential of the stem cell company but also the moral value of their investments was highlighted. Yurina himself would tell his personal story to make a point that investing in the stem cell company is “a practice of love” that would offer patients new hope for a healthy life. When discussing that the “value” of the stock lies in the possibility of giving “dreams and hope” to the world by “giving new life to patients living in pain,” the crews would be reminded of the value of healthy life which the company promises. One of the Crew would comment on Yurina’s emphasis on the moral value of their investment: “It reminds me of what somebody said: we should talk about life, not money. Where there is life, money will follow naturally. It’s a great thing.”

PROSPER AND LIVE LONG

Where there is life, money will follow naturally. If people live long, they will prosper. Another Crew, who I will call RevMed, put this vision even more explicitly and in a different order: prosper and live long. The title of his posting sums up his vision: “MediPost Shareholders Will Live Up To 120 Years Old.” Click the title, and the first line says, “However, it only applies to long-term investors.” “Stem cells are the core of regenerative medicine,” RevMed proceeds, explaining the future prospect of regenerative medicine in general. “Researchers at MediPost learned that there are stem cells in cord blood that have enormous differentiation potential comparable to that of embryonic stem cells in developmental process. They utilized it for regeneration of injured tissues, found a way to differentiate them into stem cells that produce cartilage, and further commercialized them.” Then, he talks about stem cell therapeutics in the company’s pipeline that are related to neuro-degenerative conditions, as a sort of miracle. “The day that MediPost researchers will make the miracles that Jesus performed is not far away. They will regenerate nerves for patients paralyzed on the lower half of the body from car accidents.

They will also radically reduce the morbidity of dementia. But you should not be impatient and expect that all these things would happen in one or two years.” He continues repeating that it will take a lot of time. “But they will definitely make it.” “When the regenerative medicine is established as a new paradigm for medicine which Medi will play the leading role, cardiovascular diseases and cancer, the two main causes of mortality, will be conquered. Worn-out heart and blood vessels will be regenerated into new, lively organs, or tissues. Skin will be made resilient thanks to the new regenerative cosmetics that will regenerate epithelial tissues into younger ones, and dead hair follicle cells from the bald heads will be regenerated into new cells to get black hair to sprout out. Knee joint cartilage treatment is, as a matter of fact, no more than a beginning.” The miracles RevMed envisions to be brought about by the researchers are indeed bringing back the vitality and youth to old, degenerated bodies utilizing the differentiation potential of stem cells.

“Due to the enormous costs, however, these medical benefits will be accessible only to the rich. Until now, it is not imaginable to buy lifetime with money. Qin Shi Huang died in vain while seeking an elixir of life. I dare to say that there is a way in regenerative medicine through stem cell research to the Fountain of Youth that you see in mythical stories, or Anti-aging to prevent aging. It is sad to say, but this type of medicine will be practiced in for-profit hospitals that have the cutting-edge, futuristic medical technologies. Further, it is more pitiful to say, only the rich will enjoy it.” Then, he emphasizes, “In other words, the rich can buy lifetime. Of course, everyone would be able to live up to 100 years old. To extend lifetime longer, 10, 20, or 50 years, one will need to spend quite a lot of one’s own money. The state, while enabling the business of for-profit hospitals, will redistribute the wealth by collecting more taxes. Wouldn’t a billionaire spend several million dollars to extend his life? Would you like to die leaving your

wealth, let's say a million dollar, to your children, or spend 0.9 million to extend your lifetime?" And he shares his vision for the future centering on the company's stocks, and calls for attention from other shareholders who ought to share this vision. "My fellow MediPost shareholders, the future rich, think of it this way: you will become the rich with your shares in MediPost. You will enjoy life with your wealth up to 120 years, and return your wealth to the world through the hospital. For sure, you will leave some money to your children. Maybe leave about ten MediPost shares to your children and grandchildren."

RevMed explicitly discusses the future of regenerative medicine as life extension technology. He sees it as cutting-edge medicine that will be sold at a high cost to the clients. Taking up the vision of regenerative medicine to "regenerate" old and injured tissues, he envisions the future in which people can be freed from bodily degeneration if they have power to purchase cures—money. For one can always replace or regenerate old or "worn-out" parts. By replacing them, one's life can be extended as the parts that constitute the whole are healthy, young, and vital. And, as the CartiStem shows, the vision is being realized. The problem here is not that one gets sick and dies, for the flesh is mortal, but that one gets no cure if one has no money. Wealth is health, or wealth secures health. In this vision of future, the double anticipatory economy of flesh generates not so much a tension as a promise. The double economy of flesh could generate tension as an investor becomes increasingly interested in sick bodies, and concerned with aging as a problem while they enjoy the pleasure of looking at the future market from those bodies. Nevertheless, RevMed's vision alleviates this tension by positing health as a commodity that can be purchased with money thanks to the technological development. Here, the advancement of stem cell technologies is assumed to be directly linked to the increase of value of the shares they hold in their accounts. In the future, it is postulated, a

shareholder's flesh will be fed by the return of their investment, which will be also fed by aging, degenerative bodies of others. The circuit is closed with pleasure. The potential value of their shares is linked to the potential of stem cells, and as long as one believes in the promise of stem cells and accordingly the company's potential, there should be no problem. The prosperity and longevity are inseparable here. For longevity is secured by prosperity. Health and wealth, life and capital are intrinsically linked in this vision, for life will be purchased with money.

RevMed's vision is properly the vision of biocapitalist for whom "life" becomes business opportunities, a site of unceasing exploitation from birth to death (and more!), not simply in terms of extraction but also in terms of making life itself into profitable commodities and into opportunities of speculation. Interestingly, this shareholder who possesses the stocks of the company is at the same time possessed by the company's vision, the potential of the stock's growth.

Return to Lee, the novelist's observation that the stocks offer "windows" to the world. Investing in the financial market requires and gives one a different outlook of the world. The allure of the stock market lies not only in the possibilities of huge gains in trading, although it could be the ultimate reason for people to come in and stay in the world of stocks. It is also the sense of liveliness that is felt through being in the movements of the market, activities of "reading the world" to be part of it, creating one's own world(s) through these practices, and feeling the "productivity" of these activities through the numbers that signify the virtual gains. And, there emerges certain liveliness that is felt by virtue of being in the market—here, shareholders are portrayed not as actors who have their own capacity to act vigilantly and actively, but rather agents who are animated in a sense by one's own actions instigated by the

movements of the market related to the world events, desires to keep up with them, and pleasures of making and watching things happen.

The world suddenly appears to be connected—what is happening in the New York stock exchange while one is sleeping in Seoul comes to matter; some domestic economic policy changes in China become an important issue; and, yes, the Israeli-Palestine conflict becomes much more “palpable” through its impact on the global financial market. Everything in the news now appears as a matter related to the flows of money through which one’s own here-and-now life gets connected to an event out there. And, one’s own life world can now be reformulated, or rather fabricated, as a series of investment opportunities. The events that once previously had no meaning suddenly take on significances as factors, as they affect the share values that one has or one may have. The world suddenly is animated through the magic of the speculative stories—speculative in both senses, as a conjecture about the world connectedness and its palpable impact on one’s own share (of the world) and about the investment opportunities that emerge from the world’s volatilities. “Doing stocks,” a colloquial Korean expression for the investment/speculation/trading that involve stocks, seems to be apt here, since Lee speaks of stock trading as an opening to a different form of life that comes to see the events that otherwise could have been “read” differently or not read at all. “Reading the real world” through the “window” of stocks, Lee, the novelist, gets to the point where the presumed difference between “reality” and “fiction,” and “reading” and “writing,” vanishes. Ants who are *doing* stocks constantly read the world, in a way that the stocks (whether they have or do not have) orient their vision, which is indeed writing the world through the peculiar vision. In a sense, to borrow Latour’s Tarde-inspired phrase (albeit in a different context), “to possess is being possessed; to be attached is to hold and to be held” (Latour 2005: 217). While Latour’s interest is in how to

account for actors and possibilities of different ways of being attached, I find this formulation more useful to rethink actors as the media through which intensities are channeled, amplified, and transmitted. While the stock itself becomes a medium for the shareholders to channel the world's events in a specific way, through the biocapitalist vision in which life appears to be moments of realization of profits, the shareholders themselves become the medium for the biocapital's vision and money that follows the vision.

After all, they have “shares” of the future. And, the ownership itself does not have to bind the shareholders to the company's destiny—they can always sell the shares and get liberated from their binding power. The shareholders of MediPost, who got caught in the situation where they, while it may seem absurd to the rational investors, *cannot* sell their shares away because it will actualize their virtual losses, lay bare the nature of the possession. They are possessed by the vision of the future and the potential that they once thought (and still think) to hold in their hands with the stocks that would secure their shares in the future to come. They come to see the world through the vision of the corporation, or biocapital. That is the window that is offered to them. Minute encounters in their mundane everyday life come to take on different meanings. Since the vision concerns regenerative medicine for degenerative conditions, and the company has two particular target diseases one in the market (for degenerative knee cartilage defects) and the other in the pipeline (Alzheimer's disease), the window is specifically open to see the opportunities of profit from the growing aging and aged population. The anxiety-provoking media discourse on the Centenarian Era may not cease to provoke anxieties among these shareholders, but they also see the opportunities for future profit from them. When people talk about their family members suffering from dementia, they still feel sympathetic about it, but inadvertently see the potential of the company's drug in the pipeline.

It is not to say that they simply become some cold-blooded capitalists without any moral feelings. If things happen in the way they anticipate and hope for, there will be cures for those people in pain, the company's value will raise, and hence, their share value will be increased. This happily-ever-after kind of vision is characteristic of biotech enterprises in general: since the realization of the enterprise's potential lies in the making of new therapeutics available to patients, there is a moral value added to this type of enterprise. Furthermore, given that many conditions that are targeted for stem cell treatments such as Alzheimer's disease often reduce the quality of life for patients for extended periods of time without the guarantee of cure, both the moral and economic values of therapeutics are expected to be high. The moral imperative of saving and enhancing the quality of life, and the capitalist imperative of producing more profits happily meet in the biotech promises, although how it will actually be delivered is another question (Sunder Rajan 2006). Yet, it is still noteworthy how these personal investors come to see the world through the vision of regenerative medicine. It anticipates not only a healthy future for people, but also illness and pain for which the new therapeutics can be used. It anticipates the future of longevity saturated with the increasing potential, or risk, of becoming ill, which offers the promising market for the regenerative medicine.

Interestingly, the first commercialized therapeutic from this company is not something for the rare, incurable disease that often comes up in the discussions of the promise of stem cells, but knee cartilage defects which so many old men and women live with. The condition is generally treated with micro-fracture, or artificial joint replacement surgery. While the ordinariness of the condition and availability of existing treatments can be rather unimpressive to some, the shareholders find its promise from the very commonplaceness of knee cartilage problem. The shareholders know people who live with soaring knees, and they see more and

more people, in part because they are interested in this market, whose knee cartilages are worn out. They can see the vast market while taking a walk, hanging out with family members, and talking to friends—even in their own bodies. The next therapeutic in the pipeline, for Alzheimer's, also promises an already promising and ever growing market to the shareholders. The company's promise is a good story, not only does it make sense, but one also constantly encounters evidence of the future to come through the window of stem cell stock—the future of longevity and its risks. The future has already come to these shareholders, as they see more and more people who are sick and old, including themselves, through this window of regenerative promises, or risks/opportunities associated with longevity.

PROMISES IN THE AGING/AGED BODIES

While shareholders were reminding themselves of the viability of the stem cell promise, they would share not only the long-term future vision such as RevMed's, but also of the seemingly trivial things that they observed in everyday life as evidence of the promise's viability. For instance, one of the Crew posted on the forum about how it was difficult to rent out his apartment located in a building that had no elevator. One of the potential tenants who had contacted him withdrew with an excuse, "my knee hurts." While it was not a favorable circumstance for him personally as a landlord, he was also happy to share his story with other shareholders because he saw that it revealed many people these days were suffering from defects in their knee joints, which corresponded to the market prospect of the company he invested in. Other shareholders delightfully responded to his reflection: "You must be happy!" and "you can promote CartiStem to those people." He wrote that he was posting on this matter to share what he "felt as an investor" in his "everyday life." What one sees in one's everyday life here becomes a definite evidence for the future to come. As "an investor," he got a different optic than before.

That is, instead of simply seeing people who turn away from his apartment, he now sees a potential market from their poor knee joints. From the excuse that “my knee hurts,” what he sees now is not simply a shortcoming of his property, but also the growing market, i.e., patients that would add value to his stock investment. However, as he looks at the flesh that would accommodate promise, the degenerative flesh that would be cured by regenerative medicine, as he pays attention to the degenerative body and sees its increase as an ongoing tendency, it concerns him that he also has the kind of flesh that ages, that degenerates. After all, he said, “it would be the future for all of us.” For we, investors, also live with the degenerating body in which the promise is located. Their investment appears promising not only because the technology is supposed to be good, but also because they all see it from their bodies. In addition, they also see the need to make more money to prepare for their later years. The company’s profit, which they believe to be reflected on the share value in the future, is supposed to be made by selling therapeutic products to aging bodies that are inevitably losing their vitality. People tend to live longer than before, so will I—so I should make a financial plan for the years after retirement. People tend to get sick as they age, so the market will grow, but will I? Investors rarely talk about their personal concerns about aging except for their financial vision linked to their shares. But that does not mean these investors forgot their flesh also ages. Rather, they anticipate that the problem of aging flesh will be solved by the vitality of stem cells, and after all, by the money with which one could purchase it. Investment promises them healthy and happy later years, whereas the very company they invest in promises cures for the aged body.

Mike Fortun (2008) discusses how genomics promise is, like other promises, always already involves not only language, but also matter, flesh, through the notions that put language and flesh together such as genetic propensities your flesh harbors promises. He writes: “your

flesh harbors promises; your flesh is bound to promise; your flesh is made flesh, becomes flesh, in its vast and only partially traceable entrelacements with the promising forces of words, speech, discourse”—the promise here is “actual fleshy promisings that, as promise, are nevertheless ‘not here, not now’”(Fortun 2008:105). Flesh that harbors promises. If the promise of genomics is about locating the future (unfoldings) in flesh, shaping body as something that is predictable and at risk at the same time through the notion of genetic propensity, the force of genomic promise here rests on not only plausibility and credibility of the very promise. Rather, the promise’s power comes from its capacity to tinker with body materially and linguistically, genetically and semantically to make the promise itself promising. “Your flesh harbors promises.” But in order for one’s flesh to harbor promises, one’s flesh should be remade to accommodate promises. The corporeal needs to be able to incorporate the promises. In genomics promise, for the body to accommodate the promise of genomics, flesh should cease to be a thing whose singular change is unpredictable, unknowable in advance. Bodily changes, or developmental events should be codified into a set of unfoldings of genetic codes; flesh is recodified into a set of genetic codes to be decoded in order to harbor promises of decoding.

Fortun tells us how promises, or promissory things need to be apprehended by some “body” that is ready to play with desires and pleasures that are engendered by promises. These points beg a further exploration of the materiality of promises—what are the bodies that are ready to take pleasure in certain things “promising”, what are the bodies that desire what those things “promise” to them, and how is the flesh that a specific promise harbors different from the flesh without that promise? If stem cells are promising, the researchers who will “unlock the potential” of stem cells are promising, and investment in those companies that are working on stem cells are promising, what are the bodies which stem cells can harbor? In the field of stem

cell research, what is often highlighted is a correspondence between the patient's body suffering from cellular degeneration and stem cells that are able to regenerate healthy cells. Replacing old, injured tissues with young, healthy tissues utilizing the differentiation potential of stem cells is a common idea that is told to the public. The story is, as one of my interlocutors says, "so good that one can persuade others without getting into any complexity in a few minutes". Note that a common popular metaphor used to explain the vision of regenerative medicine is car repair. Yet, the very intuitiveness of this story requires a mechanistic optic toward body. The body needs to be envisioned as a set of parts, in which worn-out parts can easily be replaced with new ones. Diseases and injuries are to be located within specific tissues, an aggregate of specific cell population. This view requires more than dissecting the body into functional tissues; one needs to assign to each part a kind of independence not only in terms of function, but also in terms of temporality. The car metaphor highlights that old or injured parts can be replaced with new ones. As the popular discourse of stem cell research often ties the promise of stem cell research not only to specific diseases, but also to cellular injury and degeneration at large, it is not a simple fragmentation of body, but also a differentiation of bodily temporality. Death here is envisioned not as a one-time irreversible event caused by aging of the whole body, but an event that can be delayed by replacing old tissues with new ones. Now, the vitality of "cord blood stem cells" appears to be incredibly promising—cord blood stem cells are extracted from the placental tissue, the "most youthful cells" as Yurina put it, which will make the knee of an old person "the youngest body part."

If they see the promise of growing wealth from aged and aging bodies, they also witness the potential from the bodies of patients who reported certain improvements in their conditions. The knees of one shareholder, Morning Dew, became one site where the Crews witness the

evidence of the future to come. This 59-year-old man decided to get his knees treated with CartiStem. Put the stem cell therapeutics in his body, he is living the promise—like other patients who become “living evidence” of the stem cell promise. When he first announced that he will get the treatments, he briefly wrote about his two dreams: “I dream of a trekking on Mt. Baekdu when it succeeds. [...] Of course, I want to be rich thanks to MediPost.” He later reports the progress and improvements on the shareholder’s forum. His well-treated knees have become the living evidence of the future to come. The fiction of ever-growing biocapital is given real flesh; with the backdrop of pervasive discourse on the problems of longevity, the promise seems to be invincible. In the long run, everyone will become rich and healthy—as the return on their investments.



Figure 3 Illustration of the Ant Revolution featured in the news article

LIVELY DREAMS

On July 30, 2013, one of the crews posted an old newspaper article on this forum from October 2011. The news article (Son and Lim 2011) covered the great rally of MediPost stock price, attributing it to these crews. Asking whether it was a “bio-revolution” as the ants claimed betting on the growth potential, or a “bio-bubble” similar to dot-com boom that pervaded the stock market a decade ago. “There is no objection to the assessment that MediPost [...] will lead the bio-theme. But, we find the ‘director’

of this ‘drama’ in which the stock price jumped up sixfold [...]. It is personal investors [...].” The article accompanies an illustration of an ant revolting (Figure3). The ant holds a red flag hanging on a pole with a red arrow, which signals raising of stock prices in the color scheme of the Korean stock market at the top. On the flag is written, “Bio-revolution of Ants—Target Price: 500,000 won.” Gray blue arrows that look like tombstones are stuck on the hill. The ant is climbing up not leisurely but vigilantly. The illustration captures how the Crews were seeing themselves. They were making a historical move against the market trend, plowing through the graves of ants. The illustration reminds them of the days of sweet dreams of the Ant Revolution. About two years later, they are left with shrunken accounts. The news article containing some worries about “overheating” of the MediPost stock and observations of major shareholders’ move to realize their profits (by selling out their stocks in this overheated market) might be read as a reminder of their blind faith at the time, yet most responses do not necessarily mention those parts. Rather, they seem to be savoring the old memory of that time, when “the world appeared to be mine,” one “could smile all the time,” and one could “dream the future.” They tell themselves about the memory of Ant Revolution, and the promise that is still alive, as long as they do not lose faith. They might be just consoling themselves, but with the memory of hopeful days that would come back again. While holding onto the promise that was not realized in the way that they anticipated, the memory of time when they could have lively dreams in the lively market, when they could dream of more lively future. Rather than forgetting and moving on, they recall the memory. Somebody said, “it was hard to figure out when to sell at the time. It was like a storm. The time of storm would come once again!” He was anticipating the intensity of the storm that was in part made by ants, and in which ants got lost.

The stock market is where finance capital appears and becomes most lively, and it feels “real” to ants through the movements of stock prices and trading volumes that seem to be related to those movements. The commonly used animal metaphors for speculators highlight the intensities that are felt among the insiders of the market revealing that the calculative, rational homo economicus is just a kind of fiction (Crosthwaite 2013). Ants are the figure of swarming or “herding” which is often regarded as an example of irrational investors. Their footsteps, unlike the ones of beasts like bears or bulls, would hardly be heard by others. These characteristics of ants might render ants as just an eccentric actor in the financial market. However, they apparently are part of the market that feed the market itself, or maintain the fiction of the market itself. It is not clear who actually won all the money in the steep rising of the share value of MediPost.

Regardless of their effort to maintain hope, the Ant Revolution seems to have been futile at this moment, although it may be too early to say this. Instead of revolutionizing how the stock market works, it left many ants caught in the situation where they should decide between waiting for the uncertain future realization of the potential value of the company, and actualizing their potential loss. The Ant Revolution, in retrospect, seems to be a daydream that cannot be realized. The lively energy of ants for whatever reasons was absorbed into the price of the stock, which profited major shareholders and people who were not committed to the promise of Ant Revolution. “Rational” investors could sell out the shares at high price for which Crews of the Enterprise Medi fought. Some who were left in this forum would still try to maintain the promise as vital. Unsatisfied with the low sales record of CartiStem, the Crews made a bumper sticker to advertise it. The sticker could not be used because it is prohibited for non-medical expert to

advertise prescription drugs. However, there was a strong commitment among the Crews to take care of the stock price by promoting the company.

Picking up the pieces of the broken dream of the Ant Revolution, these ants again see the market not only as a battlefield of numbers and money, but also as a place to dream a different future. The Ant Revolution appeared promising, not simply in a sense that it showed a sign of future success, but rather in a sense that it was able to take ants to the promissory terrain where one could imagine and dream of the future to come. Affects of various sorts were at work when the promise of the Ant Revolution was in action. One of the shareholders, a day laborer, wrote how his life, or rather his “attitude toward life” has changed in the few months since he got to know about this company and became its shareholder. For him, investing in the company was an opportunity to have a vision that something good might happen, and his future could be different from his current living condition. As a manual laborer, he had been feeling that his body had a “wrong owner” who would overtire the body without any comfort. As a day laborer who should “work a month to live a month,” he could not even dream of preparing for the later years. “But now, I can promise to give a break to my body, when I become sixty years old, that already starts withering because of this bad owner.”

The stocks are his dream, or something that animated his capacity to dream. While the stocks live on his dream and avail themselves of his dream, they also make a dream available to him. In the insecure life condition in which a distant future was even unimaginable other than the impending exhaustion of his body and death, he could see no possibility to change his own life. He lacked intellectual and economic capital to change his career path. Fluctuation of the stock price was the only place he could find the possibility—dream and hope. He can now “promise” to his body that he would “give a break” to it, and it can finally retire, for he can now imagine his

financial future. The dream might be deceiving him, but we don't know yet. Keeping the stocks in his account, he maintains his dream as an ongoing one. The ongoingness can make life livable to him, as it is not ended yet.

The possibility of change, the future that is different from the present, the availability of a dream. All these are important to think through the increasing participation of personal investors in the financial market. On the other side of the dream, there is insecurity that does not seem to change, insecurity that is deeply ingrained in our everyday life, which seems impossible to change. The society is not malleable at all; at least it appears that way. Contrary to the latter half of twentieth century, Korean society now does not seem to have any "rags-to-riches" story. Speculation indeed appears to offer a rare path that promises a change. Life is insecure, it is full of risk, then, why wouldn't people choose to take financial risk if there is at least promise—an opening? If no one seems to be responsible for people's insecurity, which seems to be prolonged, if no one really cares about their "surplus" life, why wouldn't they speculate on the promise? Even more, the investment seems to be moral in various ways, as it promises health to patients and gives the shareholders a sense of being "good investors" and making efforts for a better future.

FLESH OF THE FICTITIOUS CAPITAL

There are ants who lost their savings in this battle, and there are other ants who are waiting in order not to actualize the virtual loss. But, it will never become clear where all their loss was gone except that the company's CEO has realized quite a bit of profit by selling her own shares twice in the public stock markets. By selling her shares that she acquired through stock purchase options, she earned more than 20 million dollars, which is about five times as much as the company's net income for the year of 2011. To the angry ants, the CEO had something to

say: she was going to use the money for the new project of building a hospital specialized in stem cell treatments. Whatever her intention was, the share value plummeted upon the news. Within a month, the company issued new stocks to increase capital; she exercised warrants her owned on the company's share and secured a larger number of shares on 1/10 of the market price. She was not the only one who made good profits from this long and exciting rally. A venture capital (VC) fund that had "invested" in this company by buying bonds with warrants could exit very successfully in the middle of the rally. The VC fund's investment was made in late 2010. A large portion of the shares they acquired at warranted price was sold in July 2011, and the rest was sold within two years. Within two years, the original "investment" has grown into fourfold return—it was a successful "exit." There should be nothing strange about the executive's and VC's trading activities. They legitimately acquired the shares upon their investments (of whatever), and probably the risk they supposedly took. And, their trading activities do not appear suspicious at all. They seem to be just business as usual, or actually extremely successful business.

But, this business as usual appears quite strange when the ants are brought into the scene. When the venture CEO and the VC exercised their warrants, acquired securities, and sold them in the market to actualize the virtual value, somebody should be buying them, paying for the stocks, and turning their virtual rights into actual profits. The only way for the holders of securities to get access to the actual money is by putting them in another's hands, which both liberate them from securities and the risks associated with them, and give them chances to actualize the virtual values by being paid by the buyers. For the buyers, too, the securities become the virtual, potential value that can be realized at the moment of selling.

It is this constant movement of securities from one hand to another that the share becomes valuable, and the value can be realized. There is a “market” that takes up the stocks that are sold, but the market itself cannot work without people who would buy the securities. Since there are the potential holders of the securities, the VC could “exit” from the bind of the investments. Ants, while they have not made any direct investment and hence may not appear as significant actors, they are actually important as they provide the channels for capital’s flow, possibilities of actualizing the virtual profit, and exits for investors. The common knowledge about the Korean stock market is that the stock market is where ants become prey to institutional investors, foreign investors, and some big hands. But, ants are not just “prey” that are killed and eaten. They are also the medium, constituted by the promise of future that enables and promises capital to flow and grow.

At an abstract level, other kinds of investors can also be seen as the medium for capital’s movement from the perspective of capital and the market itself. It is because every act of exchange can provide momentum for the exchange between the virtual and the actual. What differentiates ants from other kinds of investors/traders/speculators is that they are limited in their capacity to play with the virtual and the actual state of money. It puts them in an odd and vulnerable position in the financial market. The role that “shares” play in this specific case is interesting—it is not so different from issuing money without value being fixed. A corporation can repay its debt with the stocks that they issue, as if they were conferring “shares” of the company to the creditor/investor. What actually happens at that moment is that the company’s debt is distributed in the securities issued, whose value can only be realized by the sales of those securities. The future share “holders” are actually the ones who repay the debt without necessarily being a debtor. This strange transfer of debt is made possible by making it virtual in

the form of securities. The power to play with the virtual and the actual belongs not to the “buyers” of the securities, but the ones that are entitled to issue them. Of course, the circuit of valorization will cease to work, if there is no one who would buy the securities. However, as long as the securities are associated with promises and the promises are good enough to attract ants, it can work. The potential return is presented through the promises to instigate a transaction that will actualize the virtual value of the securities. Furthermore, the virtuality of money (and securities) means a somewhat different thing to ants from to other actors—capitalists if you will— in the market. Unlike corporate actors who can issue new securities and sell the futures to others, or institutional investors/speculators whose job is to keep capital in motion with their capacity to draw money from outside the market, ants only draw on their own funds, or debts that cannot be distributed to others. The money they put into their stock accounts, or the securities that they hold does not cease to be personal. In the same vein, the debt and loss are personal. The “money” they put into the financial market is not just money, but the congealment of their dreams invested in the promises.

Of course, ants do chase money; they may enter the market with the dream of jackpot, which is allowed by the virtual movements of money. They are setting their own money in motion, which could allow money to realize its potential in the stock market, like capitalists would do. But, the money that they put in motion is also the money that was once promised to them to secure their future life by providing them daily expenditures, or whatever they want. At the moment they enter into the stock market, they exchange this potentially concrete security measure (savings) with securities that may multiply their savings. The stock market is a place where one’s own desire for money, which could be exchanged with whatever things in an extensively commodified world, coincides with the capital’s own desire for growth, and the

former is absorbed in the latter as the dream-money is turned into capital. The mysterious growth of value in the financial market is made possible by its very movement in time. And, there is no magic. The magical growth of MediPost share was indeed a product of the intensified movement of capital enabled by ants who have taken up a large volume of stocks that the VC, executives, and other institutional investors put in the market in order to realize their own profit. The ants were “taking up the supply (*mulyang-eul badajuda*),” borrowing a Korean stock investor vernacular, in anticipation of the promise’s realization.

In the good old days, one of the Crews of the Enterprise Medi, nicknamed “Recovering Hope”, had drafted symbols for the Revolutionary Army Headquarter, and for Medirang. He put spider’s webs in every logo, which some other Crews felt was a little odd. He thought the spider’s web could show the network on which the forces of ants are aggregated. From the view of the ants, the network seemed like a trap in which an ant could get caught. Even though the ant was portrayed quite large, the web does not seem to belong to the ant. Perhaps, the discomfort with these draft logos signals the sentiment of ants who cannot possess the force, while their swarming is turned into a lively force in the market. Their dreams become the flesh for (the?) fictitious capital. And, the promise of stem cells finds its life in this fictitious field of intensities where the vital potential of stem cells, lively movements of the market, and old bodies that are losing their own vitality feel really “real.”

CONCLUSION

Promissory Landscapes

Stem cells propagate, as the promises proliferate. They are fed by the mediums not only of nutrients, but also of people's commitments to the promise incited by their desires, hopes, and anxieties about the future. I have explored stem cells as a promissory thing attending to how its promise instigates various forms of labor that sustain the stem cell promise itself, and proliferates in diverse sites wherever promise is sought. The stem cell as we now know of is not a simple a biological entity, but a promissory thing. It is not simply to say that the stem cell, a given thing, gains certain social meanings and values attached to it, but rather that its mode of being and living itself is conditioned by the future-oriented vision of regenerative medicine, and made possible by the mediums of various human and nonhuman actors. The stem cell's membrane does not simply separate the cell from its surrounding, but also enables the movements of substances between the cell interior and its milieu.

Let me put it crudely. I started with the donor and ended with the stock market speculators, with the biological to the speculative economy. It is not to say that the ants' speculation is simply derivative to the stem cell promise. Rather, reversing the order that stem cell stories were told so far, we might ask: wouldn't the existence of the speculators, ants, be part of the condition for the survival of stem cell promise through the company? The promise of "exit" that ants provide could have made it easy for the company to raise capital in the stock market or to get investments from venture capitalists. The company would invest the capital the company raised (through a loan) in R&D of which maintaining stem cell population in a good condition should be part. Stem cells themselves are cultivated to produce commercial therapeutics and one might imagine stem cells in a dish talk to each other: "some of our friends

who were taken to some old person's knee provided food for today!" Yet, their living conditions were built by the public and private investments that were generated by the promise of their own biology. The continuous exchanges of materials between the stem cell and its *in vitro* milieu are mediated by people's dreams, anxieties, and hope for the future which make stem cells as a promising object of investments. While stem cells harbor the vital potential, their living itself is already peopled by promisees. Through the pores of membranes, substances of hope, anxieties, and dreams are coming into the cells to nourish them. Or, we may say that stem cells are really a world of its own that folds all these people with different future-orientations into itself while they are de-differentated into the promising future for all.

As such, the promise of stem cell biology is anchored in the vital potential of stem cells, which is the defining feature of stem cells as their intrinsic property. Their "biological potential" is expected to produce not only cells, but also scientific knowledge and therapeutics, which could turn into economic value. In other words, their biological potential already enfolds intellectual, therapeutic, and economic potential, which once again enfolds different expectations from diverse actors each of whom has different stakes. In the previous chapters, I have explored how the stem cell promise instigate various actors living on their labor, dreams, hope, and anticipations. In doing so, I have treated the potentiality of stem cells as a material anchor, or biotechnological basis of stem cell promises. In the concluding chapter, I address the question of the particularity of the stem cell's "potentiality" which I have only briefly touched on in the introduction. The particularity of stem cell's potentiality is crucial to understand how different actors could make sense of the stem cell promise. It is the notion of the potentiality of stem cells that "contains" the possibilities of differentiation that is at the center of all these actors' particular forms of engagement with the stem cell promise: egg donor's conception of eggs as

her “little life” (Chapter 1), the efforts that researchers put in to maintain the potential of stem cells (Chapter 2&3), the seemingly risky and hasty ventures of patients to offshore stem cell treatments (Chapter 4), the conception of stem cells as the gift that God prepared for people (Chapter 5), banking stem cells as the “bio-insurance” for the future (Chapter 6), and the ants’ waiting for the next breakthrough (Chapter 7). I will further hint at how the stem cell promise could resonate in Korea with certain image of time within the overt future-orientation in Korea. But, let me first start by discussing the salience of the concept of the “potentiality” in the stem cell enterprise.

AGAINST THE GRAVITY OF TIME

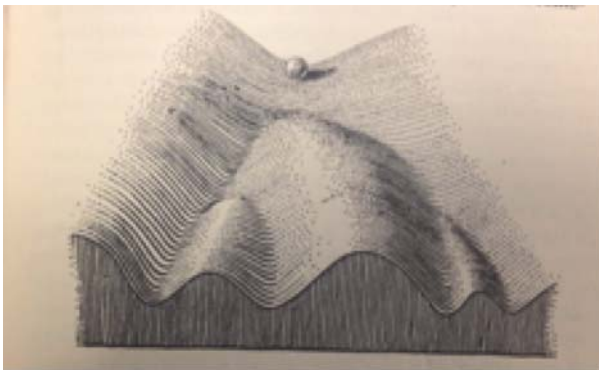


Figure 4 Waddington's diagram of epigenetic landscape

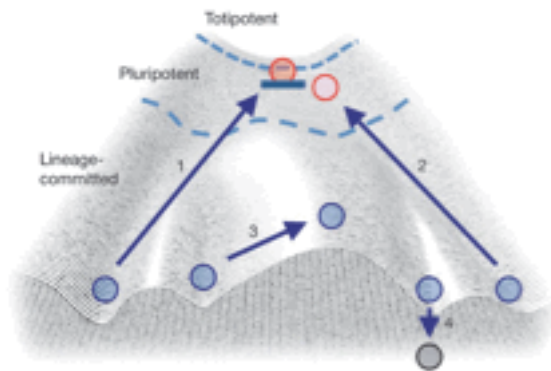


Figure 4 Yamanaka's modification of Waddington's diagram

In 2009, Shinya Yamanaka, the Nobel laureate, published an article discussing why only a very small number of adult cells are successfully “reprogrammed” to the pluripotent state. His method of reprogramming is to introduce four genes, known as “Yamanaka factors,” to already differentiated cells, and “induce” pluripotency from them. In this article, he sums up his explanatory models with a diagram of “epigenetic landscape” (Figure 5), modified from Conrad Hal Waddington’s *The Strategy of the Genes* (1957; figure 4). The same diagram has also appeared in another group’s article on the possibility of

“lineage reprogramming” or “trans-/de-differentiation” (Zhou and Melton 2008; figure 6). They also used Waddington’s diagram but modified it adding some more balls and arrows. This resurgence of Waddington’s diagram shows an interesting characteristic of stem cell biology particularly in terms of the notion of “time” which is in a stark contrast to that of developmental biology. The difference between the old figure and the new figure also manifests different modes of doing science.

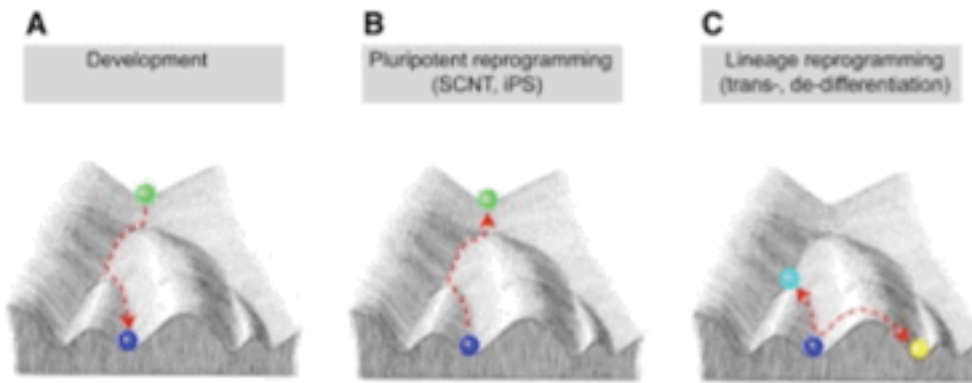


Figure 5 Zhou and Melton's modification of Waddington's diagram

It was in 1957 when Conrad Hal Waddington diagrammed what he called the “epigenetic landscape.” The diagram was to give a “mental image” to the readers on the new idea of “epigenetics,” which he defined as a field of study of “the processes of *epigenesis* in which certain ‘preformed’ characters [in zygote] interact with one another [...] before the adult condition is attained” (Waddington 1956:1241) The diagram presents the readers not an illustration of fertilized egg in development, but to an imaginary mountain-like landscape on top of which a ball is placed. The valley and slopes inform the readers to acknowledge certain propensities in the developmental process, while not negating the potential for differences. “The path followed by the ball, as it rolls down toward the *spectator*, corresponds to the developmental history of a particular part of the egg. There is first an alternative, towards the right or the left. Along the former path, a second alternative is offered; along the path to the left,

the main channel continues leftwards, but there is an alternative path which, however, can only be reached over a threshold” (29: emphasis added). In another diagram coupled with it, he illustrates the epigenetic landscape from below, in which genes (rectangles in the bottom), like pegs, tying the canvas-like landscape to the ground. The developmental biologist would have been one of the “spectators” who observe the epigenetic process from a fertilized egg to an organism, and “epigenetics” would make a biologist a very unique spectator who not only see the ball, but also the pegs on the ground eager to understanding the constellation of genes in shaping the epigenetic landscape. In Waddington’s diagram, development appears not as a simple “unfolding” of the generic potential that is inherent in the egg itself, but rather an achievement that happens in the field of intensities.

Let us move on to the early twenty-first century revivals of the diagram. In Yamanaka’s article, the ball, which was originally a fertilized egg (or its part), now signifies an induced pluripotent stem cell. “The iPS cell is like a ball rolling down the slope of a valley. The reprogramming factors *cooperatively push* cells *up* the slope to the pluripotent zone. Some cells are blocked by an epigenetic *bump* (closed rectangle) on the slope and thus *become able* to self-renew.” While he takes up the model of epigenetic landscape, he places it in a quite different narrative in which the goal is keeping the pluripotent stem cells on top of the landscape. The gravity of time that leads the given cell (the ball) to differentiation is now conceived as a kind of dragging force to the positive and collaborative force of reprogramming factors to achieve the pluripotent state. A bar is added up in the hill, which he names “the epigenetic bump.” This bump that keeps the cell in the pluripotent state can be seen as a technologically mediated moment, which promises the possibility to control the biological time. The landscape is still a force of intensities, but the most significant force here is the gravity of time, which Yamanaka

tries to overcome with the reprogramming factors. Qiao Zhou and Douglas Melton's 2008 diagram, while making a different point than Yamanaka, shows a similar conception of the epigenetic landscape. Interested in exploiting cellular plasticity in generating specific cell types, they use this diagram to imagine a better pathway from one specific end to another. Rather than pushing the cell all the way back/up to the top as Yamanaka does, one can "transdifferentiate" cells within specific lineages within the slope. If the eventual goal is to obtain specialized cells, it is plausible to move cells horizontally and vertically within proximity. While these two diagrams make different arguments, they share the orientation of reversing (more or less) the developmental process. Whether one wants to keep it up there (Yamanaka) or to find most efficient paths to other exit (Zhou and Melton), they are both committed to liberate cells from the previous commitments. Here, the force of time is seen rather burdensome, something that needs to be overcome in this twenty-first century stem cell science versions of epigenetic landscape. The model works powerfully when the audience recalls the experiences of hiking in the mountain. Any audience would know the difficulty of going uphill than the opposite. The labor of "pushing up the ball" appears, however, promising.

If scientists in Waddington's epigenetic landscape were part of "spectators" whose job is observing the developmental processes which is also a process of differentiation, contemporary stem cell scientists are rather seeing themselves as mountaineers who are climbing up the epigenetic valley with their cells which will regain the cell's potential they *lost* over time, and direct the potential of stem cells into specific directions. If Waddington's epigenetic landscape is a model to generate theories of "the how" of development, the recent revival of his model in stem cell biology is more focused on "the how to" do things for and with the developmental potential. In Waddington, the gravity of time is to put an egg in a series of interactions with

genes to make differences. Time is a creative force in a sense that it makes movements and changes. Although the outcome will be an organism, the epigenetic landscape itself is the field of intensities in which differences are made for each cell in the fertilized egg. However, in Yamanaka, time is a problem which needs to be overcome (pushing the ball up) and suspended (by the epigenetic bump). The arrow of time is still forceful, but now stem cells enable one to have grip over time itself. If the technological infrastructure for tissue culture has enacted a unique biotechnological temporality in which tissues are made to live beyond the organismic time (Landecker, Cooper), the innovation of stem cell biology in terms of our imagination of time is its promise to re-sync this biotechnological time with the organismic time in a manner that the body can overcome the degenerative force of time. Stem cell science flourishes with the promise of biology to reverse time with technological means.

Another thing to be noted: the use of epigenetic landscape model in stem cell science does not concern much about the process of going down—it rather appears to be natural. It may be just because they are only interested in exploiting the plasticity of already differentiated cells, and modeling the strategies to do so, rather than methods for differentiation. However, the feeling these two diagrams invoke is still noteworthy. The downward movement, if one recalls once again the experience of hiking, appears to be easier than climbing up. It takes less work usually than going upward. Once we get done with the arduous labor of reversing developmental time, the future, the specified endpoints, appears to be imminent. It might not be the case in practice, but it is a vision that stem cell science has proposed. Once we have the potential at hand, it appears to be only a matter of time. Stem cells can become whatever we need, so they are promising. And, the potentiality in the stem cell enterprise appears to be the individual entity's capacity for flexible production.

THE POTENTIALITY IN THE PROMISSORY LANDSCAPE

In the introduction, I briefly touched on a debate among stem cell biologists on the concept of stem cells whether it is an entity or a temporary state. The question for stem cell biologists is how to think of the relation between stem cells and their environments. Some scientists, from the systems biology view, argue that the properties of stem cells might be better understood as the properties of the system in which stem cells come to gain certain capacities, or “stemness” as the effect of the system, or the relations between the cell and its environment. But, it can also be read as a debate that gives us glimpse of the orientation of the stem cell enterprise. While the question originates from different theoretical approaches in biology, it might not simply be a theoretical problem. It is also tied to different modes of *doing* biology. If biology concerns only “the how” of life, the question of what stem cells are is a crucial conceptual question. However, from the perspective of the stem cell enterprise, including scientists for whom stem cells are tools for regenerative medicine, they are interested in “the how to” do things with life. This question could be negligible as a secondary one. As a technical object, the concept of stem cells that have the potentiality as their intrinsic property can serve as a working definition. This technological orientation of the stem cell enterprise corresponds to what others have observed in the increased interest in life sciences on controlling of life. In this sense, the notion that stem cells have the potential in themselves is explicitly linked to its overt future-orientation and the economy of promise.

Of course, my problem with the stem cell entity is different from those stem cell biologists who were concerned with the question of either entity or temporary state. It is an intriguing question in philosophy of biology in itself, but my interest lies in how the seemingly simple, yet controversial concept of stem cells as “cells having potential” can be predominant. It

might be absurd to ask: as one of my interviewees put, “it just makes a good story!” The concept makes a great story that can be communicated with relative ease: there are cells that are from or similar to embryonic states which, as everyone should know, develop into various cell types; with those cells, it will become possible to produce organs. What makes this story intuitive is the vital potential latent in the biological object, and this story becomes promising as one conceives body as set of cells, tissues, and organs that are also detachable and transferrable objects that harbor potentialities in and of themselves (Taussig, Hoeyer, and Helmreich, 2013). The intuitiveness is not natural. One should consider the modern biomedicine’s view of the body as a whole composed of discrete parts, and the organ transplantation as a practice of replacing body parts as the precursor of the intuitiveness of stem cell promise. The common idea that “cells are the basic units of life,” learned in high school biology class might be related here. We are already too familiar with the body as a set of discrete parts, and it is not strange at all to see each part harboring its own potentiality. This notion of potentiality informs each actor’s engagement with the stem cell promise, and further scholarly analysis of stem cell economy.

The regenerative potentiality of stem cells is at the center not only of the stem cell enterprise, but also of the critical analysis of stem cell economy. One way to look at “tissue economies” may be looking at the “social life” (Appadurai, 1986) of vital matters, as Catherine Waldby and Robert Mitchell (2006) have done. They have shown how, in “tissue economies,” tissues are disentangled from the previous relations and entangled in the biotech relations of production through the legal, ethical, and technological infrastructure. The status of tissues changes subsequently as they flow—tissues that once were the donor’s body parts or (potential) kin turn into gifts and/or commodities, what would otherwise become biomedical “waste.” These flows in tissue economies are enacted by technological possibilities to control and manipulate the

vitality latent in tissues to produce therapeutic and economic values. Waldby (2002) conceptualizes biovalue as “the yield of vitality produced by the biotechnical reformulation of living processes” (310) which seems to imply “vitality itself has become a potential source of value” (Rose, 2006). Embryos, for instance, whose reproductive process was associated with a specific value for reproduction of the family in the IVF context, are taken to stem cell labs and turn into biovaluable objects for regenerative medicine—their reproductive value is doubled at the IVF-stem cell interface (Franklin 2006). Yet, the flows of biological matters which presumably contain “vitality,” which will turn into biovalue under certain techno-scientific and ethico-legal conditions, cannot be initiated and continued without bodies and their labor that produce and maintain the vitality in and out of organisms’ bodies. Feminist scholars in particular have been keen on this issue and proposed important analytic tools to rethink the question of increasing capitalization of the biological in tissue economies—attending to invisible women-donors (Dickenson, 2001), reproductive/regenerative labor of egg donors/vendors (Waldby and Cooper, 2014), and reproductive agencies of the living things (Franklin and Lock 2003).

While these discussions are extremely insightful to rethink the novel mode of (re)production in the contemporary bioeconomy in general, and the stem cell economy in particular, there is a tendency to take for granted the vitality of biological materials. It is true that they are vital, but what kinds of labor should be done to maintain the vitality? What are the relations, labors, and substances are taken to keep the biological “vital” in a manner that is malleable to manipulation? One could always start from the vitality, for sure, if one sees the infrastructure (and labor adjacent to it) of biotech as the second nature for *in vitro* life forms. But, building and maintaining the infrastructure is a crucial part of the bioeconomy. The vitality of stem cells requires not only its extraction and proprietarization, but also its day-to-day

reproduction. These questions might not matter in the future: it is possible that the expansion of stem cells will become incredibly efficient and automatized, and the cost for maintaining infrastructure for cellular life and the substances needed to feed stem cells will become very cheap to the extent that they are negligible. However, the costs, efforts, and labors that are currently taken to make the future possible are not an unreal thing. It is not to say that these analytic terms that feminist scholars have developed are insufficient because they do not consider some other concrete details, but it is still important to look at the temporality of the analysis that is rather speculative and future-oriented. Biocapitalists might see “biovalue” as it is produced by the vital potentiality of stem cells. There are emergent legal and ethical infrastructures that aim at this biotech mode of enclosure, which will attribute the value to the “cognitive” labor of scientists within the current intellectual property regime. In turn, the critique of bioeconomy has drawn attention to the emergent forms of biovalue production, and further sheds light on the infrastructure and epistemological ground through which the biological processes and entities are capitalized on. The analysis inadvertently takes the coming of the future for granted, as an irreversible coming of the new era of biological control. My ethnographic engagement with the stem cell enterprise turns the clock back to the present, and looks at what is happening in the meantime. It is to emphasize how the potential of stem cells and stem cell promise become real, and come to have social efficacy, as various actors engage with them, even while the promised future is constantly deferred.

I propose to think of stem cells not as cells that *have* the potentials, but rather as cells that *come to emerge* as an entity that *hold* the potentials within certain circumstances. The epigenetic landscape diagram might be useful here to think through the promissory landscape where the stem cell emerges and is maintained as the entity that contains the potentials for the future. The

stem cell is located on top of the landscape like the ball, and it is going to move through various paths that are not fully determined, but are patterned by the forces that pull them in different directions. The promissory landscape that is shaped by a myriad of anticipations about the future and investments instigated by them are full of intense forces. There are efforts to keep the entity up on the top, while they also anticipate the downward movements in desired directions. The entity itself, as it moves through the landscape, might also change the landscape itself. The stem cell promise, as it moves in different domains, mutates in different forms. The notion of stem cells could also be modified—for instance, from cells that have the differentiation potentials and self-renewal capacity to cells that contain the vitality to bring the “life of resurrection.” I have tried to document the dynamic processes through which stem cells are *cultured* as cells characterized by the potentiality within the promissory landscape in Korea.

In the first part of this ethnography, I have focused particularly on the materiality of the biological potential of stem cells in which the promise of stem cell biology is anchored. I have explored three sites: the donor’s body, researchers’ fingertips, and patient’s body, where the promise of biology instigates and is materialized by different kinds of bodily and affective labors of humans and nonhumans. In Chapter 1, we have looked at an egg donor’s account in which the eggs are rendered as her “little life” that harbors certain potentiality, but is also a product of her bodily and affective engagements with the promise of biology. Her account shows two starkly different ways of conceiving the donation—as an act of giving eggs (and their potentiality) and as a process that involves fast-forwarding of her biological time to mature eggs into the potential of the potentiality. What her renewed account of eggs as a process or phenomenon surfaces what the idiom of donation (as giving) has left out: the potentiality itself requires labor. The researchers’ labor in the lab could also be understood in a similar vein. While most focuses

on the “intellectual” or “cognitive” aspect of research labor in producing knowledge, part of their labor involves the maintaining of potentiality. If science and technology are commonly considered in terms of the transformation of nature into valuable knowledge and objects, these researchers’ labor include making and maintaining of the “nature” itself in a way that remake cells as entities that harbor the potentiality. The working definition of stem cells cannot hold without this work of maintaining cells. If the stem cell enterprise is oriented toward the future, researchers not only produce the evidences of the future to come, but also reproduce the conditions for future production. The potentiality of stem cells also motivates patients to venture to get presumably risky offshore stem cell treatments. It is possible because patients imagine stem cells as active agents that have the potentiality to regenerate bodily tissues. When the success stories of cures are presented as “living evidences” of stem cells’ efficacy, patients’ bodies become the sites where the potentiality is actualized, which gives hope for stem cell cures to other patients.

As the potentiality of stem cells instigates each actor to engage with the stem cell, each actor is also involved in the practices that are necessary to reproduce and further amplify the promise itself. When the potentiality is seen as the natural property of cells, it is plausible to say that the donor is simply “giving” tissues from which stem cells can be “extracted,” the researcher is “manipulating” and “transforming” stem cells into something valuable, and the patient is “cured” by the efficacy of stem cells. However, if we see the potentiality not as a given thing, but as a state that is maintained and actualized only in specific circumstances, the story can be told differently. What matters is not so much the object, stem cells or their vitality, itself that circulates in the stem cell enterprise as the labors, processes, and relations that are indispensable for the biological object’s life itself. By documenting various forms of labor that are involved in

the making and maintaining of stem cells as a potent and promising entity, I highlighted that the potentiality of stem cells can be seen as the effect of the relations, processes, and practices that are invested in the potentiality of stem cells and the promise of stem cell biology. It is for this reason why I call those “actors” doing labor for stem cells as the *mediums*—medium as milieu, and medium as means. Like the “culture medium” in which cell live, these actors are the medium for stem cells that nourish, cultivate, and sustain the cellular potentiality. Since the potentiality is also the material anchor for the promise of stem cell biology, researchers and patients can also be seen the mediums for stem cell promises as they produce “evidences” of the future to come. Further, as these actors constantly generate and transmit affects through which the future is brought to the present, we may also think of these actors as the mediums that channel the spirits.

In the second part, I then turned towards other kinds of engagement with the stem cell promise that emerge as the promise finds its niche in other domains where the future matters, and the promise is sought. I looked at three different sites where time and the future matters differently: the evangelical Christian networks, the consumer market for the aging population, and the stock market. In each site, the potentiality of cells offers actors a way to have a grip on the possible futures. While what is at stake could differ among them, stem cells could be rendered as a passage point to future opportunities in these sites. In the churches where God’s promise of happiness in this world as well as after life is sought, the potentiality of stem cells becomes an evidence of God’s preparation. The stem cell promise and the promise of God, in the community of faith, can substantiate each other: God’s omnipotent power is evinced by the incredible potentiality of stem cells, which becomes another instance to reassure the believers that the promise of God will have been kept. If stem cells could be seen as the gift from God for people to enjoy longevity that God himself has prepared/promised in the church network, stem

cells' significance in the pursuit of longevity and youth takes a quite significant meaning in the market for aging population. There is no "promise" of long and healthy life in this world, but rather the blackmail that one's body will be degenerated if no preparation is made. Against the fate of prolonged, unhealthy life, the potentiality of stem cells is posed as a possible solution for the problem of aging. The future, without any absolute promise, is conceived full of uncertainties, which can be preempted by the youthful potentiality of stem cells. This technoscientific promise of longevity further exploits the grammar of insurance and financial planning. The last chapter gets into the world of personal investors. Here, the potentiality of stem cells appears to add value to the company's own potential. Even though the anticipated product was not as successful as they had expected, the company still has potential to diversify their products in the long run, like stem cells that have the potential to differentiate. Further, the personal investors anticipate that the potentiality of stem cells and stem cell company will unfold in the future in a way to return them profit. Some say it is a "fight against time" which discourages them in the process of long waiting. As some of the personal investors say, it is only a matter of time because "the potential" is obvious.

While the textures of promises are different in each site, the potentiality offers people to have a grip over the future. The stem cell enterprise works on the faith in the technological progress through which the promised future will have come, and the faith in the potentiality of stem cells to unfold by means of technology. For the stem cell enterprise, it appears to be only a matter of time to unlock the potential of stem cells. This strong sense of progressive time of technology is intertwined with the possibility to suspend and reverse biological time. In the stem cell enterprise, the passage of time means not only "progress" as it has been imagined in technoscience, but also the loss of potentiality at the cellular level. The potentiality of stem cells,

the capacity to stay in the undifferentiated state *and* to differentiate into something else without losing the potentiality, is valorized not only in cell biology, but in many different places where the future is at stake and promises are sought. However, the valorization of potentiality means not only hype, intensive optimism about the future. It could also suggest anxieties about the future in which one is constantly incited to find one's own way forward.

REDESIGN YOURSELF

“Body of the future will reverse-evolve into the state of stem cells,” writes Jungkwon Chin (2007), a Korean philosopher. It appears in the epilogue to his book *Homo Coreanicus* in which he analyzes how the “habitus” of contemporary Koreans is shaped in the historical processes from “the pre-modern” through the “modernization” based on industrialism to digital “futurism.” After analyzing the violent process that has shaped the body of contemporary Koreans, the author proposes how to remake one's body that could survive in the imminent future. “Stem cells” are used as a metaphor for the state of “the state of potentiality, which can differentiate into whatever” (296). It is not his observation of “reverse evolution (or involution)” of people's body. Rather, it is a suggestion that one “*should* sustain one's body in the state of potentiality” in order to adopt the “weight of gravity that the body experiences” (297) in the rapid and radical changes in our conditions of living. Here, the reverse-evolution becomes a project that is oriented toward the future, not a process that can be observed in retrospect. The project of reverse evolution is linked with the projection that the existing problems of capitalism would simply be exacerbated (Kortright 2012).

There is nothing romantic about this reverse-evolution to the state like stem cells, the state of potentiality. He rather acknowledges there is certain cruelty that demands one to keep oneself pluripotent, so that “one can quickly ‘connect’ one's own area to other areas, and newly

differentiate it into the organs *in need* (296: emphasis added).” This reverse evolution is a strategy of adaptation to the violent changes: “the body that constantly re-designs itself while maintaining the potentiality will, at least, suffer less from the forced nomadic life, and in some case, will enter into the world of unanticipated possibilities (297)” for “the body that has already been differentiated” (296) cannot survive the abrupt changes. It is not a natural process, but one should make oneself as the bearer of the potentiality like stem cells. In Chin’s advice to college students, he makes it more explicit what the “potentiality” is: “You should take care of yourself. Capitalism does not take care of you. Corporations constantly look for new cogs (people) that will enter the machinery to work in it. When the cog reaches its forties, they replace it with a new, fresh one. You should be ready for the time you will be thrown out. Secure your own area [of expertise] and make yourself as somebody that cannot be replaced with others. Also, you should look at things broadly. In other words, you *should* become a speralist, the combination of a specialist and generalist. It is to *make* you into the state of stem cells, which *have* the potential to differentiate into whatever.” (emphasis added)

What makes Chin’s metaphor of “stem cells” interesting is the way he conceives the “potentiality.” The potentiality here is what one *should* establish and maintain as one’s own property as stem cells do. It is the capacity to “adapt” to the violence of time on each body that makes it difficult for the already differentiated organs to survive. Undifferentiated potential is the prerequisite of one’s own survival in the tyranny of time. Whether he speaks of the historical processes of change in our conditions of living (*Homo Coreanicus*), or of aging of individuals (college magazine interview), time for the fully differentiated body only appears to be the negative force. Without securing the potentiality, time works only as a negative force in the way Chin portrays. The world outside, “capitalism,” wants one as long as one is youthful and vital

enough to be a relatively “new, fresh” cog in the machine. Capital constantly renews its own body by pulling in new organs, the bodies of people that “have already been differentiated,” which can always be replaced with other differentiated bodies (or organs from capital’s point of view). Capital does not know time except that its organs are worn out at some point, and they should be replenished with some other organs. The force of time in history is also seen as a problem, the weight, which each individual body has to endure and “suffer.” This antagonistic relation between *the* body and time is an underlying theme in both Chin’s observation of *the* society, and in stem cell biology—the solution is to strive to *have* and *maintain* the potential to deal with the antagonistic force of time.

While Chin’s use of the term “potentiality,” inferred from the use of other words and other writings, is closely associated with his reading of Deleuze and Guattari, the way it is deployed with the metaphor of stem cells shows a very peculiar articulation of the potentiality as the ability or capacity of a subject to act without restriction. When it is pronounced in the modality of imperative (should) to deal with the violent force of time, the potentiality that is to be sustained by each body is rendered not so much as the state as the object/ive. As it is combined with the language of “generalist vs. specialist” which has flourished in the discourse of “career management,” the potentiality, although it might not be what Chin meant, appears as a kind of capacity or ability of workers to adapt to the flexible work environment. Indeed, the term “speralist” he used resonates with the “T-shaped persons,” or “generalizing specialist” much celebrated in the managerial discourse on restructuring of workforce for creative processes. It is not to say that they are the same discourse: Chin’s emphasis on the potentiality is a matter of survival in the ever-changing world, while the managerial discourse seeks for enhancing the productivity of the firm in the new economy. For the former, the cog in the machine is not a

possible option, while for the latter, it is just an undesirable model of worker. The notion of potentiality conceived as the ability to become anything and to “connect” with anything to produce “organs in need” renders the potentiality as an objective to be achieved and an object to have and to be maintained by one, the stem cell-like capable subject.

The peculiarity of stem cell metaphor becomes clearer when one goes back to the metaphor of egg in his reference point, Deleuze and Guattari. What could be compared to “stem cells” in Deleuze and Guattari’s work is the egg (the Dogon Egg) in *Anti-Oedipus* and *A Thousand Plateaus*, as a figure for a “body without organs.” But, stem cells are different from the Dogon Egg. The egg itself is portrayed as a body that is also a field in which intensities are distributed. It is not so much of the potentiality as the latent capacity that is activated to produce (or become) organs in need, but the field of *immanent* desires. It is the “intense egg defined by axes and vectors, gradients and thresholds, by dynamic tendencies involving energy transformation and kinematic movements involving group displacement, by migrations.” This dynamic image of the potentiality leads us to question the boundary of an entity itself and complicate the notion of the potentiality. The Dogon Egg is not an individual entity that has the potential seed for one person, but the “egg of the world” or the “original placenta” in which two pairs of twins were placed. It is already a messy world in itself: its potentiality is immanent, but not as the capacity the egg *has*, but as the potentials of emergent processes through the vibrant movements in this egg-world which does not have to be delimited by the boundary of the egg. In contrast, the cell form of stem cells is considered to “have the potentiality” which can *turn into* something else—its becoming does not negate the boundary of the entity and its potentiality appears synonymous to its own capacity of production as a response to certain actions—produce “organs in need” when one “connects.”

Stem cells that have the potential in themselves, then, appear rather similar to flexible bodies (Martin 1994) than a body without organs. The peculiarity of stem cell's potentiality as it is conceived in the stem cell enterprise and popular imagination is that its particular emphasis on the plasticity of the entity. With the metaphor of stem cells, the potentiality appears as an object that is located in the potent entity in itself as its capacity to remain versatile to the violent changes dictated by the irreversible passage of time. At the same time, it is an objective that one should strive for in order to gain the agency to act upon time's irreversible forces. Chin's call for reinvention of oneself to maintain the potentiality is rather the anxious call for reinvention of self to "take care of" oneself against the cruelty of capital and social changes. Stay versatile, keep yourself pluripotent, live like the stem cell. The potentiality conceived this way is not just promising—it is sought when it appears things are ever-changing, but the existing order of the world appears to be recalcitrant. The capacity to stay plastic and potentially productive might be what stem cells, with their potentiality, promise.

LIVING IN THE FUTURE

It is time to really conclude. This was a story of how people in Korea engage with the promise of stem cell biology, and how the stem cell promise comes to proliferate not only in the biomedical sciences, but also in other domains where promise is sought. The promise of stem cell biology has generated various forms commitments among people who imagine or desire the future that will come when the promise is realized. In each site, the promise becomes the "signpost" that presents a possible future to the promisee. As long as the promisee's commitment is sustained, the promise would gain its force to survive. The promise in this sense lives on the imaginations of the future. But, the imaginations about the future still beg questions.

There is a general promise of stem cell biology for the regenerative medicine. The promise of health appears to be congruous to the promise of economic growth considering therapeutics anticipates the market. Not only therapeutics, but intellectual properties, instruments, and substances are involved in the production of therapeutics are anticipated to yield economic value. Hospitals will benefit, too, and it is already happening. The worldwide investments in stem cell science are full of promises, the radically different medical paradigm of regenerative medicine, hope and dreams as well as anxieties. The way stem cells first entered into the popular vocabulary in Korea was not so different from this picture. The pursuit of the “new growth engine” for the post-industrial nation, the promise to raise a paralyzed dancer from the wheelchair, and the newly found potential of Korean fingertips were performed by Hwang Woo-suk and his stem cell lines.

But, there is more. As stem cells move to the popular domain, they start making different kinds of promises. With the technological possibilities that stem cells offered (storing youthful cells, rejuvenating old body, and regenerating injured organs), biology is no longer conceived as a fate, and biological time is no longer seen irreversible, *as long as* investments are made. This plasticity of biology suggests more than an advent of an age of biological control. The flexibility of biology in Korea is set against the backdrop of anxieties about the stagnation of economy, the aging of population, and individuals’ insecurity about their own aging as irresolvable problems. Stem cells, thanks to their presumed biological potential to regenerate old and injured tissues, could find their social and biological niche within this socio-cultural and politico-economic milieu fraught with anxieties and desires in Korea regarding future(s) that is different from the present, revealing the textures of biopolitics in Korea. Stem cells as a promissory life form, and speculative forms of life simultaneously animate each other as the medium of the promise’s own

potentiality. The future-orientation here however is not necessarily hopeful. In this future, one should be plastic, flexible, and vital even though one is already old enough. The future is now, but not in the same with that biotech gurus hastily promise. Rather, the future is already being observed in the news about poor old couple's suicide, and about the stem cell anti-aging boom among the top-one-percent rich seniors.

REFERENCES

- Adams, Vincanne, Michelle Murphy, and Adele Clarke
2009 Anticipation: Technoscience, Life, Affect, Temporality. *Subjectivity* 28(1):246–265.
- Adams, Vincanne
2013 Evidence Based Global Public Health: Subjects, Profits, Erasures. In Joao Beihl and Adriana Petryna, eds. *When People Come First.* Princeton University Press.
- Agamben, Giorgio
1998 *Homo Sacer: Sovereign Power and Bare Life*. Daniel Heller-Roazen, trans. Stanford, CA: Stanford University Press.
- Ahmed, Sara
2010 *The Promise of Happiness*. Durham, NC: Duke University Press.
- Althusser, Louis
1971 Ideology and Ideological State Apparatus. In *Lenin and Philosophy and Other Essays*. Ben Brewster trans. New Left Books.
- Anonymous
2006 Kichahoekyöne Ch’amsökhan 20tae Yösöngüi Simkyöngkopaek Chönmun [Confession of a woman in her twenties at the press conference].
<http://www.hani.co.kr/arti/society/health/117633.html>. (Accessed July 1, 2015)
- Appadurai, Arjun
1986 Introduction: Commodities and the Politics of Value. In Arjun Appadurai, ed. *The Social Life of Things: Commodities in Cultural Perspective*. Cambridge University Press.
- Austin, J.L.
1962 *How To Do Things with Words*. Oxford University Press.
- Bae, Geun-jeong
2007 Söngch’ejulgisep’o Yön’gu-ro Yesunimüi Kijöngül [For the miracles of Jesus with the adult stem cell research]. *Pitkwa Sogüm [Salt and Light]*. October.
http://www.duranno.com/sl/detail.asp?CTS_ID=65077 (Accessed June 20, 2015)
- Barad, Karen
2003 Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter. *Signs* 28(3):801-831.
2007 *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Duke University Press.
2013 On Touching—The Inhuman That Therefore I Am. *Differences* 23(3):206-223.
- Bennett, Jane
2010 *Vibrant Matter: A Political Ecology of Things*. Duke University Press.

Bianco, Paolo

2013 Don't Market Stem-cell Products ahead of Proof. *Nature* 499(7458):255.

Bianco, Paolo, Pamela Gehron Robey, and Paul Simmons

2008 Mesenchymal Stem Cells: Revisiting History, Concepts, and Assays. *Cell Stem Cell* 2(4):313-319.

Birch, Kean and David Tyfield

2013 Theorizing the Bioeconomy: Biovalue, Biocapital, Bioeconomics or... What? *Science, Technology & Human Values* 38(3):299-327.

Bourdieu, Pierre

1990 The Scholastic Point of View. *Cultural Anthropology* 5(4):380-391.

2004 *Science of Science and Reflexivity*. University of Chicago Press.

Brown, Nik

2003 Hope against Hype: Accountability in Biopasts, Presents and Futures. *Science Studies* 16(2): 3-21.

Brown, Nik and Mike Michael

2003 A Sociology of Expectations: Retrospecting Prospects and Prospecting Retrospects. *Technology Analysis & Strategic Management*, 15(1):3-18.

Butler, Judith

1997 *The Psychic Life of Power: Theories in Subjection*. Stanford University Press.

Callahan, Daniel

2003 Individual Good and Common Good: A Communitarian Approach to Bioethics. *Perspective in Biology and Medicine* 46(4):496-507.

Callison, Candis

2014 *How Climate Change Comes to Matter: The Communal Life of Facts*. Duke University Press.

Callon, Michel

1999 Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St. Brieuc Bay. In *The Science Studies Reader*. Mario Biagioli, ed. New York: Routledge.

Canguilhem, Georges

1989 *The Normal and the Pathological*. Carolyn R. Fawcett, trans. Zone Books.

2008 *Knowledge of Life*. Stefanos Geroulanos and Daniela Ginsburg, trans. Fordham University Press.

Caplan, Arnold

2011 The MSC: An Injury Drugstore. *Cell Stem Cell* 9(1):11-15.

Charmaz, Kathy

1983 Loss of Self: A Fundamental Form of Suffering in the Chronically Ill. *Sociology of Health and Illness* 5(2):168-195.

1991 *Good Days, Bad Days: The Self in Chronic Illness and Time*. New Brunswick, NJ: Rutgers University Press.

Chaum

n.d. Chaum Is. <http://www.chaum.kr/info/chaumIs.aspx> (Accessed August 25, 2015)

Chin, Jungkwon

2007 *Homo Coreanicus*. Seoul, Korea: Woongjin. (Written in Korean)

Cho, Joo-hyun

2006 Egg: Politics Structured around the Vision of Biotechnology and the Touch of Women's Embodied Experience. *Hanguk Yösönghak* 22(2):5-40. (Written in Korean)

Cho, Yong-gi

2010 Ne Kaji Ttange Ttöröjin Ssi [The seeds that fall into four different soils]. Sermon, Yoido Full Gospel Church, Seoul, Korea, December 12.

2012a 4-Cha'wönüi Kido [The prayer of the fourth dimension] Yoido Full Gospel Church, Seoul, Korea, February 5.

2012b Midümiran [What is faith?] Sermon, Yoido Full Gospel Church, Seoul, Korea, September 9.

2014 Puhwal [Resurrection]. Sermon, Yoido Full Gospel Church, Seoul, Korea, April 20.

n.d. Mokhoe Ch'ölhak [Philosophy of ministry].

http://davidcho.fgtv.com/c1/C1_34.asp (Accessed July 25, 2015)

Choi, Young-chul

2005 Söngch'ejulgisep'o-ga Chaesaengüihak Taese [Adult stem cells lead the main trend in regenerative medicine] October 18. *Weekly DongA* vol. 506.

Chosun Ilbo

2011 100Se Syok'ü Ch'ukpoginga Chaeanginga [The centenarian shock: blessing, or disaster?] January 3.

Choy, Timothy

2011 *Ecologies of Comparison: An Ethnography of Endangerment in Hong Kong*. Duke University Press.

Chun, Gwanyul

2014 Ch'abyöngwön'gürup, Imi Wa Innün Minnyöngghwaüi Mirae [CHA Medical Group, the future of privatization that has already come]. *SisaIN* 332. January 20.

Clark Dav, Frank Schumann, and Stewart H. Mostofsky

2015 Mindful Movement and Skilled Attention. *Frontiers of Human Neuroscience*. 9:297.

Clarke, Adele

1998 *Disciplining Reproduction: Modernity, American Life Sciences, and the Problems of Sex.* University of California Press.

Clarke, Adele and Joan Fujimura

1992 *The Right Tools for the Job: At Work in Twentieth Century Life Sciences.* Princeton University Press.

Collier, Stephen and Aihwa Ong

2005 *Global Assemblages, Anthropological Problems.* In Stephen Collier and Aihwa Ong eds. *Global Assemblages: Technology, Politics, and Ethics as Anthropological Problems.* Blackwell Publishing.

Collins, Harry

1985 *Changing Order: Replication and Induction in Scientific Practice.* Sage.

Cooper, Melinda

2006 *Resuscitations: Stem Cells and the Crisis of Old Age.* *Body & Society* 12(1):1–23.

2008a *Life as Surplus: Biotechnology and Capitalism in the Neoliberal era.* Seattle, WA: University of Washington Press.

2008b *Experimental Labour—Offshoring Clinical Trials to China.* *EASTS* 2(1):73-92.

2015 *The Theology of Emergency: Welfare Reform, US Foreign Aid and the Faith-Based Initiative.* *Theory, Culture & Society* 32(3):53-77.

Cooper, Melinda and Catherine Waldby

2014 *Clinical Labor: Tissue Donors and Research Subjects in the Global Bioeconomy.* Duke University Press.

Corea, Gena

1985 *The Mother Machine: Reproductive Technologies from Artificial Insemination to Artificial Wombs.* Harpercollins.

Corrigan, Oonagh

2003 *Empty Ethics: The Problem with Informed Consent.* *Sociology of Health & Illness* 25(3):768-792.

Crosthwaite, Paul

2013 *Animality and Ideology in Contemporary Economic Discourse.* *Journal of Cultural Economy* 6(1):94–109.

Daston, Lorraine, ed.

1999 *Biographies of Scientific Objects.* University of Chicago Press.

Davis, Scott

1996 The Cosmobiological Balance of the Emotional and Spiritual Worlds: Phenomenological Structuralism in Traditional Chinese Medical Thought. *Culture, Medicine and Psychiatry* 20(1):83-123.

Dein, Simon

2014 Christian Fundamentalism and Science: Answers in Genesis. *Anthropol* 2(5):132-136.

Delaney, Carol

1986 The Meaning of Paternity and the Virgin Birth Debate. *Man* 21(3): 494-513.

Deleuze, Gilles and Felix Guattari

1983 *Anti-Oedipus*. Robert Hurley, Seem Mark, and Helen R. Lane, trans. University of Minnesota Press.

1987 *A Thousand Plateaus: Capitalism and Schizophrenia*. Brian Massumi trans. Minneapolis, MN: University of Minnesota Press.

Deleuze, Gilles

1997 *Negotiations 1972-1990*. Martin Joughin trans. New York: Columbia University Press.

Derrida, Jacques

2014 *Cinders*. Ned Lukacher, trans. University of Minnesota Press.

Dickenson, Donna

2001 Property and Women's Alienation from their Own Reproductive Labour. *Bioethics* 15(3):205-217.

Dreifus, Claudia

2004 A Conversation with Woo Suk Hwang and Shin Yong Moon; 2 Friends, 242 Eggs and a Breakthrough. *The New York Times*. February 14.

Duden, Barbara

1992 Quick with Child: An Experience That Has Lost Its Status. *Technology in Society* 14(3):335-344.

Dumit, Joseph

1999 Objective Brains, Prejudicial Images. *Science in Context* 12(1):173-201.

2012 *Drugs for Life: How Pharmaceutical Companies Define Our Health*. Duke University Press.

Ehrenreich, Barbara

2009 *Bright-sided: How the Relentless Promotion of Positive Thinking Has Undermined America*. Macmillan.

Ehrenreich, Barbara and Deidre English

1973 *Witches, Midwives, and Nurses: A History of Women Healers*. Feminist Press.

Endo

- 2013 Kwahagi Hal Su Ömnün Irün Chulgisep'o-do Hal Su Öpta [Stem Cells Cannot Do What Science Cannot Do]. *ScienceOn*. January 15.
<http://scienceon.hani.co.kr/77801> (Accessed August 26, 2015)

Fagan, Melinda

- 2013 *Philosophy of Stem Cell Biology: Knowledge in Flesh and Blood*. Palgrave Macmillan.
2013 The Stem Cell Uncertainty Principle. *Philosophy of Science* 80(5):945-957.

Farquhar, Judith

- 1994 Eating Chinese Medicine. *Cultural Anthropology* 9(4): 471-497.

Felman, Shoshana

- 2002 *The Scandal of the Speaking Body. Don Juan with Austin, or Seduction in Two Languages*. Stanford University Press.

Fortun, Kim and Mike Fortun

- 2005 Scientific Imaginaries and Ethical Plateaus in Contemporary U.S. *Toxicology* 107(1):43-54.

Fortun, Mike

- 2008 *Promising Genomics: Iceland and deCODE Genetics in a World of Speculation*. University of California Press.

Foucault, Michelle

- 1977 *Discipline and Punish: The Birth of the Prison*. Alan Sheridan, Trans. Vintage.

Franklin, Sarah

- 2000 *Life Itself: Global Nature and the Genetic Imaginary*. In Sarah Franklin, Celia Lury, and Jackey Stacey, eds. *Global Nature, Global Culture*. Sage.
2005 *Stem Cells R Us: Emergent Life Forms and the Global Biological*. In Stephen Collier and Aihwa Ong eds. *Global Assemblages: Technology, Politics, and Ethics as Anthropological Problems*. Blackwell Publishing.
2006 Embryonic Economies: The Double Reproductive Value of Stem Cells. *BioSocieties* 1(1):71-90.
2008 *Dolly Mixtures: The Remaking of Genealogy*. Duke University Press.
2013 *Biological Relatives: IVF, Stem Cells, and the Future of Kinship*. Duke University Press.

Franklin, Sarah, and Margaret Lock

- 2003 *Animation and Cessation: The Remaking of Life and Death*. In *Remaking Life & Death: Toward an Anthropology of the Biosciences*. Sarah Franklin and Margaret Lock, eds. Santa Fe, NM: School of American Research Press.

Fujimura, Joan

1988 The Molecular Biological Bandwagon in Cancer Research: Where Social Worlds Meet. *Social Problems* 35(3):261-283.

1996 *Crafting science: A sociohistory of the quest for the genetics of cancer*. Harvard University Press.

George, Katrina

2007 What About the Women? Ethical and Policy Aspects of Egg Supply for Cloning Research. *Reproductive BioMedicine Online* 15(2):127-133.

Gnecchi, Massimiliano, Zhiping Zhang, Aiguo Ni, and Victor J. Dzau

2008 Paracrine Mechanisms in Adult Stem Cell Signaling and Therapy, *Circulation Research* 103:1204-1219.

Good, Mary-Jo Delvecchio

2001 The Biotechnical Embrace. *Culture, Medicine, Psychiatry* 25:395-410.

Gotweis, Herbert and Byoungsoo Kim

2009 Bionationalism, Stem Cells, BSE, and Web 2.0 in South Korea: Toward the Reconfiguration of Biopolitics. *New Genetics and Society* 28(3):223-239.

Guyer, Jane

2007 Prophecy and the Near Future: Thoughts on Macroeconomic, Evangelical, and Punctuated Time. *American Ethnologist*. 34(3):409-421.

Ha, Jung-ok

2006 (A) Study on the Transformation of Biomedical Technology in Korea: From Reproductive Technology to Bioengineering. PhD dissertation. Seoul National University. (written in Korean)

Han, Clara

2011 Symptoms of Another Life: Time, Possibility, and Domestic Relations in Chile's Credit Economy. *Cultural Anthropology* 26(1):7-32.

Haraway, Donna

1988 Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies* 14(3):575-599.

1997 *Modest_Witness@Second_Millennium. FemaleMan@_Meets_OncoMouse™*. Routledge.
2004 *The Promises of Monsters: A Regenerative Politics for Inappropriate/d Others*. In *Haraway Reader*. Routledge.

2008 *When Species Meet*. University of Minnesota Press.

Harding, Susan

1987 Convicted by the Holy Spirit: The Rhetoric of Fundamental Baptist Conversion. *American Ethnologist* 14(1):167-181.

- Hardt, Michael
1999 Affective Labor. *Boundary 2* 26(2):89-100.
- Harrington, Anne
2006 The Many Meanings of the Placebo Effect: Where They Came from, Why They Aatter." *Biosocieties* 1(2):181-193.
- Hayward, Eva
2010 Fingeryeyes: Impressions of Cup Corals. *Cultural Anthropology* 25(4): 577-599.
- Heath, Deborah
1997 Bodies, Antibodies, and Modest Interventions. In Gary Lee Downey and Joseph Dumit, eds. *Cyborgs and Citadels: Anthropological Interventions in Emerging Sciences and Technologies*. SAR.
- Helmreich, Stefan
2008 Species of Biocapital. *Science as Culture* 17(4): 463-478.
- Ho, Karen
2009 *Liquidated: An Ethnography of Wall Street*. Durham, NC: Duke University Press.
- Hogle, Linda
2003 Life/Time Warranty: Rechargeable Cells and Extendable Lives. In *Remaking Life & Death: Toward an Anthropology of the Biosciences*. Sarah Franklin and Margaret Lock, eds. Santa Fe, NM: School of American Research Press.
- Hong, Sungook, ed.
2008 Special Issue: The Hwang Scandal and Human Embryonic Stem-Cell Research. *East Asian Science, Technology and Society: An Interdisciplinary Journal* 2(1).
- Hustak, Carla and Natasha Myers
2012 Involuntary Momentum: Affective Ecologies and the Sciences of Plant/Insect Encounters. *Differences* 23(3): 74-117.
- Hwang, Woo-suk, and Jae-cheon Choi
2004 *Naüi Saengmyöng Iyagi [My story of life]*. Paju, Korea: Hyohyöngch'ulp'an.
- Ikemoto, Lisa
2009 Eggs as Capital: Human Egg Procurement in the Fertility Industry and the Stem Cell Research Enterprise. *Signs* 34(4):763-781.
- Im, Hye-rin
2013 RNL Bio ilt'arhaengwiro baio-öpkye ginjang... Hwang Woo-suk t'ürauma jaehyöndoelkka noshimch'osa [The stem cell industry is fretting about the potential recurrence of the Hwang Woo-suk Trauma due to the RNL Bio's violation of the norms] *MK Economy* Vol. 1692. January 28.

In, Jeong-ok

2005 Pulch'ibyŏng Drama K'üllatta, Hwang Woo-suk Ttaemune Kŭrae-do Chŭlgŏpta [Melodramas on incurable patients are in a jam now, but I'm happy because of Hwang Woo-suk]. Hangyeore 30. May 26.

Ingold, Tim

2004 Culture on the Ground: The World Perceived Through the Feet. *Journal of Material Culture* 9: 315-340.

ISSCR (The International Society for Stem Cell Research)

2010 A Closer Look at Stem Cell Treatments. (<http://www.closerlookatstemcells.org>)

N.d. Pluripotent Stem Cells in Glossary of Stem Cell-Related Terms.

<http://www.isscr.org/visitor-types/public/stem-cell-glossary#Pluripotent>. Accessed June 20, 2015.

Ivanova, Natalia, John T. Dimos, Christoph Schaniel, Jason A. Hackney, Kateri A. Moore, Ihor R. Lemischka

2002 A Stem Cell Molecular Signature. *Science* 298(5593):601-604.

Jain, S. Lochlann

2013 *Malignant: How Cancer Becomes Us*. Berkeley, CA: University of California Press.

James, William

1896 The Will To Believe. *The New World: A Quarterly Review of Religion Ethics and Theology* 5:327-347.

Jeon, Hongtaek, Myeongho Park, Seokmyeong Yoon, Yangmin Song, Hyeongseon Jeong, Hanam Bang, and Joohyeong Han

2011 Paeksesidae, Öttök'e Haengbok'age Sal Könnin'ga? Urinün Kwayŏn Paekseshidaerül Maja Ölmana Chunbihago Innünga?" [Centenarian Era, how can we live happily: how prepared are we for the coming Centenarian Era?] *NCRS Human New Deal Report* 11-05-02.

Jeong, Yeong-il

2011 Chŭng-si, Chulgisep'o "Shinhwa" Nömösöya. [The stock market should go beyond the stem cell "myth"]. June 29. *MoneyToday*.

Jin, Hee-Jeong, Young Hwa Baek, Young Seop Lee, Jae Chul Lee, Ming Jin, Sang-Hyuk Kim

2012 Network Analysis of "Mibyung" Research. *Tongŭisaengnibyŏngnihak'hojeji* [Korean Journal of Oriental Physiology & Pathology] 26(4):546-550.

Karp, Jeffery and Grace Sock Leng

2009 Mesenchymal Stem Cell Homing: The Devil Is in the Details. *Cell Stem Cell* 4(3):206-216.

- Keller, Evelyn Fox
1983 A Feeling for the Organism: The Life and Work of Barbara McClintock. WH Freeman.
- Kim, Bu-won
2011 Musöpke Orün Chulgisep’oju... “Köp’umedo Yuühara” [The steep uptrend of stem cell stocks... “be cautious of the bubble, too.”]. July 7. MoneyWeek.
- Kim, Eun-hye
2013 Chulgisep’o Ch’iryoro Yukch’edo Salligo Yöngondo Kuhagetta [I will not only save the flesh, but also the soul with stem cell treatments] February 5. Christian Today. <http://www.christiantoday.co.kr/view.htm?id=261109>
- Kim, Gwang-ju
2014 Tangshinüi Kananül Kyöngyöngghara [Manage Your Poverty]. One and One Books.
- Kim, Hwan-suk
2006 Hwang Woo-suk Sat’aeüi Chöngch’ijök Hamüi [The Political Implication of the Hwang Woo-suk Affair] Presentation at a symposium “Hwang Woo-suk Sat’aerobut’ö Muösül Paeul Köshin-ga [What To Learn from the Hwang Woo-suk Affair]” March 10.
- Kim, Jongyoung
2009 Public Feeling for Science: The Hwang Affair and Hwang Supporters. Public Understanding of Science 18(6): 670–686.
- Kim, Malg-a
2010 Yangbang, Tongyangüihak, Taech’eüihak Hyöpchinüro Chungjangnyöngch’üng “Hoesaek Chidae” Öpsaenda [Removing the gray zone of the middle-age life (Health) by combining the Western, Oriental, and alternative medicine] Chosun Ilbo. June 23.
- Kim, Min-hee and Kang-wuk Lee
2013 “Anjönsöng Kömjüng Mönjö” “Ch’iryö Mönjö” [“Proof of safety first”, “treatment first”] Weekly Chosun vol. 2240. January 14.
- Kim, Sang-hyun
2014 The Politics of Human Embryonic Stem Cell Research in South Korea: Contesting National Sociotechnical Imaginaries. Science as Culture 23(3):293-319.
- Kim, Su-byeong
2004 Chulgisep’o, “Söngsöüi Kijök”ül Hyanghae [Stem cells, toward the miracles in the Bible]. Hangyere 21 vol. 535. November 18.
2005 “Söngsüröun Yö-in”i Shinümhanda. [The ‘saintly woman’ is groaning]. Hangyere 21 Vol. 591. December 27.
- KIOM (The Korea Institute of Oriental Medicine)
n.d. Tongsöüihak Yunghabüi Mibyöng Chindan’gijun Kaebal [Establishing diagnostic categories for *mibyöng*] <http://www.kiom.re.kr/rnd/rnd3.jsp>

KMD Architects

n.d. KMD Architects Design Narrative.

http://chaumlife.com/press/kdm_chaum_life_center.pdf (Accessed May 1, 2014)

Kopytoff, Igor

1986 The Cultural Biography of Things: Commoditization as Process. In Arjun Appadurai, ed. *The Social Life of Things: Commodities in Cultural Perspective*. Cambridge University Press.

KoreaPlus

2004 Dynamic Korea: 2004 Han'gugül Pinnaen Saramdül [Dynamic Korea: people who brought honor to Korea in 2004]. December 20.

<http://www.korea.kr/special/policyFocusView.do?pkgId=40&newsId=65084454&pageIndex=1>

Kortright, Chris

2012 C4 Rice and Hoping the Sun Can End Hunger: Tales of Plants, Evolution, Trans-genics, and Crisis. PhD dissertation. University of California, Davis.

KRX (Korea Exchange)

2010 Algi Shwiun Chünggwön P'asaengsangp'um Chip'yohaesöl [Guide to Indices of Securities & Derivative Markets].

Landecker, Hannah

2003 On Beginning and Ending with Apoptosis: Cell Death and Biomedicine. In *Remaking Life & Death: Toward an Anthropology of the Biosciences*. Sarah Franklin and Margaret Lock, eds. Santa Fe, NM: School of American Research Press.

2005 Living Differently in Time: Plasticity, Temporality and Cellular Biotechnologies. *Culture Machine* 7. <http://www.culturemachine.net/index.php/cm/article/view/26/33>. Accessed June 20, 2015.

2008 *Culturing Life: How Cells Became Technologies*. Harvard University Press.

Lander, Arthur D

2009 The 'Stem Cell' Concept: Is It Holding Us Back? *Journal of Biology* 8(70):1-6.

Langley, Paul

2007 Uncertain Subjects of Anglo-American Financialization. *Cultural Critique* 65(1): 67-91.

Laplane, Lucie

2014 Stem Cell Epistemological Issues. In Charles Durand and Pierre Charbord (eds) *Stem Cell Biology and Regenerative Medicine*. Aalborg, Denmark: River Publishers.

Latour, Bruno

1987 *Science in Action: How to Follow Scientists and Engineers Through Society*. Harvard University Press

- 1993 The Pasteurization of France. Alan Sheridan and John Law, trans. Harvard University Press.
- 2005 Reassembling the Social: An Introduction to Actor-Network-Theory. Oxford University Press.

Lazzarato, Maurizio

- 1996 Immaterial Labour. In Paolo Virno and Michael Hardt, eds., Radical Thought in Italy. Minneapolis: University of Minnesota Press.
- 2012 The Making of the Indebted Man: Essay on the Neoliberal Condition. Joshua David Jordan, trans. Semiotext(e).

Lee, Benjamin and Edward LiPuma

- 2004 Financial Derivatives and the Globalization of Risk. Duke University Press.

Lee, Chang-hun

- 2012 Happy Homo Hundred. MK News. March 6.
<http://news.mk.co.kr/newsRead.php?year=2012&no=145397> (Accessed August 27, 2015)

Lee, Chung-joon

- 2000 Shiinŭi Shigan [The Time of the Poet]. In Moksui Chip [The House of the Carpenter]. Seoul, Korea: Yŏllimwŏn.

Lee, Ho-jae, dir

- 2009 *Jak-jeon* (The Scam). 119 mins. Bidangil Pictures. Seoul, Korea.

Lee, Kyung-suk

- 2013 “Ünt’oe Hu 5Ök Wŏn P’illyo? Kŭgŏn Kongp’o Mak’et’ing” Öñŭ Kŭmnyungjŏnmun’gaŭi Kobaek. [“One needs a half million dollars after the retirement? That’s just a fear marketing” confesses a financial expert.]
<http://www.eroun.net/40393> (Accessed August 27, 2015)

Lee, Myung-bak

- 2011 The New Year’s Speech. Seoul, Korea.

Lee, Seung-hun

- 2005 Hwang Woo-suk kinyŏmup’yo nawatta [A commemoration stamp for Hwang Woo-suk came out]. OhMyNews. February 11.
http://www.ohmynews.com/NWS_Web/View/at_pg.aspx?CNTN_CD=A0000236849. (Accessed August 27, 2015)

Lee, Sun-Dong and Myong-Dong Kim

- 1997 Study on the Significance and Importance of Preclinic Phase Theory(=mibuyung) in Oriental Medicine. Taehanyebanghanŭihak’oeji [Korean Journal of Oriental Preventive Medical Society] 1(1):105-117. (Written in Korean)

- Leem, So Yeon and Jin Hee Park
2008 Rethinking Women and Their Bodies in the Age of Biotechnology: Feminist Commentaries on the Hwang Affair. *EASTS* 2(1):9-26.
- Lépinay, Vincent
2011 *Codes of Finance: Engineering Derivatives in a Global Bank*. Princeton University Press.
- Li, Zhongzi
2010 *Huangdi Neijing: A Synopsis with Commentaries*. Y.C. Kong, trans. Hong Kong: Chinese University Press.
- Luhrmann, Tanya
2013 Making God Real and Making God Good: Some Mechanisms through which Prayer May Contribute to Healing. *Transcultural Psychiatry* 50(5):707-725.
- Lynch, Michael
1985 *Art and Artifact in Laboratory Science: A Study of Shop Work and Shop Talk in a Research Laboratory*. Routledge and Kegan Paul.
- MacKenzie, Donald
2006 *An Engine, Not a Camera: How Financial Models Shape Markets*. MIT Press.
- Magnus, David and Mildred Cho
2005 Issues in Oocyte Donation for Stem Cell Research. *Science* 308(5729):1747-8.
- Martin, Emily
1987 *The Woman in the Body: A Cultural Analysis of Reproduction*. Boston, MA: Beacon Press.
1991 The Egg and the Sperm: How Science Has Constructed a Romance Based on Stereotypical Male-Female Roles. *Signs* 16(3):485-501.
1994 *Flexible Bodies: Tracking Immunity in American Culture—From the Days of Polio to the Age of AIDS*. Boston, MA: Beacon Press.
- Martin, Randy
2002 *Financialization of Daily Life*. Temple University Press.
- Marx, Karl
1976 *Capital* vol. 1. Ben Fowkes trans. Penguin.
1993 *Capital* Vol.3. David Fernbach, trans. Penguin.
- Mazzarella, William
2003 *Shoveling Smoke: Advertising and Globalization in Contemporary India*. Duke University press.

Mialet, Hélène

2012 *Hawking Incorporated: Stephen Hawking and the Anthropology of the Knowing Subject*. University of Chicago Press.

Milburn, Colin

2008 *Nanovision: Engineering the Future*. Duke University Press.

Minsanung Changnoga Mannan Saramdül [Minister San Woong Min Meets People]. FEBC, November 9, 2008.

Miyazaki, Hirokazu

2004 *The Method of Hope: Anthropology, Philosophy, and Fijian Knowledge*. Stanford University Press.

2013 *Arbitraging Japan: Dreams of Capitalism at the End of Finance*. University of California Press.

MK Business News (Maeilgyöngje)

2002 “Söp’yönje”üi Chakka, Chung-joon Lee [Chung-joon Lee, the author of *Söp’yönje*] March 27.

Moerman, Daniel

1979 *The Anthropology of Symbolic Healing*. *Current Anthropology* 20(1):59-66.

Moerman, Daniel, and Anne Harrington

2005 *Making Space for the Placebo Effect in Pain Medicine*. 3:2-6.

Mol, Annemarie

2003 *The Body Multiple: Ontology in Medical Practice*. Duke University Press.

2006 *Proving or Improving: On Health Care Research as a Form of Self-Reflection*. *Qualitative Health Research*. 16(3):405-414.

Morgan, Lynn and Meredith Michaels

1999 *Fetal Subjects, Feminist Positions*. University of Pennsylvania Press.

Murdoch, Charles and Christopher Thomas Scott

2010 *Stem Cell Tourism and the Power of Hope*. *The American Journal of Bioethics* 10(5):16-23.

Myers, Natasha

2007 *Modeling Proteins, Making Scientists: An Ethnography of Pedagogy and Visual Cultures in Contemporary Structural Biology*, PhD Dissertation, MIT.

Myers, Natasha and Joseph Dumit

2011 *Haptic Creativity and the Mid-Embodiments of Experimental Life*. In Fran Mascia-Lees, ed. *Wiley-Blackwell Companion to the Anthropology of the Body and Embodiment*. Wiley-Blackwell.

Nelson, Diane.

2013 100 Percent Omnilife: History, Economy, and the End/s of War, in Carlota McAllister and Diane Nelson, eds. War By Other Means: Aftermath in Post-Genocide Guatemala. Duke University Press.

Nietzsche, Friedrich

2006 On the Genealogy of Morality. Carol Diethe, trans. Cambridge University Press.

Novas, Carlos

2006 The Political Economy of Hope: Patients' Organisations, Science and Biovalue. BioSocieties 1: 289–306.

Ong, Aihwa

1987 Spirits of Resistance and Capitalist Discipline: Factory Women in Malaysia. SUNY Press.

Paik, Young-gyung

2006 Saengmyöngyullirül Nömsö: Nanja Köraeüi Hyönshilgwa Yösöngjuüijök Kaeip. [Beyond bioethics: the reality of egg trafficking and feminist intervention] Yö/söngiron 15:113-127.

2010 Technologies of “the Korean Family”: Population Crisis and the Politics of Reproduction in Contemporary South Korea. PhD dissertation. Johns Hopkins University.

Park, Gyung-chul

2008a Shigorüisaüi Chushik T’ujaran Muöshin’ga 1: T’ongch’alp’yön [The country doctor says what the stock investment is. Part 1: insights.] Seoul, Korea: Leader’s Book.

2008b Shigorüisaüi Chushik T’ujaran Muöshin’ga 2: Punsökp’yön [The country doctor says what the stock investment is. Part 2: analysis.] Seoul, Korea: Leader’s Book.

Park, Hye Gyong

2008 The Discursive Formation of the Neo-liberal Housewife Subject and Characteristics of Korean Middle Class Families: Based on Media Discourse Analysis and In-depth Interviews. PhD dissertation. Ewha Womans University. (written in Korean)

Park, Sang-mi

2004 Chedaehyöl Kwönwija-ga Ponün In’ganbaejulgisep’o: Kanggyöngsön Kyosu Interview [An umbilical cord blood expert’s view on human embryonic stem cells: an interview with Prof. Kyung-sun Kang]

Park, So-Jin

2009 Anxious Lives in the Period of ‘Self-Management’ and ‘Family Management’: Neoliberalism and Neoliberal Subjectivity. Kyöngjewa Sahoe [Economy and society] 84:12-39. (written in Korean).

- Patra, Prasanna Kumar and Margaret Sleeboom-Faulkner
 2011 Recruiter-patients as ambiguous symbols of health: bionetworking and stem cell therapy in India. *New Genetics and Society* 30(2):155-166.
- Petchesky, Rosalind Pollack
 1987 *Fetal Images: The Power of Visual Culture in the Politics of Reproduction*. *Feminist Studies* 13(2):263-292.
- Peterson, Alan, and Kate Seear
 2011 *Technologies of Hope: Techniques of Online Advertising of Stem Cell Treatments*. *New Genetics and Society* 30(4):329-346.
- Petryna, Adriana
 2009 *When Experiments Travel: Clinical Trials and the Global Search for Human Subjects*. Princeton University Press.
- Phinney, Donald and Darwin Prockop
 2007 *Concise Review: Mesenchymal Stem/Multipotent Stromal Cells: The State of Transdifferentiation and Modes of Tissue Repair—Current Views*. *Stem Cells* 25(11): 2896-2902.
- Pickering, Andrew
 1995 *The Mangle of Practice: Time, Agency, and Science*. University of Chicago Press.
- Polanyi, Michael
 1958 *Personal Knowledge: Towards a Post-critical Philosophy*. University of Chicago Press.
- Pollock, Anne
 2003 *Complicating Power in High-Tech Reproduction: Narratives of Anonymous Paid Egg Donors*. *Journal of Medical Humanities* 24(3-4): 241-263.
- Puig de la Bellacasa, Maria
 2009 *Touching Technologies, Touching Visions. The Reclaiming of Sensorial Experience and the Politics of Speculative Thinking*. *Subjectivity* 28(1):297-315.
 2011 *Matters of Care in Technoscience: Assembling Neglected Things*. *Social Studies of Science* 41(1):85-106.
- Ra, Jeong Chan
 2011 *Chulgisep'o Yön'guwa Nanch'ibyöng Ch'iryö* [Stem cell research and cures for the incurable diseases]. Lecture, The Academia Christiana of Korea Seminar, Seoul, Korea. October 24.
 2011 *Komapta Chulgisep'o* [Thank you, stem cells]. 2nd edition. Wisdom House. Goyang, Korea.
 2012 *The Grace of Stem Cells: A Story of Science and Faith*. Tate Publishing & Enterprises.

- Rabinow, Paul
1996 Essays on the Anthropology of Reason. Princeton, NJ: Princeton University Press.
- Ramalho-Santos, Miguel, Soonsang Yoon, Yumi Matsuzaki, Richard C. Mulligan, Douglas A. Melton
2002 “Stemness”: Transcriptional Profiling of Embryonic and Adult Stem Cells. *Science* 298(5593):597-600.
- Rapp, Rayna
1999 Testing Women, Testing the Fetus: The Social Impact of Amniocentesis in America. Routledge.
- Rheinberger, Hans-Jörg
1997 Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube. Stanford University Press.
1999 Experimental Systems: Historiality, Narration, and Deconstruction.” In Mario Biagioli, ed. *The Science Studies Reader*. Routledge.
- Robert, Jason Scott
2004 Model Systems in Stem Cell Biology 26(9):1005-12.
- Roberts, Elizabeth
2012 God’s Laboratory: Assisted Reproduction in the Andes. University of California Press.
- Roh, Won-myeong
2010 Chedaehyöl Taep’yogiöp Medi-Post Yang Yoon-Sun Taep’yo [The CEO of Medi-Post, the representative cord blood company]. May 13. MK News.
<http://news.mk.co.kr/newsRead.php?year=2010&no=246881> (Accessed August 25, 2015)
- Romain, Tiffany
2011 Freezing Life, Buying Time: Consuming Cryopreservation services in the United States. PhD dissertation. Stanford University.
- Rosaldo, Renato
2013 The Day of Shelly’s Death. Duke University Press.
- Rose, Nikolas
2007 The Politics of Life Itself: Biomedicine, Power, and Subjectivity in the Twenty-First Century. Princeton University Press.
- Rosenzweig, Franz
2005 The Star of Redemption. Barbara E. Galli, trans. University of Wisconsin Press.
- Sahlins, Marshall
1976 Culture and Practical Reason. University of Chicago Press.

- Scheper-Hughes, Nancy and Margaret Lock
 1987 The Mindful Body: A Prolegomenon to Future Work in Medical Anthropology *Medical Anthropology Quarterly* 1(1):6-41.
- Selin, Cynthia
 2008 The Sociology of the Future: Tracing Stories of Technology and Time. *Sociology Compass* 2(6):1878–1895.
- Seo, Dong-jin
 2005 The Will to Self-empowerment, the Will to Freedom: The Understanding of the Transition of Korean Capitalism and the Transformation of Subjectivity through the Self-empowerment Discourses. PhD dissertation. Yonsei University, Seoul. (written in Korean)
- Serres, Michel
 1982 The Parasite. Lawrence R. Schehr, trans. Johns Hopkins University Press.
- Shapin, Steven
 1989 The Invisible Technician. *American Scientist* 77: 554-563.
- Shapin, Steven and Simon Schaffer
 1985 Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life. Princeton University Press.
- Shin, Mi-hee and Minjeong Lee
 2006 “Hwang Woo-suk-ŭi Ch’ŏnsa”ga Malhanŭn Nanjagijŭng Kŭhu [After the egg donation: the story told by the Hwang Woo-suk’s angel. OhMyNews. January 4. http://www.ohmynews.com/NWS_Web/View/at_pg.aspx?CNTN_CD=A0000302662 (Accessed July 20, 2015)
- Shin, Seung-geun
 2005 Roh Moo-hyun-ŭi Maengshin Park Ki-young-ŭi T’aeman [Roh Moo-hyun’s blind faith, Park Ki-young’s negligence]. *Hangyeore21* Vol. 590. December 19.
- Shostak, Stanley
 2006 (Re)defining Stem Cells. *Bioessays* 28(3):301-8.
- Sismondo, Sergio
 2011 Bourdieu’s Rationalist Science of Science: Some Promises and Limitations. *Cultural Sociology* 5(1): 83-97.
- Smith, Austin
 2006 A Glossary for Stem-cell Biology. *Nature* 441(7097):1060.
- Son, Sung-tae and Geun-ho Lim
 2011 MediPost Nŏktalsae 6Pae P’oktŭng... Kŭ Twien Mesamo Isŏtta [There was Mesamo behind the MediPost’s six-fold share value rise] *Hankuk Kyungje* [The Korea Economic Daily] October 12.

Song, Prisiella

2010 Biotech Pilgrims and the Transnational Quest for Stem Cell Cures. *Medical Anthropology* 29(4):384-402

Sperber Dan

1985 *Anthropology and Psychology: Towards an Epidemiology of Representations*. *Man* 20(1): 73–89.

Spiegel, David, and Anne Harrington

2008 What is the Placebo Worth? *BMJ* 336(7651):967-968.

Star, Susan Leigh, and Anselm Strauss

1999 *Layers of Silence, Arenas of Voice: The Ecology of Visible and Invisible Work*. *Computer Supported Cooperative Work (CSCW)* 8(1-2): 9-30.

Stengers, Isabelle

2003 The Doctor and the Charlatan. *Cultural Studies Review* 9(2):11-36.

Strathern, Marilyn

1988 *The Gender of the Gift: Problems with Women and Problems with Society in Melanesia*. University of California Press.

1992 *Reproducing the Future: Anthropology, Kinship, and the New Reproductive Technologies*. Manchester University Press.

2004 *Partial Connections*. Updated Edition. AltaMira Press.

2012 *Eating (and Feeding)*. *Cambridge Anthropology* 30(2):1-14.

Sunder Rajan, Kaushik

2006 *Biocapital: The Constitution of Postgenomic Life*. Duke University Press.

2007 *Experimental Values: Indian Clinical Trials and Surplus Health*. *New Left Review* 45:67-88.

T'ükpyörhan Mannam [A Special Rendezvous]. "With Jong Yun Lee and Jung Chan Ra." FEBC, September 15, 2011.

Tarde, Gabriel

2000 *Social Laws: An Outline of Sociology*. Howard C. Warren, trans. Kitchener: Batoche Book.

Terranova, Tiziana

2000 *Free Labor: Producing Culture for the Digital Economy*. *Social Text* 63, 18(2):33-58.

Thacker, Eugene

2005 The Global Genome: Biotechnology, Politics, and Culture. MIT Press

Thompson, Charis

2005 Making Parents: The Ontological Choreography of Reproductive Technologies. MIT Press.

2010 Asian Regeneration? Nationalism and Internationalism in Stem Cell Research in South Korea and Singapore. In Aihwa Ong and Nancy Chen, eds. Asian Biotech: Ethics and Communities of Fate. Duke University Press.

Tsing, Anna

2000 Inside the Economy of Appearances. *Public Culture* 12(1):115-144.

2004 Friction: An Ethnography of Global Connection. Duke University Press.

Tusge, Azumi and Hyunsoo Hong

2011 Reconsidering Ethical Issues about “Voluntary Egg Donors” in Hwang's Case in Global Context. *New Genetics and Society* 30(3): 241-252.

Tutton, Richard

2011 Promising Pessimism: Reading the Futures To Be Avoided in Biotech. *Social Studies of Science* 41(3):411–429.

Vora, Kalindi

2012 Limits of “Labor”: Accounting for Affects and the Biological in Transnational Surrogacy and Service Work. *South Atlantic Quarterly* 111(4):681-700.

Waddington, Conrad Hal

1957 The Strategy of the Genes. George Allen & Unwin.

Waldby, Catherine

2002 Stem Cells, Tissue Cultures and the Production of Biovalue. *Health: An Interdisciplinary Journal for the Social Study of Health, Illness and Medicine*, 6(3):305–323.

2008 Oocyte Markets: Women’s Reproductive Work in Embryonic Stem Cell Research. *New Genetics and Society* 27(1):19-31.

Waldby, Catherine and Melinda Cooper

2010 From Reproductive Work to Regenerative Labour: The Female Body and the Stem Cell Industries. *Feminist Theory* 11(1):3-22.

Waldby, Catherine and Robert Mitchell

2006 Tissue Economies: Blood, Organs, and Cell Lines in Late Capitalism. Duke University Press.

Weber, Max

1992 The Protestant Ethic and the Spirit of Capitalism. Talcott Parsons, trans. Routledge.

Weiner, Annette

1980 Reproduction: A Replacement for Reciprocity. *American Ethnologist* 7(1):71-85.

Weiss, Brad

2012 Configuring the Authentic Value of Real Food: Farm-to-fork, Snout-to-tail, and Local Food Movements. *American Ethnologist* 39(3):614-626.

Yamanaka, Shinya

2009 Elite and Stochastic Models for Induced Pluripotent Stem Cell Generation. *Nature* 460(7251):49-52.

Zaloom, Caitlin

2006 *Out of the Pits: Traders and Technology from Chicago and London*. Chicago, IL: University of Chicago Press.

Zhou, Qiao and Douglas Melton

2008 Extreme Makeover: Converting One Cell into Another. *Cell Stem Cell* 3(4):382-388.

Zipori, Dov

2004 The Nature of Stem Cells: State Rather Than Entity. *Nature Reviews Genetics* 5(11):873-878.