A CRITIQUE OF EVOLUTIONARY PSYCHOLOGY: SOCIAL, THEORETICAL, AND METHODOLOGICAL CONCERNS

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TABLE OF CONTENTS

Chapter Page

CHAPTER I

INTRODUCTION

This thesis critically examines the research program of evolutionary psychology and the tension between evolutionary psychology and feminism. Feminists tend to be wary of certain claims made in evolutionary psychology, especially claims about the differences between men and women. This caution is in part due to the role difference claims have played in the history of oppression (the oppression of women and of minorities). Many evolutionary psychologists, like Steven Pinker, simply dismiss feminist concerns – claiming they are clinging to untenable postmodern, social-constructivist positions – and that feminists simply have no grounds to question the biological claims coming out of evolutionary psychology. Pinker in particular thinks the feminist resistance to evolutionary psychology is rooted in wishful thinking. I set aside the fact that not all feminists opposed to evolutionary psychology are postmodern, social-constructivists, as feminism is a *very* broad term. Instead I focus on whether or not

feminists (those concerned with women's rights, sexism, oppression, etc) could have legitimate grounds from which to question evolutionary psychology.

In chapter two I examine the sort of claims feminists are concerned with and why, looking at the role difference claims have played in the history of oppression. I suggest that feminists have legitimate reasons to be concerned *and* legitimate reasons to demand a rigorous standard of evidence for such claims, which are declared with great certainty by many evolutionary psychologists.

In chapter three I look at issues with objectivity in science. I point to cases in the history of biology where conclusions concerning complex or politically charged issues have been mistaken and where background assumptions (either scientific assumptions, cultural assumptions or both) have played a role in those mistakes. I take from these examples a lesson of modesty. My suggestion is that the subject of evolutionary psychology, the human mind, is both complex and politically charged. Thus there are additional reasons to be concerned with the legitimacy of evolutionary psychology's claims and to demand an elevated level of scientific rigor. These first chapters establish that biological difference claims have the potential to be 'politically dangerous,' and that we may need to worry about the role of background assumptions shaping those claims. After I have set up these preliminary arguments I move on to evolutionary psychology itself. Chapter four is an exposition of evolutionary psychology. I distinguish between evolutionary psychology the field of study, and Evolutionary Psychology (EP) the paradigm, which is defined by specific theoretical and methodological commitments. It is EP I am concerned with, and I exposit in detail this paradigm, which dominates the literature in this field of inquiry. I explain their commitments to adaptationism, massive

modularity, computational theory of mind, and their *method of reverse engineering* the mind.

In chapter five I begin my criticism of EP. The method of reverse engineering that is at the heart of the EP research program rests on adaptationism, which views evolution as designing efficient organisms with efficient functional traits. Adaptationists parse organisms into functional traits, and explain those traits as adaptations, designed by natural selection. In this chapter I suggest that the adaptationist view of evolution may be mistaken, that evolution is not as efficient as adaptationists make it out to be, given that natural selection is constrained in important ways. I defend an anti-adaptationist model of evolution, and I claim that there are too many contingencies and constraints in the process of evolution for someone to be able to accurately reverse engineer an organism or its physical traits, much less its psychological traits. Additionally, I suggest the computational theory of mind is incompatible with the anti-adaptationist model of evolution, and I put forth a possible alternative direction – instead of a computational mind, I suggest the mind may work through something like pattern recognition, analogy, and metaphor.

In chapter six I consider the legitimacy of EP's massive modularity claim, that the brain is composed of hundreds or thousands of functionally specific information processing mechanisms. I conclude that the EP argument for massive modularity is flawed, *and* the neurobiological evidence suggests the brain is not massively modular. I then consider additional difficulties that face EP. For instance, the EPs reverse engineer human psychological traits by considering what problems they were designed to solve during the Pleistocene era. That is, EPs assume the brain is adapted to Pleistocene

conditions. I present difficulties related to this assumption. For instance, there is evidence to suggest the brain could have evolved in significant ways since the Pleistocene. Additionally, our knowledge about Pleistocene conditions is limited, at best. All of this makes reverse engineering even more suspect, introducing more doubt into the conclusions of EP. Furthermore, I point to the general difficulties of studying humans. Namely, they make poor research subjects.

In chapter seven I revisit my discussion of background assumptions found in chapter three, looking to the history of sexual selection theory and primatology. I suggest that it is at times difficult to interpret data objectively, because we have trouble abandoning our cultural values and assumptions. We have trouble 'seeing' the data with fresh, objective eyes, so to speak. I suggest that this is in part due to the fact that we come to understand new material or data through pattern recognition and metaphor-like thinking (at least to some extent) – framing new material in familiar terms. I suggest that primatology is more prone to the influence of cultural assumptions than something like marine biology. This is because we are primates, and chimps and langurs look more similar to us than marine animals. So it is in some sense natural to interpret their actions in the framework of our cultural patterns; you might say we are more inclined to 'see' them as enacting our cultural patterns. And then with a field like evolutionary psychology, it is even more difficult to remove cultural assumptions from the interpretation of data.

Essentially my argument has two parts. First I claim that biological differences claims have the potential for political use and thus we ought to be especially certain of biological difference claims before asserting them definitively, as many evolutionary

psychologists do. Second, I point out a number of difficulties facing EP, arguing EPs cannot assuredly and accurately reverse engineer human psychological traits. That is, their research program is flawed. Thus, Evolutionary Psychologists ought to, at the very least, adopt modesty proportionate to the lack of surety in their research. Ultimately, I claim that feminists *do* have room to question the legitimacy of EPs controversial sex difference claims, and Evolutionary Psychology needs to be restructured so that it avoids the flaws of adaptationism and becomes grounded in the neurobiological evidence

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CHAPTER II

SEXUAL DIFFERENCE AND SOCIAL CONCERNS

It is the business of evolutionary psychologists to explain human nature through evolutionary biology. Evolutionary psychologists investigate the human condition by considering the historic setting in which the brain evolved. They view human psychology as a collection of adaptive traits, and they ask themselves: what were the living conditions during which the brain evolved, and what problems was the brain 'designed' to solve? Thus, their research program assumes that there is a basic human psychology and this psychology is biological, rather than something socially constructed. In chapter four I review the research program and basic tenants of evolutionary psychology in detail. Most evolutionary psychologists are committed to more than just biological claims about *human* nature. That is, they are also committed to claims about *sex specific* natures. Evolutionary psychologists hold that human psychology is biological at its base, and men and women differ biologically (from observable anatomy, brain size, to differences in endocrinology). That the sexes have fundamentally different psychologies seems obvious

to many, but sex difference claims have long been the target of criticism. Feminists in particular have had a contentious history with these sorts of claims, and in this chapter I explore that tension. I present some of the basic sex difference claims made by evolutionary psychologists, highlighting claims that make feminists uneasy. I then articulate the fundamental concerns feminists have had about sex difference claims.

Sex Difference

Evolutionary psychologists do *not* hold a 'men are from Mars, women from Venus' position. Instead, they expect to see psychological differences between the sexes only where they have faced different adaptive challenges. I will focus on three frequently cited sex difference claims: spatial cognition, mate preference, and emotions. I will begin with differing spatial and locational abilities. Most evolutionary psychologists claim that men are better than women with spatially manipulating objects and navigation.[1] This is certainly something pop culture alleges – men are better at math and women tend to stop for directions. Women, on the other hand, are better with landmarks and remembering the placement of objects.[2] Evolutionary psychologists put forward an explanation for these biological differences. If we assume that there was a sexual division of labor during the Pleistocene era, the proposed time during which the brain evolved, then we expect there to be differences in capacities related to the differing labor tasks. It is thought that men were hunters and women gatherers, and hunting requires a different skill set than gathering.[3] Challenges specific to hunters include hitting a target and navigating hunting grounds. Because these challenges were specific to men, the expectation is that natural

[1] Steven Pinker, *How the Mind Works* (New York: Viking, 2002), 344-345.
[2] Pinker, *How the Mind Works*, 345.
[3] David M. Buss, *Evolutionary Psychology: The New Science of the Mind* (New York: Pearson, 2008), 87-88.

selection would have acted on men in such a way as to improve their aim and navigation skills. Hence, men are naturally better with spatial manipulation and navigation. Gatherers face different challenges. A gatherer needs to be able to locate food sources, remember the location of the food sources, and pick out ripe and eatable foods. And as Buss's evolutionary psychology textbook points out, studies show that women not only know more about plants (factual information), but they have a better "object location memory" and can more easily remember the placement of things – so we finally know why it's the wives who find the husband's keys.[4] There are even evolutionary psychologists who claim women are better shoppers because of this gatherer history, and women prefer pink and reddish colors precisely because most ripe fruits have a red hue.[5]

The second sex difference claim I want to focus on deals with mate selection. Men and women have distinct needs and face different challenges when it comes to mate selection. Thus, evolutionary psychologists expect to see differing tendencies related to these distinct challenges. They claim that men are naturally more inclined towards multiple sexual partners and no-strings attached sex.[6] Women, on the other hand, are more focused on securing a reliable partner who can provide for them and any children they may bear.[7] And again, there is an evolutionary explanation for these differences. Women invest significantly more in children. The female carries the fetus for nine months, and then contributes a significant amount of time and nutrition during post pregnancy lactation. The male's biological contribution is one act of intercourse, which is

[4] Buss, *Evolutionary Psychology*, 88.
[5] "Sex, Shopping and Thinking Pink." *The Economist*, August 23, 2007.
Note: pink wasn't "officially" established as a feminine color until the early 20th century.
[6] Pinker, *How the Mind Works*, 344.
[7] David M. Buss, "Psychological Sex Differences: Origins through Sexual Selection," *American Psychologist* (1995): 164-168.

comparatively small. So as Robert Trivers suggested, it is in the best interest of males (in terms of passing on genes and producing viable offspring) to impregnate as many females as possible, since the cost to pass on genes is minimal.[8] On the other hand, it is in the best interest of the female to be more discriminating and choose a mate that can supply resources during pregnancy and lactation.[9] Natural selection selected for these reproductive fitness enhancing tendencies. Consequently, according to evolutionary psychologists, we find in contemporary humans that men tend to be more sexually promiscuous, desiring women who are likely to have a healthy reproductive system (young women), while women are not as promiscuous and tend to desire men who can provide for them (successful men, not necessarily young men).

Finally, we come to emotional and related behavioral differences between the sexes. I am going to put aside the evolutionary explanations in support of these sex differences for the time being, as the two examples above should give a sense of how evolutionary explanations run, and the focus of this chapter is not the science but the feminists' political concerns. Steven Pinker claims, "Men are far more likely to compete violently, sometimes lethally, with one another over stakes great and small".[10] Pinker also claims that "women experience basic emotions more intensely, except perhaps anger." In addition, whereas men compete for status violently, women are more likely to compete using verbal aggression.[11] The emotionally stoic yet violent man, and catty and emotionally charged woman stereotypes are according to evolutionary psychologists *real* biological tendencies. Along with these emotional differences, evolutionary psychologists

[8] Robert Trivers, "Parental Investment and Sexual Selection," in *Sexual Selection and the Descent of Man*, ed. B. Cambell, 136-177, (Chicago: Aldine, 1972)
[9] Buss, "Psychological Sex Differences," 164.
[10] Pinker, *How the Mind Works*, 344.
[11] Pinker, *How the Mind Works*, 345.

claim that women are more nurturing than men, particularly toward their children.[12] As Buss states, "throughout the animal kingdom, females are far more likely than males to care for their offspring. Humans are no exception".[13] Moreover, this nurturing tendency starts in early childhood, where "girls play more at parenting and trying on social roles, boys more at fighting…"[14] Evolutionary psychologists claim that these sex differences are biological. It is not simply that toy companies market pink dolls to girls and plastic swords and guns to boys, these toy preferences have a biological basis.

History of Oppression

I have presented three categories of sex difference claims. All of these claims are basic to evolutionary psychology and widely accepted by evolutionary psychologists. Now the question is, why would feminists find claims like these disconcerting. Well the answer is simple. We could break the feminist issues down a number of ways, but ultimately there is a fear of regression. Feminists have struggled to obtain some semblance of equality for women, and are still working towards the fulfillment of this goal. However, if biologists start endorsing sex difference claims, then there is a fear that footing could be lost.

Women and minority groups (and especially women *of* minority groups) have historically been marginalized and oppressed by means of biological claims. As the primatologist Sarah Hrdy points out, "biological evidence has been repeatedly misused to support ideological biases," like sexism and racism.[15] We find biological claims used to point out the inferiority of women throughout history. Aristotle claimed that women are

[12] Pinker, *How the Mind Works*, 345.
[13] Buss, *Evolutionary Psychology*, 200.
[14] Pinker, *How the Mind Works*, 345.
[15] Sarah Hrdy, *The Woman that Never Evolved*, (Cambridge: Harvard University Press, 1981), 2.

defective men: "for the female is, as it were, a mutilated male."[16] In the *History of Animals* he explains that women are far more emotional than men.[17] Emotional was (or is) opposed to rational, and rationality is the defining feature of humans, or men (for Aristotle, referring to "humans" as "man" was not some simplifying figure of speech). Thus, he says the following: "women are defective, and the male is *by nature* superior, and the female inferior; and the one rules, and the other is ruled; this principle, of necessity, extends to all mankind."[18] The term biology wasn't coined until the early 19th century, but Aristotle is often considered the first biologist in the western tradition and given the title 'father of biology'.[19] This father of biology claimed women were *naturally* inferior, and *because of women's inferior natures* Aristotle claimed that men, in virtue of their superior natures, should rule over women. Man was the rational animal, and woman was something less than man.

If we move to the late 19th and early 20th centuries, after Darwinian evolution is established as a viable and productive theory of life, we find the same form of oppression taking place. Claims about the natural or biological state of women and other marginalized groups are used as tools of oppression. I will first look at how racism and classism (two closely related 'isms') were empowered by biological difference claims in the West, specifically in the United States, and then move to biological arguments against women's rights.

It is easy to see how racism could be justified through biological claims. Take the

[16] Aristotle, *Generation of Animals*, trans. A. L. Peck (Massachusetts: Harvard UP, 1963), 2.3 737a27.
[17] Aristotle, "The History of Animals," trans. D'Arcy W. Thompson, ed. Richard McKeon, *The Basic Works of Aristotle*, (New York: Random House, 1941), 608b 5-15.
[18] Aristotle, "History," 1254b 12-14.
[19] *Internet Encyclopedia of Philosophy*, s.v. "Aristotle: Biology" (by Michael Boylan), http://www.iep.utm.edu/aris-bio/ (accessed January 28, 2011).

most egregious form of racism, slavery (not always a racial institution, but certainly racial in U.S.). There were a number of excuses for slavery in the United States. A variety of ghastly claims were made about the newly discovered African people: they don't have souls (a claim about their nature, even if it is supernatural); they are the sons of Cain, cursed by God; and they are naturally inferior, more like animals (akin to Aristotle's claim about women). Such claims were used to justify slavery, to justify treating people like animals – because they were not seen as people.

The eugenics movement was also fueled by biological claims. During the mid to late 1800s some biologists and sociologists started thinking about social problems biologically. Social problems such as drunkenness, prostitution, homelessness, etc. were 'biologized'. Many intellectuals during this time period, like William Rathbone Greg, were making biological claims about racial and class differences. For instance, the Irish are "careless, squalid, unaspiring" and superstitious, while the Scots are naturally "frugal, foreseeing, self-respecting, ambitious," stern in morality and disciplined in intelligence.[20] And Francis Galton declared that "talent is transmitted by inheritance in a very remarkable degree."[21] The races are not equal, he claimed. For instance, the "Anglo-Saxon" race is intellectually superior to the "Negro race."[22] Galton and Greg both looked at non-Anglo races and lower classes and found them to be *biologically* inferior to the hardworking, W.A.S.P., middle to upper class individuals. The lower classes were just *naturally* uncouth and unclean.

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[20] W.R. Greg, "On the Failure of 'Natural Selection' in the Case of Man," *Fraser's Magazine*: 78 (1868): 360.
[21] Francis Galton, "The First Steps Towards the Domestication of Animals, or Hereditary Talent and Character," *Macmillan's Magazine* 12 (1865): 157.
[22] Francis Galton, *Hereditary Genius: An Inquiry into Its Laws and Consequences*, (Gloucester: Peter Smith, 1972), 394.

Galton, Greg and others suspected that society was enabling the uncouth lower-class to procreate. Society, they argued, prevents natural selection from weeding out the weak. They maintained that if natural selection could take its natural course, then we would not have these unfit[23] individuals multiplying so rapidly. As Galton says, "one of the effects of civilization is to diminish the rigor of the application of the law of natural selection. It preserves weakly lives, that would have perished…" [24]

They thought the root of social problems was the growth of the lower class, and the growth of the lower class was unnatural and enabled by social institutions. Their proposed solution to social problems was to take what they knew about evolution and inheritable traits and intervene. Galton suggested implementing artificial selection and advocated something like government policies that would encourage "good" breeding and discourage "bad" breeding. Galton pointed out that just as we can select traits and breed for stronger plants and more desirable animals, so too we could obtain "a race of gifted men."[25] As he says:

> If a twentieth part of the cost and pains were spent in measures for the improvement of the human race that are spent in the improvement of the breed of horses and cattle, what a glazy of genius might we not create! We might introduce prophets and high priests of civilization into the world, as surely as we can propagate idiots by mating cretins. [26]

Thus, we have something like "barnyard politics"; the suggestion was to breed humans, selecting for desirable traits, such as intelligence and etiquette. The idea was to encourage men and women with ideal traits to procreate, while discouraging the scourge of the land

[23] Fitness in evolutionary biology is simply reproductive fitness – so their conception of biological fitness was obviously tainted by cultural prejudices.
[24] Galton, "Hereditary Talent and Character," 326.
[25] Galton, *Hereditary Genius*, 105.
[26] Galton, "Hereditary Talent and Character," 165.

from producing offspring. Now there are a number of ways one could do this. The Nazi regime, for example, encouraged the desirable Arians to procreate through propaganda, while simply killing off the undesirables, those deemed biologically inferior.

The biologist and sociologist Herbert Spencer also thought race differences and social problems were tied together. "Various races of mankind, inhabiting bad habitats, and obliged to lead miserable lives, cannot by any amount of adaptation be molded into satisfactory types."[27] Some races are, again, biologically inferior. Spencer characterizes the role of civilization in enabling the unfit more strongly, berating philanthropists for helping the poor:

> Blind to the fact that under the natural order of things society is constantly exerting its unhealthy, imbecile, slow, vacillating, faithless members, these unthinking, though well-meaning, men advocate an interference which not only stops the purifying process, but even increases the vitiation—absolutely encourages the multiplication of the reckless and incompetent by offering them a unfailing provision, and discourages the multiplication of the competent and provident by heightening the difficulty to maintain a family. [28]

Our social structure has interfered with the natural selection of human beings. Spencer proposes an approach contrary to Galton. He argues against any sort of intervention. Instead, his suggestion was to let natural selection work laissez-faire. If welfare programs are abolished, then only those capable of securing their own food and shelter would live to pass on their intelligent and hardworking genes.[29]

These biologists and sociologists were making strong claims about racial differences in psychology, not just appearance and basic physical attributes. They were claiming that the non-Anglo races were naturally inferior: less intelligent and biologically

[27] Herbert Spencer, *Social Statics, Together with Man versus the State*, (New York: Appelton, 1896), 32.
[28] Spencer, *Social Statics*, 151.
[29] Daniel Kevles, *In the Name of Eugenics: Genetics and the uses of Human Heredity*, (Los Angeles: University of California Press, 1985).

inclined towards drunkenness and licentiousness. These biological claims were used as justification for starving the poor (by eliminating social welfare programs), not hiring races known to be inferior (thus perpetuating the low class of these races), and in some cases taking away reproductive rights (through forced sterilizations). In addition, there was a fear that these 'inferior' races were swamping the 'superior' population. The social system was allowing them to procreate, despite the fact that they were "unfit" (reminiscent of some swamping fears we find today in the U.S. towards immigrants from Mexico and South America). With these biological difference claims in mind, social policies that limited the rights of these marginalized groups were adopted. Frighteningly, reproductive rights were called into question. The United States adopted compulsory sterilization policies. According to Daniel Kevles, the United States sterilized over 65,000 people against their will.[30] From Native American and black women who had forced hysterectomies and tubal litigation while hospitalized for birthing, to the disfigured and 'mentally ill' (and keep in mind, any number of things could get you classified as mentally ill, especially if you were a woman – anything from promiscuity to epilepsy).

These same figures, Galton, Greg, and Spencer, also discussed biological differences between the sexes. Darwin himself agreed with Galton and pointed to the following sex differences: "woman seems to differ from man in mental disposition, chiefly in her greater tenderness and less selfishness…maternal instincts"; and, "the chief distinction in the intellectual power of the two sexes is shewn by man attaining to a

[30] Charles Darwin, "The Decent of Man and Selection in Relation to Sex," in *From So Simple a Beginning*, ed. E.O. Wilson (New York: W.W. Norton & Company: 2006).

higher eminence, in whatever he takes up, than woman can attain."[31] Women are emotional, men intellectual. Spencer argued that because men are stronger than women, the women who survived to pass on their genes were those that could please the strongest of the men. In pleasing the dominate males, they were more likely to receive protection and food. Thus, an admiration of power, along with a tenable submissiveness evolved in women.[32] In this example, Spencer presents a sex difference claim along with an evolutionary explanation, akin to those presented by evolutionary psychologists. Thomas Henry Huxley claimed, "Women are, by nature, more excitable than men – prone to be swept by tides of emotion." [33] These same sex difference claims come up again and again: women are more emotional (expressed positively in terms of tenderness and nurturing, and negatively in terms of fits of hysteria) and men are more intelligent. Two of the oldest dichotomies are constantly paired: masculine/feminine and rational/emotional.

Biological sex difference claims played a considerable role in arguments against women's suffrage. If women are biologically inferior intellectually, if they are prone to fits of hysteria, then it would not be wise to allow them vote. One must be mentally competent to vote, and the thought of allowing hysterical individuals to vote (*doubling* the number of eligible voters) terrified those in power. According to Ted Rall, President Taft opposed women's suffrage primarily because of their emotional disposition, "it is fair to say that the immediate enfranchisement of women will increase the proportion of

[31] Herbet Spencer, "Psychology of the Sexes," *Popular Science Monthly* 4 (1873): 31-33.
[32] Spencer, "Psychology of the Sexes," 33.
[33] Thomas Henry Huxley, "Emancipation – Black and White," *Science and Education, Essays,* (New York: Greenwood, 1968), 71.

the hysterical element of the electorate."[34] Grace Saxon Mills argued before the amendment vote, "All government rests ultimately on force, to which women, owing to physical, moral and social reasons, are not capable of contributing." In addition, "The physical nature of women unfits them for direct competition with men," and "there is little doubt that the vast majority of women have no desire for the right to vote". Ultimately, "Woman Suffrage is based on the idea of the equality of the sexes, and tends to establish those competitive relations which will destroy chivalrous consideration."[35]

Anti-suffragists also argued that men and women were naturally suited to different social spheres. Men belong in politics (in *power*), women at home. Moreover, there was a fear that women's suffrage could lead to a collapse of the family unit. In a 1906 debate, the Englishman Samuel Evans put it this way:

> Women had their own honorable position in life, that position had been accorded to them *by nature*, and that their *proper sphere was the home*, where they might exercise their good and noble influence in the sacred circle of the family and home. Women would be neglecting their homes if they came into the House of Commons.[36]

In addition, there was the familiar fear of swamping, "If all women were enfranchised…they would at once swamp the votes of men."[37]

White men wielding biological claims have repeatedly marginalized women and minorities. The 'biology' has changed (from Aristotle's hylomorphism to Darwin's natural selection), but the basic game of oppression hasn't. There is the division of "us" and "them". The "us" appeals to the natural inferiority of the other. Moreover, the "us"

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[34] Ted Rall, *Wake Up, You're Liberal!*, (Brooklyn: Soft Skull Press, 2004), 125.
[35] Grace Saxon Mills, "Against Suffrage" (1914), from *Arguments Against Women's Suffrage*.
[36] Samuel Evans, "Parliamentary Debates," Hansard 4th Series Vol. 155, (1906), from *A Man's Arguments Against Women's Suffrage*.
[37] Evans, "Parliamentary Debates."

that wields the power gets to establish the authoritative claims, embedding the claims in the discourse they control (controlling the discourse *is* wielding the political power).

There have also been issues with discrimination in the work place. Again, women are naturally emotional and not as intelligent as men. If these biological claims are true, the interviewing process could be simplified by just ruling out women candidates. Besides, if women are naturally suited for nurturing, then do not *belong* at home taking care of the children? According to these nurturing claims, they are biologically superior to men when it comes to childrearing. It seems that we might infer from such claims that they have almost a moral (if simply a utilitarian) imperative to stay home with their children – at least in cases where there is a choice between mothers and fathers staying home. Because of this extensive history of oppression, feminists in particular have been wary of biological difference claims. The fear being these claims will continue to be used as grounds for discrimination.

Accountability

Before I discuss the usual response to these fears of regression, I would like to return to differences in sexual appetite, the topic which arguably spurs the most contention in feminist literature. If, as evolutionary psychologists suggest, it is in the best interest of men to seek as many fertile mates as possible and for women to be much more selective, then rape is a natural phenomenon. "Male eagerness to mate, combined with female reluctance to reproduce with any male who comes along, creates an obvious sexual conflict of interest that is virtually universal."[38] Now to be very clear, no evolutionary psychologist thinks rape is morally permissible. Nevertheless, as Pinker

[38] Barbara Smuts, "Male Aggression Against Women: An Evolutionary Perspective," in *Sex, Power, Conflict: Evolutionary and Feminist Perspectives*, 231-268, ed. David M. Buss (New York: Oxford University Press, 1996), 232.

points out, a male tendency to rape seems natural. It is not something that would be selected against, and it was likely something selected for. It is risky – a rapists faces the threat of injury – but "it could be an opportunistic tactic, becoming more likely when the man is unable to win the consent of women, alienated from a community…and safe from detection and punishment."[39]

Evolutionary psychologists want to say that rape is natural (when speaking scientifically), but not excusable (when speaking politically or morally). This, however, is potentially problematic. For example, one *might* argue that one is morally responsible only for freely chosen actions. This is *not* something I am arguing for, but I do want to discuss the issue, as it is tied to feminist concerns. If someone holds a gun to my head and tells me to steal a car, I do not seem to have a free choice in the matter, and consequently one might say I am not morally responsible for the theft. Similarly, if someone has a strong biological compulsion to do X, it seems like they may not be morally responsible for doing X (the strength of the compulsion will of course determine how free one is, and how free one is, is what corresponds to moral responsibility).

I do not think it is a stretch to say moral responsibility only comes with freedom of choice.[40] Our legal system even seems to reflect this. Individuals can claim an act of violence was done in self-defense, that they didn't have a choice in the matter. Similarly, Wilson et al point out that a man who:

> discovers his wife in the act of having sex with another man and kills one or both, he has historically been judged much less harshly than for other forms of homicide and until recently in some states would be found innocent of any crime.

[39] Pinker, *How the Mind Works*, 364.
[40] Again, I do *not* intend to make an actual argument here concerning freedom and responsibility; my intention is to gesture to these sorts of moral problems in order to outline the concerns feminists often have towards sex difference claims.

> The ethical reasoning behind this verdict is that *it is only natural* for a man to lose control in this situation.[41]

And, we occasionally have verdicts of mental incompetence rather than criminal guilt, so a biological state is grounds for denying responsibility. We could even appeal to non-criminal situations. Take examples of coprolalia Tourette's syndrome. We do not hold an individual with this sort of Tourette's morally responsible for the things they say. So to the extent which a man is biologically compelled to rape, it seems like a case could be made that he ought to be excused of moral responsibility – at least relative to the strength of the compulsion. Or at least one can see how such an argument could be developed. Because of these kinds of considerations, many feminists are extremely wary of such biological claims.

The Naturalistic Fallacy

I have explained the source of political opposition towards the sex difference claims of evolutionary psychology. Now I would like to consider the response evolutionary psychologists typically give. "Evolutionary psychologists frequently cite something called the naturalistic fallacy to describe an erroneous way of thinking about the ethical implications of evolved behaviors."[42] That is, evolutionary psychologists generally have this basic response: don't blame the science; your problem isn't with our empirical claims, it is with the *naturalistic fallacy*. As Buss accurately states, "the metatheory of evolutionary psychology is descriptive, not prescriptive – it carries no values in its teeth."[43] However, Wilson et al point out, evolutionary psychologists "are

[41] David Sloan Wilson, Eric Dietrich, and Anne B. Clark, "On the Inappropriate use of the Naturalistic Fallacy in Evolutionary Psychology," *Biology and Philosophy* 18 (2003):669-682, 676.
[42] Wilson et al, "Inappropriate use of the Naturalistic Fallacy," 669.
[43] Buss, "Psychological Sex Differences," 167.

themselves confused about the naturalistic fallacy and use it inappropriately to forestall legitimate ethical discussions."[44] Hume's version of the fallacy is most commonly cited, and it is usually summarized as "ought cannot be derived from is."[45] That is, it does not follow that just because something is natural it is ethically permissible. Elliot Sober looks at the naturalistic fallacy. According to him, Hume would find the following argument deductively invalid (as would we all):

> Torturing people for fun causes great suffering (factual premise)
> Torturing people for fun is wrong (ethical conclusion).

However, an additional premise gives us a valid argument:

> Torturing people for fun causes great suffering (factual premise)
> It is wrong to cause great suffering (ethical premise)
> Torturing people for fun is wrong (ethical conclusion)

"A factual statement must be combined with an ethical statement to derive an ethical conclusion. Hence, ought cannot be derived *exclusively* from is."[46] Wilson et al even point out that Herbert Spencer did not commit the naturalistic fallacy.[47] He derived his ethical conclusions about abandoning social welfare programs from factual premises combined with ethical premises. Even the arguments against women's suffrage were not usually fallacious. For example,

> Women are prone to hysterical fits (factual premise)
> It is wrong to give hysterically prone individuals the right to vote (ethicalpremise)
> It is wrong to give women the right to vote (ethical conclusion)

[44] Wilson et al, "Inappropriate use of the Naturalistic Fallacy," 669.
[45] Wilson et al, "Inappropriate use of the Naturalistic Fallacy," 669.
[46] Wilson et al, "Inappropriate use of the Naturalistic Fallacy," 671.
[47] Wilson et al, "Inappropriate use of the Naturalistic Fallacy," 672.

Thus, I argue, it would be erroneous to dismiss feminist concerns by maintaining natural claims are entirely distinct from ethical and social arguments, since natural claims can legitimately be used in such arguments.

Now of course strong arguments can be made against sexism and racism, even arguments that integrate natural claims. However, the long-standing place natural claims have had in the history of oppression is a reason to at least be hesitant towards, and not to immediately accept the more troubling sex difference claims. Biological sex difference claims could still effectively be used to oppress. That they *shouldn't* seems obvious. Nevertheless, we must be realistic. So frequently are "right" and "natural" tied together, that I am inclined to suspect it is a default form of reasoning (e.g., the condemnation of homosexuals by an appeal to nature – it is wrong because it is unnatural, etc). I am not suggesting we reject sex difference claims because they could be politically dangerous. What I *am* suggesting is that because sex difference claims could be politically dangerous, we ought to be certain of their truth before we swallow them whole. As Philip Kitcher puts it, "Those who frame social policies often look to the findings of the sciences for guidance. If the studies they consult are incorrect, then the mistakes may reverberate through the lives of millions." So he also argues, "*When scientific claims bear on matters of social policy, the standards of evidence and of self-criticism must be extremely high*".[48] Considering the history of natural claims and social oppression, I think it would be irresponsible for feminists not to question the legitimacy of sex difference claims. So the question for feminists is, how confident should we be in these sex difference claims? Evolutionary psychologists often speak with certitude. Pinker in particular thinks 'gender' feminists should simply pack up their cultural construct claims

[48] Philip Kitcher, *Vaulting Ambition*, (Cambridge: The MIT Press, 1985), 3.

and move out of the way of science. Science is undeniably one of the highest forms of inquiry, if not the highest. So how seriously we should take these biological difference claims? Should the feminists accept that gender differences are biologically based, or is there still room to question? The following sections will illustrate why we might be suspicious of these sorts of controversial claims.

CHAPTER III

OBJECTIVITY AND PARADIGMS

There are political factors that motivate feminists to think twice about sex difference claims. Aside from these political concerns, there are also a number of empirical issues that should stir reservations. In this chapter, I look at specific cases in the history of biology where conclusions regarding either complex or ideologically charged issues have been mistaken. I then suggest there is a lesson to learn, namely one of caution. The examples I present demonstrate how assumptions and ideological commitments of any sort – methodological, culture, etc – can encourage a form of myopia. I point out where it seems assumptions have led researchers to overlook or misinterpret important data. These assumptions (implicit or explicit) can come from either cultural ideology or commitments to particular scientific models. I look to three specific cases: Barbra McClintock's discovery of transposition; biological claims about racial differences and intelligence; and Sarah Blaffer Hrdy's surprising encounter with

langurs.

It is no secret that ideology and cultural experiences can play a role in one's biology, despite the desire for objectivity. Nor is this phenomenon necessarily unhealthy for science. Metaphor plays an important role in science, as both an edifying and heuristic tool, and our metaphors come from culture. For instance, many scientists worked as code breakers during WWII. After the war, they came home thinking of codes. As a result, the understanding of DNA as code took hold in the 1950s. Here we have a case where a cultural concept (code is linguistic, thus cultural) is brought into biology, and it has had *very* fruitful results. The sub-concepts of the metaphor have been especially helpful in understanding DNA and replication; we now have talk of transcribers, editing genes, copy errors, etc. Of course, cultural ideology can also lead one to accept a mistaken conclusion. For example, Lamarckian evolution dominated biology in the communist Soviet Union. Joseph Stalin himself pushed the theory. But of course the communists were committed to a sort of social constructionism, and this background ideology seems to have played a role in the persistence of Lamarckian evolution.

One's cultural background *can* seep into biological investigations, nudging commitments or acting as blinders. Sometimes our implicit assumptions are fruitful, other times not. And of course, an ideological discourse can develop within a field of study. The received view of any subject may loom over our judgments, predisposing us to certain understandings or interpretations. So there are two forms of ideology to consider in the history of science. By ideology I mean a framework of understanding, a collection of beliefs and metaphors by which we make sense of the world.[49] First, cultural ideology.

[49] I am using "ideology" in a sense that is broader than its usual meaning. Typically ideology refers to political beliefs, or beliefs specific to a social group or culture. But instead I am using it mean any

This entails cultural norms and values, including political, moral, and religious beliefs. Second, received views within a field. This, on the other hand, consists of dominant trends in a particular field – models and methods of understanding that would be considered 'textbook'. Essentially this second form of 'ideology' is the Kuhnian *paradigm*.

Barbra McClintock

Barbra McClintock's work in genetics nicely highlights three points. First, it is an example of how science operates and how changes in discourse take place. Second, it is an example of the importance of humility in the face of complex data. Finally, and perhaps most importantly for my project, it is an example of how assumptions can act as blinders.

It will be helpful to begin with a brief overview of McClintock's work. This overview does not do justice to the complexity of her discoveries, but it should serve to highlight important features of scientific methodology. McClintock was a highly respected cytologist and her career essentially began when, as an assistant to a cytologist at Cornell, she discovered how to distinguish and identify the chromosomes in maize.[50] Throughout her career she improved techniques for mapping chromosomes, developing new dyes and methods. In 1931 she published a paper with Harriet Creighton, a graduate student McClintock had essentially taken under her wing. This paper provided "conclusive evidence for the chromosomal basis of genetics".[51] An exciting discovery, to say the least. This is just one of many accomplishments that contributed to her high regard. In the late 1940s, continuing her work with maize at Cold Spring Harbor, she

framework or system of understanding.
[50] Evelyn Fox Keller, *A Feeling for the Organism*, (New York: W.H. Freeman and Company, 1983), 40.
[51] Keller, 52.

became convinced there was a regulatory mechanism or controlling element at the genetic level. She noticed that the mutations in her maize had an unchanging rate of mutation. This constant rate of mutation persisted throughout a plant's life cycle, and strongly suggested to her that "something was controlling the rate of mutation" – a notion taken for granted today.[52] And according to McClintock, the controlling elements could *move*, they did not inhabit a stable place on the chromosome. This capacity to change position she called transposition.[53] Keller explains that "transposition is a two-part process, involving the release of a chromosomal element from its original position and its insertion into a new position".[54] A segment of DNA can move, thus transposing genetic material. And these "jumping genes" directly corresponded to phenotypic traits, like the color of kernels.[55] She was discovering that genes essentially turn traits on and off. Her work showed that "parts of DNA might rearrange themselves in response to signals from other parts of the DNA".[56] This went against what geneticists had thought regarding the flow of information *from* DNA *to* protein; in fact, it suggested "information would, in some sense, have to flow backward, from protein to DNA".[57]

After years of collecting data, she presented her findings at the Cold Spring Harbor Symposium in 1951. She was a well respected member of the scientific community, chosen to be a part of the National Academy of Science in 1944 (the third woman ever to have been elected), and elected the first woman president of the Genetics Society of America in 1945. So despite the fact that her conclusions were at odds with the

[52] Keller, 122.
[53] Keller, 8-9.
[54] Keller, 127.
[55] Keller, 135.
[56] Keller, 9.
[57] Keller, 9.

received view, one would expect the community to show some degree of respect towards her findings. As Keller says, "By 1951, she was one of the dignitaries of her field, and scientists of her stature do not expect their work to be rebuffed out of hand".[58] At least a thoughtful consideration of the idea was in order. Instead, she was ridiculed. The consensus seemed to be that she was mad. As one prominent geneticist said, she was "just an old bag who'd been hanging around Cold Spring Harbor for years".[59]

McClintock stopped publishing and withdrew into her work, quietly continuing her research at Cold Spring Harbor (she did try once more to present her results in 1956, but they were dismissed again). The revolution of molecular genetics began in the 1950s, and McClintock took the opportunity to stay in the background and observe.[60] Eventually transposition was "rediscovered" by Jacob and Monod in the 60s, and by the 70s it was fairly well accepted.[61] In 1983 she finally received her due credit, and was awarded a Nobel Prize for the discovery of mobile genetic elements. The question is, why did it take three decades for her work to be fully recognized? It is not that she didn't have the evidence – she did (almost ten years worth of research). Keller argues that part of it was McClintock's unique way of knowing; she was a genius who could simply *see* how the maize was working.[62] This made communicating her ideas more difficult.

However, the central factor behind the slow acceptance of McClintock's work has to do with the nature of scientific discourse. As Keller says,

> It is a commonplace about scientific discourse that *the more a claim is at odds with accepted beliefs, the more resistance it encounters*. (It is also the case that *any divergent claim is by its nature hard to understand*, even for those who listen

[58] Keller, 140.
[59] Keller, 141.
[60] Keller, 153.
[61] Keller, 176.
[62] See Keller, chapters 9 and 12 for more about McClintock's vision and unique insights.

> with good will.) And the results McClintock reported in 1951 were totally at variance with the view of genetics that predominated. The biggest problem was, if genetic elements were subject to a system of regulation and control that involved their rearrangement, what meaning was then left to the notion of the gene as a fixed, unchanging unit of heredity? [63]

At the time evolutionary biologists claimed that genetic variation was random, but McClintock's research suggested "genetic changes…are under the control of the organism," and "such results just did not fit in *the standard frame of analysis*". [64]

McClintok's story serves as an example of how science works. For instance, *yes*, peer review tends to keep science in check. However, when an error in mainstream opinion is found, it can be slow to change. A profitable framework, one that shows coherence and great explanatory power, takes hold (becoming a paradigm); once it gains dominance in a community, dissenters aren't taken seriously.[65] The framework dominates not only the field, but also the vision of the field workers, so that it is difficult to 'think outside the box'. But to the credit of science, mainstream views *do* eventually change to reflect progress. When a theory stops being profitable and can no longer explain new data, then modifications are eventually accepted. As Keller says, "If Barbara McClintock's story illustrates the fallibility of science, it also bears witness to the underlying health of the scientific enterprise. Her eventual vindication demonstrates the capacity of science to overcome its own characteristic kinds of myopia".[66]

The second point or lesson I think we can take from McClintock's story is one of humility. We tend to think science is progressive. I am hesitant to definitively assert that science is progressive, but we certainly understand it as such. McClintock had a specific

[63] Keller, 144.
[64] Keller, 144.
[65] As Keller puts it, "success and orthodoxy have a natural kinship" – pg. 96
[66] Keller, 197.

sort of humility – she tended to withhold assent before she had the necessary evidence (one acquaintance remarked that McClintock probably wouldn't even commit to a position about UFOs until she had all the evidence). And she was skeptical of people who "thought they were going to solve the genome," as the gene was "merely a symbol".[67] The best we can do is construct models, through which we can make sense of the world. Some models are more accurate than others, and as more data comes in, we should adjust the models accordingly. Now the important point, I think, is that the more complex the subject of inquiry, the more humility we ought to have. As investigations into the natural world progress, the complexity correspondingly increases.

I think this is crucial to keep in mind when investigating the human condition, as evolutionary psychologists do. When talking about human psychology, a great number of variables are at play. First, both nature and nurture have an influence, but it isn't clear to what extent each factors in. If we want to simplify the matter and ignore nurture, we might find ourselves talking about DNA, which seems to be at the very base of our nature. And then there is the brain, which we could focus on rather than molecular genetics. The brain is composed of a *hundred billion* neurons, and no two brains are identical. So what brain are we studying when we study the human brain in regards to human nature? Due to the massive quantity of interconnected parts that make up the human condition, humility is in order. This is to some extent a minor point, but it is relevant when considering the way sexual selection theory and evolutionary psychology are framed in the media *and* in evolutionary psychology journals. One will often find robust, definitive claims about outrageously complex biological data in news headlines:

[67] Keller 97.

"US Scientists Discover Adultery Gene"[68]; "New Evidence for a 'Gay Gene'"[69]; "Is it all in our Genes?"[70]; "Gene for Alcoholism discovered"[71]. And the website for the journal *Evolutionary Psychology* actually has a news feed on their homepage titled, "Evolutionary Psychology in the news," which is updated several times a month with new news headlines like those above (e.g., "Men Like their Women Dumped, Study Says" – CTV News January 2011).

Tied to the above two points is the fact that assumptions can act as blinders. One can become entrenched in dogma, or theoretical commitments; "entrenched" in the sense that you can't see around it and are in some sense blind to processes outside those commitments. That doesn't mean you can't be "un-entrenched," but taking a perspective divergent from your theoretical commitments is difficult. Consider Joseph Jastrow's duck-rabbit. You can see either the duck or the rabbit, but not both. And if you are thinking duck, you see the duck. Whereas, if you are thinking rabbit, you see the rabbit (his studies showed that around Easter, people were much more likely to see the rabbit). Mental activity is involved in perception. Perception is not just a product of sense stimulus or raw observation, and assumptions can play a role in perception. Sometimes assumptions, especially background assumptions that lurk below the surface of our direct consciousness, can affect what we see when looking at data. In a letter to Oliver Nelson in 1973, McClintock writes:

> Over the years I have found that it is difficult if not impossible to bring to consciousness of another person the nature of his tacit assumptions when, by

[68] Katrina Woznicki, "US Scientists Discover Adultery Gene," *News Amen*, December 04, 2010, accessed March 12, 2011. http://www.newsamen.com/101138/us-scientists-discovered-adultery-gene.
[69] "New Evidence for a 'Gay Gene'", *Time* 11/13/1995 (vol. 146, issue 20), 95.
[70] "Is it all in our Genes?", *Playboy*: 3/1995, pp.64-66; 146-149.
[71] "A Gene for Alcoholism discovered", *MedicineNet.com*, eds. Barbra Hecht and Frederick Hecht, January 15, 2004, accessed March 12, 2011. http://www.medicinenet.com/script/main/art.asp?articlekey=26119.

> some special experiences, I have been made aware of them. This became painfully evident to me in my attempts during the 1950s to convince geneticists that the action of genes had to be and was controlled. It is now equally painful to recognize the fixity of assumptions that many persons hold on the nature of controlling elements in maize and the manners of their operation. One must await the right time for conceptual change. [72]

It was not until molecular genetics stirred things up that the community became receptive to transposition. It is as if the community needed to be in the right state of mind to accept the phenomena; they needed the right perspective to see the jumping genes.

McClintock had, for whatever reason, a different perspective than others in her field. She observed the gene from a different angle, and consequently, saw something different, and saw it earlier than others. Looking at all the details together with the organism as a whole gave her greater insight. But first you would need to think it was important to look that 'direction' – if you didn't think that was important, you wouldn't look, and consequently, you would have a different understanding. What you look for influences what you see, directing your perception.

Racial Difference and Intelligence

Next I turn to some mistaken conclusions concerning human competence. This is a familiar story, so I will only briefly look to the history. The focus here is early evolutionary racial difference claims. These claims demonstrate the close connection between cultural ideology and observation, and the difficulty of separating ideological views from objective observation. With these examples, as with McClintock's, we see assumptions acting as blinders. The role of cultural assumptions in observation is especially explicit with racial difference claims, whereas McClintock's case exposed the

[72] Barbra McClintock to Oliver Nelson, 1973, *The Barbra McClintock Papers*, accessed February 12, 2011, http://profiles.nlm.nih.gov/LL/Views/Exhibit/narrative/nobel.html.

role of scientific assumptions or commitments.

There was, of course, an ideology of racism in place before the advent of Darwinian evolution, which claimed that some (viz., white) races were intellectually, morally, or physically superior to others. However, the arrival of Darwinism gave rise to evolutionary explanations for such racial differences. Initial evolutionary histories claimed that human races branched off early on, thus there was ample time to allow for significant differences to accumulate between races, like levels of intelligence.[73] These sorts of biological stories allowed early eugenicists to continue claiming that certain races were intellectually superior. Eugenicists and others insisted their observations confirmed their theoretical expectations, that Anglo-Saxon's were intellectually superior. And even when observations failed to meet this expectation, hypotheses were often modified so that the expected conclusion was confirmed.[74]

Paul Broca practiced crainiometry, the measuring of brains. He insisted, as did others, that darker skinned humans were intellectually inferior to their lighter counterparts, and he set out to use crainiometry to prove it.[75] This was also the order of his work; he began with conclusions (assumptions shared by most upper-class white men) and *then* proceeded to gather evidence. As Gould points out, "His facts were reliable…but they were gathered selectively and then manipulated unconsciously in the service of prior conclusions".[76] Gould describes it as a circular process, where he and others began with the conclusions, looked around at some (selective) facts, and then came

[73] Steven J. Gould, *The Mismeasure of Man*, (New York: W.W. Norton & Company, 1981), 73.
[74] Gould, 100-102.
[75] Gould, 84-85.
[76] Gould, 85.

back to the initial conclusions.[77] But this isn't scientific procedure. To have some degree of objectivity, the process would need to be testable. This entails something like the following. Begin with a hypothesis and determine what you would expect to see given that hypothesis; *then* look to the data; *then* draw the conclusions. In addition to this circular approach, there are many ways the human body can be measured. At the time these scientists assumed that the more apelike a race was, the less evolved it was (by 'less evolved' they meant, inferior intelligence and moral worth). But you could take any "small set of measures to illustrate [a races'] greater affinity with apes".[78] For instance, Gould points out that white people have thin lips, just like chimpanzees.[79] If any of these gentlemen had been so inclined, they could have used this fact to conclude whites were the less evolved, inferior race. Unfortunately, since the researchers were convinced which races were inferior (more ape like) beforehand, the tests were unconsciously (or even consciously) set up to prove their conclusions. In these cases, cultural assumptions were influencing observations and data by directing the setup of the studies.

Eventually crainiometry was replaced by IQ tests, with similar results. Alfred Binet turned to psychology and tests of IQ when assessing intelligence because he doubted his own objectivity when measuring brains, practicing craniometry. He wrote in 1900:

> I feared, that in making measurements on heads with the intention of finding a difference in volume between an intelligent and a less intelligent head, I would be led to increase, unconsciously and in good faith, the cephalic volume of intelligent heads and to decrease that of unintelligent heads.[80]

[77] Gould, 85.
[78] Gould, 86.
[79] Gould, 86.
[80] Gould, 146.

In order to avoid his cultural biases he developed the first IQ test. He had the noble goal in mind of identifying students who would need additional assistance in school in order to provide them with aid. He even feared that if his rough IQ numbers were "reified," as Gould puts it, then his test would be misused, perhaps even to *limit* access to education. This could happen by marking some as naturally unable to learn, and then arguing we needn't waste resources on the hopeless.[81] Binet's fears were realized, and his IQ tests, the numbers of which he insisted were *not* definitive, were manipulated. People claimed intelligence was static, thus children with low IQs were naturally dim-witted and doomed to stay that way. Arguments were made to reserve education for those children who actually had potential, those with relatively high IQs. This is an example of biological difference claims being used to maintain the discriminating status quo.

This early work in intelligence is a clear case where *cultural* ideology influenced the interpretation of data and blinded observers to alternative explanations. For example, the idea that environment, like quality of home life, could play a role in a child's apparent intelligence was ignored. It makes sense that children from well educated families would have a head start or advantage over children from uneducated families, due to their early interaction with educated people. Nevertheless, the dominate assumption was heritability (especially that particular races were naturally inferior), and environmental factors were not considered relevant.

Henry Goddard studied the heritability of intelligence during the early twentieth century. His work serves as an example of how inquires into the heritability of intelligence operated. Binet's IQ tests were taken to demonstrate an individual's mental competence, and the assumption was of course that mental competence was hereditary.

[81] Gould, 151.

Goddard and his field workers found that "morons" and the "feebleminded" generally had parents and other relatives who were also of limited mental competence.[82] This was taken to prove the heredity of intelligence, even though the role of environment was never ruled out. Environment was not even seriously considered, despite its viability as an alternative hypothesis. These children overwhelmingly came from poor families, and their families shared the same socio-economic class when they were children. Thus these parents and children who exhibited signs of feeblemindedness shared an environment which could easily have been the source of these signs of mental incompetence. For instance, even if mental capacity is entirely biological (and not significantly influenced by early childhood stimulation), we now know that early nutrition plays a crucial role in the development of the brain. Low-income households likely couldn't provide children with adequate nutrition. This is a biological but *environmental* factor that contributes to "feeblemindedness". Goddard and others were so tied up in their theory of heredity they were blind to alternate explanations, including obvious ones, like the role of socio-economic status.

Aside from this issue, there were faults in the testing methods of field workers. The research started with Binet and his IQ test, which although questionable was at least objective to some extent. Yet soon after, researches came to generalizations about the *appearances* of people with low IQs; they had a certain 'look' about them, lived a certain way, etc. Eventually social workers abandoned tests and began diagnosing children based on their look and behavior. For instance, a female moron was the sort of woman who was

[82] Henry Herbert Goddard, *The Kallikak Family: A Study in the Heredity of Feeble-Mindedness* (New York: MacMillan Co., 1912).

"wayward, they get into all sorts of trouble and difficulties, sexually and otherwise".[83] One girl from an especially poor family was diagnosed by look of her face, "she was pretty, with *olive complexion* and dark, languid eyes, but there was no mind there. Stagnation was the word written in large characters over everything".[84] Goddard claimed that field workers could even diagnose an individual based on a description given to them (generally by other feebleminded individuals): "After some experience, the field worker becomes expert in inferring the condition of those persons who are not seen, from the similarity of the language used in describing them to that used in describing persons whom she has seen".[85] This is an even further step away from any thoroughness or objectivity. Yet Goddard claimed, "We have not marked people feeble-minded unless the case was such that we could substantiate it beyond a reasonable doubt".[86] His conception of reasonable doubt was compromised by undue confidence in heredity. The workers were so sure of themselves that rigorous testing methods were abandoned, just like researchers were so sure intelligence was hereditary that rigorous research was never generated – they didn't see a need to eliminate the possibility of environmental influence. Research and testing methods here were guided by preconceptions. If it does not occur to someone to look for answers in a particular place, then if those answers are there, they are not likely to find them. Overall, it seems that cultural assumptions were acting as blinders, and this case serves as an example of how assumptions can lead scientists to unconsciously stack the deck, by directing the arrangement and method of tests and experiments.

[83] Goddard, 10.
[84] Goddard, 73.
[85] Goddard, 15.
[86] Goddard, ix.

Sarah Hrdy and the Langurs of Abu

Finally I present Sarah Hrdy's encounter with the langurs of Abu. In this case, again, we have an issue with theoretical preconceptions acting as blinders, and further, cultural ideology influencing those preconceptions.

According to Hrdy, "by the late 1950s the modern era of primate studies – launched primarily by social scientists – had begun".[87] And these social scientists turned primatologists were heavily influenced by Radcliffe-Brown's social theory, which maintained "that social organization was a 'functionally integrated structure'".[88] The focus of his social theory was on the group, and individual members of the group were seen as *functional* constituents of the group. Predictably, the reports of early primate researchers reflected this ideological framework. They were interpreting the individual primates as functional pieces of a greater unit, working together to ensure the survival of the group. Thus it was expected that self-interest would be abandoned for the betterment of the group (or in some sense, self interests were aligned with group interests). The reports "uniformly described monkeys maintaining complex social organizations in which each had a *role* to play in the *life of the group* and all members *functioned* together to ensure the group's survival".[89] Phyllis Jay studied langurs in the late 1950s and her summary report claimed:

> A langur troop is not merely a formless agglomeration of individuals, but is a *unit* with a definite shape or structure based on intricate patterns of social relationship among the members. Every animal in the troop contributes to the maintenance of this structure by participating in these relationship patterns in a certain

[87] Sarah Blaffer Hrdy, *The Langurs of Abu: Female and Male Strategies of Reproduction*, (Cambridge: Harvard University Press, 1980), 7.
[88] Hrdy, *Langurs*, 7.
[89] Hrdy, *Langurs*, 7.

characteristic manner. [90]

The conviction that langurs and other primates were working together for the betterment of the group was so strong that fights between langurs in a group were dismissed as "anecdotal, often bizarre, certainly not typical behavior".[91] Jay insisted that overall langurs were nonaggressive and relaxed, and that this was the most noticeable feature about them.[92]

In 1961 the Japan India Joint Project released a study on langurs, after tracking a group over the course of two years.[93] Their report forced primatologists to reconsider the supposed nonaggressive and relaxed nature of langurs. They documented a number of violent struggles between incoming alpha males and others, including acts of infanticide. There were observable power struggles, and multiple takeovers by new alphas took place over the course of those two years.[94] So the question became, how is this behavior beneficial to the group (the Radcliffe-Brownian paradigm was still favored)? Hrdy points out that there were two additional viewpoints that contributed to this insistence that langurs were peaceful animals. First, at the time (1960s) it was thought that only humans murdered members of their own species.[95] Secondly, it was thought that high population densities could lead to more violence, and the langur group the Japan India Joint Project followed had a higher population than the supposedly peaceful langurs Jay followed. So overcrowding turned the peaceful langurs aggressive, and "Infanticide among langurs

[90] Phyllis Jay, 1963, quoted in *Langurs of Abu*, 8.
[91] Jay, quoted in *Langurs of Abu*, 8.
[92] Hrdy, *Langurs*, 8.
[93] Hrdy, *Langurs*, 8.
[94] Hrdy, *Langurs*, 8.
[95] Hrdy, *Langurs*, 9.

was dismissed as an instance of 'social pathology' or some other 'dysgenic' behavior".[96]

After taking a course on population biology at Stanford, Hrdy grew interested in the accounts of infanticide in langur populations.[97] She went to Harvard and studied primatology under Irven DeVore and Robert Trivers, and in 1971 she went to Mount Abu to study the correlation between overpopulation and infanticide for her PhD thesis. She went to India expecting, to some extent, that there *would* be a correlation (after all, infanticide could be advantageous if overpopulation was a problem, since a group can only support so many members). But what she witnessed suggested that infanticide was neither a pathology nor an abnormality, but an adaptation. (She went to India with expectations concerning sexual selection theory, too. This will be discussed in chapter seven). Cases of infanticide were wide spread and specifically correlated to the introduction of a new alpha male. "Aggression against infants came only from males entering the breeding system from outside….Attacks on infants come from outsider males trying to take over a troop".[98] As Hrdy states, "langur males compete fiercely for the possession of females, and that in the process, conspecifics are sometimes killed." And, "Far from being maladaptive, infanticide was found to be a widespread adaptation to normal conditions of langur life that was quite *advantageous to those males who practiced it*" (not necessarily the group).[99] The evidence was conclusive – langurs practiced infanticide, it was not an anomaly.

But as Hrdy puts it, the question was now "why we had for so long chosen to

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[96] Hrdy, 9.
[97] Sarah Hrdy interview with Thomas A. Bass, Ed. Bass, "Sarah Hrdy: Sex and the Mating Game," *Reinventing the Future: Conversations with the World's Leading Scientists*, (New York: Addison-Wesley Publishing Company, 1994), 9.
[98] Hrdy interview, 10.
[99] Hrdy, *Langurs*, 10.

regard these incidents as unnatural or pathological behavior".[100] The answer, she claims, is that neither infanticide nor selfish behavior could be accounted for in the frameworks of "group maintenance" or "species survival".[101] It seems that because researchers like Jay began with the assumption that langurs were nonaggressive, and because the focus was on the group and not the individual, the researchers of the 50s and 60s couldn't see this behavior as something natural. The ideology of the field was incompatible with this data. And further, the ideology of the field seems to have been a reflection of the time's cultural ideology:

> Not surprisingly, when we first began to intensively study our closest nonhuman relatives, the monkeys and apes, an idealization of our own society was extended to theirs: thus, according to the first primatological reports, monkeys, like humans, maintain complex social systems geared towards ensuring the group's survival. [102]

The theoretical framework Jay and others brought to their observations predisposed them to interpret the actions of the individual monkeys as directed towards the benefit of the whole. And when the data went against this assumption, it was dismissed as anomalous.

It took a while for Hrdy's conclusions to win over the primatology community (though not as long as McClintock's ideas took). Explaining the initial reaction to her findings in Abu, Hrdy says, "I was attacked by some of the most eminent anthropologists in the country. They said my evidence was inadequate and that the animals I was studying must be crazy".[103] And she seems in agreeance with my claim that background assumptions influence the interpretation of data, saying:

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[100] Hrdy, *Langurs*, 10.
[101] Hrdy, *Langurs*, 10.
[102] Hrdy, *Langurs*, 11.
[103] Hrdy interview, 11.

> Within that paradigm (Radcliffe-Brownian), how can an individual do something counter to the group interest?....Anthropologists couldn't believe it was happening, which brings us back to the idea of scientific paradigms and the assumptions we start out with. Few of us are aware of *how powerfully these assumptions shape the research questions we ask and the observations we make*.[104]

As McClintock said, tacit assumptions can act as blinders. But as Hrdy notes, once someone approaches the data from a new perspective, and opens up that perspective by drawing attention to it, then anyone can 'see it.' "Once the initial leaps of imagination have been made" the community at large can see the alternative picture.[105] So again, the received view in science can be slow to change, but it can and it does change to fit new data.

The important lesson here is that not only can our scientific paradigms influence our observation, but our cultural ideologies can influence our scientific paradigms. So, the closer a biological paradigm mirrors social values, the more careful we ought to be, closely monitoring our objectivity.

Gould asks in "The Mismeasure of Man", after reflecting on how Paul Broca used numbers to prove prior conclusions:

> We can stand back and show that he used numbers not to generate new theories but to illustrate a priori conclusions. Shall we believe that science is different today simply because we share the cultural context of most practicing scientists and mistake its influence for objective truth? Broca was an exemplary scientist; no one has ever surpassed him in meticulous care and accuracy of measurement. By what right, other than our own biases, *can we identify his prejudice and hold that science now operates independently of culture and class?* [106]

[104] Hrdy interview, 11.
[105] Hrdy interview, 24.
[106] Gould, 74.

Again, assumptions, both cultural and scientific, can infect observations. The best we can do is carefully reassess biological conclusions that closely mirror ideological trends and values.

CHAPTER IV

EVOLUTIONARY PSYCHOLOGY

In this chapter I present an exposition of evolutionary psychology's methodology and theoretical commitments. But before I detail these commitments, I want to be clear about the term "evolutionary psychology." David Buller makes what I take to be a critical distinction for any debate concerning evolutionary psychology, stressing the importance of clearly articulating the position in question. He distinguishes "evolutionary psychology" from "Evolutionary Psychology," capital E and P. Buller says that by "evolutionary psychology" he means a field of inquiry.[107] This general field of inquiry is marked by a single commitment: investigating human psychology through evolutionary biology. It seems perfectly reasonable to investigate the human condition using evolutionary biology, and I personally think this is a respectable approach to understanding human psychology. So to be clear, I do not side with critics who reject the evolutionary approach out of a fear of political consequences. I believe potential political

[107] David Buller, "Evolutionary Psychology: A Critique," *Conceptual Issues in Evolutionary Biology*, ed. Elliott Sober, (Cambridge: The MIT Press, 2006), 197.

consequences are certainly a reason to be cautious, but not a reason to abandon promising research – and this research *is* promising. After all, the brain is a product of evolution, and the brain plays an enormous role in human psychology. To neglect the evolutionary history of brain and mind in the study of human psychology would be an egregious error. As Cosmides and Tooby put it, "The human brain did not fall out of the sky, an inscrutable artifact of unknown origin, and there is no longer any sensible reason for studying it in ignorance of the causal processes that constructed it."[108]

"Evolutionary Psychology," on the other hand, refers to a paradigm defined by specific commitments, both theoretical and methodological. I have adopted Buller's distinction, and "Evolutionary Psychology" (henceforth referred to as EP) is the target of my criticisms and thus the focus of this chapter. Those at the forefront of the EP paradigm include David M. Buss, Steven Pinker, John and Leda Cosmides, and Martin Daly and Margo Wilson.[109] I look primarily to these individuals in explaining EP, as they are the major mouthpieces of EP.

Natural and Cumulative Selection

As Buller puts it, "The basic tenant of Evolutionary Psychology is that, just as evolution by natural selection has created human morphological adaptations, so it has created human psychological adaptations".[110] Before exploring this 'basic tenant' in detail, I will say something about natural selection. Natural selection is a blind process that can "select" traits which benefit an organism's reproductive success in a given environment. For example, if an organism's environment is such that being a certain

[108] Leda Cosmides and John Tooby, "Origins of domain specificity: The evolution of functional organization," *Mapping the Mind: Domain specificity in cognition and culture*, eds. L. Hirschfeld and S. Gelman, (New York: Cambridge University Press, 1994), 85.
[109] David J. Buller, *Adapting Minds,* (Cambridge: MIT Press, 2006), 12.
[110] Buller, "Evolutionary Psychology," 197.

color pays off in terms of reproductive success, then that color trait will likely be selected for. If, for instance, our organism in question is a bird that lives in a lush green environment, then being green would pay off in terms of evading predators. Those in the population who best matched the surrounding flora would be more likely to escape death by predation, thus having a better chance of living long enough to produce offspring. And because they are more likely to produce offspring than their browner brothers, the next generation will have a higher population of birds with the green trait. So natural selection would push the population in this green-feathered direction.

There are three ingredients necessary for natural selection: variation, differential fitness, and heritability.[111] For natural selection to work in the above scenario the green trait must be something inheritable, otherwise the trait would not be passed on. It must also be a trait that already exists within the population in varying degrees– natural selection doesn't just 'poof' traits into existence based on the need of an organism; it is a blind process. And it must be a trait that increases *fitness*, which is defined as *differential reproductive success*. This is how the heritable trait is selected for; it allows the organism to produce more offspring, thus increasing the number of organisms with the trait in the subsequent generation.

The mental traits EPs are concerned with are complex traits, and *cumulative selection* is necessary for complex traits to evolve by natural selection. Cumulative selection is set off from simple, single-step selection in that it pushes a population in a fairly stable direction. For cumulative selection to take place some additional ingredients are needed: a relatively slow mutation rate (large changes are often catastrophic and

[111] Charles Darwin, "On the Origin of Species," in *From So Simple a Beginning*, ed. E.O. Wilson (New York: W.W. Norton & Company: 2006).

deadly), a continuing supply of variation, fitter intermediates (e.g., natural selection couldn't push kangaroos from hopping to running, because there isn't a fitter intermediate form between hopping and running – the organism would function worse before it got better), and *stable selection pressure*. Stable selection pressure is essential, and this key ingredient plays a vital role in EPs method of investigation. If selection pressures are unstable, and every few generations trait X becomes useless and Y beneficial and vice-versa, then large changes are not likely to take place.

Going back to the above example, for green-feathered camouflage to evolve by natural selection, the species must inhabit the same colored environment for several generations. If for one generation the environment is lush green but the next brown, there wouldn't be any pressure to select for green in future generations. The push for green plumage would cease. In fact, brown would likely be selected for. And once the green camouflage is in place, if environmental pressures change then the species could be disastrously affected. For instance, if a long drought comes to the region, and there is no longer green flora, but instead the region is marked by the browns of dirt and dried up flora, then this green species becomes an easy target for predators, meaning the species could face extinction.[112] If extinction is avoided, then there will either be new selection or migration. Brown plumage may be selected for if the trait still exists as a variation within the population, or the species may move to a greener environment. Changes in populations are fairly slow, and since natural selection runs on environmental pressures,

[112] Peter and Rosemary Grant have documented numerous changes in the Galapagos finches over a surprisingly short period of time. These changes are directly correlated to successive periods of floods and drought. For example, after the 1982-83 El Niño, cactus populations have gone down. Because of this environmental change, the cactus finches (*geospiza conirostris*) who inhabit the dry shrub land have been struggling to make a living, since their main food source is the cactus. Jonathan Weiner, *The Beak of the Finch: a Story of Evolution in our Time*, (New York: Alfred A. Knopf, 1994).

if environmental pressures change, so will the direction of selection. So for any sort of complex adaptation to arise through natural selection, it will be through cumulative selection, and stable selection pressures are essential.

EPs claim that important human psychological traits are adaptations, and these adaptations are so complex that they required "hundreds of thousands of years of cumulative selection" to evolve, meaning these traits required hundreds of thousands of years of reasonably *stable selection pressure* to evolve by natural selection.[113] This is a crucial requirement, and if accurate, it certainly narrows down the possible time frame during which the selection took place. Because of the time needed to evolve these psychological traits, EPs claim that they must have been selected for during the Pleistocene era (which spans from 1.8 MYA to 10,000 years ago). The "environment of evolutionary adaptedness" (EEA) refers to the past environment to which a particular trait is adapted.[114] As Buller explains, a species' EEA is:

> the set of environmental properties that prevailed during the period in which its adaptations ceased to be modified under selection and came to be maintained at or near fixation by selection… the period in a species' evolution during which its adaptations enjoyed a good 'fit' with its environment.[115]

And EP's claim the environmental conditions that faced early hominids during the Pleistocene compose the human EEA, so human psychological traits are adapted to the conditions of the Pleistocene era.

Human ancestors spent two million years as hunters and gathers during the Pleistocene, and two million years would presumably be enough time for our complex psychological traits to have evolved. The time that has elapsed since the Pleistocene is

[113] Buller, "Evolutionary Psychology," 197.
[114] Buller, Adapting Minds, 58.
[115] Buller, Adapting Minds, 59.

only 1% of the hunter and gatherer existence our ancestors had and (according to EPs) not enough time for "new complex designs" to evolve.[116] So the basic strategy of the EPs is to reflect on the alleged problems faced by our ancestors in Pleistocene conditions and then develop evolutionary explanations for our (contemporary) behavior patterns, under the assumption that these patterns were originally traits that evolved *as* solutions to problems faced in the Pleistocene. This reverse engineering approach requires a specific view of evolution, which I will now move to.

Evolution: the adaptationist program

Expectedly, how one understands the mechanics of evolution will impact the core of one's evolutionary psychology. So in order to understand the EP paradigm, we must examine their view of evolution. Tooby and Cosmides are essentially the founders of the EP research program. Accordingly, I will look to them in expositing EPs evolutionary commitments, since how one cashes out the mechanisms of evolution is essential in terms of EP research (which, as I will show, is driven by reverse engineering). My central claim here is that Tooby and Cosmides are adaptationists and that EP's research program essentially depends on adaptationism. Tooby and Cosmides repeatedly endorse the adaptationist program, claiming that cognitive psychologists "can find a productive new analytic tool in a carefully reasoned adaptationist approach."[117]

Adaptationists emphasize the role of natural selection in understanding the process of evolution. Of course natural selection is widely agreed to be the driving force of evolution, but adaptationists tend to ignore or dismiss other processes by which evolution can be guided or by which natural selection is constrained (genetic drift,

[116] Buller, "Evolutionary Psychology," 206.
[117] Cosmides and Tooby, "Origins of domain specificity," 86.

chance, pleiotropy, historical constraints, etc.). They generally divide organisms into traits and explain the evolution of an organism trait by trait. The extent to which they divide the organism into parts or traits varies, but there is definitely this divisive approach. Then, for any trait an organism may have, adaptationists attempt to explain that trait as an adaptation. Adaptations are traits that are selected for by natural selection because they increase/d fitness in a particular environment (again, fitness is differential reproductive success).[118] So for any trait, the adaptationist assumption is that it must exist because it was useful. And then a story is constructed about the historical situation in which that trait was useful and therefore evolved. Narratives of this sort are known as *Darwinian histories*, a term coined by Phillip Kitcher. Kitcher explains that a Darwinian history is "a narrative which traces the successive modification of a group of organisms from generation to generation in terms of various factors, most notably that of natural selection."[119] Darwinian histories are hypotheses about the possible course an organism took through history to acquire its current modifications or adaptations. These are an essential explanatory tool for evolutionary biologists.

It will be helpful to keep in mind Elliott Sober's distinction between "selection for" and "selection of." *Selection for* trait X is the selection of X for X itself (X is the focus of the selection), while *selection of* trait Y means Y is an epiphenomenon, a secondary effect and not the direct effect of natural selection. So if there were *selection for* X and *selection of* Y, X would be the target of the selection and Y would be 'selected'

[118] E.g., why do peacocks have large and brightly colored tails, which seems disadvantageous when avoiding pretators? Well, to attract the peahen. Why do some men rape? According to Pinker, it is probably a tendency that evolved so that low status males could spread their genes.
[119] Phillip Kitcher, "Darwin's Achievement," Reason and Rationality in Natural Science, ed. Nicholas Rescher, (New York: University Press of America, 1985), 133.

only as a byproduct.[120] Sterelny and Griffiths' give a nice example with running water – it sorts rocks and sediments by mass, the lighter flowing further than the heavier. This is *selection for* mass. However mass often corresponds to color in rocks and sediments. So there is also a sorting of rocks by color. This is *selection of* color. Color is not the target of selection; its arrangement is a byproduct of weight. The water is 'blind' to color and is only arranging rocks by mass (the selecting of sediments would be the same, based on mass, even if the color association was inverted).[121]

Adaptations are traits that are *selected for*. Adaptationists attempt to explain common traits as adaptations. Their investigating assumption is that the trait in question served a purpose, and they attempt to give functional explanations for a trait's evolution. However, assuming every trait is an adaptation, with only a few exceptions, means assuming evolution takes place be means of a highly efficient sort of natural selection. For the adaptationist, organisms are *designed* by natural selection to fit their environment, as each trait was 'developed' to serve a function. Cosmides and Tooby use the analogy of a lock and key, referring to the fit between environmental challenges and adaptations.[122] If traits are consistently explained as adaptations, then the assumption is that natural selection is responsible for these traits and that natural selection is not limited in any significant way by historical contingencies (including chance, bauplan, pleiotropy, etc.).[123]

As Buss claims, "a central premise of evolutionary psychology is that the main

[120] Elliott Sober, *Natural Selection: Evolutionary Theory in Philosophical Focus*, (Chicago: University of Chicago Press, 1993).
[121] Kim Sterelny and Paul Griffiths, *Sex and Death: an introduction to philosophy of biology*, (Chicago: The University of Chicago Press, 1999), 77-78.
[122] Tooby and Cosmides, "Origins of Domain Specificity," 96.
[123] John Tooby and Leda Cosmides, "Beyond Intuition and Instinct Blindness," *Cognition* 50 (1994), 43.

nonarbitrary way to identify, describe, and understand psychological mechanisms is to articulate their functions – the specific adaptive problem they were designed by selection to solve."[124] Tooby and Cosmides in some sense paradigmatically defend the adaptationist position, boldly stating "function determines structure" - just like the function of an airplane determines the structure of an airplane.[125] Airplanes are designed for a specific function (flying) and their structure reflects this. That is, they have the structure they do because of the function they are intended to perform. Tooby and Cosmides claim that in evolved systems "there is a causal relationship between the adaptive problems a species encountered during its evolution and the design of its phenotypic structure".[126] And that causal relationship is such that adaptive problems cause phenotypic structure, through the process of natural selection (i.e. structure is selected for, an adaptation). They take the design metaphor very seriously – "For human-made artifacts and biological systems, form follows function" .[127] They claim that functional explanations are:

> essential for understanding how natural selection designs organisms. An organism's phenotypic structure can be thought of as *a collection of "design features" – micro-machines*, such as the functional components of the eye or liver. Over evolutionary time, new design features are added or discarded from the species' design because of their consequences…Natural selection is a feedback process that "chooses" among alternative designs on the basis of how well they function. By selecting designs on the basis of how well they solve adaptive problems, *this process engineers a tight fit between the function of a device and its structure.* (my emphases).[128]

[124] David M. Buss, "Evolutionary Psychology: a New Paradigm for Psychological Science," *Psychological Inquiry* 6 no. 1 (1995), 6.
[125] Tooby and Cosmides, "Beyond Intuition," 44.
[126] Tooby and Cosmides, "Beyond Intuition," 42.
[127] Tooby and Cosmides, "Beyond Intuition," 44.
[128] Tooby and Cosmides, "Beyond Intuition," 44-45.

They suggest that evolution works exclusively, without any significant constraints, by natural selection.

Because of this, we see organisms that were "designed" to fit their environment. Granted they aren't consciously designed, but adaptationists like Tooby and Cosmides characterize the process of natural selection as being extremely efficient, such that organisms seem to optimally suit their environment.[129] They wouldn't deny exceptions to this optimal functionality, but, as they say, "Natural selection is a relentlessly hill-climbing process which tends to replace relatively less efficient designs with ones that perform better" (notice the language, "replace", not "modify").[130] And as they say in another work:

> natural selection is a hill-climbing process that tends to choose the best of the variant designs that actually appear, and because of the immense numbers of alternatives that appear….natural selection tends to cause the accumulation of *very well-engineered functional designs*". [131]

So it seems they are strongly committed to efficiency. And at the very least, traits were designed to fulfill a function, whether or not they still serve that function.

It is only fair to note that occasionally EPs will mention that evolution doesn't necessarily produce optimal organisms, and that chance and history play *some* role in constraining the design process of natural selection. Natural selection is blind, after all. Tooby and Cosmides note that both "chance and natural selection" govern the process of evolution. Though they qualify that, saying, "although chance plays a delimited role in evolution and explains the existence and distribution of many simple and trivial

[129] Tooby and Cosmides, "Beyond Intuition," 45.
[130] Tooby and Cosmides, "Beyond Intuition," 58.
[131] Tooby and Cosmides, "Toward Mapping the Evolved Functional Organization of Mind and Brain," *Conceptual Issues in Evolutionary Biology*, ed. Elliot Sober, (Cambridge: The MIT Press, 2006), 187.

properties, one thing cannot be plausibly explained as the product of chance processes: complex functional design."[132] They will also discuss the blindness of natural selection, saying "evolution is a historical process, not a foresightful one."[133] Overall, however, EPs do view evolution as an efficient organism designing process. And their brief mentions of chance and blindness are almost always tied to caveats about how they are *not* sociobiologists. As Buss explains, sociobiologists differ from evolutionary psychologists in that many of them were committed to the idea that humans are "fitness maximizers" and that "humans possess mechanisms with the goal of maximizing their inclusive fitness."[134] But evolutionary psychologists and Evolutionary Psychologists are both careful to point out that psychological mechanisms evolved because they maximized fitness *in the time during which they evolved*.

However, the environment and selection pressures have changed, so these mechanisms don't necessarily increase fitness *now*. The point they intend to make with their talk of chance and blindness is that adaptations are adaptations specific to the environment in which they evolved. So our psychological traits are adapted to solve Pleistocene problems, not 21st century problems. Tooby and Cosmides have this to say after their brief talk of chance, history, and blindness:

> Our evolved mechanisms were constructed and adjusted in response to the statistical composite of situations actually encountered by our species during its evolutionary history…these mechanisms were not designed to deal with modern circumstances that are evolutionarily unprecedented. By the same token, they cannot have been designed to solve all potential problems under all possible circumstances either, because our species did not encounter all problems under all

[132] Tooby and Cosmides, "Origins of domain specificity," 86.
[133] Tooby and Cosmides, "Origins of domain specificity," 87.
[134] Buss, "New Paradigm," 9.

circumstances.[135]

And, "well-engineered performance should be evident only under conditions that mimic relevant aspects of the ancestral environments in which these mechanisms were designed to operate".[136] So, these mechanisms are optimally suited to the problems faced in the past, during the time they evolved. Thus, despite their notes about constraints on natural selection, they do see natural selection as an efficient process, which designs organisms with traits that optimally suit the environment in which they evolved.

Modularity: psychological traits

One of Evolutionary Psychology's central commitments is to the modularity of mind. They claim the mind is modular, meaning it is composed of hundreds or thousands of "functionally distinct cognitive adaptive specializations" or "adaptive problem-solving devices."[137] That is, the mind is not simply one adaptation, and it doesn't work as a general information processing device. Instead, the mind is composed of a multitude of psychological traits or adaptations, and each of these is a *specialized* information processing devise. EPs make heavy use of the computer metaphor, and with this metaphor in mind one can think of mental modules as specialized computer programs housed in the brain. Each program is suited to a particular task. It receives information (external or internal) related to its task, processes that information, and then produces an output.

According to Buss "an evolved psychological mechanism is a set of processes inside an organism" that has, essentially, three characteristics. First, it exists because it

[135] Tooby and Cosmides, "Origins of Domain Specificity," 87.
[136] Tooby and Cosmides, "Origins of Domain Specificity," 87.
[137] Tooby and Cosmides, "Origins of Domain Specificity," 90. & "Toward Mapping," 180.

"solved a specific problem of individual survival or reproduction recurrently over human evolutionary history".[138] Second, it "takes only certain classes of information or input." And input, either internal or external, can be either "actively extracted from the environment or passively received," and "specifies to the organism the particular adaptive problem it is facing". And third, the mechanism takes the information and transforms it into output, which "regulates physiological activity, provides information to other psychological mechanism, or produces manifest action." This output solves a specific adaptive problem, relative to the environment during which it evolved.[139] So for any specific scenario relevant to survival and reproduction, directly or indirectly, information is sent to the appropriate module, which in turn produces an output in the form of adaptive behavior suited to the scenario at hand. As Pinker puts it, "The mind is organized into modules or mental organs, each with a specialized design that makes it an expert in one arena of interaction with the world".[140] These modules were designed by natural selection to solve problems our Pleistocene ancestors faced, and "the various problems for our ancestors were subtasks of one big problem for their genes, maximizing the number of copies that made it into the next generation".[141]

Sterelny and Griffiths describe modules as "domain-specific, mandatory, opaque, and informationally encapsulated mechanisms".[142] They are *domain-specific* in that they are specialized to deal with particular problems. They are *mandatory* in that humans "do not choose to approach these problems in this specific way".[143] The modules

[138] Buss, "New Paradigm," 6.
[139] Buss, "New Paradigm," 6.
[140] Steven Pinker, *How the Mind Works*, (New York: Norton, 2009), 21.
[141] Pinker, *How the Mind Works*, 21.
[142] Sterelny and Griffiths, *Sex and Death*, 326.
[143] Sterelny and Griffiths, *Sex and Death*, 326.

automatically kick in when presented with certain information. They are *opaque* in that we can't consciously access them. EP has a method through which they discover the modules, as will be discussed, but it isn't that we can simply look into our mind and 'see' the modules at work. And finally, they are *informationally encapsulated* in that they don't "make use of the information stored elsewhere in the cognitive system".[144] For example, we may have a module that induces fear when it processes information like "slithering creature." If we see a snake, even a harmless garden snake, this module kicks in. This module cannot access our knowledge about the particular snake's harmlessness. It just receives the information, processes it, and outputs fear – regardless of whether or not the human knows better.

Evolutionary Psychologists claim that having specialized cognitive mechanisms is better (i.e., more optimal or efficient) than having a general-purpose cognitive mechanisms.[145] This claim, together with the commitment discussed above to natural selection's efficiency, leads EPs to conclude that the mind must be massively modular. One point that is made in support of massive modularity is the specialization you see in other areas of the body. For instance, our organs are quite specialized – the heart specializes in pumping blood, the lungs specialize in oxygenating the blood, and so on. We can see that natural selection has developed highly specialized organs elsewhere, and this should lead us to expect the same sort of specialization within the mental organ.

As Buss puts it, "Different adaptive problems typically select for different adaptive solutions…there is no such thing as a 'general solution' because there is no such

[144] Sterelny and Griffiths, *Sex and Death*, 326.
[145] Tooby and Cosmides, "Beyond Intuition," 55.

thing as a general 'problem'".[146] Essentially the issue is efficiency, and as Pinker says, "a jack-of-all-trades is master of none, and that is just as true for our mental organs as for our physical organs".[147] As Tooby and Cosmides state, "What counts as adaptive behavior differs markedly from domain to domain".[148] And they say elsewhere:

> As a rule, when two adaptive problems have solutions that are incompatible or simply different, a single general solution will be inferior to two specialized solutions…*generality can be achieved only by sacrificing effectiveness*. Consequently, domain-specific cognitive mechanisms, with design features that exploit the stable structural features of evolutionarily recurring situations, can be expected to systematically outperform (and hence preclude or replace) more general mechanisms that fail to exploit these features.[149]

The mind simply would not function well (or at least, as well) if it was a general processing device, responsible for all cognition – from determining what counts as a good mate, to what counts as good food. The adaptive rules for mate selection are quite different from the rules for food selection.[150]

Tooby and Cosmides argue that massive modularity isn't just more likely, given the way natural selection works, but "even simple learnability analyses show that it is *in principle impossible* for a human psychology that contained nothing but domain-general mechanisms to have evolved, because such a system cannot consistently behave adaptively".[151] They give three reasons for this 'in principle impossibility.'

(I) "What counts as fit behavior differs from domain to domain."[152] What counts as a fit strategy in one domain can vary widely from another, even if the domains are

[146] Buss, "New Paradigm," 7.
[147] Pinker, *How the Mind Works*, 28.
[148] Tooby and Cosmides, "Beyond Intuition," 56.
[149] Tooby and Cosmides, "Origins of Domain Specificity," 89.
[150] Tooby and Cosmides, "Origins of Domain Specificity," 90.
[151] Tooby and Cosmides, "Origins of Domain Specificity," 90.
[152] Tooby and Cosmides, "Origins of Domain Specificity," 91.

similar in some ways. For example, in sexual relations avoiding one's relatives is a fit course of action, since offspring could have serious genetic defects. However, when it comes to sharing resources, avoiding one's relatives is *not* fit. It is fit to help one's relatives over others, as their reproductive success is tied to the success of your own genes (success defined as 'being passed on').[153] Similarly, "what counts as a 'good' mate has little in common with a 'good' lunch."[154] Adaptive courses of actions cannot be deduced or learned by general criteria, "because they depend on statistical relationships between features of the environment, behavior, and fitness that emerge over many generations and are, therefore, not observable during a single lifetime".[155]

(II) If the modules are "content-free architectures" (and EPs like Tooby and Cosmides describe general processing mechanisms this way), we wouldn't know what to do when the environment fails to offer the necessary clues about proper action.[156] And the environment frequently fails in this respect, especially when it comes to first encounters.

(III) "Combinatoral explosion paralyzes any truly domain-general system when encountering real-world complexity".[157] Tooby and Cosmides point out that a domain-general mechanism lacks content (either domain-specific knowledge or procedures) "that can guide it towards the solution of an adaptive problem".[158] That is, a general processor could not contain rules of relevance, and would thus have difficulties functioning quickly, or at all. Pinker talks about the frame problem with Daniel Dennett's robot thought

[153] Tooby and Cosmides, "Origins of Domain Specificity," 91.
[154] Tooby and Cosmides, "Beyond Intuition," 56.
[155] Tooby and Cosmides, "Origins of Domain Specificity," 91.
[156] Tooby and Cosmides, "Beyond Intuition," 57.
[157] Tooby and Cosmides, "Origins of Domain Specificity," 91.
[158] Tooby and Cosmides, "Origins of Domain Specificity," 94.

experiment.[159] Their claim is that a general processing machine couldn't contain rules of relevance, which leads to a situation where the machine must test every possible scenario, taking a ridiculous (and maladaptive) amount of time.[160] So, because having specialized cognitive mechanisms would arguably be more efficient, and because their view of evolution is committed to this efficiency, they conclude that the brain must be made up of domain specific modules.

On top of this theoretical evidence for modularity, EPs also have empirical evidence. Buss lists twenty supposedly known modules, including patterned distribution of fears, vision, and sexual preferences. David Buller points out that cognitive scientists have given evidence that suggests "modules for face recognition, language, the motions of inanimate objects, the classification of plants and animals, and the interpretation and explanation of human behavior".[161] But he explains the real difference between EPs and the majority of cognitive scientists is in the number of modules postulated. Again, EPs are committed to *massive* modularity. As Tooby and Cosmides themselves state, "our cognitive architecture resembles a confederation of hundreds or thousands of functionally dedicated computers (often called modules)"[162]

Computational Theory of Mind

Following both the commitment to natural selection's efficiency and the commitment to massive modularity, Evolutionary Psychologists also hold to a computational theory of mind – a view that claims the mind works via a form of logical syntax. Computational theory of mind (CTM) was a product of functionalism in

[159] Pinker, *How the Mind Works*, 14.
[160] See also Tooby and Cosmides, "Origins of domain Specificity" pg. 94.
[161] Buller, Adapting Minds, 68.
[162] John Tooby and Leda Cosmides, Foreword in Simon Baron-Cohen, *Mind-blindness: an Essay on Autism and Theory of Mind*, (Cambridge: MIT Press, 1995), viii.

philosophy of mind. As a theory of mind, functionalism gives an account of mental states, explaining thought processes and behavior. The basic model of mind in functionalism consists of input, a causal chain of states, and an output that results from the input and causal chain. Alan Turing's work played an important role in the development of functionalism, and the mind is thought of much like a Turing machine. Mental states are the causal structures in between input and output, and the causal structures for humans happen to be intentional states or propositional attitudes (beliefs, desires, thoughts). According to Ned Block, "the functionalist answer to 'what are mental states?' is simply that mental states are functional states".[163] Instead of reducing mental states to physical states (like type identity theory), mental states are reduced to functional states. For example, instead of claiming pain *is* c-fibers firing, the functionalist would say that pain is a functional state that serves as a damage indicator and repair motivator. Pain is a state brought about by some sort of bodily damage (input), which causes a desire to stop the damage, and this desire then causes an action that is meant to move (output) the damaged area away from the cause of damage. So, functional states are multiply realizable. A cat has pain if it has a mental state that functions as a damage indicator and repair motivator, regardless of whether or not it has c-fibers firing or a sophisticated mental representation of anguish.

The computational theory of mind works under functionalism and is in a sense assumed in functionalism; the causal chain that runs between input and output is treated as running on logical rules, like modus ponens. Beliefs serve as premises and inferences

[163] Ned Block, "What is Functionalism?," *Philosophy of Mind: a guide and anthology*, ed. John Heil, (New York: Oxford University Press, 2004), 184.

to conclusions, or outputs.[164] CTM takes the metaphor between mind and computer very seriously, and according to CTM, thought is computational. For the computational theory of mind, rules of inference are basic to cognition and the mind works much like a Turing machine or computer. That is, the mind comes preprogrammed with a computational syntax system that takes input (internal or external), computes the input, and then produces an output.

It is easy to see how the computation theory of mind follows modularity, especially since modules are explained as specialized information processing devices (psychological traits). Tooby and Cosmides comment, "we should be able to develop a computational theory of the organic information-processing device that governs social exchange in humans".[165] That is, given evolution and the modular mind, we should be able to develop *a computational theory of mind.* The discussion of modularity above reflects their computational view, as they talk of rules and information processing mechanisms. And their use of the machine and computer metaphors is extensive. Steven Pinker even dedicates a chapter to defending computationalism in his book *How the Mind Works*. Pinker nicely sums up computational theory of mind as "the idea that information processing is the fundamental activity of the brain".[166] And he translates mentalisitic terms in a way that fits computationalism and the computer metaphor with which it is constantly joined, "Beliefs are inscriptions in memory, desires are goal inscriptions, thinking is computation, perceptions are inscriptions triggered by sensors, trying is

[164] Jerry Fodor, "The Persistence of the Attitudes," Problems in Mind, ed. Jack Crumley, (Mountain view: Mayfield Pub, 1987).
[165] Tooby and Cosmides, "Beyond Intuition," 50.
[166] Pinker, *How the Mind Works*, 83.

executing operations triggered by a goal"[167]

Methodology

If evolution works like adaptationists claim, then there is amazing promise in terms of a research program. According to Buss, a key premise of EP "is that the main nonarbitrary way to identify, describe, and understand psychological mechanisms is to articulate their functions – the specific adaptive problems they were designed by selection to solve".[168] Evolutionary Psychologists parse the brain based on function, just like anatomists do the body.[169] And each parsed psychological trait is a module, the psychological adaptations that the EP research program attempts to understand.

According to Tooby and Cosmides the brain is "an information-processing device that was *designed* by the evolutionary process," and consequently we can *reverse engineer* the mind.[170] To understand *how* the brain works we just need to know the *what* and the *why* – what are the problems it was designed to solve, and why was it designed to solve those problems. As Tooby and Cosmides say, "in other words, you need to ask the same questions of the brain as you would of the cash register" – it's clear they take the machine metaphor seriously.[171] Steven Pinker rightly notes that we can only reverse engineer something if we know what it was designed to do. And we do know what the brain was designed to do: "the ultimate goal that the mind was designed to attain is maximizing the number of copies of the genes that created it".[172] It is important to note that their commitment to optimality is crucial to reverse engineering. It would be difficult

[167] Pinker, *How the Mind Works*, 78.
[168] Buss, "New Paradigm," 6.
[169] Buss, "New Paradigm," 6.
[170] Tooby and Cosmides, "Beyond Intuition," 47.
[171] Tooby and Cosmides, "Beyond Intuition," 47.
[172] Pinker, How the Mind works, 43.

to guess what something was specifically designed for if the design functions poorly (for example, a parent may have a terrible time guessing the function of various inventions designed by their young children).

To summarize, the EPs are claiming natural selection is a highly efficient process that designs organisms (or modifies organisms) based on a 'desired' function, where the desired function is a function that solves survival problems or increases fitness.[173] This adaptationist picture paired with their Pleistocene EEA claim (the claim that human psychological traits evolved during the Pleistocene) comprise the base of EP's research method. We can take what we know about the Pleistocene era (from various fields of study like anthropology, geology, etc) and determine the sorts of problems humanoids faced at the time. And after dissecting human psychology into functional modules we can then develop hypotheses about what these traits were 'designed,' as adaptations, to do. That is, we can reverse engineer the human mind like we could a well designed machine.

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[173] Because evolution is a blind and unconscious process, the designing is *indirect*; though the language of the adaptationists does bring to mind *direct* design.

CHAPTER V

ADAPTATIONISM AND REVERSE ENGINEERING

As outlined in the preceding chapter, Evolutionary Psychology's research program proceeds by means of reverse engineering, which relies unavoidably on adaptationism and efficiency, if not optimality, in evolution. After all, one can only reverse engineer an organism or machine's structure based on function if that structure is actually a result of function, i.e. if it has the structure it does *in order to* perform the function. Thus, adaptationism entails purposiveness in the sense that an organism's structure (as a whole and /or divided into traits) serves (or served) a purpose. Even then, reverse engineering assumes a certain level of efficiency. Researchers need to be able to reasonably guess the purpose of parts, and if the parts are inefficient or redundant, then *accurately* guessing their intended function could be difficult or even impossible. Reverse engineering assumes the parts of the structure are in place to serve a function (a past or present function), but if there are unnecessary parts or if parts are not actually there to

serve that particular function, then reverse engineering is misguided.

Despite the widespread acceptance of the adaptationist perspective, it is not clear this is the most accurate model of evolution. And if the adaptationist program fails, especially in the way critics like Stephen J. Gould suggest, then so does EPs current research program. If we cannot count on evolution consistently producing well-designed, adaptive traits, then we cannot reverse engineer those traits. In this chapter, I present criticisms of EPs evolutionary assumptions, which in turn leads to criticisms of their method of investigation and computational model of mind.

Natural Selection: Designer or Tinkerer

I want to first note that the adaptationists perspective and the alternate, anti-adaptationist perspective of evolution are not radically different. When it comes to the basic mechanics of evolution, both agree on *what* the mechanisms are: evolution works through natural selection, contingencies, and constraints. But when it comes to the efficiency of those mechanisms and the degree to which those mechanisms affect the structure of an organism, the two factions part ways. For instance, they both view natural selection as the primary force behind evolution, but they disagree when it comes to attributing limits to natural selection. Their difference essentially lies in focus. We might think of them as two distinct paradigms, loosely speaking. That is, they are conceptualizing the process differently.

Donna Harraway says when considering paradigms, "An important aspect of a paradigm is metaphor, and it is suggestive to investigate the use of metaphor to direct research and its interpretation."[174] I want to propose that the adaptationists and anti-adaptationists are using different metaphors, which affects research methodologies in

[174] Donna Harraway, *Crystals, Fabrics, and Fields*, (New Haven: Yale University Press, 1976), 2.

evolutionary biology, including evolutionary psychology. I claim that the adaptationists metaphorically characterize natural selection as a *designer*, while those I have been calling anti-adaptationists characterize natural selection as a *tinkerer*. In this chapter I unpack their differences by exploring their distinct metaphors. As discussed in my exposition of adaptationism, adaptationists take the design metaphor quite seriously. They talk about reverse engineering, compare the human brain to a Turing machine and computer, and repeatedly discuss natural selection's *designs*: "An organism's phenotypic structure can be thought of as a collection of '*design features' – micro-machines*"[175]; "To figure out how the mind works, cognitive scientists will need to know *what problems our cognitive and neural mechanisms were designed to solve*"[176]; "…the human brain, an information-processing device that was *designed by the evolutionary process*"[177]; "…attributing adaptive complexity to natural selection is not just a recognition of design excellence…"[178]; "The ultimate goal the mind was *designed* to attain is maximizing the number of copies of the genes that created it"[179]; "Sight and action and common sense and violence and morality and love are no accident, no inextricable ingredients of an intelligent essence, no inevitability of information processing. Each is a tour de force, wrought by *a high level of targeted design*"[180]. It is without question that Evolutionary Psychologists, with their adaptationist mindset, rely excessively on the designer metaphor.

A designer plans, and thus produces efficient and capable designs. Natural

[175] Tooby and Cosmides, "Beyond Intuition", 44.
[176] Tooby and Cosmides, "Beyond Intuition," 47.
[177] Tooby and Cosmides, "Beyond Intuition," 47.
[178] Pinker, *How the Mind Works*, 174.
[179] Pinker, *How the Mind Works*, 43.
[180] Pinker, *How the Mind Works*, 19.

selection is, of course, a blind process, but adaptationists are emphasizing the efficiency and creativity with which natural selection fashions organisms. Anti-adaptationists, on the other hand, characterize natural selection as a *tinkerer*, constrained by limited tools, materials, and expertise (metaphorically speaking). A tinkerer is someone who might build or fix things around the house, but not professionally. Blueprints and plans are not a part of the tinkering process; the 'building' or 'fixing' takes place on a need-to basis. *Trial and error* is the basic procedure. Furthermore, the tinkerer rarely has access to a wide range of materials. They use whatever is immediately at hand to solve problems. For instance, when I use plastic coat hangers to prop open my apartment windows, I am acting like a tinkerer: using something I have around the house as an immediate solution to a problem. A designer, on the other hand, would design a more proper and fitted solution. They might design and install a pulley system or a spring loaded lift. This would be more efficient, but beyond the tinkerer's capabilities (including their limited materials and time constraints).

And an important point to note is that if someone were to give a functional explanation for the coat hanger's structure, as if it were designed for keeping windows open, they would be mistaken. Its function as a window prop is *not* the reason for its structure; the coat hanger was not designed for the purpose of propping open windows (so saying the half circle at the top of the triangle exists, or has the structure it does, because of its role as a window prop is wrong; the explanation is in some sense backwards). Whereas we *are* able to give a functional explanation of the pulley system in virtue of its role as a window prop. The spring is there because it helps in the lifting process, etc.

Francois Jacob argues against the comparison between natural selection and an engineer, i.e., the design metaphor, saying it "does not seem to be a suitable comparison":

> First, because in contrast to what occurs in evolution, the engineer works according to a preconceived plan in that he foresees the product of his efforts. Second, because of the way the engineer works: to make a new product, he has at his disposal both materials specially prepared to that end and machines designed solely for the task. Finally, because the objects produced by the engineer, at least by the good engineer, approach the level of perfection …Darwin emphasizes over and over again the structural or functional imperfections of the living world.[181]

So there are three basic arguments against the designer metaphor. Natural selection is blind, natural selection has limited materials to work with, and natural selection does not consistently result in optimal or highly efficient organisms – the claim here is that there exists a range of efficiency or optimality, from failure (extinction), clumsy, to some good and even optimal cases. As Jacob says, "natural selection does not work as an engineer works. It works like a tinkerer – a tinkerer who does not know exactly what he is going to produce but uses whatever he finds around him…"[182]

Foresight

Adaptationists talk about how traits are *designed for* a particular function. However, this talk of 'designed for' carries with it connotations of planning, foresight, and intention. It is not clear how a blind process could design X *for* the function Y. Adaptationists also describe natural selection as a hill climbing process, meaning in some sense it works towards designs that better suit the environment. But the anti-adaptationsts are wary of the 'hill climbing' metaphor and the related 'designed for' talk. First of all, natural selection is, again, a *blind* process and not headed in any direction, up or down. It

[181] Fancois Jacob, "Evolution and Tinkering," *Science* 196 (1977): 1163.
[182] Jacob, "Evolution and Tinkering," 1163.

is not clear how a blind process could be hill climbing, working towards some superior design[183]. Natural selection can only work with what is immediately at hand. Environments change, and they can change drastically and quickly. Natural selection cannot plan for future problems, as a designer might. Moreover this idea of organisms "getting better" and working towards some end is problematic. Fitness is defined in terms of differential reproductive success, and it is *always* relative to an environment. No organism is independently and objectively fit. For instance, an organism's capacity to ponder moral questions is not unequivocally good or optimally fit; it is only "good" in an environment where pondering moral questions increases reproductive fitness.[184] Because environments change, and because natural selection is blind, it isn't clear how natural selection could make an organism "better" (at least not consistently or unequivocally). First, it doesn't seem capable. Second, there is no defined endpoint (what is at the top of the hill?). So natural selection's blindness seems to favor the tinkerer metaphor over the designer metaphor. The designer *designs for*, while the tinkerer *uses for*, i.e., uses what is at hand to solve immediate problems and cannot plan ahead (due to the immediacy of the problem).

[183] You might think something blind could 'feel' its way to the top of a hill. And this sort of metaphor might work for natural selection. Except we'd want to say there are deadly chasms and spots of quicksand scattered everywhere. The critter in question might die a quick death by falling into a chasm, or get stuck in quicksand and die slowly. It's only by some skill and a lot of luck that this blind critter could keep climbing the hill (I'm not sure we could talk about there being a top of the hill, a 'final goal', etc). So even if we do want to say natural selection could be hill climbing, the only reasonable conception of that climbing is tinkerer-like, not designer-like.

[184] We tend to be anthropocentric and assume humans are the most highly evolved organisms, that evolution was working up to us, and is still working towards some further intelligent being - as if something like human intelligence is at the top of the hill. But this is not how evolution works, and this mistaken mindset was behind the genetics movement. Lower classes, the intellectually and morally "inferior", were deemed unfit. And the upper class eugenicists were afraid these fast reproducing lower-class people would 'swamp' the more fit W.A.S.P.s with their high reproduction rate. They expressed this fear of swamping by the unfit in terms natural selection (see chapter two). *But*, through the lens of Darwinian evolution, those supposedly inferior lower-classes were by definition more fit. They were passing on more genes – the evolutionary definition of fitness!

Constraints

The anti-adaptationists note that "nature functions by integration".[185] That is, natural selection does not build new designs from scratch, it modifies existing designs. It 'tinkers' with what is at hand. This tinkering conception of evolution emphasizes *modification* when envisioning natural selection's modus operandi, "To create is to recombine".[186] In so doing, they consider *constraints* – architectural and material. Natural selection selects forms based on reproductive success and survival patterns, and it can only select. It cannot "poof" new traits into existence, so to speak. For example, a kangaroo would be fitter if it could run like a cheetah. Nonetheless, natural selection is never going to 'design' a running kangaroo. It lacks the necessary materials. There are no fitter intermediates to select for between hopping and running. Natural selection works with small genetic variations, and any kangaroo whose leg structure varied in the direction of running would be an inferior hopper compared to his fellows. Imagined kangaroo intermediates between hopping and running would be bad at both running and hopping. And because hopping is doing the job right now, the less fit intermediate form in the direction of running would not be selected for. Even though running would be fitter in the end, natural selection has historical and structural constraints. History has fashioned a hopping kangaroo. The hopping structure is already in place, and is such that it can't be modified to run.

So where adaptationists like Tooby and Cosmides say "function determines structure,"[187] anti-adaptationists are going to point to historical constraints and say, 'structure determines function.' Think of the coat hanger window prop – its rigid

[185] Jacob, "Evolution and Tinkering," 1162.
[186] Jacob, "Evolution and Tinkering," 1163.
[187] Tooby and Cosmides, "Beyond Intuition," 44.

structure determined its function as a window prop, and a number of available rigid objects could have performed the same function (some better, some worse). I could have used a book, water bottle, or even an especially firm pillow. That is to say, the coat hanger was not designed to prop windows any more than books or water bottles were. So in this respect, the anti-adaptationists want to say history and material constraints are primary, not function. Evolution is not *just* the result of "hill climbing" natural selection. There are many factors to consider, factors which suggest we cannot assume the majority of traits are adaptations designed by natural selection for a specific purpose. At the very least, these factors suggest that even if traits are adaptations, they are constrained in such a way that we could not always correctly reverse engineer an organism.

Stephen Gould and Elisabeth Vrba coined the term "exaptation" to fill what they saw as a gap in evolutionary terminology.[188] Exaptation refers to "features that now enhance fitness, but were not built by natural selection for their current role".[189] Exaptations could be traits that were previously adaptations, but were co-opted for a new use. For example, feathers were adaptations for heat regulations in dinosaurs, and were later co-opted by some of these bipedal dinosaurs for flight. Or an exaptation could be a trait "whose origin cannot be ascribed to the direct action of natural selection", which is co-opted for a current use.[190] For example, a trait could be a byproduct of pleiotropy. Changes in a gene can have a number of effects; genes aren't as simple as one gene, one trait. [191] Natural selection could select for a particular change in a gene because it has

[188] Stephen Jay Gould and Elisabeth S. Vrba, "Exaptation – a missing term in the science of form," *Paleobiology* 8 (1982): 4-15.
[189] Stephen Jay Gould, "Exaptation: a Crucial Tool for an Evolutionary Psychology," *Journal of Social Issues* 47 (1991): 46.
[190] Gould, "Exaptation," 46-47.
[191] Gould notes that there are probably not 'genes for'. "Repeated parts are coordinated in development; selection for a change in one element causes a corresponding modification in others" (Panda 24)

effect 1 (so *selection for* effect 1). But if this change also has an effect 2, there will also be *selection of* trait 2, as an epiphenomenon. Perhaps even effect 2 later becomes useful. Natural selection works with what it has available, so if a secondary effect of a gene is useful in a given environment, we would call it an exaptation. Lewontin gives a nice example of pleiotropy: "an enzyme that helps to detoxify poisonous substances by converting them into insoluble pigment will be selected for its detoxification properties. As a result the color of the organism will change, but no adaptive explanation for the color per se is either required or correct".[192] If that color is beneficial, then so much the better for that organism.

Gould and Lewontin are well known critics of the adaptationist program. In "The Spandrels of San Marco and the Panglossian Paradigm" they discuss structural constraints and traits as epiphenomena, using the example of spandrels to help illustrate problems in the adaptationist program.[193] Architectural spandrels are an architectural constraint. When a building has domed ceilings, it is necessary to have spandrels to support the structure. They direct the weight of the ceiling onto the pillars, which bear the load. Spandrels are famous for being elaborately decorated. Sometimes the spandrel decorations seem to fit so fantastically in with the rest of the decorations that we might think the spandrels were put there *just* to house the art. But this is not the case. The housing of art is a secondary function, an epiphenomenon. The primary function is supporting the weight of the domed roof. Similarly, there are *structural constraints* on organisms. Sometimes organisms have certain characteristics (or certain characteristics

[192] Richard Lewontin, "Adaptation," *Scientific American* 239 (1978): 228.
[193] Stephen Jay Gould and Richard C. Lewontin, "The Spandrels of San Marco and the Panglossian Paradigm: A Critique of the Adaptationist Program," Conceptual *Issues in Evolutionary Biology*, ed. Elliott Sober, (Cambridge: The MIT Press, 2006), 79-97.

are selected for) not because those characteristics are optimal characteristics to have, but because of structural constraints. That is, structural constraints are often the primary reason for characteristics, and the 'usefulness' or adaptation is a secondary feature, or an epiphenomenon.

If exaptations are not rare, then the adaptationist program outlined in the previous chapter fails, since it works on the assumption that most traits are adaptations. Again, we cannot functionally reverse engineer a structure that was not designed for the function in question, and in some sense has that function accidentally.

Contingencies

Gould, as a paleontologist, certainly emphasizes the importance of history in the evolution of organisms. Not only does he emphasize history in the 'structural constraints' sense (natural selection can only act on what's already there), as mentioned above, but he also points to the importance of historical events. One example is the rise of the mammals. Mammals didn't come to "rule" the earth, beating out the dinosaurs, because of natural selection. The success of mammals is *not* a result of natural selection's efficiency. Instead it seems to be *primarily* the result of a chance historical event (likely a meteorite). It was only after the extinction of dinosaurs at the end of the Cretaceous that the rat-like mammals had an opportunity to flourish. With the dinosaurs gone, there were a number of empty 'niches' waiting to be filled. Massive diversification took place as the rat-like mammals took advantage of whatever useful variations they had, and as a result mammals became the dominant land animal. A chance event (like a meteorite) can radically change the direction of evolution.

Besides a massive event like that which wiped out the dinosaurs, chance or luck

plays a role in the survival of individual organisms. That is, small historical events affect evolution. There is a lot to be said about being in the right place at the right time. Suppose an organism within a population, like an ant, is born with some very useful trait. Maybe this ant has some mutation that allows it to digest a wider variety of foods, thus increasing its available food supply. And suppose the ant's population lives in a region where finding food is tough and this is their biggest survival hurdle. This ant with the fortunate mutation might not live long enough to pass it on due to some unrelated misfortune. Perhaps he is standing in the wrong place at the wrong time, and an elephant steps on him! A chance event can abet or impede the incorporation of a new trait into a population.

Another example of a contingency would be genetic drift in small isolated populations. According to Gould and Lewontin, genetic drift has three relevant consequences.[194] First, the populations "will become genetically differentiated, and even fixed for different alleles at a locus in the complete absence of any selective force at all. "Second, alleles can become fixed in a population in spite of natural selection". And finally, new mutations have only a small chance of becoming integrated into a population, even if they seem to be especially useful. Related to this, chance plays a role in the variations on traits that do occur in an individual organism.

Contingencies, such as these, play into the tinkerer metaphor. The tinkerer might be able to fix a plumbing problem with a wire coat hanger, but only because her partner insisted they buy the cheap wire coat hangers and not the plastic ones five years earlier. And like structural constraints, contingencies can hamper the process of reverse engineering; they are unknowns that the inquirer must take into consideration. Had the

[194] Gould and Lewontin, "Spandrels," 88-89.

tinkerer (by some chance event) not had wire coat hangers on hand, she would have been required to find a different solution, or perhaps she would simply have been unable to solve the problem.[195]

The Panda's Thumbs and Messy Machines

An important difference between the work of a designer and the work of a tinkerer is the finished product. With the designer[196] you expect efficiency and optimality. The structure was designed specifically to serve a function, so unnecessary parts or parts detrimental to the function would be surprising. With a tinkerer, on the other hand, you would not expect optimality. In fact, you would be surprised to see consistent optimality, just as you would be surprised to see consistent inefficiency in the designer's work.

Gould and others critique the adaptationists for characterizing natural selection as a process that consistently designs efficient organic machines. Given the above discussion of blindness, constraints, and contingency, natural selection could not consistently result in efficiency or optimality. As Gould says, natural selection jury-rigs and "odd arrangements and funny solutions are the proof of evolution".[197] Natural selection can produce somewhat optimally functioning organisms, but overall there should be a range of optimality, with plenty of subpar organisms. So we can look to the natural world, and ask ourselves, does this look like the work of a designer or a tinkerer? If the majority of organisms seem to function optimally and efficiently, then the designer

[195] John Beatty discusses Darwin's own suggestion that chance (specifically chance or accidental variation) plays a role in evolutionary outcomes: "Chance Variation: Darwin on Orchids," *Philosophy of Science* 73 (2006), 629-641.
[196] I am assuming the designer is fairly proficient. It seems like a designer is a designer in virtue of his role as a designer. So we might say he is only a designer to the extent to which he can design.
[197] Stephen Jay Gould, "The Panda's Thumb," *The Panda's Thumb: More Reflections in Natural History*, (New York: Norton, 1980), 20.

metaphor would be appropriate (and if the natural world exhibits complete efficiency or optimality, we would need to reconsider the theory of natural selection entirely). But if instead there is a range of optimality, with few maximally efficient organisms, and a whole range of less efficient organisms, then the tinkering metaphor is appropriate.

Gould uses the panda's thumb as an example of suboptimal 'design.' This is a very clumsy thumb, and is in fact a modified wrist bone. Pandas spend the majority of their day eating bamboo, as they must consume approximately twenty-five pounds of bamboo a day and they must first strip the tough outer fibers off. The panda uses its small inflexible thumb to clutch the bamboo, and then uses its teeth to strip the bamboo. The thumb essentially works as a support in a clamp-like system. It cannot move, but the other digits can press against it, allowing the pandas to clamp onto bamboo while they strip it with their teeth.

Suppose a designer were given the panda's problem (consuming bamboo) and asked to design a solution. Any designer, even a subpar designer, could do better than the panda's thumb. The panda's thumb is a clumsy solution, and looks very much like the product of a tinkerer.[198] First of all, the panda's thumb is, again, not actually a thumb, but is in fact an extension of the radial seasamoid, part of the wrist. This extended wrist bone is supported by the adductor and abductor muscles, making a thumb-like apparatus. Ordinary bears, the sort of organism from which the pandas evolved, have fairly large radial seasamoids. So it was a material available to be tinkered with (whether to help in climbing or consuming food, or both). The adductor and abductor muscles shifted with the extension of the bone, "because the enlarged bone blocked them short of their original

[198] Gould, "Panda's Thumb," 24.

sites".[199] The bone and muscles *might* even be part of a single genetic change. The radial seasamoid is also extended in their back paws, which is not adaptive but seems to be tied to the growth of the seasamoid in the front paws (redundancy in the panda's structure). The point is, this digit is a *makeshift* thumb. It was made from spare parts already on the bear, and it performs a function, though not efficiently, looking very much like the product of a tinkerer.

Overall, the natural world does look like the work of a tinkerer. The digestive system of rabbits is modified in such a way that allows them to break down their high fiber herbivorous diet, though this modification requires them to dine on their own feces. Honey bee workers can defend their hive by stinging, but stinging leads to death, as the stinger gets stuck in the target and essentially rips the bee's insides out. The "contrivances" that evolved in orchids to attract insects are all made "from the common components of ordinary flowers, parts usually fitted for very different functions".[200] That is, they were not specially designed for insect capturing, but were modified. Charles Darwin himself commented on the lack of optimality and efficiency found in organisms:

> Nor ought we to marvel if all the contrivances in nature be not, as far as we can judge, absolutely perfect; and if some of them be abhorrent to our ideas of fitness. We need not marvel at the sting of the bee causing the bee's own death; at drones being produced in such vast numbers for one single act, and being then slaughtered by their sterile sisters; at the astonishing waste of pollen by our fir-trees; at the instinctive hatred of the queen bee for her own fertile daughters; at ichneumonidae feeding within the live bodies of caterpillars; and at other such cases.[201]

Sickle-cell anemia could be taken as another example of suboptimal design. Sickle-cell anemia is a recessive disorder, the carriers of which are resistant to malaria. Biologists

[199] Gould, "Panda's Thumb," 23.
[200] Gould, "Panda's Thumb," 20.
[201] Darwin, *The Origin of Species*, 749.

have evidence that this 'sickle-cell gene' was selected for because of the fitness gaining properties of malaria resistance.[202] However, the secondary effect is maladaptive. This gene is an appalling design for malaria resistance, and no designer with half a mind would chose this solution. On the other hand, it does make sense under the tinkering model of natural selection.

There are a lot of interesting contrivances in the natural world, and there *is* a range of optimality (which I think extinctions can attest to). The number of "panda's thumb" cases suggests that the tinkering model of natural selection is more suitable than the designer model. When discussing a blind construction process, optimality is suspicious. The burden is on the adaptationists to explain how optimality and efficiency could be the usual product of evolution, as well as to explain the efficiency and optimality in these seemingly clumsy designs. The constraints on natural selection seem to result often in messy designs, and if this is typical of organisms, accurately reverse engineering those designs is a problem.[203]

Intellectual Modesty

In the *Descent of Man* Darwin admits that in the *Origin of Species* he may have described natural selection as having too strong of a role in evolution:

> I probably attributed too much to the action of natural selection or the survival of the fittest…I had not formally sufficiently considered the existence of many structures which appear to be, as far as we can judge, neither beneficial nor injurious [redundancy, tinkering]…I was not able to annul the influence of my former belief, then widely prevalent, that each species had been purposely created; and this led to my *tacitly assuming* that every detail of structure,

[202] Ricki Lewis, *Human Genetics: Concepts and Applications* (Boston: McGraw-Hill, 1997).
[203] It seems as though Gould and Lewontin's criticisms of the adaptationist program have led to somewhat of a shift in research. Many researchers recognize that evolution is messy and exaptations exist (though the insistence that important traits must really be adaptations, selected for, persists). So those involved in adaptationist research are not all Panglossians.

excepting rudiments, was of some special, though unrecognized, service.[204]

That is, not only does Darwin admit to limits on natural selection, but he takes back some Panglossian assessments of structure and function (which he suggests were rooted in his heavy emersion in the creator paradigm). He thinks he probably exaggerated the power of natural selection.[205] He even advocates something like modesty in the assessment of function, "We must not, however, be too confident in deciding what modifications are of service to each being: we should remember how little we know about the use of many parts".[206]

I think modesty is a vital issue here. Gould and Lewontin point to the difficulty of dividing organisms into traits. "Organisms are integrated entities, not collections of discrete objects".[207] And the EPs are concerned with the structure of the mind, *not* observable structures, making it even more difficult to divide. Even if one could without trouble divide physical traits functionally, it doesn't seem likely that we could accurately divide mental traits. The EPs are confident in their ability to parse the mind into modules, but considering the complexity of the mind and our general ignorance of it, this confidence is misplaced.[208] I discuss additional difficulties with modules in the next chapter.

Some EPs have responded to Gould and Lewinton's Panglossian charge. Tooby

[204] Darwin, *The Descent of Man*, 863.
[205] Darwin, *Descent of Man*, 863.
[206] Darwin, *Descent of Man*, 862.
[207] Gould and Lewontin, "Spandrels," 83.
[208] In "Domain Specificity and Theory of Mind", Apperly et al investigate our ability to reason about mental states (Theory of Mind). Their study concluded that the tests we have are not fine-tuned enough to rule out either general processing *or* modularity: "there is no clear evidence for domain-specificity because existing methods fail to separate belief reasoning itself from other processes associated with belief reasoning and with belief-reasoning tasks" (572). This puts a damper on the evolutionary psychologists' research program, since they are committed to modularity and draw conclusions from that commitment.

and Cosmides, for instance, continue to maintain that adaptations are "very functionally designed."[209] Though I think the thought behind this sort of response is, 'very functionally designed, all things (*constraints*) considered.' My argument is *not* that it is impossible to reverse engineer an organism. I think many EPs take Gould to be saying this, and perhaps he is. Rather, my argument is that there exists a good deal uncertainty and guess work in the process (is the trait an adaptation, exaptation, or neither? what were the EEA conditions? were there chance happenings that played a significant role in the development of that trait? etc.). Thus the EP research program is largely unable to make definitive claims about the evolution of human nature. Hence the danger in being so quick to affirm sex difference claims. Buss et al respond to Gould's criticisms by claiming that, yes, exaptations exist, but natural selection is still the guiding process of evolution (and I'm not sure Gould would disagree).[210] Other EPs have stated that, yes, exaptations exist, but "the major faculties of the mind" are adaptations – however, they have yet to show this is the case. [211]

Buss et al also note that evolutionary hypotheses, even in EP, must be *consistent* with evolutionary theory and what is known about the trait in question. Gould acknowledges this, as he criticizes adaptationists for endorsing hypotheses based on consistently alone. Consistency does not amount to proof. But more importantly, Buss et al note that there are empirical tests.[212] EPs can develop a hypothesis, and usually through surveys test that hypothesis.[213] I am skeptical of the accuracy of most of EPs empirical

[209] Cosmides and Tooby, "Beyond Intuition," 43, footnote 1.
[210] David M. Buss et al, "Adaptations, Exaptations, and Spandrels," *American Psychologist* 53 (1998), 543.
[211] Buller, *Adapting Minds*, 85.
[212] Buss et al, "Adaptations, Exaptations," 543-544.
[213] For example, when testing whether or not men find women with a particular body ratio attractive, they select groups of men, present them with a range of women with varying body proportions, and calculate the results.

tests, which have a difficulty of ruling out alternative cultural explanations for traits (this is due to the unique nature of the subjects in questions, humans – a species which has constructed intricate and influencing cultural niches). Sometimes the surveys are distributed broadly and cross-culturally, which is ideal. But this is the exception not the rule, since the cost of such large scale research is expensive. And of course there are problems with selecting representative individuals to survey and framing the survey questions in a way that is not leading.

I take Gould's contingency and constraints arguments seriously. It is not that we can easily say one way or another whether *x* and *y* are adaptations or exaptations. But the fact that exaptations likely exist and that evolution involves more than just natural selection, suggests to me that we cannot reverse engineer the brain (even if we could divide psychological traits, how could we tell what their functional origins were?). So the EP research program seems seriously flawed – it rests on reverse engineering, which in turn rests on this faulty adaptationist position. There seems to be a lot of uncertainty in the EP research program, coming from the complexity of the mind and the difficulty of separating biological tendencies (modules) from cultural conditioning. As I have argued earlier, when scientific claims have the potential for political consequences, we ought to be especially certain of those claims, having higher standards of evidence and of self-criticism.[214] There is a discrepancy between EPs confidence and their lack of scientific rigor. That is not to say there isn't heuristic value in reverse engineering and thinking about natural selection as a designer, but it is to say their approach lacks the scientific rigor that their confidence in politically charged claims demands.

[214] Kitcher, *Vaulting Ambition*, 3.

An Alternative Approach to Mind

As discussed in the previous chapter, Evolutionary Psychologists hold a computational view of mind. This view, like the method of reverse engineering, seems to rely on efficiency and optimality in evolution. I would like to consider the outline of an approach to mind that could be consistent with Gouldian constraints, an approach that can avoid problems EP faces based on its heavy adaptationism. This approach emphasizes the roles of pattern recognition, analogy, and metaphor, as opposed to the computational model of mind; and it is congruent with the anti-adaptationist picture of evolution. There isn't a unified front defending any one position against EPs computational theory of mind, but there is a contingent of individuals with somewhat similar theories that are compatible with Gould's perspective. Howard Margolis is one of these individuals.

Margolis claims that "A Darwinian process would not yield unqualified efficiency".[215] He recognizes constraints, like Gould and Lewontin; and he says,

> *The brain we are interested in evolved by Darwinian selection and therefore must represent the current state of a viable Darwinian pathway*. This naturally has consequences, imposing constraints on a brain that has been produced by Darwinian evolution which would make such a brain operate in ways that would never be seen in a designed brain, such as a computer. Thus we are led to an account which differs in some important ways from the sort of account that (implicitly, and sometimes explicitly) takes the digital computer as a model of how human cognition can be supposed to work. [216]

When exploring Mind and its origins, we have to remember that "Darwinian variation is blind" and "Darwinian selection is near sighted".[217] Instead of having a computational

[215] Howard Margolis, *Patterns, Thinking, and Cognition: a Theory of Judgment*, (Chicago: University of Chicago Press, 1987), 33.
[216] Margolis, *Patterns*, 29.
[217] Margolis, *Patterns*, 33.

theory of mind, which doesn't match up with the anti-adaptationist view of evolution, Margolis claims the following:

> We apparently have stored in our brains a large number of patterns, and at least a large part of cognition…consist of being cued (not consciously, of course) to whatever pattern we first find that satisfies the situation… we then see (or hear, or feel, or remember, etc.) details that suit that pattern which may have no external correlations at all.[218]

He points to the difficulty of catching typos as one illustration. I have trouble catching typos when editing my work because I know what I meant to say, so that is what I 'see'. I fill in the blanks when I have missed a word, or my brain auto corrects a misspelling, etc.

Margolis suggests that pattern recognition is the basic structure of our cognitive functions, and that after language developed, abstract reasoning was able to develop. Abstract reasoning "is a specialization of pattern-recognition applied to language, and logic is a further specialization of reasoning characterized by its fully abstract character".[219] Logic is not basic, like those who hold the computational view of mind claim (like Tooby, Cosmides, and Pinker). Logic is a more recent adaptation, and its complexity gives testimony to the fact that it is 'a further specialization'. Experience does suggest that humans have something like pattern recognition as the basic structure of the mind, and it is only after some additional effort and practice that most of us can develop skills in computational reasoning, mapping rules of inference and deduction on to our more basic framework. Logic seems like an acquired skill, while pattern recognition and 'category thinking' seem more basic. And a pattern recognition process is clumsier than a computational process, but we *expect* some degree of clumsiness if evolution works

[218] Margolis, *Patterns*, 40.
[219] Margolis, *Patterns*, 61.

through history and tinkering.

In support of Margolis' position, we can take into consideration how much we rely on metaphor (something very 'un-computational'). Douglas Hofstadter can be seen as offering objections to EPs computational view of mind based on evolution and the way we actually think. His position is similar to Margolis's, and throughout his work he appeals to metaphor and analogy as basic to understanding or meaning:

> The brain is a device that has evolved in a less exact world than the pristine one of orbiting planets, and there are always far more chances for the best laid plans to "gand agley." Therefore, mathematical simulation has to be replaced by abstraction, which involves discarding the irrelevant and making shrewd guesses based on analogy with past experience.[220]

The mind use metaphor and analogy, not logical syntax, at its most basic level.

Lakeoff and Johnson "give evidence that conceptual metaphors are mappings across conceptual domains that structure our reasoning, our experience, and our everyday language".[221] This mapping across domains of concepts is not isomorphic; the mapping is weighted towards the more familiar domain. The more familiar domain serves as a framework or template for understanding unfamiliar or abstract concepts.[222] Take the metaphor "time is money." Time is an abstract concept, and in this sense money is more familiar to us. So in this case, money is the "source" domain while time is the "target" domain.[223] And, "the salient features of the source guide our thinking and not vice versa".[224] We can understand time *through* the template of money. The sub-concepts of

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[220] Douglas Hofstadter, *Metamagical Themas: Questing for the Essence of Mind and Pattern*, (New York: Basic Books Inc., 1985), 650.
[221] George Lakoff and Mark Johnson, *Philosophy in the Flesh: The Embodied Mind and its Challenge to Western Thought*, (New York: Basic Books, 1999), 47.
[222] Doren Recker, "How to Confuse Organisms with Mousetraps," *Zygon* 45 (2010), 654.
[223] George Lakeoff and Mark Johnson, *Metaphors We Live By*, (Chicago: The University of Chicago Press, 2003), 253.
[224] Recker, "How to Confuse Organisms," 654.

money, things we can do with money, are used as a framework for understanding time: you can have time, give time, spend time, invest time, run out of time, be worth the time, use time profitably, waste time, etc.[225]

Lakoff and Johnson's book *Metaphors We Live By* points out how frequently we use metaphor – in fact, we use some metaphors so often that we seem to forget that they are metaphors! Some examples: "Ideas are objects. Linguistic expressions are containers. Communication is sending".[226] Happy, conscious, health, and more are "up", while sad, unconscious, sickness, death, and less are "down".[227] The extent to which we rely on metaphor in or daily communications and understanding suggest (akin to Margolis position) that our minds categorize and decipher more fluidly than computationally. And they claim that "most of our normal conceptual system is metaphorically structured; that is, most concepts are partially understood in terms of other concepts".[228]

I have claimed the EP's research program is flawed because it has grown from an inaccurate view of evolution. I maintain that it is highly unlikely we could accurately reverse engineer psychological traits, because in order for us to reverse engineer these psychological traits, we would have to know what they were originally designed to do, what function they were 'built' to perform (plus there is a difficulty with dividing the mind into traits). We cannot functionally reverse engineer because we cannot count on accurately assessing the 'intended' function of traits that are a product of a blind and tinkering process. Furthermore, the computational theory of mind that the EPs hold to doesn't resemble the work of a blind process. It is highly doubtful that computation and

[225] Lakoff and Johnson, *Metaphors*, 8.
[226] Lakoff and Johnson, *Metaphors*, 10.
[227] Lakoff and Johnson, *Metaphors*, 15.
[228] Lakoff and Johnson, *Metaphors*, 56.

logic are the primary or basic structure of mind. Instead, something messier like analogy and metaphor seems more likely, and match our daily experiences (as metaphorical creatures that are *not* naturally adept with logic).

CHAPTER VI

NEUROBIOLOGY AND THE PLEISTOCENE

As discussed in chapter four, the reason EPs think the mind consists of "hundreds or thousands" of domain specific modules, is that our hominid ancestors faced a wide array of adaptive problems.[229] In this chapter I question whether or not the mind is massively modular. I consider the possibility of a more domain-general mind, and conclude that it not only *could* evolve by natural selection, but that this is likely the case. I look at the brain's plasticity in my critique of massive modularity and suggest the neurobiological evidence lends itself to a less modular, more domain-general mind. I then move on to discuss issues concerning reverse engineering the mind based on Pleistocene conditions and additional considerations concerning the application of evolutionary theory to humans.

Massive Modularity, a false dichotomy

EPs argue that the brain must be massively modular, and their principle claim in support of this is that a domain general mechanism could not successfully solve the wide

[229] John Tooby and Leda Cosmides, Foreword in Simon Baron-Cohen's *Mind-blindness: an Essay on Autism and Theory of Mind*, (Cambridge: MIT Press, 1995), viii.

array of adaptive problems that faced our hominid ancestors in the Pleistocene. They further point to the domain specificity in our organs. The heart and lungs, for instance, have specific jobs and they perform those individual jobs efficiently. So they claim that natural selection typically selects for specificity and does not tend to make vital parts of the body 'multi-purpose.'

I want to begin by looking at this first claim, that a domain-general mechanism could not successfully solve the adaptive problems faced by our ancestors. Tooby and Cosmides note that it is not simply a matter of plausibility, likeliness or efficiency. Rather, "it is *in principle impossible* for a human psychology that contained nothing but domain-general mechanisms to have evolved, because such a system cannot consistently behave adaptively."[230] Now, I will grant that it is highly unlikely that *only* domain-general mechanisms evolved by natural selection (note, they say mechanism*s*, plural). But this does *not* indicate the brain is massively modular – it is not the case that massive modularity necessarily follows from the supposed impossibility of *only* domain-general processors. You could have, for instance, a few domain specific modules together with a domain-general mechanism. I will argue that this middle ground is a reasonable position, *and* the evidence from neurobiology seems to support it. Tooby and Cosmides's 'in principle impossibility' claim is overstated, and even if it were the case, it isn't all or nothing.

Tooby and Cosmides propose the case of a woman using the same mechanism to select a mate as she does to select food.[231] This humorous picture is intended to illustrate the absurdity of domain-general mechanisms. However, it is neither impossible nor

[230] Tooby and Cosmides, "Origins," 90.
[231] Tooby and Cosmides, "Origins," 90;

absurd to have a general processor or mechanism successfully direct both mate selection and food selection. David Buller proposes an obvious mechanism that would be capable of this. He suggests, though only hypothetically, a social learning mechanism, "which involves observation of models…followed by imitation of the observed behavior of those models".[232] The woman would watch those gathering food as they pick out ripe fruits, and imitate this food selection. And when she goes to select a mate, the social learning mechanism would have her mimic the mate selection practices of other females. Fruit and mates are quite distinct, but a social learning mechanism could easily have her categorize and act appropriately."The domain-general mechanism would generate domain-specific solutions".[233] Buller is not claiming social learning really is the domain-general mechanism by which the mind works; instead he is countering their 'in principle impossibility' claim.

Buller argues that Tooby and Cosmides fail to take into consideration the possibility of a domain-general mechanism generating domain-specific solutions, in part because they fail to give any extensive account of what is meant by 'domain-general psychological mechanisms'. EPs (particularly Tooby, Cosmides, and Pinker) seem to assume the domain-general mechanism in question is some postmodern tabula rasa, lacking complexity and functioning exclusively through some vaguely defined mechanism of learning or induction. They portray their opponents as advocating the 'standard social science model,' which they characterize as cultural constructionism.[234] This amounts to a straw man of the opposition. Of course cultural constructionists aren't

[232] David J. Buller, *Adapting Minds*, (Cambridge: The MIT Press, 2006), 145.
[233] Buller, *Adapting Minds*, 146.
[234] Tooby and Cosmides, "Beyond Intuition," 54; Pinker, *How the Mind Works*, 44-47; c.f., Pinker, *The Blank Slate*.

going to buy into evolutionary psychology, but those active in critiquing the field primarily present arguments pertaining to the apparent lack of scientific rigor, *not* cultural relativism. So as Buller points out, Cosmides and Tooby "fail to show that domain-general mechanisms can't generate domain-specific solutions because their arguments rely on a misrepresentation of how a domain-general problem solver would function in different problem domains".[235] So the first difficulty with the massive modularity argument is that it rests on a false dichotomy, as proponents fail to consider something between purely massive modularity and purely domain-general mechanisms. Furthermore, even if it wasn't a false dichotomy their 'in principle impossibility' claim is refuted by a plausible example.

But to continue, concerning the prospect of domain-general mechanisms, we can grant the EPs an implausibility claim in place of their impossibility claim. The EPs strengthen this implausibility by appealing to the specialization found in the body. When we look at the vital organs of the body we find that they are highly specialized. The heart, lungs, liver and other vital body parts have specific functions and do not solve general problems. So EPs would argue, it seems that when it comes to crucial traits, natural selection selects for specialization, not general-mechanisms. However, Buller and others have pointed to the immune system as an example of a domain-general adaptation; i.e., a crucial part of the body that is not specialized. In the case of the immune system's antibody assembly process, natural selection *has* selected (and thus, *can*) for plasticity or domain generality.

The immune system is continually exposed to a diverse range of dangerous pathogens. Much like the mind, it faces a massive array of problems. Yet the immune

[235] Buller, *Adapting Minds*, 146.

system has not developed individual modular mechanisms to handle each and every one of the pathogens it comes across. Instead the immune system has developed a general solution to the plethora of problems it faces; the immune system is, in an important sense, a general-domain mechanism. Buller puts it nicely:

> Through a single, elegant process, B cells assemble antibodies in response to each invading pathogen, and these are built 'from scratch.' In fact, B cells don't even have genes for each antibody. Rather, they possess mere gene fragments from which they assemble, on the spot, the genes necessary for building antibodies…[the antibody population] has been shaped by interaction between the antibody-assembly process and the pathogenic environment to which the individual has been exposed. The 'structure' of the antibody population, in short, is a product not of genetic specification, but of interaction between the immune system and the environment. [236]

The antibody assembly line is genetically inherited, but the specialization of the antibodies (the individual 'programs' within the immune system) is a result of the environment, specifically exposure to diverse pathogens. That is, the plasticity of the assembly line is an adaptation, but the functionally specialized antibodies are not. They are not passed on; they are a result of the immune system's plasticity together with environmental exposure. The immune system is a domain general mechanism which actually generates domain specific solutions (like Buller's hypothetical learning mechanism). And this is not that surprising, considering the massive number of pathogens the immune system faces, and how quickly these pathogens change generation to generation.

Tooby and Cosmides claim, "both empirically and theoretically, there is no more reason to expect any two cognitive mechanisms to be alike than to expect the eye and the

[236] Buller, *Adapting Minds*, 140.

spleen, or the pancreas and the pituitary to be alike."[237] However, I will argue that the brain is not like the eye or spleen. Neurobiology suggests it works more like the immune system. I now turn to the brain itself to evaluate the plausibility of domain-general mechanisms. As Panksepp and Panksepp (2000) say about inferences from evolutionary history to psychological explanations, "let us be constrained by the evidence rather than captivated by the sea-swell of possibilities."[238]

How the Brain Works

There are two cell production zones in the brain: the ventricular and the subventricular. The ventricular zone produces the cells that make up the oldest parts of the brain, the parts of the brain we have had the longest, ancestrally speaking. These cells compose the limbic system and midbrain, which are responsible for coordination, sexual response, and basic emotions like fear (our most 'animal' parts, so to speak).[239] The subventricular zone, on the other hand, produces cells that make up the most evolutionarily recent additions to the human brain, the neocortex, which is responsible for higher cognitive functions. And these more recent parts of the cerebral cortex are where the EP's modules would be found.[240] If EPs are right, that human modules came about during the Pleistocene and that the modules in question are specific to humans, then the cortex and neocortex are the only possible parts of the brain that could house modules. This is because it is the cerebral cortex that sets human brains apart from those of other animals; the cortex is specific to mammals, and humans have an especially large and complex cortex.

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[237] Tooby and Cosmides, "Origins," 90.
[238] Jaak Panksepp and Jules B. Panksepp, "The Seven Sins of Evolutionary Psychology," *Evolution and Cognition* 6 (2000), 113.
[239] Buller, *Adapting Minds*, 131.
[240] Buller, *Adapting Minds*, 131.

Cell production in the ventricular zone works much the way cell production does elsewhere in the body; new cells push older cells out of the zone, creating layers of cells with the oldest the farthest from the production zone.[241] The subventricular zone, on the other hand, operates in a rather unique way. The cells produced in the subventricular are essentially migratory, and they "must actively 'migrate' to their final destinations in the brain, wending their way through a thicket of other cells. Once they reach their final destinations, they grow branching axons that form connections with other cells."[242] In terms of the brain's development, the main structures of the cortex are thought to be under tight genetic control, since they are the same in individuals, regardless of environment.[243] These structures (along with their primary subdivisions) are all in place shortly after birth. On the other hand, the functionally specialized circuits that characterize the adult brain take longer to get into place, and they *do* differ relative to environment.

The development of the adult brain takes place by an addition and subtraction process, where an overabundance of cells and connections are formed and later trimmed relative to environmental stimuli. The subtraction or pruning process takes place via cell competition and cell death: "the neurons with the strongest activation wins, and the cells that lose the competition lose their connections to other cells and eventually die".[244] And, "this process of pruning the overabundance of connections and cells forms the brain circuits that carry out our *specialized cognitive functions*," like those described by EPs as

[241] Buller, *Adapting Minds*, 131.
[242] Buller, *Adapting Minds*, 132.
[243] Buller, *Adapting Minds*, 132.
[244] Buller, *Adapting Minds*, 132.

modules.[245]

There are two types of innervations relevant in the pruning process: "spontaneous neural firings internal to the brain itself and the brain activity produced by sensory inputs".[246] Most of us are familiar with how crucial stimulation is during developmental periods, and there have been cases of children raised in isolation without stimulation, who have been incapable of later picking up speech (e.g., Victor, 'the wild boy of Aveyron'). To see how the pruning process involves environmental experience, I will look at two examples. My first example is the eye: stimulation during the developmental period is essential for the development of the visual cortex and thus vision itself.[247] For instance, if one eye is kept closed during development, so that the brain is receiving little to no data from that retina, that eye will be functionally blind.[248] "Even though the cells projecting from the retina produce normal outputs after you reopen the eye, the areas in the cortex to which they feed will no longer respond appropriately to visual inputs".[249] Similarly, "If infants are deprived of auditory inputs, they are subsequently unable to process speech or understand language without special intervention".[250]

Functionally specific neural circuits develop, or don't, based on environmental input. Exposure, in a sense, defines these more functionally-specific circuits. We might think of it this way – the circuits are pruned to solve problems only if the organism is

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[245] Buller, *Adapting Minds*, 132.
[246] Buller, *Adapting Minds*, 132-133.
[247] Lisa Putzar, et al, "Early Visual Deprivation Impairs Multisensory Interactions in Humans," *Nature Neuroscience* 10 (2007): 1243-1245; Arianna Maffei, et al, "Potentiation of Cortical Inhibition by Visual Deprivation," *Nature* 443 (2006): 81084.
[248] Terrence W. Deacon, "What Makes the Human Brain Different?", *Annual Review of Anthropology* 26 (1997), 350.
[249] Buller, *Adapting Minds*, 133.
[250] Buller, *Adapting Minds*, 133. C.f.: Ione Fine, et al, "Comparing the Effects of Auditory Deprivation and Sign Language within the Auditory and Visual Cortex," *Journal of Cognitive Neuroscience* 17 (2005): 1621-1637.

exposed to the related input during development. For instance, if auditory data is received, we might say that making sense of it is a problem to be solved. The auditory stimulus is responsible for connecting or 'turning on' what we may ineloquently call the 'language area'. But if there is no auditory data to make sense of, functioning auditory circuits are pointless features. So the lack of stimuli results in pruning that doesn't allow for use of the 'language area' (at least without special intervention). As Buller says, "in short, environmental inputs to the brain shape the more fine-grained cortical structures by determining the outcome of cell competition."[251]

This "proliferate-and-prune" process, where an overabundance of cells and connections are pruned, produces or shapes brain circuits that resemble EP's modules in their functional specificity. The process "can produce relatively stable brain circuits that specialize primarily in particular information-processing tasks".[252] These circuits can solve adaptive problems, and "they can even be produced with some regularity across populations and down lineages".[253] This is due primarily to the similarity of environmental inputs experienced during development (almost all human infants are exposed to spoken language and visual stimuli, for instance). So as Buller says, "although an adult human brain can be characterized by 'modular' information-processing structures, these are environmentally shaped, not 'genetically specified,' outcomes of development".[254] Genes are responsible for the overabundance of cells and connections, but the environment is responsible for pruning, and it is the pruning that shapes the final

[251] Buller, *Adapting Minds*, 133.
[252] Buller, *Adapting Minds*, 134.
[253] Buller, *Adapting Minds*, 134.
[254] Buller, *Adapting Minds*, 134.

product.[255] Different environmental stimuli lead to differing functionality.

Additionally, research evidence suggests that much of the brain's wiring to the cortex and neocortex is actually a *result* of the brain's rapid growth during development in humans (i.e., growth came first, and additional wiring came later, natural selection taking advantage of the 'spare parts' available, so to speak). I will switch gears here and discuss the evolution of human brains and the difference between human brains and the brains of other mammals. Debates over the role of brain size have long prevailed in the study of brain evolution and intelligence. And within evolutionary studies of the human brain, there have been problems accounting for how functionally isolated units of circuitry (modules) could have evolved. Terrence Deacon says it is "disturbing" that:

> many contemporary claims and assumptions about the nature of brain evolution in human ancestry take for granted assumptions that would be judged biologically implausible with respect to other organ systems (e.g., accretion of new structures, recapitulation, modular change).[256]

That is, it isn't clear how the EPs modules could have evolved in steps, by modification (as is necessary for a plausible account of evolution).

But continuing the discussion of brain size debates, many have thought that bigger brains are smarter brains, since bigger brains entail more processing power. While this is generally true, the matter is not so simple.[257] Whales and elephants, for example, have much larger brains than humans, but they do not appear to have the 'higher' cognitive capacities found in humans (quantifying and qualifying intelligence is difficult and problematic, but I will keep it simple here – researchers are ultimately interested in

[255] Buller, *Adapting Minds*, 135.
[256] Deacon, "What Makes the Human Brain," 338.
[257] Terrence Deacon, "Rethinking Mammalian Brain Evolution," *Integrative and Comparative Biology* 30 (1990), 649.

the development of human-like intelligence).[258] But then one might say (and many have said) that it is not brains size, but brain size *relative to* body size. Whales and elephants are also enormous animals, and their bodily size taxes their brain function in a number of ways. However, the body/brain ratio does not seem to correlate directly or seamlessly to intelligence either. Tiny mammals and birds have a brain to body size ratio greater than humans ("and an even higher ratio of neuron number to body size").[259] Additionally, the brain to body size ratio is increased greatly in dwarfism, yet intellectual functions do not change correspondingly (consider small and 'teacup' dog breeds).[260] Thus intelligence is not as simple as size. It seems form and internal organization must also play an important role.

Deacon explains how the human brain is unique. Primates tend to have a higher brain to body size ratio. Essentially, body growth slows sooner in primates, and "primate encephalization is the result of a shift in *post*crainial growth processes, not a modification of brain growth!"[261] Compared to other mammals, "at every growth stage these primates have a higher ratio of brain to body size."[262] So the evidence indicates that it would be more accurate to say (if natural selection is responsible) that there was selection for stunted body growth, not that there was selection for bigger brains. *But* when the growth rates in humans are compared with other, similarly-sized primates we find that "human beings do not have stunted growth. *The difference is that human brains grow as though*

[258] I think it is fair to say that such terminology, "*higher* cognitive capacities," is anthropocentric. Additionally, 'higher' brings connotations of directedness in evolution. Nevertheless, this is the conventional language.
[259] Deacon, "Rethinking Mammalian," 649.
[260] Deacon, "What Makes the Human Brain," 341.
[261] Deacon, "What Makes the Human Brain," 343.
[262] Deacon, "What Makes the Human Brain," 342.

they were in an ape with a very much larger body (in excess of 1000 lbs)".[263]

It is the rate of brain growth during development that distinguishes the human brain from other mammals, and the evidence from neurobiology suggests that this difference in growth rate "produces different neural architectures with different functional consequences".[264] *And*, much of the brain's wiring in the cortex and neocortex is likely due to the extended growth of the human brain. Amazingly, neural circuitry has the potential to "acquire (given appropriate training) nearly any function".[265] For example, the neural circuits in the 'visual cortex' of a blind person can become rewired to process auditory stimulus and brail reading. So, "Neural circuits can assign themselves."[266] And we can even surgically direct neural circuits in the somatosensory cortex to process vision.[267] So neural circuits are not specialized in the sense that they are 'set in stone.' They can change or modify their specialized functions. And a likely explanation for much of the cortex and neocortex circuitry is the malleability of neural circuits together with the rapid brain growth during development. There is still a lot of work to be done here, but so far the neurobiology suggests that "human disproportions of forebrain structures have produced a reorganization of connectivity from the inside out".[268] The additional wiring of the frontal lobes look more like Gouldian exaptations – not selected for, but once the excess was there, modified in useful ways. Furthermore, this is the direction neurobiology seems to be moving – away from simple size calculations, towards research into the brain's flexibility. I am not suggesting that this is

[263] Deacon, "What Makes the Human Brain," 344.
[264] Deacon, "What Makes the Human Brain," 345.
[265] John R. Skoyles, "Neural Plasticity and Exaptation," *American Psychologist* 54 (1999), 438.
[266] Skoyles, "Neural Plasticity," 438.
[267] Skoyles, "Neural Plasticity," 438.
[268] Deacon, "What Makes the Human Brain," 356.

the end of the story, but rather that current research in neurobiology has taken a new direction, and this direction conflicts with EPs massive modularity claims.

All of this is to say that there exists *neural plasticity*.[269] Neural plasticity "refers to the ability of brain regions to perform different functions, so that a given brain region has the capacity to take on the function of any other region".[270] And as Buller says,

> This kind of flexibility entails not only the possibility of multiple developmental out comes, which are contingent on the environment, but also the possibility of change or reorganization of structure in response to changes in the environment…the brain's ability to remake itself in response to changing environmental demands.[271]

Our brains change. They even continue to grow in old age, continuing the environmentally driven pruning process. And this plasticity seems to be in part a function of the brain's interconnectivity. For example, if one finger is lost, the corresponding region in the brain will shrink, while neighboring regions will grow, taking over the space. Similarly, if a finger is over stimulated its corresponding region will grow (this has been demonstrated in piano players).[272] We can also see the interconnectivity and cross-wiring of the brain in the increase of activation of the visual cortex when someone is touched on the same side of and at the same time as when presented with a visual stimulus. The visual cortex is not just stimulated by vision, but also tactile sensation. Synesthesia is another example. Synesthesia is a condition marked by peculiar experience/stimuli relations. An individual with synesthesia might hear colors, or see sounds. That is, upon receiving auditory stimulation they might experience visuals, or

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[269] C.f., Michael Anderson, "Massive Redeployment, Exaptation, and the Functional Integration of Cognitive Operations", *Synthesis* (2007): 329-345.
[270] Buller, *Adapting Minds*, 137.
[271] Buller, *Adapting Minds*, 137.
[272] Skoyles, "Neural Plasticity," 439.

upon receiving visual stimulation they might experience sounds. This seems to indicate a connection, or at least a possible connection, between sensory domains in the brain. Moreover, cross-wiring evidence seems to provide a compelling explanation for phantom limbs.[273]

As discussed in chapter four, EPs claim modules are informationally encapsulated. That is, modules do not have access to information stored in other parts of the brain. So the 'fear of snakes' module outputs fear at the input of slithering, regardless of whether or not information about the snake's harmlessness is stored elsewhere. A good example of what an informationally isolated module would look like can be found in the evolutionarily 'older' parts of vision. The Muller-Lyer illusion captures this. In this illusion two parallel lines of equal length are presented side by side. One line has "v" shapes with the wedge tip pointing out from the each end of the line; the other line has "v" shapes with the wedge tip pointing in, towards the end of each line. We literally cannot help but see the second of these two lines as longer. You can take a ruler and measure them, discovering the lines are of equal length, but as soon as that ruler is taken away, you may *know* the two lines are of equal length, but you cannot *see* that they are. Thus there is evidence that some modules may exist with lower level functions.

However, this is not to say there exists massive modularity. The evidence suggests there is limited modularity. For instance, when we look at higher cognitive functions, especially something like the interpretation of what we see, things look less modular and more interconnected. Going back to Jastrow's duck-rabbit discussed in chapter three, we can see how thoughts or ideas are capable of affecting vision in terms of interpretation (affecting in the sense of *directing*). It has been shown that if you have

[273] V.S. Ramachandran, *A Brief Tour of Human Consciousness*, (New York: Pi Press, 2004), 13-14.

bunnies on the mind, then you are more likely to see the rabbit, not the duck (that is to say, you are more likely to see the rabbit *first*; it doesn't mean you are incapable of switching 'lenses' and seeing the picture as a duck).[274] So there is strong evidence to suggest that to a large degree the brain is cross-wired, though there seems to be something like limited modularity on a certain (more 'primitive') level. The interconnectivity between functionally specific circuits discussed above is evidence against the claim that all functionally specific circuits (EP's modules) are informationally isolated. As Buller says,

> The degree of informational overlap in our brains shows the brain circuits are not 'domain specific,' but that they are domain dominant… our brain circuits are not so specialized that they deal only with restricted domains. Instead they deal mostly with particular domains, and they do so only contingently.[275]

That is, most brain circuits are not informationally isolated, nor are they absolutely specialized. Their specialization is conditional and fluid and adaptable to varying circumstances.

Not only does it seem like EPs are wrong when they say modules are informationally encapsulated, but what they are calling modules, these functionally specific brain circuits, are not adaptations! Or at least, a great number of them are not. As discussed above, evidence from neurobiology suggests that much of the brain's neural circuitry is the useful *byproduct* of excessive brain growth during development; i.e., many neural circuitries are *exapatations*. Additionally, because many of the functionally

[274] Similar examples to consider: walking home alone in the dark, through a wooded park, after watching a scary movie, we might imaginatively see the tree branches as claws out to get us, vs. walking in the dark with a loved one, after watching a romantic comedy, we might find the very same park pleasantly enchanting (Recker). And some might mention snakes (perhaps how they recently found a snake) in the presence of another who is afraid of snakes, and for hours afterward they may see snakes *everywhere*, jumping at the sight of a stick, shoestring, or anything long and skinny.
[275] Buller, *Adapting Minds*, 139.

specific 'modules' are actually plastic mechanisms shaped by the environment, they are not products of natural selection, and thus not adaptations (because learning is involved, this would be more like Lamarckian evolution than Darwinian evolution). As Buller says:

> In short, it is simply not the case that 'our mental organs owe their basic design to our genetic program,' which evolved during the lifetime of the individual organism. They owe their basic design to environment-guided brain activity, which occurs during the lifetime of the individual organism.[276]

And if these so-called modules are not the products of natural selection, the EP research methodology will fail to explain them. We cannot functionally reverse engineer them by assuming they are adapted to Pleistocene conditions, nor can we isolate them from current environmental conditions. Yet EP and massive modularity claims seem to require our ability to do both. Of course there is still a lot of work to do in the field of neurobiology, so Buller, Deacon, Panksepp, et al, do not have the final story. Nonetheless, the picture given introduces enough doubt to make EP's claims, especially the more problematic, culturally bound and politically consequent claims, questionable.

Pleistocene Conditions

Now let's consider further evidence against the EP paradigm. As discussed in chapter four, the EPs think that because of the complexity of the brain, cumulative selection was necessary for the human brain's evolution. And the only time frame with the necessary duration and stable selection pressure to account for the brains complexity is the Pleistocene. This is the grounds for their appeal to Pleistocene conditions in reverse engineering the brain. A few critical remarks here. First, the anthropological evidence is limited, to say the least. The EEAs (the set of environmental conditions to which the

[276] Buller, *Adapting Minds*, 137.

mind is supposedly adapted) that EPs ponder are at best educated guesses. We do not have access to information that could objectively and certainly tell us what our hominid ancestors were doing back then. As Buller says, "we can't specify the adaptive problems faced by our ancestors precisely enough to know what kinds of psychological mechanism would have had to evolve to solve them".[277] EPs claim they can gather evidence about Pleistocene EEAs by looking at contemporary hunter-gather societies. However, to think contemporary hunter-gatherers and their problems have not changed significantly since the Pleistocene is really an incredible assumption. EPs also think we can infer Pleistocene conditions from the functional design we see in contemporary human brains.[278] But since it is the design and function of modules that we are investigating, without independent evidence this procedure sounds blatantly circular.

As Jaak and Jules Panksepp put it, "we can only work effectively with the here and now brain/mind process," and "as is recognized by most, all historical/functional issues are largely hidden from any direct analysis."[279] So until we have a time machine, we ought to lay off the mostly idle speculations concerning Pleistocene conditions.[280] Panksepp and Panksepp note that many EPs are already "wisely backing away from creative speculations concerning the role of specific Pleistocene EEAs" .[281] Though, they add that it might be sensible to have a moratorium on such speculations until more information comes in. Our ignorance about the Pleistocene is an obvious wrench in the

[277] Buller, *Adapting Minds*, 93.
[278] David Buss, "Sexual Strategies Theory: Historical Origins and Current Status", *Journal of Sex Research* 35 (1998), 29; Randy Thornhill, "The Concept of an Evolved Adaptation", *Characterizing Human Psychological Adaptations* eds. G.R. Bock and G. Cardew, (Chichester, UK: Wiley, 1997), 11.
[279] Panksepp and Panksepp, "Seven Sins," 113.
[280] We have already seen that reverse engineering is a seriously flawed method of investigation. But even if there were cases where we could reasonably reverse engineer, there are already so many contingencies. The question of whether or not the Pleistocene assumption holds is just another mark lowering the epistemic probability.
[281] Panksepp and Panksepp, "Seven Sins," 113.

process of reverse engineering.

Furthermore, there is reason to believe the brain could have changed in important ways since the Pleistocene. EPs think the mind "reflects completed rather than ongoing selection", as they claim the structure of the mind was laid down during the Pleistocene.[282] Because the 10,000 years since the Pleistocene is less than 1% of the two million years hominids spent as Pleistocene hunter-gatherers, EPs say "it is unlikely that new complex designs – ones requiring the coordinated assembly of many novel, functionally integrated features – could evolve in so few generations".[283] So the question is, could the mind have evolved significantly within the last 10,000 years? Sure, "new complex designs" probably haven't evolved. However, EPs (particularly Tooby and Cosmides) do not seem to have considered the possibility of old complex designs being significantly *modified* since then, or that they have been put to new uses (exaptations).[284]

Digesting evolutionary timescales is a bit difficult. The Pleistocene lasted around two million years, so compared to that, 10,000 years almost seems trivial. Nevertheless, I do not think we can rule out the possibility of significant modifications. A lot has changed in the past 10,000 years. Take into consideration how prolific humans are at constructing their own niches, and the rapidly changing human social environment, which is widely agreed to have shaped the evolution of human intelligence. This gives us reason to think important modifications *could* have taken place.[285] Furthermore, work in behavioral genetics and animal husbandry suggests that it only takes six generations of

[282] John Tooby and Leda Cosmides, "The Past Explains the Present: Emotional Adaptations and the Structure of Ancestral Environments", *Ethology and Sociobiology* 11 (1990): 380-381.
[283] *The Adapted Mind: Evolutionary Psychology and the Generation of Culture* (New York: Oxford University Press, 1992), ed. J.H. Barkow, L. Cosmides, and J. Tooby, 5.
[284] Buller, "Evolutionary Psychology," 206.
[285] Buller, *Adapting Minds*, 99.

selective breeding "for robust temperamental differences to be induced into animal lines".[286] The Institute of Cytology and Genetics in Russia has demonstrated this remarkably quick change in behavior over generations. In 1959 researches gathered foxes with the hope of recreating the evolution of dogs from wolves. They selected the tamest and most approachable of the foxes to breed, each generation selecting the tamer and more approachable, submitting them to tests which gauged their reaction to humans. By the eighties, not only were the artificially selected foxes "so doglike that they would leap into researchers' arms and lick their faces," but they were physically different than their more aggressive brothers.[287] They also evolved piebald fur, floppier ears, and up-curved tails – all traits characteristic of domestic dogs. So it is quite feasible that human behavioral traits (like those which EPs try to capture with their module model) evolved after the Pleistocene, much more recently than EPs assume is possible.

And of course, the actual plasticity of the brain lends itself to the idea of modifications after the Pleistocene. The point is, it is possible that the EPs are also wrong about the Pleistocene being the EEA to consider when attempting reverse engineering. And the more doubt we find in their fundamental claims, the more modesty we should ask of their proclaimed results.

Additional Difficulties

I would like to consider some additional difficulties facing Evolutionary Psychology. EPs have the thorny, though exciting, task of applying evolutionary theory to human beings. Problems arise in virtue of their research subjects, and EPs face troubles that other evolutionary biologists do not.

[286] Panksepp and Panksepp, "Seven Sins," 113.
[287] Evan Ratliff, "Taming the Wild," *National Geographic*, March 2011,46. (34-59)

First of all, humans make terrible experimental animals. As Sterelny and Griffiths rightly note, "humans are expensive to keep in captivity".[288] And unlike Drosophila, which are excellent research subjects, humans have a long life span. In fact, they have the same life span as those who would presumably be experimenting on them. So there is a difficulty in accruing the necessary data, tracking evolutionary changes. To top it all off, there are a number of legal restrictions when experimenting with humans. We cannot take children and raise them in isolation to track the turning on and off of neural circuits. We cannot set up controlled environments and rule out alternative explanations when testing hypotheses. That is, a controlled environment like that found in the film *The Truman Show* is not possible. So, "experimental data is restricted in many important ways".[289] And of course, experimental data would be nice to have when supporting evolutionary claims.

Additionally, the comparative method is important in evolutionary biology. It is useful to look to and compare closely related species, whether you are interested in anatomy, behavior, or biochemistry. This can tell us something about "when and why" particular traits arose.[290] When it comes to human behavioral traits or psychology, evolutionary psychologists cannot apply the comparative method, as "most of our immediate relatives are extinct".[291] We are "evolutionary orphans".[292] This makes studying human evolution more difficult. Sterelny and Griffiths also point the problem of swapping facts and values. This difficulty was discussed to some extent in chapters two and three. Sterelny and Griffiths put it best when they say, "we suspect that hope has

[288] Sterelny and Griffiths, *Sex and Death*, 313.
[289] Sterelny and Griffiths, *Sex and Death*, 313.
[290] Sterelny and Griffiths, *Sex and Death*, 314.
[291] Sterelny and Griffiths, *Sex and Death*, 314.
[292] Sterelny and Griffiths, *Sex and Death*, 314.

been rather too fecund a father to belief in the debates on evolutionary theories of human behavior".[293] It's hard to resist ideology and moralizing. Sometimes values color our vision. Claims about the evolutionary history of humans, adaptation stories, can become grounds on which people back or oppose certain social issues. The naturalistic fallacy is dangerous. And, especially considering the other difficulties in applying the evolutionary models to humans, we should be terribly careful not to go from an 'is' (when the 'is' is questionable enough) to an 'ought.' This third problem is the most troublesome because it can have dangerous social applications, and of course it can lead to bad science. Like the eugenics movement discussed in chapter two. The idea of fitness strayed from reproductive fitness to something like societal fitness (so the 'is' was mistaken), things like intelligence and good manners. Why not sterilize the dumb and impolite, especially when we can so obviously see that these traits are specific to people of origins *x*, *y* and *z*? This was a favored means of social management, until WWII led us to reconsider (although Native American women were still being sterilized in the 70s; forced hysterectomies, tubal ligation and whatnot). But the swap can go both ways. We can also be more inclined to accept explanations of human psychology or biology when those explanations are in line with our values. In the following chapter I give an example of how values can influence the interpretation of data in biology, especially when the data involves humans or human-like organisms (other primates, for example).

[293] Sterelny and Griffiths, *Sex and Death*, 317.

CHAPTER VII

SEXUAL SELECTION THEORY AND PRIMATOLOGY

In this chapter I present evidence that suggests cultural values and assumptions can play an influential role in biology, expanding on my discussion of the influence of cultural paradigms in chapter three. I look to the history of sexual selection theory (SST) and the field of primatology as examples, and point to biological claims that suspiciously match cultural values and assumptions.

Sexual Selection Theory

I will first look to the history of classical sexual selection theory, and the shift in discourse that began in the 70s. Classical sexual selection theory began with Charles Darwin. SST proposes that some traits are not selected for by natural selection, but by mates. Let's take the peacock as a quick example. Darwin was puzzled by the plumage of the peacock. How on earth could something relatively defenseless, that stood out so

conspicuously be selected for? It makes the peacock an easy target, offering no camouflage. Eventually Darwin speculated that the plumage was selected for by the *peahens*. The peahens were attracted to the bright extended plumage (evidence suggests it indicates health) and chose to mate with the peacocks that exhibited such traits. Thus those peacocks with bright plumage passed their genes on more than those with drab plumage, increasing the number of flamboyant feathers in the next generation. SST takes into consideration the fact that males and females of a species generally have distinct needs and look for different traits in partners. So it involves an investigation into sex differences, both in physical and behavioral traits, specifically mate preferences.

In *The Decent of Man* Darwin speculated that males were naturally wooers, while females were naturally coy and passive – an assumption that may have been tied to Victorian propriety. He writes: "that the males of all mammals eagerly pursue the females is notorious to everyone" and, "The female, on the other hand, with the rarest exception, is less eager than the male. As the illustrious Hunter long ago observed, she generally 'requires to be courted;' she is coy…"[294] Further, males are "generally eager to pair with any female," regardless of how attractive they may be.[295] Later, in the mid-twentieth century, Angus John Bateman makes a significant contribution to the foundations of sexual selection theory with his paper "Intra-sexual Selection in Drosophila."

Bateman ran a set of sixty-four experiments with Drosophila and found that only 4% of females failed to produce offspring, while 21% of males failed to fertilize any

[294] Darwin, *Decent of Man*, 932-933.
[295] Darwin, *Decent of Man*, 935.

female. He also found that the variance in male reproductive success was much larger than the variance among females.[296] From this he concluded, as Hrdy explains:

> Where as a male could always gain by mating just one more time, and hence benefit from a nature that made him indiscriminatingly eager to mate, a female, already breeding near capacity after just one copulation, could gain little from multiple mating and should be quite uninterested in mating more than once or twice.[297]

Using these experiments, Bateman extrapolated from Drosophila to *nature at large*, claiming that males, in almost all species, exhibit an "undiscriminating eagerness," while females exhibit an "undiscriminating passivity".[298] He says that even in a supposedly monogamous species like humans, this sex difference would be "expected to persist as a relic".[299] Robert Trivers further contributes to the field by suggesting that we can explain the Bateman paradigm through anisogamy, the fact that gametes differ in size between sexes.[300] The sex that invests the least competes to mate with the sex that invests the most, and female gametes are thought to be a greater investment than male gametes. Though as Hrdy notes, Trivers and others doing similar calculations fail to take into account the cost males incur competing for females.[301]

Donald Dewsbury, following the work of Sarah Hrdy, captures the above claims of Darwin, Bateman and Trivers under the title of "The Darwin-Bateman Paradigm" (which I will use interchangeably with "Bateman paradigm," as that is Hrdy's original

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[296] A.J. Bateman, "Intra-sexual Selection in Drosophila," *Heredity* 2 (1948): 349-368.
[297] Sarah Blaffer Hrdy, "Empathy, Polyandry, and the Myth of the Coy Female," *Conceptual Issues in Evolutionary Biology*. Ed. Elliott Sober. 3rd ed. (Cambridge: Pradford Books, 2006), 133..
[298] Bateman, "Intra-sexual," 365.
[299] Bateman, "Intra-sexual," 365.
[300] Robert Trivers, "Parental Investment and Sexual Selection," Sexual Selection and the Descent of Man, ed. B. Campbell (Chicago: Aldine, 1972): 136-207.
[301] Hrdy, "Empathy," 133.

terminology).[302] Dewsbury takes this paradigm to essentially consist of three assumptions. First, the reproductive success of males is more variable than that of females, meaning females are going to have a fairly stable rate of reproduction (the majority guaranteed to produce offspring), whereas the reproductive success of males within a species are going to vary more significantly between individuals. Second, males gain more reproductive success than females do from mating frequently. Again, this is thought to be the case because females contribute the larger gamete and because (what I take to be a more significant reason) females generally (though not always) carry the fetus and feed the infant, both of which tax the females resources. And finally, "males are generally eager to mate and relatively indiscriminate whereas females are more discriminating and less eager".[303] This is the promiscuous male, coy female claim, and it essentially comes out of the other two assumptions.

Classical sexual selection theory (or the Darwin-Bateman paradigm) gives us the following: males are promiscuous and unfaithful, competing amongst each other for females, while females are coy, choosey and nurturing, engaging in sex only for reproduction. There is, however, a problem with these ascriptions of characteristics to the sexes, even aside from using terms so heavily laden with cultural values. That is, an abundance of counterexamples. As Hrdy notes, the three assumptions of the Bateman paradigm given above are appropriate in some situations, but they "are far from universal".[304] And she goes on to say that these assumptions have hindered our understanding of mate selection and breeding in different species, especially in

[302] Donald Dewsbury, "The Darwin-Bateman Paradigm in Historical Context," *Integrated Comparative Biology* 45 (2005): 831-837.
[303] Dewsbury, "The Darwin-Bateman Paradigm," 831.
[304] Hrdy, "Empathy," 131.

primates.[305] In primates alone we find polyandry, sexually assertive females, females soliciting sex even while not fertile, homosexual encounters, female competition, male parenting, a larger variance in female reproductive success (through skipped ovulations, abortions), and so on.[306] Females (from birds to primates) engage in and even solicit sex while infertile (when they are either not ovulating or are already pregnant). And they do not seem to be universally choosey; "a lioness may mate 100 times a day with multiple partners over a 6-7 day period each time she is in estrus".[307] There is, and has been, abundant evidence showing that females are often 'promiscuous'. Additionally, not only do we find the tendency for males to be nurturing towards their offspring, we also find *unrelated* males, with no biological tie or investment in the young, who develop nurturing relationships with infants. This is especially found in the Barbary macaquers and savanna baboons. Among the savanna baboons it has been documented that male 'friends' of the mother (males that the mother may simply interact with) form "special relationships" with the female's infant, "carrying it in times of danger and protecting it from conspecifics…".[308] Jeanne Altmann, a primatologist who studies the baboons, refers to these males as "god-fathers."[309]

Such counterexamples were available during the reign and development of classical sexual selection theory, but they were overlooked and often dismissed as anomalies. Hrdy actually worked under Trivers at Harvard, and was deeply immersed in this Bateman paradigm. When she went to study the langurs in Abu, she witnessed female langurs solicit sex from alien bands of males. Hrdy absolutely could not make

[305] Hrdy, "Empathy," 132.
[306] Hrdy, "Empathy," 135-145.
[307] Hrdy, "Empathy," 135.
[308] Hrdy, "Empathy," 137.
[309] Hrdy, "Empathy," 137.

sense of this, and she immediately dismissed the first cases she witnessed as anomalies (this was not the behavior she was trained to expect). It was simply a weird, anomalous occurrence, as it did not fit the expectations she had developed at Harvard with Trivers and others. She says,

> At the time, I had *no context for interpreting* behavior that merely seemed strange and incomprehensible *to my Harvard-trained eyes*. Only in time, did I come to realize that such wandering and such seemingly "wanton" behavior were recurring events in the lives of langurs.[310]

As I said, these counter examples were available and abundant, but it was not until 1979 that the Bateman paradigm came into question. For three decades it reigned undisputed, before the counterexamples were more thoroughly taken into consideration. Once the counterexamples were brought to the table, it slowly became apparent that biologists couldn't indiscriminately describe sexual selection through the archetypical coy female and promiscuous male. The question is, why were these counterexamples ignored and read as anomalies?

The Persistence of the Bateman Paradigm

Hrdy has two explanations for why the Bateman paradigm endured in the face of these counterexamples. The first is that there existed an androcentric bias, "a preconstituted reality in which males played central roles".[311] A 'male's eye view,' if you will. Males played the active role in sexual selection, while females played the passive role. Feminists have long accused biology of being male-centered, and Hrdy claims that this accusation is "undeniable".[312]

Opposing Hrdy, I do not think male-centered biology is a suitable explanation for

[310] Hrdy, "Emapthy," 137.
[311] Hrdy, "Empathy," 146.
[312] Hrdy, "Empathy," 152.

the persistence of the Bateman paradigm. Yes, males were assigned the active role in sexual selection theory, but a male-centered perspective does not explain the continued acceptance of classical sexual selection theory. If it were only androcentrism at work, the theorists would have noticed that not all males fit the promiscuously active stereotype. That is, androcentrism does not explain why theorists failed to take note of the abundant counterexamples. Moreover, there was a failure to even consider the males' role in what was traditionally thought to be female business, e.g. parenting (a euphemism for 'mothering'). Hrdy herself writes at length about how the male's role in parenting had been over looked in classical sexual selection theory. Males may have been the center of some aspects of sexual selection theory, but they were fairly well ignored when it came to their involvement with infants. Thus researchers were certainly not focusing on a male perspective consistently; females were at the center of all work related to infants. Consequently, I do not think the persistence of the Bateman paradigm reflects androcentrism so much as it reflects a Victorian cultural perspective, an ideological framework – and this is Hrdy's second explanation. So it is more like *anthropocentrism*, not androcentrism, that lead researchers astray.

Hrdy argues that the other reason the Bateman paradigm persisted was that the objectivity of the researchers was compromised by an ideological framework reflecting Victorian values – a framework that influenced their interpretations. That is, values were being brought to the table (unknowingly) and leading researchers astray by directing their vision such that counterexamples were overlooked. As Hrdy says, "we were predisposed to imagine males as ardent, females as coy; males as polygynists, females as monadrous".[313] Men are (or ought to be) active and unnurturing (i.e. manly), women

[313] Hrdy, "Empathy," 146.

passive and motherly, and these cultural patterns were, in a sense, framing the researchers' interpretation of the data. This was the pattern with humans (or at least this was the cultural ideal), and so there were similar expectations from other species. I think Hrdy's explanation here seems reasonable, considering how closely the descriptive terms were mirroring Victorian values. For example, coyness, passivity and nurturing were (or perhaps are) feminine values, while promiscuity and vigor were masculine values (despite Protestant morals). This can explain why the female promiscuity *and* the male parenting counterexamples were both overlooked.

Similarly, Donna Harraway claims that the interpretations of biologists "simply mirror ideological phases in the history of the Western world".[314] That is, the conclusions biologists reach when interpreting data actually reflect, to some extent, the values and ideas that are flowing through the cultural discourse. Haraway's position, that the interpretations given to data reflect the cultural ideologies of the time, encapsulates Hrdy's Victorian values explanation, which I suggested above has merit. The sexual selection theorists were interpreting the data such that females were sexually passive, males active, which reflects the perceived normalcy of coy women and ardent men found in Victorian ideology. And as Anne Fausto-Sterling insists, "scientists do not simply read nature to find truths to apply in the social world. Instead, they use truths taken from our social relationships to structure, read, and interpret the natural".[315] Before I give some further evidence supporting Harraway's claim, I want to note that I do not think culture or ideology necessarily plays a *causal* role. Instead, as I will suggest later, the issue seems to be with how we 'visualize'; the issue is finding familiar patterns in the new, patterns

[314] Hrdy, "Empathy," 148.
[315] Anne Fausto-Sterling, *Sexing the Body: Gender Politics and the Construction of Sexuality*, (New York, NY: Basic Books, 2000), 115-116.

through which we make sense of the new.

I noted above that there was a change in discourse surrounding SST. By this I mean there was a move away from the coy female and promiscuous male archetypes – archetypes through which mating behaviors were being framed. Just as the Bateman paradigm reflects[316] the cultural values and assumptions (the cultural discourse, we may say) of the time during which it was developed and subsequently reigned, so too the change in discourse away from the coy female model reflects the cultural discourse of its time. The second wave of feminism was culminating during the beginning of this transition away from the 'coy female.' So the feminist framework was well established and social norms, like *passive* and *nurturing* women, were under fire. And interestingly, researchers in primatology were starting to "find politically motivated females and nurturing males" around the same time Geraldine Ferraro is running as Vice President of the United States, and as "Garry Trudeau starts to poke fun at 'caring males' in his cartoons".[317] The changes in theory seem to steadily echo the changes in cultural discourse, so there is evidence that Hrdy and Haraway's explanations are accurate. As further evidence, consider the following: the second wave of feminism ideologically liberates women from their mandatorily nurturing and passive roles, while researchers discover the assertive female. Contraceptives are made accessible, allowing women to engage in sex that does not lead to reproduction, while researchers concede that female primates engage in sexual actives while infertile. Women are being liberated ideologically from the confines of compulsory marriage (unmarried and divorced women were no longer entirely ostracized), and polyandry is found in the wild. These corollaries

[316] Either actually reflects or simply looks similar to.
[317] Hrdy, "Empathy," 148.

are fairly clean, and *perhaps* too much so to be coincidence.

Cultural values and assumptions make up (to some degree) the framework through which we make sense of the world – even the natural world. It is not that cultural values and assumptions cause us to see *x*; rather, it is because we have those cultural frameworks our vision is directed to *x*, we are more likely to take note of *x*.

Consider the role of metaphor in language, as discussed in chapter five. A well known or familiar concept is used to make sense of an unknown, unfamiliar, or simply more abstract concept. So for example, we use the familiar and tangible concept of money to make sense of the more abstract concept of time, time is money. And under the concept of money are subconcepts. Money is spendable, savable, valuable, etc. If the metaphor is a good metaphor, then some subconcepts of the source domain get mapped on to the target domain: spend time, save time, valuable time, etc. In general, the way we make sense of new material resembles to some extent this process. We might think of it as making sense by association, by recognizing familiar patterns in new material or data. When presented with something new, we reach for aspects that are familiar to what we know, and work from there. As a personal example, when I was first presented with the details of Australia's government system, I came to understand it essentially by analogy: prime minister is like the U.S. president, the labor party is like the democratic party, etc. Similarly, when I took Latin I came to understand it by comparing it to what I know – English and some Spanish.[318] In general I think it is fair to say we make sense of the new by an appeal to the old. Familiar concepts serve as a *frame* for new concepts that exhibit similarities, similarities by which we can associate it to the familiar. And this is not

[318] The Latin for "I love" is *amo*, the Spanish for love is *amor*; the Latin for tree is *arbor*, and still to this day I can't bring the Latin word to mind without first thinking of Arbor Day, as my springboard to the Latin term – I was familiar with Arbor Day before Latin

necessarily a process at the forefront of consciousness – in some sense, our mind automatically grasps for similarities from which to cling and build an understanding.

Now consider what happens in science: we collect data and then make sense of that data. And before researchers go out to collect data, they generally have a hypothesis in mind, which we might think of as an 'expectation'. Of course this is a simplistic picture of science, but nevertheless, a great bulk of the endeavor is collecting data with certain expectations in mind, and subsequently interpreting that data (as either being in line with expectations or not). Now I am suggesting that in this process of interpreting data, cultural values and assumptions can play a role, and they can play a role in a way that is similar to the above use of metaphor and association. There are patterns and ideas in culture, which are so familiar to us that they are in some sense ingrained in our thoughts (e.g. mothers are nurturing – 'mothering'). And these patterns can sometimes be the lens or frame through which we make sense of or interpret new data, often unconsciously. For instance, the patterns we are familiar with in culture might simply be recognized more quickly in the field. Those familiar patterns might be more likely to stand out as frames of explanation, more so than some unfamiliar explanation (as discussed in chapter three – with the langurs of Abu, it was simply inconceivable that infanticide could be something other than an anomaly).

That is to say, past frameworks or patterns are part of the way we make sense of the world, and we have a great number of cultural frameworks. It isn't that culture causes data to be a certain way, or even that culture *causes* us to see the data this way or that. Cultural background assumptions can simply makes us *predisposed* to *see* the data in a particular way. And I think a visual metaphor is helpful here. Understanding and

interpreting are often captured under this idea of 'seeing' (e.g., "the way I see it…" – an expression introducing one's interpretation). So consider an analogy between Jastrow's duck-rabbit and the case of the not-so-coy females. Females were performing some coy-like acts, and some promiscuous acts. Biologists attempt to give fairly unified explanations for animal behavior. And when researchers like Hrdy went out into the field to study the behavior, if they were expecting coy females then they were more likely to interpret the actions of the females in a corresponding way. Similarly, if I told someone unfamiliar with the duck-rabbit that I was going to show them a picture of a bunny, and then presented the picture, they would in all likelihood see the rabbit. I could then point out the duck 'pattern', and they would presumably then see the duck. Similarly, as Hrdy notes (and as discussed in chapter three) once someone suggests an alternate explanation or an alternate framework (that is viable), other researchers can then see that explanation in the data. But they need to be prodded first – either by an accumulation of counterexamples, the suggestion of an alternative explanation, or both. It takes something to spur the questioning of our usual patterned thought. And perhaps this is a way in which feminism can be useful to science – feminists tend to spur questions.

Cultural Influence and Evolutionary Psychology

The above discussion points out where culture seems to have influenced the interpretation of data in biology. Primatology has been especially prone to this influence. If my suggestion about pattern recognition is on the right track, this would be because *we* are primates. The bonbons, chimps, and langurs look similar to us. So it makes sense that we would be more likely to see our cultural patterns (like coy females and ardent males) in their behavior. Whereas, if we are investigating the mating practices of snakes, we are

not as likely to bring cultural assumptions to the table. The pattern relationship isn't as strong; snakes do not look like us, for example.

Now consider evolutionary psychology. In this discipline it would be even more likely that our cultural assumptions could influence the interpretation of data, whether the data consists of certain controlled experiments or surveys. Researchers are coming to the table with all kinds of background assumptions about humans and differences between men and women. If, as I have suggested, we have some trouble stepping away from our cultural assumptions in primatology, we are certainly going to have trouble in evolutionary psychology. And consider the language we can slip into in evolutionary psychology. *Our* brains; *our* hominid ancestors; *our* behavioral traits. I am suggesting that objectivity is a greater obstacle for evolutionary psychology than it is for a field like marine biology. This is all the more reason for EPs to be self critical of their research, and more reason to hold EPs to a rigorous standard of evidence – standards at least as high as those found in other fields of biology, if not higher.

CHAPTER VIII

CONCLUSIONS

Steven Pinker adopts Christina Hoff Sommers' distinction between gender feminism and equity feminism.[319] Gender feminism is your classic variety of third wave feminism, which we might say (as Pinker does) dominates gender and women's studies programs, as well as feminist and women's organizations (a gender feminist essentially amounts to any feminist willing to call themselves a feminist without qualification). Equity feminism, on the other hand, is simply an ethical position that holds sex discrimination is wrong. Pinker claims that it is the gender feminists who are attacking evolutionary psychology, with their typical "disdain for analytical rigor".[320] He characterizes them as extremists, holding the position that personalities, sexualities, and genders are all *entirely* cultural constructs, and anyone who says otherwise must be

[319] Christina Hoff Sommers, *Who Stole Feminism?* (New York: Simon & Schuster: 1994).
[320] Pinker, *The Blank Slate*, 342.

somehow misogynistic or simply 'doesn't get it'. And he claims this gender feminism is just another example of the "ideological cults that are prone to dogma and resistant to criticism," which 'academia breeds'.[321] Furthermore, when these feminists question biological difference claims, Pinker states they are:

> handcuffing feminism to railroad tracks on which a train is bearing down…neuroscience, genetics, psychology, and ethnography are documenting sex differences that almost certainly originate in human biology…Gender feminists want either to derail the train or to have other women join them in martyrdom.[322]

That is, Pinker suggests that these feminists critical of evolutionary psychology are doomed, that science is in the process of proving them wrong, and to continue rejecting the biological sex difference claims is hopeless.

Though the purpose of this thesis was not to correct this common misconception of feminism (his characterization of third wave feminism is a straw man, if not simply an insulting caricature), I did want to establish that there are legitimate, feminist (gender or equity) grounds for questioning evolutionary psychology's project. I argue that we should take a lesson from history and only cautiously make definitive claims about biological difference. By appealing to history – namely the extensive and appalling role biological difference claims have had as tools of oppression – I establish that there *are* legitimate political or even ethical grounds from which to question certain claims coming out of evolutionary psychology. That is, the 'fear' of difference claims, which Pinker so quickly ridicules and dismisses as both unjustified and misguided, is actually quite reasonable.

Besides political or ethical cautions, the nature of the subject in question is such

[321] Pinker, *The Blank Slate*, 341.
[322] Pinker, *The Blank Slate*, 343.

that it, again, necessitates prudence and humility. When dealing with either complex or culturally charged issues in biology, we tend to make mistakes. And of course the human mind is both culturally charged and immensely complex. One problem is that we tend to develop a kind of myopia through emersion in either scientific or cultural paradigms. The influence of cultural ideologies or background assumptions in science is a serious concern, as discussed in chapters three, five, and seven. We tend to understand new things relationally, by framing them in terms of familiar patterns. For example, I come to understand a new language by framing it or patterning it off of the languages I am already familiar with. And science is not exempt from this process. We came to understand DNA through the framework (or metaphor) of code. In sexual selection theory and primatology we used cultural paradigms, like the coy female and ardent male, to make sense of animal behavior (and in this case we were repeatedly mistaken in our conclusions– as discussed in chapter seven). Objectivity is an issue, and when the subject of investigation closely resembles preexisting patterns (which make up background assumptions) objectivity is even harder to get at. We don't have access to raw data – it is always filtered through our fallible senses and subsequently interpreted or "made sense of." And this making sense process happens in a mind that is full of cultural patterns. Because the subject of evolutionary psychology is human nature, it is even more difficult to remain objective; evolutionary psychologists are coming to the investigatory table loaded with background assumptions about the subject (we have a *great* deal more assumptions about human nature than about minerals, fish, or even other mammals). Hence, there is this additional reason to be initially skeptical or cautious of claims coming out of evolutionary psychology.

Aside from the political concerns and concerns of objectivity, which can serve as motivations for questioning EPs claims, the research program of EP is seriously flawed in a number of ways. You would think based on Pinker's confidence in EP and ridicule of feminist objectors that EP must be a solid program, and Pinker certainly speaks of it as such. But the science just isn't high quality. It is riddled with problematic assumptions. Evolutionary Psychologists attempt to reverse engineer the human mind, but as I have argued they cannot do so with any accuracy. In order for their method of reverse engineering to work, at minimum, the following conditions must hold: psychological traits (the EP modules) must be adaptations; these adaptations must be adapted to Pleistocene conditions; and we must know the details of those Pleistocene conditions. The adaptationist view of evolution is flawed, as I argue in chapter five, and it doesn't seem as though we can legitimately assume psychological traits are adaptations. The plasticity of the brain and recent advances in neurobiology strongly suggest that most of the psychological traits EPs are concerned with (human specific traits) are *not* adaptations. They are either shaped in part by environmental stimuli (and thus not adaptations) or they are actually exaptations.

Furthermore, even if a psychological trait is an adaptation, we cannot legitimately assume it is adapted to Pleistocene conditions. The brain's plasticity suggests that the brain and human psychology could have evolved in a number of significant ways since the Pleistocene. As discussed in chapter six, it only takes five or six generations for noteworthy changes in behavioral traits to take place. *Moreover*, even if a psychological trait is an adaptation, adapted to Pleistocene conditions (neither of which are strong assumptions), we simply do not know enough about those Pleistocene conditions to

accurately reverse engineer the brain. Our knowledge about Pleistocene humanoids is severely limited.

We are spurred to caution and perhaps even suspicion by political and cultural concerns (the history of oppression and difficulties in obtaining objectivity in this particular subject). And then when the research program of Evolutionary Psychology is critically examined, we find that there are severe flaws in both their theoretical and methodological commitments. In this thesis I have argued that feminist concerns *are* justifiable and that work in evolutionary psychology requires a elevated degree of modesty and evidential rigor. And not only do the EPs fail to demonstrate the appropriate level of modesty in their declarations of sex difference, but the EP program is critically flawed. So I conclude that not only are feminist concerns justifiable, but evolutionary psychology needs to be restructured. The research program must be modified so that it avoids the flaws of adaptationism and, most importantly, becomes constrained by the neurobiological and anthropological evidence.

REFERENCES

Anderson, Michael L. "Massive Redeployment, Exaptation, and the Functional Integration of Cognitive Operations." *Synthese* 159, no. 3 (2007): 329-45.

Apperly, Ian A., Dana Samson, and Glyn Humphreys. "Domain-specificity and Theory of Mind: Evaluating Neuropsychological Evidence." *Trends in Cognitive Sciences* 9, no. 12 (2005): 572-77.

Aristotle, and A. L. Peck. *Generation of Animals.* Harvard University Press, 1963.

Aristotle. "The History of Animals." Edited by Richard McKeon. Translated by D'Arcy W. Thompson. In *The Basic Works of Aristotle,*, 633-41. New York: Random House, 1941.

Barbra McClintock to Oliver Nelson. 1973. Accessed January 12, 2011. http://profiles.nlm.nih.gov/LL/Views/Exhibit/narrative/nobel.html.

Barkow, Jerome H., Leda Cosmides, and John Tooby. *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*. New York: Oxford University Press, 1992.

Bass, Thomas A. "Sarah Hrdy." In *Reinventing the Future: Conversations with the World's Leading Scientists*, 7-25. Reading, MA: Addison-Wesley Pub., 1994.

Beatty, John. "Chance Variation: Darwin on Orchids." *Philosophy of Science* 73 (2006): 629-41.

Block, Ned. "What Is Functionalism?" In *Philosophy of Mind: a Guide and Anthology*, edited by John Heil, 183-99. Oxford: Oxford University Press, 2004.

Boylan, Michael. "Aristotle: Biology." Internet Encyclopedia of Philosophy. Accessed January 28, 2011. http://www.iep.utm.edu/aris-bio.

Buller, David J. *Adapting Minds: Evolutionary Psychology and the Persistent Quest for Human Nature*. Cambridge, MA: MIT Press, 2006.

Buller, David J. "Evolutionary Psychology: A Critique." In *Conceptual Issues in Evolutionary Biology*, by Elliott Sober, 197-216. Cambridge: MIT Press, 2006.

Buss, David M. "Evolutionary Psychology: a New Paradigm for Psychological Science." *Psychological Inquiry* 6 (1995): 1-30.

Buss, David M. *Evolutionary Psychology: the New Science of the Mind*. Boston: Pearson/Allyn and Bacon, 2008.

Buss, David M., Martie G. Haselton, Todd K. Shackelford, April L. Bleske, and Jerome C. Wakefield. "Adaptations, Exaptations, and Spandrels." *American Psychologist* 53 (1998): 533-48.

Buss, David M. "Psychological Sex Differences: Origins Through Sexual Selection." *American Psychologist*, 1995, 164-68.

Buss, David. "Sexual Strategies Theory: Historical Origins and Current Status." *Journal of Sex Research* 35 (1998).

Cosmides, Leda, and John Tooby. "Origins of Domain Specificity: the Evolution of Functional Organization." In *Mapping the Mind: Domain Specificity in Cognition and Culture*, edited by L. Hirschfeld and S. Gelman, 85-116. New York: Cambridge University Press, 1994.

Darwin, Charles. "On the Origin of Species." In *From so Simple a Beginning: the Four Great Books of Charles Darwin*, edited by Edward O. Wilson, 441-764. New York: W.W. Norton &, 2006.

Darwin, Charles. "The Descent of Man, and Selection in Relation to Sex." In *From so Simple a Beginning: the Four Great Books of Charles Darwin*, edited by Edward O. Wilson, 767-1254. New York: W.W. Norton &, 2006.

Deacon, Terrence W. "Rethinking Mammalian Brain Evolution." *Integrative and Comparative Biology* 30, no. 3 (1990): 629-705.

Deacon, Terrence W. "What Makes The Human Brain Different?" *Annual Review of Anthropology* 26, no. 1 (1997): 337-57.

Deacon, Terrence William. *The Symbolic Species: the Co-evolution of Language and the Brain*. New York: W.W. Norton, 1997.

Dewsbury, D. A. "The Darwin-Bateman Paradigm in Historical Context." *Integrative and Comparative Biology* 45, no. 5 (2005): 831-37.

Economist. "Sex, Shopping and Thinking Pink." August 23, 2007. Accessed February 12, 2011. http://www.economist.com/node/9682588.

Evans, Samuel. "Parliamentary Debates." *Hansard*, 4th, 155 (1906). Accessed January 23, 2011. http://www.johndclare.net/Women1_EvansArguments.htm.

Fausto-Sterling, Anne. "Science Matters, Culture Matters." *Perspectives in Biology and Medicine* 46, no. 1 (2003): 109-24.

Fausto-Sterling, Anne. *Sexing the Body: Gender Politics and the Construction of Sexuality*. New York: Basic Books, 2000.

Fine, Ione, Eva M. Finney, Geoffrey M. Boynton, and Karen R. Dobkins. "Comparing the Effects of Auditory Deprivation and Sign Language within the Auditory and Visual Cortex." *Journal of Cognitive Neuroscience* 17, no. 10 (2005): 1621-637.

Fodor, Jerry. "The Persistence of the Attitudes." In *Problems in Mind*, edited by Jack Crumley. Mountain View: Mayfield Pub, 1987.

Galton, Francis. *Hereditary Genius: an Inquiry into Its Laws and Consequences*. Edited by Cyril Dean. Darlington. Gloucester: Peter Smith, 1972.

Galton, Francis. "The First Steps Towards the Domestication of Animals, or Hereditary Talent and Character." *Macmillan's Magazine* 12 (1865).

Goddard, Henry Herbert. *The Kallikak Family: a Study in the Heredity of Feeble-mindedness*. New York: Macmillan, 1912.

Gould, Stephen Jay, and Elisabeth S. Vrba. "Exaptation - a Missing Term in the Science of Form." *Paleobiology* 8 (1982): 4-15.

Gould, Stephen Jay, and Richard C. Lewontin. "The Spandrels of San Marco and the Panglossian Paradigm: A Critique of the Adaptationist Program." In *Conceptual Issues in Evolutionary Biology*, edited by Elliott Sober, 79-97. Cambridge: MIT Press, 2006.

Gould, Stephen Jay. "Exaptation: a Crucial Tool for an Evolutionary Psychology." *Journal of Social Issues* 47 (1991): 43-65.

Gould, Stephen Jay. "Ten Thousand Acts of Kindness." In *Eight Little Piggies: Reflections in Natural History*, 275-83. New York: Norton, 1994.

Gould, Stephen Jay. *The Mismeasure of Man*. New York: Norton, 1981.

Gould, Stephen Jay. "The Panda's Thumb." In *The Panda's Thumb: More Reflections in Natural History*. New York: Norton, 1980.

Greg, W.R. "On the Failure of 'Natural Selection' in the Case of Man." *Fraser's Magazine* 78 (1868).

Hampton, Simon J. "Domain Mismatches, Scruffy Engineering, Exaptations and Spandrels." *Theory & Psychology* 14, no. 2 (2004): 147-66.

Haraway, Donna Jeanne. *Crystals, Fabrics, and Fields: Metaphors of Organicism in Twentieth-century Developmental Biology*. New Haven: Yale University Press, 1976.

Haraway, Donna Jeanne. "The Contest for Primate Nature: Daughters of Man-the-Hunter in the Field." In *Simians, Cyborgs, and Women: the Reinvention of Nature*, 82-108. New York: Routledge, 1991.

Hecht, Barbra, and Frederick Hecht, eds. "A Gene for Alcoholism Discovered." *MedicineNet.com*, January 15, 2004. Accessed March 12, 2011. http://www.medicinenet.com/script/main/art.asp?articlekey=26119.

Hofstadter, Douglas R. *Metamagical Themas: Questing for the Essence of Mind and Pattern*. New York: Basic Books, 1985.

Hrdy, Sarah Blaffer. "Empathy, Polyandry, and the Myth of the Coy Female." In *Conceptual Issues in Evolutionary Biology*, by Elliott Sober, 131-60. Third ed. Cambridge, MA: MIT Press, 2006.

Hrdy, Sarah Blaffer. *The Langurs of Abu: Female and Male Strategies of Reproduction*. Cambridge: Harvard University Press, 1980.

Hrdy, Sarah Blaffer. *The Woman That Never Evolved*. Cambridge: Harvard University Press, 1981.

Huxley, Thomas Henry. "Emancipation - Black and White." In *Science and Education; Essays*. New York: Greenwood Press, 1968.

"Is It All in Our Genes?" *Playboy*, March 1995.

Jacob, Francois. "Evolution and Tinkering." *Science* 196 (1977): 1161-166.

Keller, Evelyn Fox. *A Feeling for the Organism: the Life and Work of Barbara McClintock*. San Francisco: W.H. Freeman, 1983.

Keller, Evelyn Fox. *Refiguring Life: Metaphors of Twentieth-century Biology*. New York: Columbia University Press, 1995.

Kevles, Daniel J. *In the Name of Eugenics: Genetics and the Uses of Human Heredity*. New York: Knopf, 1985.

Kitcher, Philip. *Vaulting Ambition*. Cambridge: MIT Press, 1985.

Kitcher, Phillip. "Darwin's Achievement." In *Reason and Rationality in Natural Science*, edited by Nicholas Rescher. New York: University Press of America, 1985.

Kuhn, Thomas S. *The Structure of Scientific Revolutions*. Third ed. Chicago: University of Chicago Press, 1996.

Lakoff, George, and Mark Johnson. *Metaphors We Live by*. Chicago: University of Chicago Press, 2003.

Lakoff, George, and Mark Johnson. *Philosophy in the Flesh: the Embodied Mind and Its Challenge to Western Thought*. New York: Basic Books, 1999.

Lewis, Ricki. *Human Genetics: Concepts and Applications*. Boston: McGraw-Hill, 1997.

Lewontin, Richard. "Adaptation." *Scientific America* 239 (1978): 213-30.

Lloyd, Elisabeth Anne. *The Case of the Female Orgasm: Bias in the Science of Evolution*. Cambridge: Harvard University Press, 2005.

Maffei, Arianna, Kiran Nataraj, Sacha B. Nelson, and Gina G. Turrigiano. "Potentiation of Cortical Inhibition by Visual Deprivation." *Nature* 443, no. 7107 (2006): 81-84. doi:10.1038/nature05079.

Margolis, Howard. *Patterns, Thinking, and Cognition: a Theory of Judgment*. Chicago: University of Chicago Press, 1987.

Neisser, Ulric. *Cognition and Reality: Principles and Implications of Cognitive Psychology*. San Francisco: W.H. Freeman, 1976.

"New Evidence for a 'Gay Gene'" *Time*, November 13, 1995.

Panksepp, Jaak, and Jules B. Panksepp. "The Seven Sins of Evolutionary Psychology." *Evolution and Cognition* 6 (2000): 108-31.

Pinker, Steven. *How the Mind Works*. New York: Norton, 2009.

Pinker, Steven. *The Blank Slate : the Modern Denial of Human Nature*. New York: Viking, 2002.

Rall, Ted. *Wake Up, You're Liberal!: How We Can Take America Back from the Right*. Brooklyn: Soft Skull Press, 2004.

Ramachandran, V. S. *A Brief Tour of Human Consciousness: from Imposter Poodles to Purple Numbers*. New York: Pi Press, 2004.

Ratliff, Evan. "Taming the Wild." *National Geographic*, March 2011.

Recker, Doren. "How to Confuse Organisms with Mousetraps: Machine Metaphors and Intelligent Design." *Zygon* 45 (September 2010): 647-63.

Roughgarden, Joan. *Evolution's Rainbow: Diversity, Gender, and Sexuality in Nature and People.* Berkeley: University of California Press, 2009.

Silverstein, Louise B. "Evolutionary Psychology and the Search for Sex Differences." *American Psychologist* 51, no. 2 (1996): 160-61.

Skoyles, John R. "Neural Plasticity and Exaptation." *American Psychologist* 54, no. 6 (1999): 438-39.

Smuts, Barbara. "Male Aggression Against Women." In *Sex, Power, Conflict: Evolutionary and Feminist Perspectives*, edited by David M. Buss and Neil M. Malamuth, 231-68. New York: Oxford University Press, 1996.

Sober, Elliott. *Natural Selection: Evolutionary Theory in Philosophical Focus*. Chicago: University of Chicago Press, 1993.

Spencer, Herbert. "Psychology of the Sexes." *Popular Science Monthly* 4 (1873).

Spencer, Herbert. *Social Statics: Together with Man versus the State*. New York: D. Appleton, 1896.

Sterelny, Kim, and Paul E. Griffiths. *Sex and Death: an Introduction to Philosophy of Biology*. Chicago: University of Chicago Press, 1999.

Thornhill, Randy. "The Concept of an Evolved Adaptation." In *Characterizing Human Psychological Adaptations.*, edited by Gregory Bock and Gail Cardew. Chichester: Wiley, 1997.

Tooby, J., and L. Cosmides. "The past Explains the Present: Emotional Adaptations and the Structure of Ancestral Environments." *Ethology and Sociobiology* 11, no. 4-5 (1990): 375-424.

Tooby, John, and Leda Cosmides. "Beyond Intuition and Instinct Blindness." *Cognition* 50 (1994): 41-77.

Tooby, John, and Leda Cosmides. Foreword. In *Mind-Blindness: an Essay on Autism and Theory of Mind*, by Simon Baron-Cohen. Cambridge: MIT Press, 1995.

Tooby, John, and Leda Cosmides. "Toward Mapping the Evolved Functional Organization of Mind and Brain." In *Conceptual Issues in Evolutionary Biology*, by Elliott Sober, 175-96. Third ed. Cambridge: MIT Press, 2006.

Trivers, Robert. "Parental Investment and Sexual Selection." In *Sexual Selection and the Descent of Man: 1871-1971*, by Bernard Campbell, 136-77. London: Heinemann, 1972.

Weiner, Jonathan. *The Beak of the Finch: a Story of Evolution in Our Time*. New York: Knopf, 1994.

Wilson, David Sloan, Eric Dietrich, and Anne B. Clark. "On the Inappropriate Use of the Naturalistic Fallacy in Evolutionary Psychology." *Biology and Philosophy* 18 (2003): 669-82

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Findings and Conclusions: This thesis critically examines the research program of evolutionary psychology and the tension between evolutionary psychology and feminism. Feminists tend to be wary of claims made by evolutionary psychologists about men and women having *biologically* different psychologies and behavioral tendencies, and many evolutionary psychologists have dismissed feminist concerns out of hand. In this thesis I argue that feminists have good reason to be concerned, considering the role biological difference claims have played in the oppression of women and minorities throughout history. I also argue that when dealing with politically charged biological claims a high standard of evidence is necessary. Furthermore, I argue the research program of evolutionary psychology seems seriously flawed, not holding to a rigorous standard of evidence. The research method of evolutionary psychologists is one of reverse engineering. They maintain that the brain is massively modular, composed of hundreds of functionally specific modules or psychological traits. As adaptationists they claim that these modules are adaptations, selected for by natural selection to solve problems faced during the Pleistocene era. Thus, evolutionary psychologists reverse engineer these psychological traits by asking what problems these traits were designed to solve during the Pleistocene.

I argue that their adaptationist view of evolution is mistaken and our knowledge of Pleistocene conditions is limited. Consequently, it is not possible to accurately reverse engineer psychological traits. Additionally, the evidence from neurobiology strongly suggests the brain is not massively modular, but only limitedly modular. So not only do evolutionary psychologists fail to meet the rigorous standards of evidence their politically charged claims require, but their theoretical and methodological commitments contain critical flaws. Thus, the feminist concerns are legitimate and evolutionary psychology needs to be restructured, particularly so that it avoids the flaws of adaptationism and becomes grounded in the neurobiological evidence.

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