The Text in the Machine

American Copyright Law and the Many Natures of Software, 1974–1978

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ABSTRACT: This article is a case study in the history of software copyright in the United States from 1974 to 1978. It focuses on the work of a group called the National Commission on New Technological Uses of Copyrighted Works. CONTU, as this group was known, faced the problem of choosing which ontology of software—by which I mean a conception of the nature of software as an invention—should serve as the conceptual underpinning for the law of software copyright. In particular, the commissioners needed to decide whether computer programs are texts, machines, means to communicate with machines, or many of these things at once. CONTU's history shows how the discursive emergence of software as a new technology has been shaped by the convergence of commercial interests, the transmission of technical knowledge to lay audiences, and idiosyncratic views on the nature of information technology and human creativity.

On 19 December 1974, Congress created the National Commission on New Technological Uses of Copyrighted Works. CONTU, as the group was known, was an advisory commission instructed to study how copyright law should be reformed in order to regulate the use of devices such as photocopiers and computers, which enabled the automatic reproduction of information.[1] Lawmakers hoped that the creation of CONTU would

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1. Copyright is the standard form of protection used for media such as books, pho-

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enable them to set aside discussions on technological matters in order to focus on the bureaucratic details that were precluding the passage of the bill that would become the Copyright Act of 1976.[2] At the end of its run in 1978, CONTU advised Congress to enact additional legislation establishing software as a new category of creative work protected by this new act. However, the modesty of this recommendation belies the commissioners' ambitious effort: from 1974 to 1978 they undertook one of the most extensive federal reviews of the computing industry that had ever occurred.

The commissioners' work on the copyright implications of computing comprised the problem of determining whether software merits recognition as a new kind of creative work eligible for copyright protection. This is the problem they referred to as the "copyright-eligibility of software." The Copyright Office had registered copyrights for computer programs since the mid-1960s, but only because it considered software to be a kind of book or pamphlet; by 1978 nearly 2,000 programs had been registered as such at the office.[3] This reduction of software to the text of the code that a programmer had written meant that copyright protection was very weak. For instance, a programmer could copyright the text of a program in a specific programming language, but any competitor who merely translated the program into another language would end up with software that performed the same functions without committing copyright infringement.[4]

This article is a case study in the history of software copyright focused on the work of CONTU. Although the commissioners had the dual mission of studying photocopying and computing, they handled these two tasks separately. This essay focuses on the latter. I argue that the commissioners reduced the problem of assessing the copyright-eligibility of software to that of choosing an ontology of software—that is, a conception of the nature of software.[5] This process did not rely on the examination of the technical

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tographs, musical recordings, and television programs. It gives authors exclusive rights to reproduce and distribute their creative work. National Commission on New Technological Uses of Copyrighted Works, *Final Report of the National Commission on New Technological Uses of Copyrighted Works*; United States Copyright Office, "Circular 1."

2. National Commission on New Technological Uses of Copyrighted Works, *Meetings 1 through 5*, 0.

3. A legal formality, registration establishes a public record of the copyright claim. A registration is required before any infringement suits can be filed, and it serves as incontestable proof of the validity of the author's copyright claim. United States Copyright Office, "Books and Pamphlets."

4. The submission of the binary code (the sequence of zeroes and ones that humans would not be able to understand) was barred by the office, as works could only be registered in a medium that was "intelligible to a human being"; "Computer Program Copyrighted for First Time."

5. I use the term "ontology of software" as a shorthand for the phrase "conception of the nature of software." This usage aligns with recent work in the histories of computing and intellectual property law. Gerardo Con Díaz, "Contested Ontologies of Software"; Andrea Bonaccorsi, Jane Calvert, and Pierre Joly, "From Protecting Texts to

specifications of any programs, but on understanding, selecting, and modifying the ontologies of software that CONTU's witnesses delivered. These ontologies were often mutually incompatible, and they underscored the legal and conceptual disagreements that differentiated computing firms from industrial research laboratories and universities.[6] On the one hand, spokespeople for industrial research laboratories and academic programmers opposed the copyright-eligibility of computer programs on the grounds that software was ultimately a machine component that fell under the purview of patent law. They hoped to lower their operation costs by precluding software providers from charging hefty licensing fees and setting further legal restrictions on the distribution of computer programs. On the other hand, software firms and hardware manufacturers insisted that computer programs were texts that should fall squarely within the scope of copyright law. They hoped to impede the unauthorized distribution of the software that they made and sold, especially among big clients such as public and private research institutions.[7] Solving the legal and conceptual problems that emerged from the dissonance between these positions required deciding whether programs are lists of instructions, illegible texts, a means to communicate with machines, or even machine components.

My argument brings to the history of computing the methods and problems of the new history of intellectual property law.[8] Led primarily by historians of science and technology and legal scholars, this body of work has so far been focused primarily on patent law.[9] This focus has enabled both the revision of our narratives for the history of fields such as computing and biotechnology, and the introduction of new ways of thinking about historical objects such as patents, technical diagrams and illustra-

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Protecting Objects in Biotechnology and Software"; Michael Caloran, "The Mutability of Biotechnology Patents"; Helen Nissenbaum, "Hackers and the Contested Ontology of Cyberspace."

6. The commissioners used the terms "software" and "computer program" interchangeably, and they sometimes used the word "software" as a plural for "computer program." They often changed their terms in order to match the usage they found in any documents or testimony that they were studying. For more on the interchangeable uses of these terms, see David Nofre, Mark Priestley, and Gerard Alberts, "When Technology Became Language"; Thomas Haigh, "Software in the 1960s as Concept, Service, and Product."

7. For more on the industry's clients, see Martin Campbell-Kelly, William Aspray, Nathan Ensmenger, and Jeffrey R.Yost, *Computer*; Martin Campbell-Kelly, *From Airline Reservations to Sonic the Hedgehog*.

8. Intellectual property law is the field of law that governs the ownership of creative and inventive works by means such as patents, copyrights, trademarks, and trade secrets. Robert Merges, Peter Menell, and Mark Lemley, *Intellectual Property in the New Technological Age*.

9. See Mario Biagioli, "Between Knowledge and Technology"; Mario Biagioli, "Patent Republic"; Daniel Kevles, "Inventions, Yes; Nature, No"; Kara Swanson, "Authoring and Invention."

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tions, and court decisions.[10] As a result, historians of science and technology have gained new historical and methodological insights necessary to scrutinize subject matter that was once exclusively the purview of lawyers and legal scholars. However, some of the most interesting questions in the history of intellectual property arise just outside of the purview of patent law, when firms and individuals struggle to decide either which form of protection is best suited for a new good, or if any protection is available to begin with.[11] Indeed, the present article shows how this struggle has been shaped by commercial interests, the transmission of technical knowledge to lay audiences, and idiosyncratic views about the nature of information technologies and human creativity.

This article is divided into three parts. The first section provides an overview of the relationships between the computing industry and CONTU's formation and early work. It shows how the commissioners acquired their basic understanding of the technical and legal aspects of software during a tour of IBM's facilities in New York led by the company's legal and technical staff. The second recounts how the views on the nature and copyright-eligibility of software that the commissioners encountered throughout their meetings deviated from what they had learned at IBM. The final section shows how the only commissioner who dissented from CONTU's official recommendation, Pulitzer Prize–winning author and journalist John Hersey, drew on his own views on the nature of human creativity in order to reject the establishment of software as an entirely new kind of copyright-eligible work.

10. For patenting and computing, see Gerardo Con Díaz, "Embodied Software"; Con Díaz, "Contested Ontologies of Software"; Martin Campbell-Kelly, "Not All Bad"; and Pamela Samuelson, "The Strange Odyssey of Software Interfaces as Intellectual Property." For patenting and biotechnology, see Daniel Kevles, "A Primer of A, B, and Seeds"; Daniel Kevles, "New Blood, New Fruits"; Daniel Kevles, "Patents, Protections, and Privileges"; Daniel Kevles and Ira Berkowitz, "The Gene Patenting Controversy"; Daniel Kevles, "Ananda Chakrabarty Wins a Patent"; Doogab Yi, "Who Owns What?" Kara Swanson, "Biotech in Court." Works that explore new methods and questions in the history of intellectual property include Alain Pottage and Brad Sherman, *Figures of Invention*; William Rankin, "The Person Skilled in the Art Is Really Quite Conventional"; Swanson, "The Emergence of the Professional Patent Practitioner"; and Joseph Gabriel, *Medical Monopoly*. See also Alex Wellerstein, "Patenting the Bomb"; Christopher Beauchamp, "Who Invented the Telephone?" Nicolas Rasmussen, *Gene Jockeys*; and Christopher Kelty, *Two Bits*.

11. See, for instance, Kevles, "Inventions, Yes; Nature, No"; Kevles, "New Blood, New Fruits"; Christopher Kelty, "Inventing Copyleft"; Pamela Samuelson, "The Story of *Baker v. Selden*"; Jon Harkness, "Dicta on Adrenalin(e)"; and Rebecca Eisenberg, "The Story of *Diamond v. Chakrabarty*." See also Biagioli, "Between Knowledge and Technology"; Christopher Beauchamp, *Invented by Law*; Maureen O'Rourke, "The Story of *Diamond v. Diehr*."

Computing and CONTU

The early 1970s were turbulent years in the history of American copyright reform. Since the 1950s, lawmakers in Congress had been attempting to overhaul the nation's copyright system, but a series of disagreements had prevented the passage of a new copyright act for nearly two decades.[12] The most prominent points of contention had been the Copyright Office's bureaucratic structure; the official requirements that authors needed to meet in order to secure copyright protection; and the need to pay royalties when a television program was transmitted via cable television.[13] By the early 1970s, lawmakers believed that they were finally approaching the passage of a new copyright act, but one final hurdle stood in their way—the fear that computers could soon enable users to unleash a wave of paperless copyright infringement.

Computers were becoming cheaper, smaller, and easier to use than ever before, and the market for their programs was growing at an unprecedented rate.[14] Until the late 1960s, IBM had distributed its application programs free of charge with the purchase of its hardware. This practice was called "bundling," and it stopped in 1969 when the company issued what is now known as its "unbundling decision."[15] Once IBM started to charge a fee for its own application programs, the market for computer programs started to grow, and many firms in the software products industry began to see healthy profit for the first time. At the same time, the development of computer networks and time-sharing systems for universities and federal agencies demonstrated that individual computers could be connected with one another to form wide networks for the transmission of information.[16]

No prominent corporate or federal agents believed that users were already committing computer-assisted copyright infringement, but lawmakers and the heads of the Copyright Office agreed that it was only a matter of time before computers became the new machine of choice for the copyright pirate.[17] Reformers and scholars alike believed that computer-enabled data transmission would create a sequel to the paper-based piracy that had accompanied the spread of photocopying machines since the 1960s.[18] Indeed, the use of photocopiers had wreaked havoc on the publishing industry. Academic journals had perished because users were can-

12. Barbara Ringer, "Copyright Law Revision."

13. Ibid.; E. Stratford Smith, "The Emergence of CATV."

14. Campbell-Kelly et al., *Computer*.

15. For more on unbundling, see Steven Usselman, "Unbundling IBM"; Campbell-Kelly, *From Airline Reservations to Sonic the Hedgehog*; and JoAnne Yates, "Application Software for Insurance in the 1960s and Early 1970s."

16. Joy Rankin, "From the Mainframes to the Masses"; Campbell-Kelly et al., *Computer*.

17. Barbara Ringer, "Our Copyright Law."

18. See, for instance, Ringer, "Copyright Law Revision."

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celing their subscriptions in favor of photocopying the articles that interested them; publishing firms had become especially litigious against public libraries that provided photocopying services; and libraries and individual users continued to photocopy millions of pages every year.[19] However, photocopiers had ceased to be the only popular machines that could reproduce information at the touch of a button. The new generations of computers could do the same, even though their reproductions did not necessarily leave behind a paper trail.[20]

It was in response to these concerns that Congress created CONTU in 1974. Lawmakers believed that the spread of computers and photocopiers created important problems in copyright law, but they did not want to delay their efforts to pass a copyright reform act any further. CONTU would enable them to exclude from the upcoming Copyright Act what lawmakers called "some of the knotty problems" created by these two technologies.[21] President Gerald Ford approved of this mission statement, and in 1975 he appointed twelve commissioners to CONTU. These commissioners, shown in figure 1, represented the interests of copyright owners, copyright users, and the general public. Those who represented copyright owners included John Hersey and three executives from publishing firms.[22] The commissioners representing copyright users included Harvard law professor Arthur Miller and three representatives from the professional community of librarians.[23] Finally, those selected on behalf of the general public included Melville Nimmer, a prominent copyright scholar; George Cary, a former register of copyrights; Stanley Fuld, a former federal judge; and Rhoda Karpatkin, executive director of the Consumers Union. Chairing the commission was Arthur Levine, a prominent intellectual property scholar.

Surprisingly, the commissioners' collective expertise covered all matters relevant to CONTU's mission except for one: computing. Instead, they brought to the table decades of experience studying copyright law on an academic level, navigating its implications for different kinds of institutions, and protecting the needs and rights of copyright owners and users.

19. Harvey Perlman and Laurens Rhinelander, "Williams & Wilkins Co. v. United States."

20. Campbell-Kelly et al., *Computer*.

21. National Commission on New Technological Uses of Copyrighted Works, *Meetings 1 through 5*, 0.

22. The three executives were Dan Lacy, senior vice president of McGraw-Hill; E. Gabriel Perle, vice president of Time Inc.; and Hershel Sarbin, president of Ziff-Davis Publishing. This paragraph is based on National Commission on New Technological Uses of Copyrighted Works, *Final Report of the National Commission on New Technological Uses of Copyrighted Works*, 4.

23. These were Alice Wilcox, director of the first library teletype network to cross state lines; William Dix, Librarian Emeritus of Princeton University; and Robert Wedgeworth, executive director of the American Library Association.

FIG. 1 The CONTU commissioners, other prominent practitioners in the field of intellectual property, and their assistants. Barbara Ringer, assistant register of copyrights, is standing second from the left. John Hersey, author of the fiery dissent against the rest of the commissioners' views on the nature of software, is sitting third from the right. (Source: Box 59, John Hersey Papers; courtesy of Yale Collection of American Literature, Beinecke Rare Book and Manuscript Library, Yale University, New Haven, CT.)

Their exposure to the relationships between computing and copyright law began on 18 December 1975, when a copyright attorney for IBM named Joseph Taphorn took them on a tour of his company's facilities.[24] Several months earlier, Taphorn's colleagues had written to CONTU offering the commissioners an opportunity to learn the basic components of a computer and to become familiar with software programming.[25] Although some commissioners doubted that such education was necessary, Levine and Karpatkin eventually convinced their colleagues that understanding the point of view of a firm as important as IBM would be valuable both to CONTU and to the computing industry as a whole.

At IBM's Data Processing Division headquarters in White Plains, New York, Taphorn and his colleagues introduced the commissioners to the history and technical details of hardware and software. The IBM staff presented the company and its machines as the culmination of centuries of data processing, which they defined as "recording and handling of information by means of mechanical or electronic equipment."[26] In their view, the history of data processing was a teleological narrative of isolated technological advances that began with adding machines in the seventeenth century, passed through Charles Babbage's designs in the nineteenth century, accelerated with the development of ENIAC and transistors, and cul-

24. Ibid., 43.
25. Ibid., 33.
26. Ibid., 43.

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minated with IBM's current devices.[27] There were no corporate interests, regulatory frameworks, or industrial conflicts in this narrative, nor was there a history of usage, programs, or programming. Instead, the history of data processing appeared to the commissioners as the history of how a series of isolated and benevolent inventors created groundbreaking devices for the benefit of mankind. The endpoint of this history was the modern computer—a device that operated with punched cards, magnetic tapes, or disks and which the IBM staff defined as a machine that can accept, organize, and manipulate input to produce "an output that does not look like any other product."[28]

The records of this meeting suggest that IBM did not refer to software as an entity that could exist separately from any hardware. Instead, hosts such as Taphorn used the terms "software development" and "programming of a machine" in reference to the "instructions sets" that directed the operation of a computer and were "intimately related" to the design of the machines they controlled.[29] In other words, the collective wisdom of the IBM staff suggested that if there was such a thing as "software," it was inseparable from the hardware. A set of instructions did not become a computer program until it became the programming of a machine after being loaded onto a tape, disk, punched card, or computer. This meant that everything that a programmer did prior to this loading—the brainstorming, flowcharting, and even the writing of the instructions in a particular language such as COBOL or FORTRAN—constituted writing. The IBM staff did not explicitly articulate the legal implications of this observation, but this view of programming meant that the human-readable code that programmers produced was nothing but a text similar to the ones that copyright law had protected for centuries.

After this discussion on the nature of software and a brief informal chat with a few executives, the commissioners examined a handful of printers, card readers, and terminals. The IBM staff took them from room to room, showing them a collection of devices with which some of the commissioners were probably unfamiliar. As the visitors marveled at some of the mechanisms they encountered, Ralph Gomory, IBM's vice president and director of research, casually explained his vision of what the future could bring to the computing industry. Devices would surely get cheaper and smaller, and there was no doubt that the ability to copy and transmit data would soon become very affordable, even to casual users sitting in their homes. Processors were becoming more powerful, so the computers' ability to copy and transmit information was bound to improve considerably, diminishing "the clumsiness of copying."[30] As computer networks became

27. Ibid., 43–46.
28. Ibid., 43.
29. The quotes in this paragraph are taken from ibid., 43–62.
30. Ibid., 50.

wider and denser and machines became more widely available, transmitting any material at all from one computer to another would become a pedestrian task regardless of the copyright status of the material being transmitted. In short, Gomory presented the commissioners with a view of the future in which poems, books, and maybe even images and computer programs could be transmitted from one machine to another as easily as television sets received their signals through broadcasting or cable.[31]

These lessons suggested to the commissioners that the primary challenge that they needed to address was the need to reform copyright law in order to prevent the illegal distribution of proprietary programs. This problem dated back to the mid-1960s. In 1964, a second-year student at Columbia Law School named John Banzhaf had submitted two short computer programs to the Copyright Office.[32] Less than a month later, the Copyright Office had accepted Banzhaf's copyright registrations, but not on the grounds that software was a new category of work eligible for protection. Instead, the registration had been the result of the office's so-called "rule of doubt policy"—the practice of resolving uncertain cases in favor of the applicant.[33] In response to Banzhaf's request for registration, the office classified software as kinds of books and pamphlets, and not as a new category of work eligible for copyright protection.[34] This had made software a kind of literature in the eyes of copyright law, and it meant that the fact that software could also be presented through the use of flowcharts, sequences of zeroes and ones, or even electrical circuitry diagrams was irrelevant.

The Natures of Software

During their first few months of work, the CONTU commissioners slowly started to agree on some of the features that defined software. At first they struggled to find an appropriate analogy with which they could understand the nature of computer programs. Their efforts to determine what "computer programs are more or less like" had only enabled them to determine the categories of things to which software did not belong.[35] By 1977, they had decided that programs "are 'like' little else," and that they

31. Ibid., 49–51.

32. "Computer Program Copyrighted for First Time"; United States Copyright Office, "Books and Pamphlets."

33. Office of Technology Assessment, *Finding a Balance*.

34. Assessing the copyright-eligibility of computer programs was difficult because software complicated the distinctions between an idea, an expression of an idea, and an invention that stood at the heart of intellectual property law. "Computer Program Copyrighted for First Time"; United States Copyright Office, "Books and Pamphlets." See also Biagioli, "Between Knowledge and Technology"; Biagioli, "Patent Republic."

35. The quotes in this paragraph are taken from CONTU, "Report of the Software Subcommittee to the National Commission on New Technological Uses of Copyrighted Works," in "Computer Software," Box 58 in JHP.

might not be "like" books, paintings, or many machines. The characterization of software that satisfied them most was its definition as "a fixation of a series of statements or instructions to be used in conjunction with a computer in order to bring about a certain result." This definition had even led many commissioners to conclude, shortly after their visit to IBM, that copyright law should be amended to define software in that manner.

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To assess the viability of this definition, the commissioners solicited feedback from prominent programmers, lawyers, and business leaders. Internet pioneer Joseph C. Licklider was the only academic computer scientist who addressed the nature and copyright-eligibility of software at a CONTU meeting. During informal conversations prior to this meeting, the commissioners had come to recognize him as one of the most relevant academic computing researchers for their purposes.[36] In the 1960s Licklider had served as the director of ARPA, the organization that would later become DARPA, the Department of Defense Advanced Research Projects Agency. Through this agency, he had selected, funded, and even helped to direct research groups on timesharing, networking, and interactive computing at universities across the country.[37] Central to his work was the creation of timesharing networks, which connected several work stations to a central processing terminal and gave each user the impression of having full control over his or her machine. Licklider was now a professor at MIT, and he remained very interested in networking and resource sharing.

To the commissioners, Licklider's interests and status suggested that he was especially well qualified to discuss one of the primary issues that concerned them, namely whether computer programs were the kinds of objects that could be transmitted through geographically vast networks of computers.[38] In his testimony, Licklider spent some time discussing how computer networks worked and how they could change over time, but his primary goal was to discuss what software was. He told the commissioners that their definition of software bothered and distressed him, although he fell short of telling them that they were entirely wrong. Certainly, text in a programming language could be transmitted from one computer in a network to the next, but Licklider believed that programs should not be reduced to the texts that programmers used to construct them. To him, a

36. National Commission on New Technological Uses of Copyrighted Works, *Transcript of CONTU Meeting Number 18*.

37. The biographical remarks about Licklider in this paragraph are based on M. Mitchell Waldrop, *The Dream Machine*.

38. The commissioners' consideration of Licklider as the representative of all academic computer scientists illustrates what historians of technology and scholars in science and technology studies identify as the blurry lines that separate expertise from political prominence in the history of scientific advising and technological decision-making. Of course, Licklider's reputation as a researcher preceded him, but his prominence in the management of federal research projects made him especially appealing as a witness for CONTU. See Rebecca Slayton, *Arguments that Count*; Jay Aronson, *Genetic Witness*; Simon Cole, *Suspect Identities*; Tal Golan, *Laws of Men and Laws of Nature*.

program was, ultimately, "something that gets slipped into a computer."[39] A program may have instructions written in a specific language, but for these instructions to become useful, they require a computer; unlike a poem or a novel, a program is worthless without this connection to a device. For this reason, Licklider believed it was a mistake to think about a computer program as a description of a process or as a set of instructions, regardless of the medium in which a programmer submitted it to the Copyright Office. To press this point further, Licklider explained that the commissioners' question of whether a program "is more like ink on paper or like magnetics in a magnetic medium, or holes in electrons in a semiconductor" would become irrelevant if CONTU accepted that software was an object that transcended any medium used to transmit it.

Licklider was convinced that CONTU was misinterpreting the nature of software, so he insisted that the commissioners' decision to focus on copyright was inappropriate.[40] His argument that a program was a thing to be inserted in a computer was central to his more ambitious goal of arguing that patent law provided more appropriate protection for software. Licklider believed that a computer program was "very much like a machine"—that is, that software is "something which, when activated, when energized, behaves and produces process." Thus, the problem of securing intellectual property protection for software amounted to recognizing that protecting the code that a programmer wrote did nothing to protect the program itself. "All people want is the effect of the action of the program," he explained in a climactic point of his oral testimony, "they don't care a thing for the particulars of the expression."

Licklider's passionate testimony did not ultimately sway the commissioners to believe that software was ineligible for copyright protection, but it did put a quick end to the possibility of debating whether software was such a novel form of technology that it required the development of an entirely new form of intellectual property protection. Commissioner Hersey had become the most avid advocate of this argument. Before joining CONTU, Hersey had become a central creative and political figure in American fiction, nonfiction, and journalism.[41] His first novel, *A Bell for Adano*, won the Pulitzer Prize for the Novel in 1945. By the start of his tenure at CONTU, Hersey had published nearly twenty books. He was both the master of a college at Yale University and president of the Authors League of America. It was in the latter capacity that he had been appointed as commissioner; his presence in CONTU was meant to ensure that the

39. All quotes in this paragraph are taken from oral testimony of JCR Licklider, in "Computer Software," Box 58 in JHP.

40. All quotes in this paragraph are taken from ibid.

41. John Hersey is now best known for his 1946 book *Hiroshima*, on six of the survivors of the atomic bombing of Hiroshima in August 1945. The biographical information in this paragraph is based on Nancy Huse, *John Hersey and James Agee* and Nancy Huse, *The Survival Tales of John Hersey*.

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commission would take into consideration the best interests of the country's authors.

In his recent works, Hersey had repeatedly shown how texts, literature, and national prosperity are inseparable features of an author's life.[42] He believed that the work of literary authors was crucial to the well-being of the nation. A society that rejected art was doomed to self-destruction, and authors had the moral responsibility of ensuring that such rejection did not take place. His recent works, especially *The Algiers Motel Incident* and *Letter to the Alumni*, depicted authors who both assumed moral responsibility for the worlds in which they lived, and intervened actively in the issues of their time. Hersey assumed these responsibilities in his own life; he had become very politically involved, and had risen to the top of the Authors League. By the mid-1970s, he had completed works such as *The Conspiracy* and *My Petition for More Space*, which continued to emphasize that art—especially literature in all its forms—is essential to ensure that social structures do not self-destruct.

What interested Hersey most about computer programs were not their technical details, but the fact that programs included text.[43] He believed that these texts were not of the same kind as those with which he had become familiar prior to joining the commission. Instead, they seemed to him a blend between words and machines—hybrid objects that replaced human creativity with the potential for mechanical and electronic efficiency. It was on this point that Licklider's testimony resonated most with Hersey's views. Indeed, the two of them came to agree that computer programs were devices that triggered specific processes—that is, that they belonged to a category of objects that fell under the purview of patent law. These devices had a textual component, but they were not what Hersey identified as works of authorship.[44]

Prominent attorneys at industrial research laboratories joined Licklider and Hersey in their belief that copyright was an inappropriate form of protection for computer programs. Among them was Robert O. Nimtz, one of the most prominent patent lawyers at the time. A staff member at Bell Telephone Laboratories' Intellectual Property Division, Nimtz had become well known in his field for his advocacy of software patenting. Since the 1960s, he had been especially interested in identifying and systematizing patent-drafting techniques that inventors could use to secure patent protections for their programs.[45] His ideas on the nature and patent-eligi-

42. Previous works on Hersey pay special attention to how Hersey's political work related to his creative work, but they do not address how these relationships impacted his work at CONTU. The biographical information in this paragraph is based on Huse, *John Hersey and James Agee*.

43. John Hersey, "Computer Software Protection Act" and "JLS Draft," both in "Computer Software," in Box 58 of JHP.

44. "JLS Draft," in "Computer Software," in Box 58 of JHP.

45. Con Díaz, "Embodied Software" and "Contested Ontologies of Software."

bility of software had risen to prominence in the 1960s thanks to his central role in directing the journey of an application for a software patent from Bell's laboratories to the Supreme Court.[46]

Writing on behalf of Bell Laboratories, Nimtz submitted a detailed critique of CONTU's work. He warned that Congress and the commission had failed to realize that a legal mechanism such as copyright would ultimately "hinder the further development" of software. He provided two justifications for this reasoning. First, he argued that secrecy was the "main avenue of protection" that had enabled the spread of computer programming, and from this he concluded that the widespread adoption of copyright would strip companies of their preferred method of protection. Second, he insisted that software was "radically different from any other subject matter" ever to fall under the purview of copyright. In his view, this difference stemmed from the fact that computer programs were simultaneously machine-control elements and writings. Regardless of how firmly copyright law could restrict the use, reproduction, and distribution of the text of a computer program, it would fail to protect what was actually the "valuable subject matter" of a program, namely its uses.[47]

At the heart of this critique was Nimtz's understanding of software as an object with an unstable nature.[48] He believed that software could be found in two forms. First, there was text—flowcharts, verbal descriptions of algorithms, and even written statements of the program steps in a programming language. In this form, software was writing akin to books, poems, and hand-drawn illustrations, and so it was eligible for copyright protection. This is where Nimtz's understanding of the nature of software was most distinct from Licklider's: unlike Licklider, who saw software as an entity with a dual nature, Nimtz believed that the nature of a computer program was a function of the relationship between its history and its medium. As long as the program took the form of texts or diagrams, it merely conveyed information to a reader. However, Nimtz insisted, the journey of a computer program from a programmer's mind to the work of a computer involved more than just the typing of text. At some point, the program would need to be fixed in a machine-readable medium such as a magnetic tape; otherwise no computer would be able to run it. Once this fixation occurred not "for the purpose of recording or storing the information in the writings," but for "the sole purpose of controlling a machine," the program ceased to be just a text. At this point, the program became a "machine element," thus making patents, not copyright, the appropriate legal protection for it.

46. This journey culminated with the issuing of Gottschalk v. Benson, 409 U.S. 63 (1972). See Con Díaz, "Contested Ontologies of Software"; Pamela Samuelson, "Benson Revisited."

47. All quotes in this paragraph can be found in Robert O. Nimtz to Arthur Levine, August 30, 1978, in "Computer Software," in Box 58 of JHP.

48. This paragraph is based on ibid.

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The views of Nimtz, Hersey, and Licklider stood in stark opposition to those advanced by the people representing hardware and software firms. The latter appeared before the commission with the apparent aim of securing any form of protection they could. For instance, prominent programmer Martin Goetz, on behalf of Applied Data Research (ADR), explained that copyrights would give his company additional protections that would complement software patenting and trade secrecy. He appeared to have no qualms with the assertion that computer programs were writings, or even literary works.[49] ADR had secured copyright protection for all its major products; high-demand programs such as AUTOFLOW were protected by both patents and copyrights; and users were required to sign an agreement that precluded them from distributing or reproducing any programs or their components.[50] Goetz insisted that the view of programs as machine components was inaccurate, and that programs were essentially texts that could be translated from a programming language into machine language.[51] The fact that they could embody a machine process was irrelevant to the question of software copyright, even though it remained crucial to software patenting.[52]

The computing industry appeared to form a single school of thought on the matter of software copyright. Indeed, Goetz stood alongside the Information Industry Association (IIA) and the Computer and Business Equipment Manufacturers Association (CBEMA)—the professional association for firms such as Honeywell and IBM.[53] Representatives from the CBEMA and the IIA agreed that extending copyright protection to computer programs was a desirable development. Like Goetz, they did not protest the treatment of software as a form of literary work that had sparked deep concern in Hersey, Licklider, and Nimtz. On the contrary, the industry representatives argued that the working definition of software as a literary work comprising a set of instructions should be further

49. National Commission for New Technological Uses of Copyrighted Works, *Transcript, CONTU Meeting No. 16*. See also Edith Holmes, "Program Copyright Gains Support," *Computerworld*, 10 October 1977, in "Computer Software 1," in Box 59 of JHP.

50. National Commission for New Technological Uses of Copyrighted Works, *Transcript, CONTU Meeting No. 16*, 58. For more on AUTOFLOW, see Con Díaz, "Embodied Software"; Nathan Ensmenger, "The Multiple Meanings of a Flowchart."

51. This was unusual for Goetz, as his firm and lawyers had repeatedly argued that software is a patent-eligible machine. At CONTU, however, this line of thought would have worked against his argument for the copyright-eligibility of software. National Commission for New Technological Uses of Copyrighted Works, *Transcript, CONTU Meeting No. 16*, 62.

52. Ibid., 61.

53. This alliance was unusual given that CBEMA had stood in stark opposition to Goetz and the IIA on the matter of software patenting. CBEMA often argued that software patenting would preclude the growth of the software industry, but it did not object to software copyright because copyrights were easier to bypass than patents. Con Díaz, "Contested Ontologies of Software."

amended to protect any programs that were automatically generated by a computer in the course of executing another program.[54]

The computing industry's needs were as important to the commissioners as its ontologies of software. As CONTU's term came to an end, the commissioners received the results of a survey that they had commissioned to the Boston-based consulting firm Harbridge House.[55] This survey was designed to identify the financial and legal needs of the software industry based on a study of 116 companies affiliated with the Association of Data Processing Services Organization (ADAPSO, the main trade organization for the software industry). Harbridge House reported that the limited monopolies afforded by patents and copyrights were "a matter of monumental insignificance to the industry," and firms seeking such protection seemed to be an anomaly. It also found that some firms were more willing to seek intellectual property protection for their programs than others. One characteristic that often determined whether or not a company would be interested in applying such protection was the kind of programs it produced. Those that sold custom-made programs for engineering or other technical fields were the least likely to seek copyright or patent protection, and those that created off-the-shelf applications or systems programs were the most likely to seek it. A more important characteristic was the size of the company; large firms that produced operating systems and business software often sought some sort of intellectual property protection.

ADAPSO's leaders insisted that the Harbridge House survey had clearly demonstrated one crucial point: the intellectual property protection of software, which could be partially achieved through copyright, was immensely important to the industry.[56] In their formal statement to CONTU, they explained that all the companies that had answered the questionnaire agreed that it was important to protect the programs that had become their primary assets. Some of them had relied on patents, and for over a decade others had relied on copyrights. Most of them even relied on several forms of protection simultaneously, since there were no clearly defined legal mechanisms to provide what ADAPSO called "the degree of protection deemed necessary by the industry."[57] ADAPSO wholeheartedly

54. For a view of this matter in the popular press, see Edith Holmes, "Program Copyright Gains Support," *Computerworld*, 10 October 1977, in "Computer Software 1," in Box 59 of JHP.

55. Harbridge House was founded by the prominent government official and former secretary of the navy Paul Robert Ignatius. In the 1970s, it had taken on federal research projects, especially those related to reforming American intellectual property law. This paragraph is based on Harbridge House, *Legal Protections of Computer Software: An Industrial Survey*, as found in *Copyright, Congress and Technology: The Public Record*, edited by Nicholas Henry, vol. 4, 370.

56. Statement of ADAPSO to National Commission on New Technological Uses of Copyrighted Works. Software Protection Committee, January 1976–August 1977, in Box 6 of MAGP.

57. Ibid., 3.

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rejected the idea that software could be considered "mechanical devices." The group argued instead that programs were authored by professional programmers, and that they were merely writings for highly technical areas. Unlike IBM, which had defined programs as objects that came into being once the instructions written by a programmer were loaded onto a computer, ADAPSO insisted that everything—from the flowcharts to the machine code that directed a machine—was a text, and that all of it was therefore eligible for copyright protection.[58]

The needs of the industry as portrayed by ADAPSO and Harbridge House motivated the commissioners to favor software copyright. CONTU's *Final Report* shows that the commissioners' work to identify the nature of computer programs relied on the computing industry's argument that computer programs were, ultimately, text. It proposed that copyright law should be amended to declare that "computer programs, to the extent that they embody an author's original creation," are eligible for copyright protection.[59] This was grounded on the assumption—opposite to the views of Nimtz, Licklider, and especially Hersey—that a computer program is merely a form of writing that consists of sets of instructions. The *Final Report* stated that software was "prepared by the careful fixation of words, phrases, numbers, and other symbols in other media."[60] It also presented an analogy that paired computers with music systems.[61] A computer's circuit boxes were analogous to music boxes, punch cards to piano rolls, and magnetic disks to music tapes. This analogy advanced the view that programs loaded onto a computer, like recorded music in a music player, were just "sets of information in a form which, when passed over a magnetized head, caused minute currents to flow in such a way that desired physical work is accomplished."[62]

Hersey's Dissent

John Hersey wrote a fiery dissent against his colleagues' stance on the ontology and copyright-eligibility of software. He believed that CONTU's decision was inappropriate and unnecessary, and in his private drafts he condemned the commission's misunderstanding of what he understood as

58. Ibid., 5.

59. National Commission on New Technological Uses of Copyrighted Works, *Final Report of the National Commission on New Technological Uses of Copyrighted Works*, 1.

60. Ibid., 10.

61. Music systems, especially pianola rolls, have been a recurring source of metaphors in American copyright law for more than a century. See White-Smith Music Publishing Company v. Apollo Company, 209 U.S. 1 (1908); Capitol Records v. Naxos of America, 4 N.Y. 3d 540 (N.Y. 2005).

62. National Commission on New Technological Uses of Copyrighted Works, *Final Report of the National Commission on New Technological Uses of Copyrighted Works*, 1.

"the duality" of software.[63] By this, he meant that at "a certain point in its development," a computer program transforms from a writing to "a machine control element, a mechanical device" which "ought not to be copyrighted." In his dissent, Hersey transformed his ideas on the duality of software into a framework to understand the nature of software that took into consideration each program's own history. Following Nimtz's arguments, he noted that the development of a program proceeds through several stages. A program would first be born out of a programmer's effort to define a task. It would then be outlined through flowcharts, translated into code using languages such as FORTRAN or COBOL, and then translated again, this time into machine language that was illegible to human beings.

Hersey believed that after this final translation, the program entered maturity—a "mechanical phase" in which it "becomes physically embodied" in punched cards, disks, tape, or chips.[64] Programs only became valuable in this mature stage, for it was only then that they were able to perform their unique function, namely the control of the electrical impulses within a computer that enable the completion of a prescribed task. By this point, the program did not merely describe or direct mechanical work. On the contrary, the program was what actually did the work. For this reason, Hersey believed that CONTU was committing a grave mistake by failing to realize that the instructions (which they equated with the program) eventually became "an essential part of the machinery to produce desired results." In his view, the commissioners did not understand that software is merely a "device capable of commanding a series of impulses which open and close the electronic gates of the computer."

Hersey's views on the nature and copyright-eligibility of software were also motivated by his personal understanding of the value of human creativity.[65] In a commission that often seemed to focus too much on what Hersey believed to be "excessively lawyerish fine points," he felt responsible for taking his colleagues on long "excursions into emotion."[66] He had insisted throughout the hearings that the decision to extend copyright protection to computer programs was not just a misguided legislative maneuver, but also an attack on the cultural well-being of the nation. More important, he repeatedly reminded commissioners that the equation of software with writ-

63. All quotes in this paragraph are taken from John Hersey, "Software: A Dissent," draft dated 27 January 1978, and annotated 6 February 1978, in "Computer and Software 2," in Box 59 of JHP.

64. All quotes in this paragraph are taken from ibid., 28.

65. Hersey himself allegedly committed copyright infringement and plagiarism several times since the 1940s, but no evidence suggests that his experience with infringement informed his work in the commission. William H. Honan, "Hersey Apologizes to a Writer over an Article on Agee"; Anne Fadiman, *Ex Libris*, 109.

66. John Hersey to Arthur Levine, undated correspondence, in "Copyright and Software 4," in Box 59 of JHP.

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ings was an affront to human nature. In his view, copyright protection was intended for categories of media made by and for human beings, including "written words by the human eye," "music by the ear," and "paintings by the eye."[67] He complained that the commissioners were polluting both human creativity and the notion of a writing, and that they were committing a dangerous "blurring and merging of human and mechanical communication."[68] This negation of the qualities that separated human beings from machines would equate the work of a computer with literary expressions of human emotion. The great danger was that a culture that accepts the equivalence of men and machines would eventually become unable to experience, bring to life, or even communicate "the bundle of qualities" that comprise humanity—human emotions such as courage, fear, desire, and hope.[69]

But Hersey lost this battle, and the high premium that the testimony of the computing industry's representatives carried was made evident in CONTU's *Final Report*. His colleagues proceeded almost as if they had chosen to ignore most of the testimony delivered by the opponents of software copyright, and they explicitly rejected Hersey's opinions on the matter. They viewed his attempts to plead for human emotions as a prompt to legislate in a way that would give the government the right to "assess the merits of a work and choose only those works which in its view are 'good enough' for copyright."[70] In turn, this would create an unfair distinction between works of "great and small aesthetic value" that determined eligibility for copyright. For this reason, they concluded that extending protection to computer programs was essential to ensuring that copyright law "applied to all forms of expression." Indeed, they explained that this was the only way to ensure that the country would have a copyright law broad enough "to shelter the works of Nobel Laureates and computer programmers without causing any confusion about which is which."

CONTU's recommendations on software copyright did not face any opposition in Congress. In 1980, lawmakers passed the Computer Software Copyright Act, an amendment to the Copyright Act of 1976 designed almost exclusively to incorporate CONTU's recommendations into copyright law. The act defined computer programs as software firms and hardware manufacturers understood them, namely as "a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result."[71] This helped to spark an exponential increase in the number of registered computer programs; by the mid-1980s the Copyright Office was accepting over five thousand yearly registrations

67. John Hersey, "Additional Views on Computer Software," in Box 58 of JHP.
68. Ibid.
69. John Hersey, "Memorandum," 3 February 1978, in Box 58 of JHP.
70. The quotes in the rest of this paragraph are found in "Software Subcommittee Report and Additional Views," undated, in "Computer Software," in Box 58 of JHP.
71. H.R. 6933, 46.

for computer programs—one thousand more than the total number accepted from 1964 to 1980.[72] The 1980 act made computer programs a new class of copyright-eligible works, and it afforded them similar protections to those that copyright law traditionally provided for works of literature. This meant that software no longer needed to be classed with literary works, as it had been since the 1960s. It enabled firms to submit a collection of materials—the texts written in any programming language, any verbal or graphic descriptions of the program, and any supporting documentation—as a single bundle for the purposes of copyright registration.[73]

The 1980 act marked the beginning of a new era in the history of software copyright that extends to the present day. It transformed CONTU's *Final Report* into a very rare kind of document—a piece of the legislative history of copyright on which courts can rely to study the congressional intent behind the text of the law. In fact, in 1983 one court went so far as to conclude that Congress's unproblematic adoption of CONTU's recommendations meant that the report itself "reflects the Congressional intent."[74] However, during the 1980s, judges across the country struggled to identify which parts of a program written in a programming language constituted its copyright-eligible expressive elements, and which ones were merely technical elements required to enable the program to work in a particular machine. Indeed, CONTU's recommendations and the 1980 act left to the courts a difficult puzzle that has not yet been resolved—crafting standards to distill creativity from utility in a computer program.[75] The spread of software for personal computing in the 1980s, home internet starting in the 1990s, and cloud computing today have made this task more difficult than ever.

Conclusion

Copyright law served as a ground on which programmers, business managers, lawyers, and laypeople negotiated ontologies of software. Historians of computing have long recognized that the word "software" has

72. Office of Technology Assessment, *Finding a Balance*, 65.

73. Anon. (probably an attorney for ADAPSO), "Discussion of Proposed Amendments," 23 October 1981, in Box 58 of JHP.; Office of Technology Assessment, *Finding a Balance*, 65.

74. Midway Manufacturing Company v. Strohon, 564 F. Supp. 741 (N.D. Ill. 1983), at 750 n.6. Other decisions that relied on CONTU's work include Apple Computer v. Formula International, 725 F.2d 521 (9th Cir. 1984); Apple Computer v. Franklin Computer, 714 F.2d 1240 (3rd Cir. 1983).

75. The most prominent cases in this group include Data Cash Systems v. JS&A Group, 628 F.2d 1041 (7th Cir. 1980); Apple Computer v. Franklin Computer, 714 F.2d 1240 (3rd Cir. 1983); Apple Computer v. Formula International, 725 F.2d 521 (9th Cir. 1984); Q-Co Industries v. Hoffman, 625 F. Supp. 608 (S.D. N.Y 1985); and Whelan Associates v. Jaslow Dental Laboratory, 609 F. Supp. 1307 (E.D. Pa. 1985).

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taken on several historically contingent meanings; that historical actors used this word primarily in reference to products, services, concepts, or some combination of them; and that these uses played a crucial role in shaping the historical relationships among programmers, users, and the markets and institutions that connected them.[76] Recent studies of the history of software patenting have enriched and expanded this work in two ways. First, the collection of meanings that historical actors have attributed to the word "software"—and, more importantly, the collection of ontologies of software that they have advanced—is surprisingly diverse. Second, a deeper understanding of this diversity is crucial to make sense of the historical relationships between the computing industry and the law.[77]

CONTU's story shows that this diversity is not unique to the history of software patenting, and it invites the introduction of a new theme into the historiography of computing. In recent years, historians of software have focused on the contexts within which people make, sell, or use computer programs. They have paid special attention to problems such as the making of the so-called information age and how programs embody the knowledge and values of the communities in which they circulate. In the process, they have demonstrated that the history of software is a rich ground on which to study major themes such as gender politics, globalization, federal funding, and regulation.[78] In contrast, the history of CONTU illustrates how a fundamental question—what is software?—has shaped the emergence of computer programs as technologies and properties.[79] In other words, it invites us to take a closer look at the historical contingency and significance of ontologies of software.

More generally, the history of software can enrich our understanding of how discourse shapes the emergence of new technologies as distinct

76. See, for instance, Nofre, Priestley, and Alberts, "When Technology Became Language"; Michael Mahoney, "What Makes the History of Software Hard"; Haigh, "Software in the 1960s as Concept, Service, and Product"; Campbell-Kelly, *From Airline Reservations to Sonic the Hedgehog*.

77. Bonaccorsi, Calvert, and Joly, "From Protecting Texts to Protecting Objects in Biotechnology and Software"; Con Díaz, "Embodied Software"; Con Díaz, "Contested Ontologies of Software"; Samuelson, "The Strange Odyssey of Software Interfaces as Intellectual Property."

78. The major historiographical reviews in the field include Nathan Ensmenger, "The Digital Construction of Technology"; Haigh, "The History of Information Technology"; Mahoney, "What Makes the History of Software Hard"; Thomas Misa, "Understanding 'How Computing Has Changed the World.'" See also Thomas Misa, ed., *Gender Codes*; Janet Abbate, *Recoding Gender*.

79. For years, many legal scholars, philosophers, and media theorists have crafted and advanced their own definitions of the word "software." However, adopting any one of them before engaging with our historical sources may prompt us to overlook some of the legal, conceptual, and commercial tensions that historical actors have faced. See David Berry, *The Philosophy of Software*; Rob Kitchin and Martin Dodge, *Code/Space*; Lev Manovich, *Software Takes Command*; Matthew Fuller, *Software Studies*.

entities.[80] The ontologies that the commissioners juggled were not inconsequential sparks of rhetorical flare. On the contrary, they highlighted what their authors identified as the defining features of software, and they were designed to serve as the conceptual underpinnings for the law of software copyright. There was no doubt that software was a technology, but the commissioners and witnesses disagreed on whether it was a text, a machine, a new creative work, or even an object with a changing nature. The mandate to provide recommendations to Congress forced them to choose one of these ontologies, but the mechanisms that they employed to make this choice did not include examining the technical details of computer programs. Instead, the commissioners relied on the authority and needs of large firms and trade associations, the prominence of Licklider and Nimtz in their respective fields, and their own views on creativity and copyright law.

CONTU's story also demonstrates that the history of the intellectual property protection of software is not neatly punctuated by the sequential entrenchment of ontologies of software. Previous scholars have studied case law and federal policy to show how various forms of intellectual property protection have served as the grounds on which software was transformed from a text to a machine, from an algorithm to a process, or from a series of mental steps to an intangible invention.[81] However, the CONTU commissioners' work shows that various ontologies of software coexisted and competed with one another; that each view was indicative of its proponents' commercial and legal circumstances; and that the assessment of the copyright-eligibility of software boiled down to deciding which ontology should emerge victorious.

Further study of technology and intellectual property will yield new insights into how the makers, users, and regulators of technology have juggled various ontological stances. This process often relies on the search for comparisons between new and old technologies, and it is a recurring phenomenon in the practice and history of intellectual property law. Like the CONTU commissioners, many federal judges, lawmakers, and the makers and users of new technologies have constructed, debated, and come to agreements about the nature of such technologies.[82] Some of their pre-

80. See Ruth Oldenziel, "Signifying Semantics for a History of Technology"; Slayton, *Arguments that Count*; Nofre, Priestley, and Alberts, "When Technology Became Language"; Peter Galison, "Ten Problems in History and Philosophy of Science."

81. See, for instance, Bonaccorsi, Calvert, and Joly, "From Protecting Texts to Protecting Objects in Biotechnology and Software"; Samuelson, "The Strange Odyssey of Software Interfaces as Intellectual Property"; Stobbs, *Software Patents*.

82. Debates about the nature of new technologies are not unique to the history of software. On the contrary, a focus on these ontological matters enables us to use the historiography of intellectual property as a tool to connect historiographies such as those of computing and biotechnology. See Pottage and Sherman, *Figures of Invention*; Biagioli, "Patent Republic"; Biagioli, "Between Knowledge and Technology"; Con Díaz, "Contested Ontologies of Software"; Kevles, "Inventions, Yes; Nature, No"; Daniel Kevles, "The Genes You Can't Patent."

ferred ontologies have reached courts and Congress; even fewer of them have become the conceptual grounding on which new legislation or court decisions stand. As researchers explore these issues, the histories of technology and intellectual property will continue to unveil how the handful of ontologies that survive this process were the victors in battles that could encompass entire industries.

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