

From closed world discourse to digital utopianism: the changing face of responsible computing at Computer Professionals for Social Responsibility (1981–1992)

Megan Finn & Quinn DuPont

To cite this article: Megan Finn & Quinn DuPont (2020) From closed world discourse to digital utopianism: the changing face of responsible computing at Computer Professionals for Social Responsibility (1981–1992), *Internet Histories*, 4:1, 6–31, DOI: [10.1080/24701475.2020.1725851](https://doi.org/10.1080/24701475.2020.1725851)

To link to this article: <https://doi.org/10.1080/24701475.2020.1725851>



© 2020 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 02 Mar 2020.



Submit your article to this journal



Article views: 1553



View related articles



View Crossmark data

From closed world discourse to digital utopianism: the changing face of responsible computing at Computer Professionals for Social Responsibility (1981–1992)

Megan Finn^a and Quinn DuPont^b 

^aUniversity of Washington, Seattle, Washington, USA; ^bUniversity College Dublin, Dublin, Ireland

ABSTRACT

Computer Professionals for Social Responsibility (CPSR) began in 1981 as a group of computer scientists concerned about nuclear destruction. Early CPSR members analysed military planning documents and levelled technical critiques at how computers were to be used in battle, highlighting the limits of computing technologies. Although early CPSR arguments were primarily technical, as responsible professionals their practices were based on a collective morality and a willingness to question their profession's economic self-interest. As the Cold War thawed in 1989, CPSR met a series of challenges, including financial issues, leadership turnover, and a changing and expanding role for information technology. CPSR emerged from this crisis with a renewed focus on "civil liberties" that was largely underwritten by the Electronic Frontier Foundation. Although CPSR's civil liberties advocacy sometimes retained its early arguments and practices by addressing the limitations of information technologies, they also adopted the emerging views of Silicon Valley's "digital utopianism," advocating for the growth of information technology. We describe this seemingly contradictory shift in responsibility along three axes: the use of standpoint epistemology for responsible computing, a transition from professional choice to lobbying, and a transition from substantivism to instrumentalism. In this paper, we characterize an important instance of collective responsibility for computing by tracing the evolution of CPSR's first decade of practices, techniques, and arguments with an eye towards the challenges of responsible computing today.

ARTICLE HISTORY

Received 22 August 2019
Revised 28 January 2020
Accepted 29 January 2020

KEYWORDS

civil liberties; computers and war; pre-Internet history; responsible computing; technology activism; values in computing

Debating the ethical use and responsible development of computing technologies is an evergreen concern that has intensified in recent years. With IT workers' renewed political consciousness, these technologies have taken on new meaning and importance. Political activism in computing communities today animates a broad range of topics, technologies, ideologies, and institutions. The so-called "techlash" includes the

CONTACT Megan Finn  megfinn@uw.edu  University of Washington Information School, Mary Gates Hall, 1851 NE Grant Ln, Seattle, WA 98105, USA

© 2020 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

Tech Workers Coalition, employee protests for safe workplaces at Google, activist organizations such as AI Now Institute, and political debates about the spread of “fake news.” In this article we draw attention to the resurgence of interest in “responsible computing” and contextualise it historically through a case study of Computer Professionals for Social Responsibility (CPSR), a professional group that sought to shape the future of computing through moral principles and values.

CPSR began in 1981, lasted for over 30 years, and spun off many of today’s leading Internet watchdog and activist groups. While mostly focused in the United States, CPSR’s extensive reach and decentralised, chapter-driven work agenda nonetheless meant that the organization addressed a wide-ranging set of concerns with global impact. This history has important lessons for the subsequent development of network and computer technologies by illuminating the origins of some of the ongoing debates and struggles for technology’s responsible use and development.

We enter into the responsible computing debate by uncovering and highlighting an organization that spans the formative years of the Internet, provides evidence of early activist and reform efforts, and therefore offers a source of reflection for politics today. We identify organizational changes in the context of broader social changes and new technological issues. We found that CPSR marshalled technical and political values to shape our contemporary understanding of responsible computing.

Using archival materials from the Charles Babbage Institute and the Stanford University Archives, as well as published and new oral histories with seven key figures of CPSR from its fertile early and middle periods (1981-1992),¹ we highlight how the organization’s social and political reforms drew on notions of responsibility. We focus on CPSR’s advocacy practices and its articulations of principles and found evidence of “responsible” professional activity operating in the context of changing social values in a capitalist and technologically organized society. During this period, CPSR often led the development of responsible computing but has seldom been acknowledged as an important actor. Despite its positive influence, CPSR also failed to recognize and resist broader moral transformations that were underway and through its practices, the organization was an active participant in the shift from “the closed world” (Edwards, 1997) to “the rise of digital utopianism” (Turner, 2006).

We analyse transformations in responsibility within CPSR during the height of its influence. Originally, CPSR sought to *limit* the development of computers for nuclear and AI-enabled weapons systems. Later, social, political, and technological changes along with shifts in organization membership caused CPSR and its allies to advocate for the *expansion* of computing technologies. One of those issues, privacy and surveillance, emerged as a potent concern. Throughout this transformation, responsible computing remained CPSR’s *raison d’être*: it educated the public and government about the risks of computing technologies even as the substance of its moral claims changed dramatically over time.

We characterize this transformation as an evolution of practices that constitute a new kind of responsible computing. CPSR members were originally motivated by professional choice, but later became motivated by political action. Once CPSR became active in direct lobbying and political persuasion, CPSR’s activism changed. While the organization grew in power, the epistemic standpoint that both motivated and limited

its duty of responsibility was replaced by emergent technocratic powers. The transformation from peaceniks to technocrats links Edwards' and Turner's theses—from closed world discourse to digital utopianism—but does not explain the connection. Thus, we turn to Andrew Feenberg's schema of technology (1999) and find that CPSR practices shifted from substantivism to instrumentalism. Early members of CPSR railed against a dangerous closed world by describing how technical means are linked to risky ends in complex military computing systems. Once CPSR became a technocratic actor, however, their previously sceptical views about technology transformed into a liberal faith in its progress. We conclude by offering lessons for today drawn from CPSR's history.

Resisting closed world logics

CPSR emerged out of concerns about computer-aided nuclear war. In 1981, the US government was deep in the Cold War. Initially, a small group of computer professionals at Xerox Palo Alto Research Center (PARC) raised concerns about computer-aided nuclear war on an internal mailing list. Nearby computer professionals and Stanford researchers joined the discussion and the nascent CPSR formed. Soon after, the Strategic Defense Initiative (SDI) was announced in 1983. The SDI aimed to fund novel science and engineering techniques, including advances in computing, to develop automatic defences against Soviet missile attacks. CPSR described SDI as "an armed early warning system... [that] would respond instantly to attack, intercepting missiles in space" (CPSR Speakers Bureau Speaker Training Packet, 1987). They also uneasily opposed military funding for artificial intelligence projects such as the Strategic Computing Initiative (SCI). In their expert opinion, the SDI and SCI were likely to contain software errors and therefore should not be developed. Members of the early CPSR sought to restrict military funding of SDI in particular and nuclear weapons systems in general,² concerned that the efforts of computer professionals should not be dictated by military logics.

By the close of the decade, the Cold War was fading and nuclear tensions were easing. Faced with new global politics alongside changing values and ideologies of CPSR members and emerging social issues as a result of new computing technologies, CPSR's activism broadened in scope. In this middle period of their history, CPSR entered into debates about electronic voting, community broadband, participatory design, and Internet governance; computer and online civil liberties became a focal concern. Using the methods developed previously for educating and shaping policy about SDI and SCI, CPSR members vigorously addressed emerging privacy and surveillance issues, including the debate about a new federal policy that would expand digital recordkeeping in the criminal justice system. Heralding the climate of activism today, when CPSR was in dire financial shape in the early 1990s the Electronic Frontier Foundation (EFF) stepped in to support their efforts, initiating an era of cross-pollination and collaboration between the two organizations. Key members of CPSR later founded influential Internet privacy advocacy and lobbying groups.

Although not widely acknowledged, at its peak CPSR provided the moral compass for the responsible integration of computing technologies in society. For CPSR,

responsibility was part of the computing profession. CPSR worked to educate the public, government, and their fellow computer professionals about the dangers of technology. Yet, the early 1980s were a very different time socially and politically, with the Vietnam War fresh in most Americans' minds and the Cold War seemingly getting hotter and more likely to erupt in full-scale nuclear war. The election of US President Ronald Reagan stoked the concerns of many. As Paul Edwards (1997) has described, at this time it was the metaphor of a "closed world" that defined geopolitics *through* computing. The "closed world" was a self-referential space of computer techniques and technologies that reinterpreted everything as systems and mathematical simulations. Against this backdrop, CPSR sought to counter these discourses by transcending systems thinking and instead provoking questions about how *real* systems are developed—with all their bugs, errors, and complexity.

In another way, however, CPSR was founded in a time and place that already looked beyond the old "closed world" discourse. Silicon Valley's earlier history as the home of US chip manufacturing and military contracts was receding and had left behind a toxic legacy, literally. By 1981, Silicon Valley had become a bustling hub of software development and venture capital (Castells, 1996; Saxenian, 1994). Fred Turner (2006) described how in Silicon Valley "new communalists" championed a belief in digital utopianism, disparaging government and bureaucracy while valorising the "open" world of decentralized communities, flexible production, networked communication, and individualism. The history of CPSR provides a crucial link between two influential histories of computing culture—Paul Edwards' *The Closed World* (1997) and Fred Turner's *From Counterculture to Cybersculture* (2006). The changing nature of responsibility was, for CPSR and computer technology communities more generally, a bridge that connected the closed world of military technology that *ought to be limited* to the emancipatory and utopian world of the Internet that *ought to be expanded*.

Computers in war and the limits of technology

The history of Silicon Valley computing technology is deeply entwined with the American military in the production of chips for missiles and guidance systems (e.g., Westinghouse), basic research with military applications (e.g., Stanford Research Institute) and large defence contractors (e.g., Lockheed Missile and Space) (Heinrich, 2002; Hossfeld 1990; Lowen, 1997; O'Mara, 2019; Saxenian, 1994). In the United States, funding from the military dominated computer science and electrical engineering fields through this period (National Research Council, 1999: 57).

The military was essential to the formation of Silicon Valley. In 1946, Stanford founded Stanford Research Institute (SRI) to take up military contracts, though it was spun off after student protests against Vietnam in the 1960s (Stanford University Class of 1970, 1985). In this era, about half of the region's silicon chips were for the military. By the 1970s, the introduction of venture capital as the primary source of financing began to diversify the region's economy (Saxenian, 1994). Nonetheless, the military remained a dominant player in the Valley. For example, Lockheed Missile and Space employed 24,000 people on its 175-acre campus through the 1980s, nearly twice the size of Intel and five times larger than Apple (O'Mara, 2019). Culturally, the white-collar

workers on military contracts were notably different from the emerging computing industry workers who strongly identified as counter-cultural, “communalist,” and revolutionary in spirit (Turner, 2006).

Some computer scientists chose not to accept military funding. Working at Xerox PARC was known to be one way to work on computing technologies while avoiding pressures to apply for DARPA funding (Smith, 2018; Winograd, 1984b). Significantly for CPSR, its co-founder Severo Ornstein, who had worked on military-funded projects such as SAGE (the Semi-Automated Ground Environment defense system) at the beginning of his career, joined other PARC researchers in 1981 to form a mailing list for people concerned about nuclear war (Ornstein & Gould, 1994). The group at PARC was soon meeting regularly and participating in wide-ranging conversations with graduate students and researchers from Stanford, other computing industry insiders, and activists in the Valley. The group discussed what “computer professionals … could do to contribute to the movement for nuclear disarmament” (Winograd, 1982).

In a Summer 1982 meeting in Palo Alto, the group settled on the name “Computer Professionals for Social Responsibility,” joining a rich milieu of activist technology organizations. Activist organizations such as the Technology and Society Committee (TASC), a defunct Silicon Valley group from the 1960s that re-formed as an offshoot of the Citizens’ Technology and Employment Program, sought to transform Santa Clara Valley’s military economy into a more socially useful one (McGrath, 1982). Elsewhere, activists were organizing against the military-industry alliance. In Boston, High Technology Professionals for Peace were dedicated to finding positions for people outside the defence contract system (Halpern, 1984). Computer People for Peace organized nationally in the late 1960s and early 1970s and was an early influence for some CPSR members (Gaillo, 2018).³ Internationally, anti-war activism was also often associated with the computer industry. In Britain, the Direct Action Committee Against Nuclear War chose the Atomic Weapons Research Establishment in Aldermaston as the destination for their famous protest march, which was home to some of Britain’s most advanced computing facilities (Lavington, 2019).

Silicon Valley is named for being home to silicon chip production plants, whose workers engaged in activism different from that of CPSR. Many workers at chip fabrication plants were immigrant women who endured a chemically toxic and unsafe working environment, sexist work culture, racist language and verbal abuse, and little opportunity for career mobility because of stereotypes (Hossfeld, 1990; Matthews, 2003; Pellow & Park, 2002). Labour unions attempted to organize workers in the 1970s and early 1980s but failed due to harassment and union-busting tactics. Labour and environmental movements also allied with residents in the Silicon Valley area who protested the dumping of toxic chemicals that polluted water supplies (Lécuyer, 2017). While the “blue-green” coalition between labour activists and environmentalists did not last and the labour movements ultimately failed, this nascent activism against “big tech” has endured and expanded (Mayer, 2008; Pellow & Park, 2002).

The “computer professionals” of CPSR were not manufacturing workers and therefore had greater employment protection. The computer professionals of CPSR wrote software, designed hardware, and researched computer science—generally, activities of the middle and white-collar classes. As such, the computer professionals of CPSR

usually had job security and freedom of intellectual pursuit. For example, at PARC, early members of CPSR described to us how management did not support their activism but neither threatened actions against it, which enabled a permissive work environment (Smith, 2018). This stands in contrast to the experience of the union organizers working in Silicon Valley manufacturing firms. These firms developed anti-union tactics and fired organizers (Pellow & Park, 2002). Of course, members of CPSR met resistance as well, but of a different kind. Especially for those working in the military-academic-industrial context, “responsible computing” came with employment risks. Members of TASC who worked on defence contracts, for example, risked losing their security clearance (McGrath, 1982). As well, CPSR was denied booth space at a major conference for computer professionals and the pervasiveness of military funding that shaped computer science research cost some CPSR members opportunities (Gould, 1983). But, CPSR’s activism was from its inception framed as moral choice and not labour action, which helped avoid direct retaliation by employers and military and government funders.

Dedicated efforts by PARC and Stanford researchers helped to organize and publicize CPSR. In early 1983, CPSR registered as a non-profit organization, established offices in Palo Alto, and began publishing their seasonal newsletter. CPSR chapters quickly emerged in cities where local computer professionals had strong connections to the original Palo Alto group and chapters across the US formed thereafter.

One of the primary inspirations for CPSR were Physicians for Social Responsibility (PSR), which started in the 1960s. PSR was influential in two ways. First, they were seen as a successful model for the conduct of a professional group resisting nuclear war—how to be a professional while holding a moral position.⁴ CPSR members emulated PSR’s model by invoking their technical expertise. Second, PSR’s organizational scheme and chapter model was copied by CPSR.⁵ Chapters of CPSR pursued their own interests, while the original chapter in Palo Alto set the national agenda in the early years. Critically, when CPSR registered as a non-profit organization, they published guidelines that stipulated acceptable practices: CPSR’s primary work was to be educational and as a non-profit organization they were not allowed to introduce or lobby for specific legislation (Valentine, 1984; see also Suchman, 1982b).

The early focus of CPSR was on the threat of nuclear war and members of CPSR communicated their professional opinions through academic writing, *The CPSR Newsletter*, and the press. The first president of CPSR, Brian Cantwell Smith, circulated a “General Statement, for folks who are curious about... CPSR” (Smith, 1982). This general statement had been thoroughly discussed and debated at meetings and in its final version stated,

*Computer Professionals for Social Responsibility (CPSR) is an alliance of computer professionals concerned about the impact of computer technology on society.... We are particularly alarmed by the increasing role that computers play in the threat of nuclear war. We deplore the extent to which our knowledge and skills are used to develop weapons systems that contribute less to our security than to our common peril.*⁶

In the first newsletter, CPSR Palo Alto co-directors Lucy Suchman and John Larson stressed that local meetings offered a place where people could simultaneously “strengthen... general knowledge of the history and politics of the arms race” and

discuss “the underlying morality of technologies designed for global warfare” (Suchman & Larson, 1983). In these meetings, members debated different characterizations of “social responsibility” while ensuring that public venues where used to “comment specifically on the role that computers play in nuclear weapon systems and strategy” (Suchman & Larson, 1983). Internal conversations, often led by Suchman, sometimes questioned whether objections to the militarization of computing should be conveyed along political and moral lines (i.e., we should not do this because it is wrong) or as solely technical arguments (i.e., this is not technically feasible) (Suchman, 1982a).

Smith (1993) strongly supported the view that CPSR ought to focus on technical arguments, especially those that communicated the limits of computing. In an advertisement for the *San Jose Mercury News*, CPSR offered an early public statement of its moral agenda: “we believe that computer failure or human error, singly or in combination, could accidentally trigger a nuclear war” (Smith, 1982). Describing and communicating the technical capabilities of computers used for nuclear war systems was a primary activity of the early CPSR and set its moral agenda as professionals who know best—what would later set a path towards technocracy.

Strategic initiatives

Coinciding with the advent of CPSR were two initiatives undertaken by the United States to shape advancements in computing research. The first, launched by President Ronald Reagan in March 1983, was the Strategic Defense Initiative (SDI), also known as “Star Wars.” The program was enormously expensive, costing \$22 b over its 8 years; however, some of the high costs have been attributed to financial violations and conflicts of interest (Reiss, 1992, pp. 100—112). The second, Strategic Computing Initiative (SCI), was developed by the US Defense Advanced Research Projects Agency (DARPA) and also launched in 1983. SCI focused on artificial intelligence and the design of full stack computing systems (from circuits to software to interface). The three initial SCI program applications were an autonomous vehicle, a “pilot’s associate,” and a carrier battle group management system (Defense Technical Information Center 1983, p.v). According to Paul Edwards (1997), both SDI and SCI represented “the culmination of long-term research programs whose essential aims had not changed since their initiation in the 1950s” and marked a return to military-sponsored computer research (p. 276).

Confusion over names and objectives was a strategy by the U.S. government to promote SDI (Reiss, 1992, p. 52-56). President Reagan described SDI in oblique but ominous terms, announcing “a comprehensive and intensive effort to define a long-term research and development program to... [eliminate] the threat posed by strategic nuclear missiles” (Ronald Regan, “Address to the Nation on Defense and National Security,” March 23, 1983 cited in Boyer, 2010).⁷ In fact, SDI was administered by the Strategic Defense Initiative Organization (SDIO) and SCI by DARPA. Yet, while the public understood SDI as a kind of automated “invulnerability shield,” many American scientists thought it to be an “impossible fantasy” (Edwards, 1997, pp. 288—289). Program managers attempted to counter this narrative but the strategic purpose of SDI remained unclear into Reagan’s second term as president (Office of Technology

Assessment, 2014, p. 6; Reiss, 1992, p. 98). CPSR worked to differentiate and educate the public about the program's risks.

In 1983, the U.S. public was encouraged to be very enthusiastic about computers. During a country-wide tour of CPSR's slide and audio show on the risks of computers in war, Steve Berlin (1987) of the Boston CPSR chapter observed that *Time Magazine* choose the personal computer for its "man" of the year cover (Brosan & Segal, 1983). This enthusiasm made it easy for the U.S. government to fund SDI despite cost estimates at the time between \$400 b to \$800 b (Halloran, 1984). Moreover, the program was conceived without technical and scientific experts who would have understood that it had an infeasible goal (Reiss, 1992, pp. 37–38; Steinberg, 1988; Lakoff & York, 1989, pp. 14–23). Berlin (1987) also argued that it was developed without consulting foreign policy advisors, arms control advisors, or Congress. Developing SDI would largely be guesswork—the software was simply going to be too large and complex to trust (see for example, CPSR NTB Study Group, 1988).

The nature of SDI meant that it could not be tested. Critics believed that if it was ever used, the system might still be defeated by unexpected forms of attack (CPSR Speakers Bureau Speaker Training Packet, 1987). Given these realities, as expert computer professionals, CPSR informed the public that it would be impossible to create trustworthy computer code this complex (CPSR Speakers Bureau Speaker Training Packet, 1987). The members of CPSR believed that they, as experts, should help the public understand what computers could and could not do.

In debates about SDI, CPSR was supported by allies. Some of these allies, such as David Parnas, a University of Victoria computer scientist who was on the SDI advisory panel, did not share all of CPSR's objections to the role of computing technology in nuclear weapons research. Yet, in his SDI advisory panel resignation letter, Parnas argued that "the goals stated for the Strategic Defense System [sic] cannot be attained," and observed that "during the first sittings of our panel, I could see the dollar figures dazzling everyone" (Parnas, 1985i). To Parnas, not only were there conflicts of interest within the advisory panel, the technical problems were intractable, which was part of the appeal. Parnas wrote, "several of the first speakers at the first meeting of our panel could not hide their delight at the unbounded set of technical challenges implicit in the unattainable goals of this project" (Parnas, 1985i). After resigning from the advisory panel, across a series of reports Parnas demonstrated why he believed SDI would fail (Parnas, 1985a, 1985b, 1985c, 1985d, 1985e, 1985f, 1985g, 1985h). CPSR later circulated Parnas' reports and saw him as an ally inside the military-academic complex.⁸

The similarly named Strategic Computing Initiative also drew the attention of CPSR. The DARPA architects of SCI imagined a research program with funded researchers working on next-generation technologies, including mental interfaces and intelligent machines (Defense Technical Information Center, 1983). However, military applications were also part of the plan. As mentioned above, the three initial SCI program applications were military command and control systems (Defense Technical Information Center, 1983, p. V; Roland & Shiman, 2002). For DARPA managers, these applications were included to satisfy generals and justify the program to Congress. SCI was later found to cost \$1 b between 1983 and 1993 (Roland & Shiman, 2002). The application of AI technologies to weapons that SCI promised raised difficult questions for

organization members with anti-war roots (Winograd, 1984a, 1984b; see also Winograd & Borning, 2016).

CPSR leaders Ornstein, Smith, and Suchman (1984) critiqued SCI in the *Bulletin of the Atomic Scientist* (Figure 1), arguing that “like all computer systems, artificial intelligence systems may act inappropriately in unanticipated situations” (p. 11). Like all early CPSR documents, they used technical expertise for the basis of a moral argument, writing “because of this fundamental limit on their reliability, we argue against using them for decision-making in situations of potentially devastating consequence” (Ornstein et al., 1984). However, SCI was developed by DARPA managers with experience funding computing science research programming (Roland & Shiman, 2002), and therefore SCI garnered broad support across the computer science community, including by other researchers at PARC. Supporters of SCI saw the possibility to change computer science research for generations (Stefik, 1985) – exactly what CPSR feared.⁹

The CPSR was not the only organization considering the societal implications of computing during the Cold War, but its impact was significant—and on the rise. In the trade magazine *Computing*, CPSR was credited with being “the most interesting and fastest growing of all such organizations” (Segerdal, 1984). CPSR stood out from other anti-nuclear and anti-war organizations not because it questioned the ethics of the nuclear arms race, but because it questioned the reliability of the computing technology itself. CPSR’s willingness to question the quality of computer technologies, while sometimes risking employment and losing lucrative research and development contracts gave them authority and credibility.

The many CPSRs

Since its inception, CPSR struggled to define its activities. Despite efforts of the early CPSR leadership to focus on computers in weapons systems, Peter Hubbard (1983), a member of the San Jose chapter, had detected a drift away from “the nuclear issue” and asked the editors of the *CPSR Newsletter* to define the organization’s focus. As CPSR grew, local chapters and working groups independently focused their activity on different projects. CPSR members’ personal politics oriented some advocacy and activism, but political ideology was not prescribed.

But even before the Cold War ended, emerging social, political, and economic realities raised new issues for CPSR members. The most influential changes came from networked computers and their commercial use, which included a rapid increase in personal computing. These technologies, however, brought new kinds of issues and risks. In 1988, Robert T. Morris launched the first real Internet worm, which led to the first felony conviction under the 1986 Computer Fraud and Abuse Act. As a computing issue that affected society, the Morris Worm was discussed and condemned by CPSR (“CPSR Responds”, 1989). CPSR also led a successful lobbying effort to require SEMATECH, an Austin, TX semiconductor consortium that was partially funded by the Pentagon, to consult a coalition of environmental organizations and labour unions (Chapman, 1991; Siegel, Smith & Wilson, 1990). Meanwhile, the CPSR Computers in the Workplace group identified changes brought about by new computer technologies and fought for gender equality, safer work environments, worker privacy, and less

Strategic computing

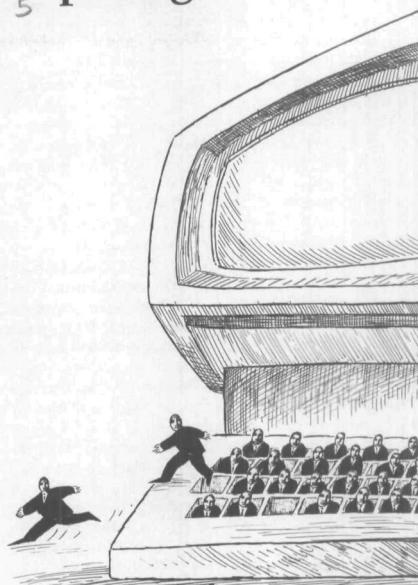
The Department of Defense Advanced Research Projects Agency (DARPA) was formed in the late 1950s to promote basic research. Indeed, DARPA's Information Processing Techniques Office, headed by distinguished computer scientists, has established itself as the principle government sponsor of computer research at universities and industrial laboratories. Much of this research has been generic in nature—applicable to a large variety of military and non-military problems. But in October 1983, DARPA launched a new "Strategic Computing Plan" with the express purpose of focusing research on specific military applications. Because of the broad influence that DARPA exercises on the direction of computer research in this country, such a pronounced shift of purpose deserves public scrutiny. The authors contend that the Strategic Computing Plan is dangerously misleading, because it blurs the distinction between straightforward progress in computer science and mere wishful thinking. The plan's suggestion that "artificial intelligence" will enable strategic nuclear weapons to be handled almost entirely by computer illustrates the serious consequences that could result if policy makers begin to depend upon technological fantasy.

by Severo M. Ornstein, Brian C. Smith and Lucy A. Suchman

IN THE 1940s, atomic physics was about 25 years old. Building on the discoveries of the new field, scientists were able to produce a weapon more powerful than had ever before been conceived. In the 1980s computer science—which also happens to be about 25 years old—has become the critical field underlying modern weapon systems. This is not yet widely recognized. When we think of nuclear weapons, we tend to envision the warheads and the explosions, forgetting about the complex computer technology that supports the decision to fire the missiles and directs them to their targets. Computer systems are by now used throughout the military, for early warning, communications, weapons guidance and in the simulations with which targets are selected and battles planned.

DARPA's Strategic Computing Plan aims to develop a new generation of computing technology for military applications. The plan initiates a five-year, \$600 million program, and there is good reason to believe that this is just the beginning. The proposal contains plans for developing an underlying technology base of new hardware and software. The hardware emphasis will be on microelectronics and multi-

Severo M. Ornstein is a computer scientist and chairman of Computer Professionals for Social Responsibility, based in Palo Alto, California. Brian C. Smith, who teaches computer science and philosophy at Stanford University, and Lucy A. Suchman, an anthropologist, are members of the research staff at the Xerox Palo Alto Research Center.



Paul Valéry, West Germany

processor architectures, from which the Agency hopes to obtain at least a thousand-fold increase in net computing power. The software component focuses on artificial intelligence—particularly on what is known as expert systems—to provide machines with "human-like, intelligent capabilities" including natural language understanding, vision, speech and various kinds of automated reasoning.¹

On top of this technology base, three specific military applications are to be developed. For the Army, the plan proposes a class of "autonomous vehicles," able not only to move around independently, but also to "sense and interpret their environment, plan and reason using sensed and other data, initiate actions to be taken, and communicate with humans or other systems." For the Air Force, the suggestion is a "pilot's associate" to aid aircraft operators who are "regularly overwhelmed by the quantity of incoming data and communications on which they must base life or death decisions," in tasks ranging from the routine to those that are "difficult or impossible for the operator altogether" and require the "ability to accept high-level goal statements or task descriptions." Finally, the Navy is offered a "battle management system," "capable of comprehending uncertain

Bulletin of the Atomic Scientists
11

Figure 1. CPSR members brought their arguments to the scientific community. Severo M. Ornstein, Brian C. Smith, & Lucy A. Suchman (1984). Strategic computing. *Bulletin of the Atomic Scientists*, 40(10), 11–15. <http://www.thebulletin.org>. Reprinted by permission of the publisher (Taylor & Francis Ltd, <http://www.tandfonline.com>).

social isolation for computer professionals. CPSR was also deeply involved in the U.S. adoption and transformation of Participatory Design (PD), hosting its first conference. Participatory Design, or "co-operative design," is a radical Scandinavian labour practice

from the 1970s that sought to involve underrepresented voices in the design process (Bødker, Ehn, Sjögren, & Sundblad, 2000; Clement & Van den Besselaar, 1993), and later came to be a ubiquitous technique in design research amongst computing professionals. In 1987, CPSR also began sponsoring Directions and Implications of Advanced Computing (DIAC), a conference focused on the social impact of computing. Yet another group, the Computing and Civil Liberties group resisted the Federal Bureau of Investigation's (FBI) high-tech upgrade to the National Crime Information Center (NCIC), a centralized crime database ("CPSR Reports", 1989; "CPSR Testifies on SCIC Before House Subcommittee", 1989; Dahl, 1988). Echoing its earlier "reliability and risk" ethic, CPSR argued that in addition to privacy concerns, the NCIC was too unreliable and might generate false positives (Rosenberg, 1986).¹⁰ Because of the analysis by CPSR, the FBI dropped NCIC (Roberts, 1991).¹¹

These and many other activities signalled a change in CPSR's interests. In 1991, CPSR's then-President Eric Roberts emailed members, writing, "in the last few years, we have faced three separate crises—in our program direction, in our finances, and in our activist base—each of which has now persisted for such a long time that the word 'crisis' no longer seems appropriate" (Roberts, 1991). Over the next decade, these three forces would shape CPSR and in turn play a role in shaping the meaning of responsible computing today.

Programs crisis: Changing world, changing CPSR

For CPSR and much of the world, 1989 was an important year. World peace seemed to be a real possibility. In April 1990, the *Bulletin of the Atomic Scientists* moved the Doomsday Clock back from six to ten minutes before midnight ("Ten minutes to midnight", 1990). The following year the *Bulletin* described the world as entering a "new era," and set the Doomsday Clock to seventeen minutes before midnight—two minutes before the theoretical start of the clock and the earliest point in its seventy-two-year history ("A New Era", 1991). The threat of nuclear war seemed to be coming to an end.

At the same time, the field of computing was changing in significant ways. Personal computers and local Bulletin Board Systems (BBSs) were proliferating (Campbell-Kelly & Garcia-Swartz, 2013), national telecommunications networks such as France's Minitel were growing rapidly (Driscoll & Paloque-Berges, 2017; Mailland & Driscoll, 2017), and the US ARPANET was transitioning from an experimental DARPA network to the NSFNET, and soon, to the commercial Internet of today (Abbate, 2000; Fidler & Russell, 2018).

Throughout these rapid geopolitical and technological changes, the "closed world discourse" that CPSR had identified and fought was fading (Edwards, 1997). Simultaneously, a "cyber utopian" spirit was growing in the Silicon Valley computer industry (Turner, 2006). According to Fred Turner (2006), these actors were driven by a metaphor of people freely connected through networked computing, characterized as a decentralized, commercial, participatory, and seemingly democratic world. Gone were the calls to *limit* the use of technology in military settings; the spirit of cyber utopianism called for an *expansion* of the use of computer technology—into every school, business, and nook of human life. After the Cold War, arguments about technical reliability of software were less potent.

Alongside these broad social changes, CPSR also had to deal with organizational issues. The end of the Cold War produced an existential crisis for the organization and, in retrospect, was also its zenith. Many of the founding members decreased their activity with CPSR, while others left the organization altogether. New members brought with them new ideas. CPSR had to address the changing technological landscape, which introduced new kinds of computing, novel risks, and a growing market for computer technologies. While there was never consensus across the many CPSR chapters about social, political, or economic issues, the cyber utopian thinking from Silicon Valley became more evident in CPSR's public positions, signalling a dramatic change from its earlier statements and activities. As leaders of responsible computing up to this point, this transformation within CPSR would have far-reaching implications.

Financial crisis: Emergence of the EFF

CPSR was at a crossroads, with leadership split between three futures: continued focus on "risk and reliability" (after all, nuclear arms were not dismantled); taking up multiple foci; or shutting down entirely. In the closing plenary of the fall 1989 conference, CPSR President Terry Winograd summarized early CPSR work as helping to avoid "imminent military and social dangers arising from computer technologies" (Pierce & Murry, 1989). Winograd then asked the audience what these new threats and opportunities meant for the future of the organization and called for a new era of responsible computing (Pierce & Murry, 1989).¹²

The National Information Infrastructure (NII), a result of the High Performance Computing Act of 1991 funded by the Clinton and Gore administration, worried CPSR (e.g., "National Information Infrastructure: A Public Interest Opportunity," 1993; "Serving the Community: A Public Interest Vision of the National Information Infrastructure," 1984).¹³ CPSR believed the NII proposal was too narrowly focused on economic benefits and lobbied Vice President Gore for the inclusion of public interest and community issues (O'Mara, 2019, p. 300; see also Sy, 1993).

Reflecting this moment of organizational confusion, CPSR somehow both failed to see the emerging risks of commercialisation, but also seemed to understand them clearly. On the Left, CPSR argued that "the NII cannot be limited to the commercial sphere but must also serve the public interest" ("Serving the Community: A Public Interest Vision of the National Information Infrastructure," 1984). But on the Right, CPSR argued for an "open market for content" because the "NII has the opportunity to level the playing field" ("Serving the Community: A Public Interest Vision of the National Information Infrastructure," 1994). Regardless of its understanding of the economics underpinning the NII, CPSR articulated an optimistic vision for computing's future, believing that if NII design followed its design recommendations NII could "serve the public interest, [by] revitalizing our communities and the nation as a whole." ("Serving the Community: A Public Interest Vision of the National Information Infrastructure", 1984).

While CPSR was redefining its values at the end of the Cold War, the organization was undergoing more mundane but equally serious challenges. Chapter membership had grown rapidly through its early history, peaking in 1988-89 with twenty-one chapters and 3,100 registered (dues paying) members ("CPSR/Boston Hosts 1991 Annual Meeting at MIT," 1991). Despite the increase in membership, early funding from

foundations had dried up, and CPSR finances were in such bad shape that the organization was at risk of being unable to pay staff ("CPSR/Boston Hosts 1991 Annual Meeting at MIT," 1991; "Notes from The CPSR Board," 1991). Eric Roberts (then CPSR secretary) described 1989 as "the most serious fiscal crisis we have had since our founding" (Roberts, 1989). To make matters worse, after 1989, membership declined rapidly and never recovered. Despite the rising profile of computer technologies in society, by 1991, CPSR dropped to 2,100 members, and by 1995 there were only 1,800 registered members ("CPSR Global," 1995). Meanwhile, Gary Chapman, the executive director for six years, announced his move to Boston and then to Texas to pursue his 21st Century Project, with the goal of orienting technology policy "toward peaceful, productive, and environmentally sound goals" ("Rockefeller Foundation Funds", 1990; "Rockefeller Foundation Awards \$100,000 to the 21st Century Project", 1990; "Chapter Updates", 1995). CPSR could not afford to immediately replace Chapman and went without an executive director for some time (Roberts, 1990).

With post-Cold War questions about its purpose lingering, a large but unwieldy chapter structure and declining membership, and a serious financial crisis, the future of CPSR looked bleak. In this moment of organizational upheaval, in stepped a new organization, the Electronic Frontier Foundation (EFF). Through its three co-founders, Mitch Kapor (founder of Lotus 1-2-3, then one of the world's largest computer companies), John Gilmore (cypherpunk and outspoken libertarian), and John Perry Barlow (former lyricist for the Grateful Dead), the organization was well funded, narrowly focused on technolibertarian ideas, and had a dynamic spokesperson with powerful message.¹⁴ One of its first activities (aided by Apple co-founder Steve Wozniak and an anonymous donor) was to donate \$275,000 to the struggling CPSR—the largest single donation in CPSR's history ("Barlow, Kapor, Wozniak", 1990). This donation was earmarked for CPSR activities that focused on online civil liberties; an emerging topic in 1986 that had been previously discussed within CPSR but animated few of its members ("Barlow, Kapor, Wozniak," 1990).

According to Gary Chapman (1987), the work on "civil liberties" had first started at CPSR in the mid-1980s not because of a mission-driven desire to make an impact in the area, but as an accident. Chapman and Ornstein were looking to vary *The CPSR Newsletter* content and were getting high quality submissions about online civil liberties, a novel topic for CPSR at the time.¹⁵ According to Chapman, it was only after publishing respectable work on the topic that civil liberties activists began to see CPSR as an ally and legitimate online activist organization (Chapman, 1987). Yet, the individualistic, anti-government, techno-libertarian rhetoric espoused by civil liberties activists vexed some of CPSR's leadership and often contradicted work in areas such as community networking, participatory design, and the social and environmental impact of computing. However, because CPSR's work was driven by its members' interests and the organization did not require participants to share political or economic ideologies—a strategy that had forged broad alliances in the fight against nuclear war—it also enabled contradictory activities to coexist within one organization.

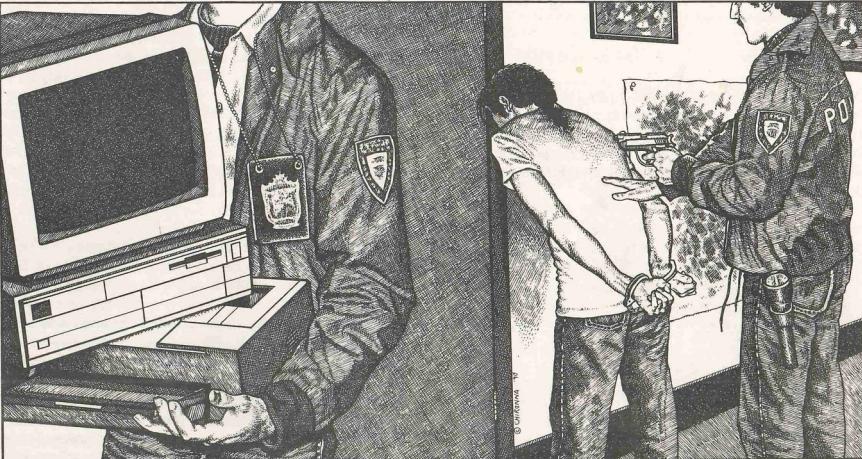
Activist crisis: the rise of online civil liberties

In the Summer 1990 issue of *The CPSR Newsletter*, incoming President Eric Roberts announced the large EFF donation. In the next *Newsletter* (Figure 2), nearly all mention

Inside: 1990 CPSR Annual Meeting; Privacy and Lotus Marketplace

The CPSR Newsletter

Volume 8, No. 4 COMPUTER PROFESSIONALS FOR SOCIAL RESPONSIBILITY Fall 1990



Crime and Puzzlement
John Perry Barlow
Desperados of the DataSphere

So me and my sidekick Howard, we was sitting out in front of the 40 Rod Saloon one evening when he all of a sudden says, "Lookee here. What do you reckon?" I look up and there's these two strangers riding into town. They're young and got kind of a restless, bored way about 'em. A person don't need both eyes to see they mean trouble. . . . Well, that wasn't quite how it went. Actually, Howard and I were floating blind as cave fish in the electronic barrens of the WELL, so the whole incident passed as words on a display screen:

Howard: Interesting couple of newusers just signed on. One calls himself acid and the other's optik.

Barlow: Hmm. What are their real names?

continued on page 2

Barlow, Kapor, Wozniak Start Electronic Frontier Foundation

Shortly after the Operation Sun Devil raids in which young computer hackers were arrested across the country, Mitch Kapor, founder of the Lotus Development Corporation, John Perry Barlow, and Steve Wozniak of Apple Computer fame started the Electronic Frontier Foundation. A fourth donor who wishes to remain anonymous also contributed to the financial resources of EFF. One of EFF's first acts was to award a two-year \$275,000 grant to Computer Professionals for Social Responsibility to support a public education campaign on the importance of protecting civil liberties and First Amendment rights in computer communication. Since then EFF has been providing legal support for specific individuals who have been, in the view of the EFF Board of Directors, unfairly caught up in law enforcement's crackdown on computer hackers. EFF has

continued on page 15

Figure 2. The CPSR Newsletter, Vol. 8, No. 4, Fall 1990. Image courtesy of the Charles Babbage Institute Archives, University of Minnesota Libraries, Minneapolis, MN. (CBI 107 -Computer Professionals for Social Responsibility, Box 1, Folder 1).

of CPSR's mainstay topics had disappeared and instead featured Barlow's soon-to-be famous "Crime and Puzzlement" story, a gonzo, cyber utopian, narrative about Barlow, his friend Howard, and the famous hacker Acid Phreak (Barlow, 1990). The rest of the *Newsletter* republished the EFF's "Mission Statement" and a "Legal Overview" of "The Electronic Frontier and the Bill of Rights" ("Barlow, Kapor, Wozniak", 1990). Similarly,

the “Legal Overview” provided by the EFF analysed the applicability of the United States Constitution’s first, fourth, and fifth amendments to the online realm (“Barlow, Kapor, Wozniak”, 1990), mooting arguments that would show up in Barlow’s (1996) infamous *Declaration of the Independence of Cyberspace* six years later. At the 1990 CPSR Annual Meeting, Barlow delivered the keynote presentation, using the platform to advance the EFF’s agenda of online privacy (“1990 CSPR Annual Meeting,” 1990). Similarly, in 1991, a joint CPSR-EFF Public Policy Roundtable focused on only two topics: “the promotion of free speech and the conduct of criminal investigations in the digital domain” (“CPSR-EFF Public Policy Roundtable Scheduled,” 1990). CPSR pursued online civil liberty issues, though in pursuing these issues they also publicly criticized Mitch Kapor’s Lotus Marketplace, a business and households demographics database co-developed with Equifax (“Privacy Concern Raised,” 1990).

The EFF grant likely saved CPSR from financial collapse but it prompted concern from the leadership and its long-term members. In February 1991, CPSR convened a leadership retreat and solicited feedback from its members about its future direction. In emails sent in advance of the event, members aired their concerns. Jeff Johnson (member of CPSR Board of Directors) wanted to “revitalize and refocus” the Reliability and Risk program, believing that it was wrong to assume the “current world events [would] nullify interest, internal or external to CPSR, in the use of computer technology in critical systems, particularly military ones” (Johnson, 1991). Lucy Suchman (1991), a founding CPSR member who held many leadership roles in the 1980s, expressed a general concern about changing values, writing, “I have for a long time felt that the terms ‘drift’ and ‘development’ are used alternately to describe the course that CPSR has taken over the years.” Founding and long-term members Terry Winograd and Severo Ornstein both expressed concern that the focus on online civil liberties was a mistake. Winograd (1991) wrote,

“[t]he preponderance of our civil liberties work is being produced by lawyers, not computer professionals, and the arguments they are bringing forth are legal and social ones, not technical ones. ... I don’t feel that my own knowledge or experience in the professional sphere is very related to it. I think this is true of the majority of our membership.”

Ornstein (1991) echoed Winograd’s concerns, writing, “[n]or do I see any way to argue that CPSR’s expertise qualifies it to comment or work on most of the underlying [civil liberty] problems.” Winograd (1991) even suggested dividing CPSR: one organization would do “civil liberties activities” and the other would be a “left-wing computer-professional community.”

During these transitional years, the Washington, DC chapter became a second office. Led by Office Director Marc Rotenberg, the DC CPSR office was soon lobbying government officials.¹⁶ As an activist strategy, lobbying in DC proved highly effective, but for an organization founded by computer scientists in Silicon Valley its early members often felt adrift.

As civil liberties and online privacy issues grew in importance due to new technologies and their risks, shifting values, and new ideologies, CPSR entered into the privacy-enhancing technologies debate, reflecting the organization’s increasing willingness to accept corporate, technological solutions for social problems as opposed to CPSR’s earlier role as educators. For example, in 1991, CPSR co-sponsored a conference on “Encryption, Privacy, and Communications” with the EFF and RSA Data Security Inc.,

the first and then-largest cryptography technology provider ("CPSR Co-Sponsors," 1991). A "Statement in Support of Communications Privacy" (1991) was released that called for "privacy-enhancing technologies" to "strengthen economic competitiveness, encourage technological innovation, and to ensure that communications privacy will be carried forward into the next decade."

These new activist practices reflected a changing organization which no longer articulated scepticism about computing, a message previously honed from its unique expertise that gave them credibility within the industry and the public. In its place, increasingly CPSR members publicly expressed optimism about using technology to solve complex problems, a form of the techno-libertarian worldview dubbed "The California Ideology" (Barbrook & Cameron, 1996) that would come to dominate the Valley.

While the history of CPSR is largely forgotten by computer professionals today, its "civil liberties" legacy lives on in the privacy-focused spin-offs and coalitions that emerged from these fertile years. In 1991, CPSR launched the Computers, Freedom, and Privacy (CFP) conference, which ran until 2015 (see www.cfp.org). The CFP conference was sponsored and run by CPSR until 1995, but as CPSR's influence declined, they became a minor sponsor and in 1999, the Association for Computing Machinery (ACM) took over management of the conference. Additionally, in 1991, CPSR received a US \$5,000 grant to organize the first meeting of UK charity Privacy International (PI), which was formerly based in Sydney, Australia ("Inside CPSR: National News," 1991). Privacy International has since become an important, and sometimes controversial, online privacy advocacy group. In 1994, CPSR and the Fund for Constitutional Government (FCG) jointly launched Electronic Privacy Information Center (EPIC), led by CPSR's Marc Rotenberg (Roberts, 1994). EPIC continues to lead online privacy advocacy, especially in the US. By 1993-94, however, EFF's money was spent and its influence within the organization soon waned. CPSR continued until 2013 with dwindling membership.

Discussion: What was responsible computing?

From the early 1980s to the 1990s—the vibrant, early-to-middle period of CPSR's history—the practices of "responsible" computer professionals underwent a dramatic shift. In telling the history of CPSR, we described the *practices* of computer professionals rather than their own justifications to excavate the operations of moral responsibility in computing at this time. In further developing this approach, in this section we briefly characterize CPSR's transformation of responsibility across three axes: 1) the use of standpoint epistemology for responsible computing, 2) a transition from professional choice to lobbying, and 3) a transition from substantivism to instrumentalism. In the concluding section, we use these three axes of responsibility to describe lessons that CPSR's history holds for responsible computing today.

From a moral standpoint

The early CPSR was characterized by its expertise, a standpoint through which members understood responsible computing. We invoke standpoint theory as a way to understand how the everyday actions and discourses of groups produce power

(Harding, 1992). By focusing on the knowledge claims of CPSR (its epistemology), we see evidence of how the group imagined its socially constructed world and its “grounds” of knowledge (Harding, 1992, p. 445). As such, the standpoint of CPSR is the site from which evaluations—moral, political, or otherwise—are made. The standpoint of the early CPSR was that of elite computer professionals who used technical knowledge, rational argumentation, and to a limited extent, rhetorical persuasion to assess technology’s impact on society. Their ethical work, arguing for a limit to the use of computing, was outside of the mainstream of their profession.

As time went on, there were two major changes in how CPSR conducted its activism. First, CPSR’s technical knowledge was central to its standpoint. However, other foci developed over time, some of which required other types of knowledge to be held with equal or greater value to computing knowledge. Second, CPSR expanded its role while transforming from an elite but marginalized group to an established political player. CPSR informed and guided political processes through technical knowledge. These two changes—in foci and establishment—engendered technocratic power. The clearest example of CPSR’s technocratic power is found in its engagement in advocacy for online civil liberties and the tensions it produced. Early CPSR members who understood responsible computing from the perspective of their social situation and a collective struggle against nuclear war complained that a “drift” was occurring—a drift away from technical knowledge and towards legal analysis and political problem solving. In the later CPSR, pragmatic knowledge was needed to *produce* political change, not to speak truth to power. While early CPSR standpoint could be characterized as radical moral clarity, middle CPSR moved to pragmatic, technocratic, political action.

By understanding early CPSR from its standpoint—as an elite but non-dominant group—we can also see the limits of the organization and what this means for responsible computing. For example, from the standpoint of women working in chip manufacturing plants in Silicon Valley or, more likely today, women working in assembly plants in Southeast Asia or Mexico, the sense of “responsible computing” is considerably more expansive. The political struggles of these marginalized groups are concerned with health and safety, environmental pollution, and basic human rights. Today, some approaches to computing ethics inherit these epistemological and political limitations (Benjamin, 2019; Greene, Hoffmann, & Stark, 2019).

From professional choice to lobbying

As CPSR’s approach to knowledge shifted, so too did the practices that they brought to bear on computing technology. CPSR began as an organization of computer professionals dedicated to educating the public about the risks of computer systems in the military. The early CPSR examined military planning documents and shared its in-depth expert analysis with the public and other computing professionals by speaking at industry and academic events, writing reports and scholarly publications, and by addressing the public directly. These unglamorous early practices were understood by CPSR members as moral because they were motivated by a sense of personal and

professional duty. Early CPSR opened up the possibility for members to feel like they could make professional choices both to use their skills to help stop nuclear war.

In our interviews with key CPSR members, this idea that responsibility meant professional and personal obligation to the public interest was emphasized over political unity. That is, engaging in the struggle to be a responsible computer professional who avoids nuclear catastrophe was the shared politics; partisan (in the sense of U.S. politics) political discussions were relatively rare. In this sense, early CPSR was deeply involved in interrogating the politics of wartime technologies and associated policies through its practices, but this did not necessarily translate into a shared view of politics, be it socialist or libertarian.

After CPSR established its office in Washington, they increased direct lobbying of politicians and wrote statements on non-military issues. This meant taking political stances that may not have been agreed upon, causing some group strife and concern. CPSR's focus shifted from wrestling with how to be responsible professionals in a world dominated by military funding to national lobbying focused on changing the minds of policy makers. During this same period, membership also decreased. For a largely voluntary organization that struggled for funding and attention, these challenges were non-trivial. Yet, with these three shifts—the move away from military technologies, from public engagement to policy lobbying, and increasingly professionalized advocacy—CPSR was effective at producing the change they sought, often by partnering with newly emerging civil society groups. However, some members also felt that they were no longer engaged in the common struggle to identify professional choices that shaped the practice of responsible computing.

From substantivism to instrumentalism

In this final section, we attempt to characterize CPSR's rhetoric aimed at shaping the development and use of technology as a path to addressing some of the limitations of CPSR arguments. Initially, CPSR set forth a "substantivist" approach to technology, which later gave way to an "instrumentalist" approach (Figure 3). Substantivism is a theory of technology wherein technology embodies specific values and shapes society (Feenberg, 1999, p. 2).¹⁷ Martin Heidegger, substantivism's famous advocate, thought that technology "revealed" being, which, in modernity, means increasing control, efficiency, and rationality. From this point of view, nuclear weapons technology in the 1980s had an automatic and unyielding character, seemingly marching the world towards nuclear war, and so CPSR fought against designs that would increase the autonomy of computers to make decisions in war.¹⁸ As computer professionals educating the public on appropriate limitations of computers, early CPSR was a technocratic organization expressing substantivist values.

The CPSR that followed the Cold War often argued that technology could be designed to meet socially beneficial ends — whether it was CPSR's inclusive vision for the National Infrastructure Initiative or Barlow's ideal of freely associating individuals online. The instrumentalist approach to technology, designing technology to meet socially beneficial ends, is part of CPSR's legacy, but while the shift from substantivism

Technology is:	Autonomous	Humanly Controlled
Neutral	Determinism	Instrumentalism
Value Laden	Substantivism	Critical Theory

Figure 3. Adapted from Feenberg (1999, p.9).

to instrumentalism unshackled the organization it also changed the substance of its claims to responsible computing.

The substantivist approach that animated early CPSR critiques took on the military-academic-industrial logics of the 1980s outlined in Edwards' *The Closed World* (1997) and argued that projects such as SDI could not produce reliable autonomous systems. The instrumentalism adopted later made it hard for CPSR to counter the growing wealth and power of the computing technology industry, which had played a part in strategically re-casting technology as neutral and under human control, even if it led to public policy successes. If companies claimed laudable goals and used computers for good purposes, the instrumentalist might argue, responsible computing ought to stand in support.

While this paper just scratches the surface of the many CPSR activities, we focused on the early and middle periods because its practices provide an important link between two key cultural histories of computing, which also implicitly link substantivist and instrumentalist thinking: Edwards' (1997) "closed world" and Turner's (2006) "new communalists." While some of the old "reliability and risk" arguments resurfaced in civil liberties debates, ultimately, the instrumentalist work of enhancing civil liberties was supported by a techno-libertarian imaginary and digital utopianism (Turner, 2006).

Considering the catastrophes credited to the computer industry today — complicity in genocide, fomenting right-wing extremism and authoritarianism, producing "winner take all" markets, collapse of the free press, rise of underpaid "gig" work, and the wickedness of misinformation — some of which seem poised to bring about regulatory change, CPSR provides an inspiring model for how activist computer professionals might tackle the shortcomings of their own profession by engaging workers in the struggle to find practices that constitute responsible computer professionals, even when it means working against one's own interests. Echoing Pasquale and Cockfield (2019), we argue that activists today must move away from instrumentalist framings and resurface substantivist approaches to promote deeper examinations of how technology structures society.

Conclusion

In our reading of CPSR, we identified a series of key moments for the organization: a moral concern about nuclear war potentially caused by the SDI computer systems; resistance to a growing military-industrial-academic complex and especially the SCI and SDI projects; the rising power and wealth of Silicon Valley software entrepreneurs; the end of the Cold War and an internal debate about CPSR's future; a financial crisis and new sources of funding for the organization; changing CPSR leadership and declining chapter membership; and the emergence of new and more pervasive

technologies of surveillance and control. Throughout this sequence of events, CPSR engaged individual computer professionals, launched numerous conferences and academic sub-fields in computing, educated the general public, participated in policy debates, and directly lobbied government officials.

First, we see the vast number of techniques employed by CPSR as illustrative of the shifting values of computer professionals' responsibility. In its early years, while there were many other anti-nuclear and "Professionals for Social Responsibility" groups, the organization emerged as a moral leader. Its technical arguments were diligent, consistent, and conservative but also morally courageous because they were professionally risky. Its arguments made them outsiders to the mainstream of computing, in some respects, but CPSR continued to press a moral position and educated the public and other professionals in its field. This approach was successful; by making technical arguments against lucrative research and development work during the Cold War, its membership grew. As the organization gained successes and political clout they continued its advocacy, but its arguments were no longer as morally courageous. Instead, CPSR's advocacy became more politically ambitious, and CPSR members organized large conferences and effectively lobbied government officials.

Second, for all of the limitations and issues CPSR faced, it is remembered as an organization that did its "homework," to borrow the words of CPSR President Eric Roberts. That homework was mostly taken on by volunteers who applied their expertise to morally guide the development of computing towards responsible ends. Leaders were challenged to energize people to do difficult work and to have a coherent direction and purpose. CPSR's advocacy was seemingly endless and often without clear results. Financial crises and membership challenges were endemic to CPSR and made the job of promoting responsible computing difficult. Nonetheless, the history of CPSR's early and middle periods offer the groundwork for a new, responsible relationship to computing technologies today.

CPSR was not an organization that could be characterized by straightforward political or ideological designations and all its important contributions are not covered here. Yet, this brief history of CPSR ought to motivate today's scholars and activists of technology to reflect on, draw from, and be inspired by CPSR's dedication to the cause and its imperfect legacy. There is much to be learned.

Notes

1. From the Stanford University Archives, we examined newsletters, clippings, and office memorandum from Terry Winograd's and Eric Roberts' personal papers. From the Charles Babbage Institute, we examined their records related to CPSR which included Newsletters, clippings and papers. We are also grateful to Alan Borning who shares papers and clippings related to CPSR with us. We conducted oral histories with Brian Cantwell Smith, Severo Ornstein, Terry Allen Winograd, Lucy Suchman, Alan Borning, Eric Roberts, and Doug Schuler.
2. CPSR worked on a range of issues related to computing and nuclear war (e.g. Borning, 1984; Borning, 1987; Bellin & Chapman, 1987).
3. Terry Winograd was also a member of Computer People for Peace. (Winograd & Borning, 2016).

4. For example, in an exchange dated August 23, 1982, (Jackie) Keane, Kliszewski, Trigoboff, and (Ron) Nowicki discussed what made PSR effective and whether “purely” technical expertise could be used for political ends (Winograd, 1982).
5. CPSR founder Severo Ornstein thought that this loose organizational structure was ultimately problematic because “computer people” were not distributed evenly across the country and small chapters would not maintain cohesion (Ornstein, 2018).
6. “CPSR General Statement” appeared in its Annual Reports through the mid-1980s and was referred to in *The CPSR Newsletter*. Earlier versions of the statement were slightly more alarmist (see Smith, 1982).
7. SDI was alarming to many because it seemed to assume the inevitability of nuclear war and focused on missile defense research (Boyer, 2010; Norman, 1987).
8. Issues of the *CPSR Newsletter* advertised that Parnas’ reports could be purchased directly from CPSR. Parnas later wrote an article for the *CPSR Newsletter* (Parnas, 1986).
9. For an example of how PARC-based computer scientists argued for the SCI program, see Stefik (1985).
10. The NCIC had been watched by CPSR since they started examining civil liberties (Rosenberg, 1986).
11. “Our 1988 report on the FBI’s National Crime Information Center computer system was given public credit for the agency’s decision to drop their proposal to include a tracking facility by which they could monitor movements of individuals, even when those individuals had not been charged with a crime” (Roberts, 1991).
12. Winograd’s speech asked CPSR “to take advantage of the new, historic changes going on in the world and to create new opportunities for using computers to benefit people everywhere” (Pierce & Murry, 1989).
13. When the High Performance Computing Act (HPCA) was announced in 1991, CPSR supported the initiative, which through the associated High Performance Computing and Communications Initiative (HPCCI) eventually led to the development of the Mosaic and Netscape web browsers (“Serving the Community”, 1984; “National Information Infrastructure”, 1993).
14. Kapor and Barlow had previously discussed Operation Sundevil on The Well, an early virtual community (Rheingold, 2000; Turner, 2006). Operation Sundevil was an attempt by the US Secret Service to crack down on cybercrime, but the raids irked Kapor and Barlow who saw them as an infringement of liberty and a potential restriction of an emerging market.
15. The Winter 1986 *Newsletter* featured a number of stories about “computers and civil liberties” and announced that while its focus has always been military uses of computing technology, “this area of concern has always been part of CPSR’s charter.” The *Newsletter* continued, “computers and privacy, civil liberties, security and abuse of information technology will now take their place alongside the military topics we have regularly addressed as issues that are... integral” (“Computers and Civil Liberties”, 1986).
16. CPSR’s lobbying was mainly staged from its Washington headquarters. Rotenberg was hired for his capabilities to directly lobby U.S. government officials, which he did successfully on many occasions. For example, Rotenberg personally handed U.S. Vice President Gore a CPSR report on NII (“CPSR NII Report Delivered to White House,” 1994).
17. As Andrew Feenberg (1992, 1999, 2002) has argued, the social impact of technology is usually framed as a binary choice between determinism and neutrality. As with standpoint theory, Feenberg argues that the world is socially constructed, and specifically, that technological development is not determining for society but is “overdetermined by both technical and social factors” (Feenberg, 1992, p. 307). This overdetermining is twinned by the technological artefact—its “double aspect”—where social meaning and functional rationality meet. Unfortunately, the functional rationality of technology tends to isolate artefacts from their original meaning (Feenberg, 1992, p. 311). Instead, we see only the ostensibly neutral result, a product of hegemony that is largely unyielding to democratic control.

18. According to Feenberg, substantivism really emerges in the U.S. after the Second World War when technocratic optimism (the Space Race, early Vietnam War) was replaced by substantivism (late Vietnam War, Cold War). It was in this society that most of CPSR's members came to age.

Acknowledgments

First and foremost, we thank the members of CPSR for their work. In particular, we are grateful to Lucy Suchman, Severo Ornstein, Terry Allen Winograd, and Alan Borning for their input on our paper – we interpreted the archival documents and the oral histories to tell a succinct story of CPSR that (as all histories are) is inevitably incomplete. By including our own analysis, we recognize that our version of this story may even be unfamiliar to those who lived it. Charles Babbage Institute's Amanda Wick and Jeffery Yost first pointed us to CPSR. We thank the Web that Was 2019 conference organizers Anne Helmond and Michael Stevenson. We received thoughtful input on an early draft at a workshop generously hosted by Data & Society. Three anonymous reviewers provided invaluable feedback. Thank you to our NSF collaborator Katie Shilton and to Kate Miltner.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work is supported by NSF grant #1634202.

Notes on contributors

Quinn DuPont is an assistant professor of Management Information Systems at University College Dublin. His most recent book, *Cryptocurrencies and Blockchains*, was published by Polity (2018).

Megan Finn is the author of *Documenting Aftermath: Information Infrastructures in the Wake of Disasters* with MIT Press (2018). She is an assistant professor at University of Washington.

ORCID

Quinn DuPont  <http://orcid.org/0000-0002-9376-6755>

References

1990 CPSR Annual Meeting Held at Stanford University. (1990). *The CPSR Newsletter*, 8(4), 26.
 A New Era. (1991). *Bulletin of the Atomic Scientists*, 47(10), 3.

Abbate, J. (2000). *Inventing the internet*. Cambridge, MA: MIT Press.

Barbrook, R., & Cameron, A. (1996). The Californian ideology. *Science as Culture*, 6(1), 44–72. 10/doi:10.1080/09505439609526455

Barlow, J. P. (1990, Fall). Crime and puzzlement: Desperados of the datasphere. *The CPSR Newsletter*, 8(4), 1–15.

Barlow, J. P. (1996). Declaration of the independence of cyberspace. Retrieved from Electronic Frontier Foundation website: <https://www.eff.org/cyberspace-independence>.

Barlow, Kapor, Wozniak Start Electronic Frontier Foundation. (1990, Fall). *The CPSR Newsletter*, 8(4), 16–18.

Bellin, D., & Chapman, G. (1987). *Computers in battle, will they work?* (1st ed.). Cambridge: Harcourt Brace Jovanovich.

Benjamin, R. (2019). *Race after technology: Abolitionist tools for the New Jim Code*. Hoboken, NJ: John Wiley & Sons.

Berlin, S. (1987, April 17). Sample talk. [Guidelines for presenting reliability and risk]. Retrieved from Stanford University Archives. (Terry Allen Winograd Papers SC1165 Box 22).

Bødker, S., Ehn, P., Sjögren, D., & Sundblad, Y. (2000). Co-operative design—Perspectives on 20 years with 'the Scandinavian IT Design Model. *Proceedings of NordiCHI, 2000*, Stockholm, 22–24.

Borning, A. (1984). Computer reliability and nuclear war. *International Physicians for the Prevention of Nuclear War Report*, 2(3), 16–21.

Borning, A. (1987). Computer system reliability and nuclear war. *Communications of the ACM*, 30(2), 112–131. doi:10.1145/12527.12528

Boyer, P. S. (2010). Selling star wars: Ronald Reagan's strategic defense initiative. In K. Osgood & A. K. Frank (Eds.), *Selling war in a media age: The presidency and public opinion in the American century*. Gainesville, FL: University Press of Florida.

Brosan, R., & Segal, G. (1983, January 3). Machine of the Year [Cover]. *Time*. Retrieved from http://content.time.com/time/covers/0_16641_19830103.00.html.

Campbell-Kelly, M., & Garcia-Swartz, D. D. (2013). The history of the internet: The missing narratives. *Journal of Information Technology*, 28(1), 18–33. 10/gf6hj8. doi:10.1057/jit.2013.4

Castells, M. (1996). *The rise of the network society*. Maiden, MA: Blackwell.

Chapman, G. (1987, December 2). Email to Terry Winograd and Steve Zilles. Retrieved from Stanford University Archives. (Terry Allen Winograd Papers SC1165 Box 22).

Chapman, G. (1991, Winter-Spring). 21st century project helps in SEMATECH campaign. *The CPSR Newsletter*, 9(4), 34.

Chapter Updates. (1995, Winter). *The CPSR Newsletter*, 13(1), 25.

Clement, A., & Van den Besselaar, P. (1993). A retrospective look at PD projects. *Communications of the ACM*, 36(6), 29–37. 10/dmnj5p. doi:10.1145/153571.163264

Computers and Civil Liberties. (1986, Winter). *The CPSR Newsletter*, 4(1), 1.

CPSR/Boston Hosts 1991 Annual Meeting at MIT. (1991, Summer). *The CPSR Newsletter*, 9(3), 5.

CPSR Co-Sponsors Meeting on Encryption, Privacy and Communications. (1991, Winter-Spring). *The CPSR Newsletter*, 9(1–2), 11.

CPSR Global. (1995, Winter). *The CPSR Newsletter*, 13(1), 4.

CPSR NII Report Delivered to the White House. (1994, Winter). *The CPSR Newsletter*, 11(4), 1–31. & 12(1).

CPSR NTB Study Group. (1988). *The SDI's National Test Bed: An Appraisal* (No. WS-100-5). Retrieved from Charles Babbage Institute Archives, University of Minnesota Libraries.

CPSR Reports on the FBI's National Crime Information Center. (1989, Spring). *The CPSR Newsletter*, 7(2), 1–7.

CPSR Responds to the Internet Computer Virus. (1989, Winter). *The CPSR Newsletter*, 7(1), 1–3.

CPSR Speakers Bureau Speaker Training Packet. (1987). [The packet included audio transcript of Reliability and Risk, flyers advertising the show, articles about CPSRs positions, and other materials supporting the speakers]. Retrieved from Stanford University Archives. (Terry Allen Winograd Papers SC1165 Box 22).

CPSR Testifies on SCIC Before House Subcommittee. (1989, Spring). *The CPSR Newsletter*, 7(2), 7–8.

CPSR-EFF Public Policy Roundtable Scheduled. (1990, Fall). *The CPSR Newsletter*, 8(4), 19.

Dahl, M. K. (1988). *The National Crime Information Center: A Case Study in National Databases* (No. CL-100—2). Retrieved from Charles Babbage Institute Archives, University of Minnesota Libraries.

Defense Technical Information Center. (1983). *DTIC ADA141982: Strategic Computing. New-Generation Computing Technology: A Strategic Plan for its Development and Application to Critical Problems in Defense*. Retrieved from <http://archive.org/details/DTIC ADA141982>.

Driscoll, K., & Paloque-Berges, C. (2017). Searching for missing "net histories". *Internet Histories*, 1(1–2), 47–59. doi:10.1080/24701475.2017.1307541

Edwards, P. N. (1997). *The closed world: Computers and the politics of discourse in cold war America*. Cambridge, MA: MIT Press.

Feenberg, A. (1992). Subversive rationalization: Technology, power, and democracy. *Inquiry*, 35(3–4), 301–322. 10/fnv3nt. doi:10.1080/00201749208602296

Feenberg, A. (1999). *Questioning technology*. London: Routledge.

Feenberg, A. (2002). *Transforming technology: A critical theory revisited*. Oxford; New York: Oxford University Press.

Fidler, B., & Russell, A. L. (2018). Financial and administrative infrastructure for the early internet: Network maintenance at the defense information systems agency. *Technology and Culture*, 59(4), 899–924. 10/gf6csd. doi:10.1353/tech.2018.0090

Gaillot, A.-D. (2018, April 2). Remembering the '70s activist group that tried to save us from the tech industry. Retrieved from The Outline website: <https://theoutline.com/post/4029/computer-people-for-peace-history>.

Gould, L. (1983, summer). CPSR Denied Booth Space at NCC [National Computer Conference]. *The CPSR Newsletter*, 1(1), 4.

Greene, D., Hoffmann, A. L., & Stark, L. (2019). Better, nicer, clearer, fairer: A critical assessment of the movement for ethical artificial intelligence and machine learning. *Proceedings of the 52nd Hawaii International Conference on System Sciences*. doi:10.24251/HICSS.2019

Halloran, R. (1984, October 27). \$400 billion price is seen for antimissile plan. *New York Times*, 26.

Halpern, J. (1984, January). Working with technology for peace. *Bulletin of the Atomic Scientists*, 1–2.

Harding, S. (1992). Rethinking standpoint epistemology: What is "strong objectivity?" *The Centennial Review*, 36(3), 437–470.

Heinrich, T. (2002). Cold war armory: Military contracting in Silicon Valley. *Enterprise and Society*, 3(2), 247–284. doi:10.1093/es/3.2.247

Hossfeld, K. J. (1990). "Their Logic against Them": Contradictions in Sex, Race, and Class in Silicon Valley. In Ward, K. (Ed.). *Women Workers and Global Restructuring* (pp. 149–178). Ithaca, NY: ILR Press Cornell University.

Hubbard, P. (1983, Summer). What is our real focus? [Letter to the Editor]. *The CPSR Newsletter*, 1(2), 2.

Inside CSPR: National News. (1991, Spring). *The CPSR Newsletter*, 10(1–2), 28.

Johnson, J. (1991, February 5). CPSR leadership retreat statements. Retrieved from Stanford University Archives. (Terry Allen Winograd Papers SC1165 Box 22).

Lakoff, S. A., & York, H. F. (1989). *A shield in space? Technology, politics, and the strategic defense initiative*. Berkeley: University of California Press.

Lécuyer, C. (2017). From clean rooms to dirty water: Labor, semiconductor firms, and the struggle over pollution and workplace hazards in Silicon Valley. *Information & Culture: A Journal of History*, 52(3), 304–333. 10/gfzshx. doi:10.1353/lac.2017.0012

Lowen, R. S. (1997). *Creating the Cold War university: The transformation of Stanford*. Berkeley: University of California Press. doi:10.1086/ahr/103.5.1721

Mailland, J., & Driscoll, K. (2017). *Minitel: Welcome to the internet*. Cambridge, MA: The MIT Press.

Matthews, G. (2003). *Silicon Valley, women, and the California dream: Gender, class, and opportunity in the twentieth century*. Stanford, CA: Stanford University Press.

Mayer, B. (2008). *Blue-Green coalitions: Fighting for safe workplaces and healthy communities*. Ithaca, NY: Cornell University Press.

McGrath, L. (1982, November). TASC Force: Facing the social consequences of technology. *Los Gatos Magazine*, 22.

National Information Infrastructure: A Public Interest Opportunity. (1993, Summer). *The CPSR Newsletter*, 11, 1–5.

National Research Council. (1999). *Funding a revolution: Government support for computing research*. Washington, DC: The National Academies Press.

Norman, C. (1987). The dark side of SDI: Technologies being developed as part of the strategic defense initiative will be inherently capable of offensive uses, claim speakers at the AAAS annual meeting. *Science*, 235(4792), 962–963. [10.cfz4vq](https://doi.org/10.cfz4vq).

Notes from the CPSR Board. (1991). *The CPSR Newsletter*, 9(4), 23. (Fall).

O'Mara, M. P. (2019). *The code: Silicon Valley and the remaking of America*. New York: Penguin Press.

Office of Technology Assessment. (2014). *Strategic defense initiative: Survivability and software*. Retrieved from <http://muse.jhu.edu/book/34762>.

Ornstein, S. (1991, February 6). CPSR leadership retreat statements. Retrieved from Stanford University Archives. (Terry Allen Winograd Papers SC1165 Box 22).

Ornstein, S. (2018, July 26). Interview by Quinn DuPont and Megan Finn [oral history, recorded].

Ornstein, S., & Gould, L. (1994, November 17). *An interview with Severo Ornstein and Laura Gould* (B. H. Bruemmer, Interviewer). Woodside, CA: Charles Babbage Institute Archives, University of Minnesota Libraries.

Ornstein, S. M., Smith, B. C., & Suchman, L. A. (1984). Strategic computing. *Bulletin of the Atomic Scientists*, 40(10), 11–15. [10.1080/00963402.1984.11459292](https://doi.org/10.1080/00963402.1984.11459292)

Parnas, D. L. (1985a). *Artificial intelligence and the strategic defense initiative*. University of Victoria. Charles Babbage Institute Archives, University of Minnesota Libraries. (CBI 107, Box 1).

Parnas, D. L. (1985b). *Can automatic programming solve the SDI software problem*. University of Charles Babbage Institute Archives, University of Minnesota Libraries. (CBI 107, Box 1).

Parnas, D. L. (1985c). *Can program verification make the SDI software reliable*. University of Victoria. Charles Babbage Institute Archives, University of Minnesota Libraries. (CBI 107, Box 1).

Parnas, D. L. (1985d). *Is SDIO An efficient way to fund research*. University of Victoria. Charles Babbage Institute Archives, University of Minnesota Libraries. (CBI 107, Box 1).

Parnas, D. L. (1985e). *The limits of software engineering methods*. University of Victoria. Charles Babbage Institute Archives, University of Minnesota Libraries. (CBI 107, Box 1).

Parnas, D. L. (1985f). *Why conventional software development does not produce reliable programs*. University of Victoria. Charles Babbage Institute Archives, University of Minnesota Libraries. (CBI 107, Box 1).

Parnas, D. L. (1985g). *Why software is unreliable*. University of Victoria. Charles Babbage Institute. (CBI 107, Box 1).

Parnas, D. L. (1985h). *Why the SDI software system will be untrustworthy*. University of Victoria. Charles Babbage Institute Archives, University of Minnesota Libraries. (CBI 107, Box 1).

Parnas, D. L. (1985i, June 28). *Letter to Mr. James H. Offut*. [Alan Borning's papers shared with the authors.]

Parnas, D. L. (1986, Spring). Why I won't work on SDI: One view of professional responsibility. *The CPSR Newsletter*, 4(2), 1.

Pasquale, F. A., & Cockfield, A. J. (2019). *Beyond instrumentalism: A substantivist perspective on law, technology, and the digital persona* (SSRN Scholarly Paper No. ID 3327607). Retrieved from Social Science Research Network website: <https://papers.ssrn.com/abstract=3327607>.

Pellow, D. N., & Park, L. S.-H. (2002). *The Silicon Valley of dreams: Environmental injustice, immigrant workers, and the high-tech global economy*. New York, NY: New York University Press.

Pierce, B., & Murry, H. (1989, Fall). CPSR/Washington D.C. Hosts 1989 Annual Meeting. *The CPSR Newsletter*, 7(4), 4.

Privacy Concern Raised Over Lotus Marketplace. (1990, Fall). *The CPSR Newsletter*, 8(4), 31.

Reiss, E. (1992). *The strategic defense initiative*. Cambridge [England]: Cambridge University Press.

Rheingold, H. (2000). *The virtual community: Homesteading on the electronic frontier*. Cambridge, MA: MIT press.

Roberts, E. (1989, Fall). From the secretary's desk. *The CPSR Newsletter*, 7(4), 23.

Roberts, E. (1990, Fall). Notes from the CPSR board. *The CPSR Newsletter*, 8(4).

Roberts, E. (1991, February 28). Symposium on future directions for CPSR, March 23 [Email]. Retrieved from Stanford University Archives. (Terry Allen Winograd Papers SC1165 Box 22).

Roberts, E. (1994, Spring). The President's column. *The CPSR Newsletter*, 21(2), 21.

Rockefeller Foundation Awards \$100,000 to the 21st Century Project. (1990, Summer). *The CPSR Newsletter*, 9(3).

Rockefeller Foundation Funds 21st Century Project Planning Phase. (1990, Fall). *The CPSR Newsletter*, 8(4), 31.

Roland, A., & Shiman, P. (2002). *Strategic computing: DARPA and the quest for machine intelligence, 1983-1993*. Cambridge, MA: MIT Press.

Rosenberg, R. (1986, Fall). Privacy in the computer age. *The CPSR Newsletter*, 4(4), 12.

Saxenian, A. (1994). *Regional advantage: Culture and competition in Silicon Valley and Route 128*. Cambridge, MA: Harvard University Press.

Segerdal, A. (1984, May 10). Taking a moral stand over the nuclear circus. *Computing*, 24–25.

Serving the Community: A Public Interest Vision of the National Information Infrastructure. (1994, Winter). *The CPSR Newsletter*, 11–12(4–1), 1–10.

Siegel, L., Smith, T., & Wilson, R. (1990, Summer). Sematech, Toxics, and U.S. Industrial Policy: Why we are concerned. *The CPSR Newsletter*, 8(3), 9–13.

Smith, B. C. (1982, October 6). CPSR report (very long message). [Email to Antiwar.pa]. Retrieved from Stanford University Archives. (Terry Allen Winograd Papers SC1165 Box 22).

Smith, B. C. (1993). Limits of correctness in computers. In T. R. Colburn, J. H. Fetzer, & T. L. Rankin (Eds.), *Program Verification: Fundamental Issues in Computer Science* (pp. 275–293). Netherlands: Springer. Retrieved from https://doi.org/10.1007/978-94-011-1793-7_13.

Smith, B. C. (2018, July 11). Interview by Quinn DuPont and Megan Finn [oral history, recorded]. Stanford University Class of 1970. (1985). Panel discussion of the Vietnam years. Retrieved from <https://purl.stanford.edu/qy931tj9913>.

Statement in Support of Communications Privacy. (1991, Winter-Spring). *The CPSR Newsletter*, 9(1–2), 11.

Stefik, M. (1985). Strategic computing at DARPA: Overview and assessment. *Communications of the ACM*, 28(7), 690–704. doi:[10.1145/3894.3896](https://doi.org/10.1145/3894.3896)

Steinberg, G. M. (1988). *Lost in space: The domestic politics of the strategic defense initiative*. Lexington, Massachusetts: Lexington Press.

Suchman, L. A. (1982a, July 2). CPSR report (very long message) [Email]. Retrieved from Stanford University Archives. (Terry Allen Winograd Papers SC1165 Box 22).

Suchman, L. A. (1982b, November 24). Meeting with Paul Valentine [Email]. Retrieved from Stanford University Archives. (Terry Allen Winograd Papers SC1165 Box 22).

Suchman, L. A. (1991, February 5). CPSR leadership retreat statements. Retrieved from Stanford University Archives. (Terry Allen Winograd Papers SC1165 Box 22).

Suchman, L. A., & Larson, J. (1983, Summer). Lessons learned. *The CPSR Newsletter*, 1(1), 3–4.

Sy, K. J. (1993, Summer). The NII: What does it mean for libraries. *The CPSR Newsletter*, 11(2), 5–7.

Ten Minutes to Midnight. (1990). *Bulletin of the Atomic Scientists*, 46(3), 3.

Turner, F. (2006). *From counterculture to cybersculture: Stewart Brand, the Whole Earth Network, and the rise of digital utopianism*. Chicago: University of Chicago Press.

Winograd, T. (1982, July 1). *Email to Laura Gould*. Retrieved from Stanford University Archives. (Terry Allen Winograd Papers SC1165 Box 22).

Winograd, T. (1984a, Winter). DARPA strategic computing proposal. *The CPSR Newsletter*, 2(1), 1.

Winograd, T. (1984b, Spring). Some thoughts on military funding. *The CPSR Newsletter*, 2(2), 1–3.

Winograd, T. (1991, February 4). CPSR leadership retreat statements. Retrieved from Stanford University Archives. (Terry Allen Winograd Papers SC1165 Box 22).

Winograd, T., & Borning, A. (2016, November). *My politics as a technologist: A conversation with Terry Winograd and Alan Borning*. Fall Distinguished Lecture presented at the Technology Policy Lab, University of Washington. Technology Policy Lab, University of Washington.