SHOT SCICIS Workshop
Old Ideas: Recomputing the History of Information Technology
October 13, 2013 Portland, Maine

On the Procrustean Bed: Edmund Berkeley and the Social Responsibility of Computer People

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Introduction: A Struggle of Ideas

Edmund Callis Berkeley was born on March 20, 1909 in New York City. From 1918 to 1923, he attended St. Bernard's School for Boys at 111 East 60th Street, where he learned about the sciences, the arts, creativity and character. At that age, Berkeley recalled, "The first ambition I ever had was to paint black fences orange. In New York in the East Sixties when I was a child being taken to the park, I used to see every now and then men in white suits transforming dirty iron fences into radiant red-orange glory."[1]

Berkeley continued his education from 1923 to 1925 at Phillips Exeter Academy, where he was the youngest student, yet graduated first in his class. At this point in his life, Berkeley wanted to be "a mining engineer, so as to find mineral specimens in exotic places."[2] His teachers at Phillips Exeter, however, recognized Berkeley's exceptional mathematical talents and singled him out for individual tutoring. While at Phillips Exeter, Berkeley lived at a boarding house in town and was not well accepted by his fellow students, some of whom were ten years older than this sixteen-year-old brainiac.

Feeling he was too young for college at 16, Berkeley's parents kept him out of school for a year; he worked as an instructor at St. Bernard's School. In 1926, he entered Harvard College, where he majored in mathematics and graduated summa cum laude four years later. After his first year at Harvard, Berkeley changed his mind about becoming a mining engineer. He realized "how much hard work was the lot of your mining engineer, the disadvantages of your distance from civilization, and how distressingly inaccurate your data and your conclusions had to be." Berkeley decided on a career as a creative mathematician.[3] He highlighted the most lasting lesson gained from his college years in a commencement address he delivered on June 19, 1930: "But what most distinguishes us today as seniors from the freshmen we were four years ago is that we have gained methods of thinking, a set of tools for finding out facts, and these methods will remain because they have become subconscious in our habits."[4] This concern with "Modern Methods of Thinking" would become the focus of Berkeley's work for the rest of his life.

When Berkeley graduated from Harvard in June 1930, impacts of the October 1929 stock market crash were becoming starkly evident. Unemployment had risen to over 4 million, from 429,000 before the crash. By 1930, the Metropolitan Life Insurance Company reported that 24% of its industrial policy holders in 46 larger U.S. cities were jobless.[5] In New York City, homeless people built a shantytown called "Hoover Valley"[6] in the bed of an abandoned reservoir north of Belvedere Castle in Central Park, outside the windows of tony Fifth Avenue

and Central Park West apartments. By the end of 1930, nearly 6,000 people could be found selling apples for five cents apiece, eking out a living on New York City street corners.[7] In the midst of unemployment and economic uncertainty, Berkeley's parents pressured him to be practical and reconsider his career as a creative mathematician: "[T]his was sublimated, by repeated parental urging, into the applications of mathematics in business: actuarial work in the life insurance business. … 'Go to work in a big business where you can be secure and your income will rise year after year to a good figure; never mind what you really want to do,' said the Circe of being practical."[8] In 1930, Berkeley went to work as a clerk in the actuarial department of Mutual Life Insurance Company on Nassau Street in New York City. He stayed there four years.

In 1934, Berkeley "broke out of this cocoon" after inheriting a little over $8,000. He used the money to travel for three and a half months, visiting ten European countries including Norway, the Soviet Union, Greece, and Italy. In the autumn of that year, Berkeley returned from his travels and took a job in the actuarial department at Prudential Insurance in Newark, New Jersey.

Once the United States entered World War II, many Prudential employees were given leave for active military duty and Berkeley was among them. In 1942 he enlisted in the Navy and served as a Naval Reserve officer for three and a half years until going on inactive duty in 1946. His first assignment was with the Office of the Inspector in Newark, where he supervised supply distribution. He was later reassigned to a post that better utilized his skills, under Howard Aiken at the Harvard Computation Laboratory. Berkeley described this assignment as "a really stimulating experience."[9]

After the war, Berkeley returned to work at Prudential Insurance where he "began to work on some of the most interesting assignments I had ever had … About two-thirds of the time was spent in determining how the company could make use of new automatic electronic equipment for handling information. This was the most satisfying combination of work and pleasure that I had yet put together. But a change of vice-presidents resulted in extensive curtailment of this assignment."[10] In 1948, Berkeley resigned from Prudential to go into business for himself as a consulting actuary, writer, publisher, teacher, and developer of small computer and robots. The topics Berkeley Enterprises was "particularly interested in" included "symbolic logic, computers, robots, mathematics, operations research, language, [and] explanation." He later recalled, "I threw caution to the birds at last, but for the first time I was able to call my soul my own."[11]

Berkeley's soul was his own, but he learned to be careful about how he shared it with the world. In his 1955 biographical entry in the *Harvard Class of 1930 25th Anniversary Report*, he described his views on controversial subjects in terms that he hoped would not arouse suspicions about his loyalty:

> As to social, political, and/or religious views, I have some strong convictions. But as a result of Mr. Joe McCarthy and some other people who promote "guilt by association," I don't speak out as freely as I used to.
>
> Socially, I am in favor of the underdog, and the common man; and I am opposed to people who push them around. I think the common man needs a good deal of help –

> mainly to escape from the torrent of partially true misinformation which he encounters all around him …
>
> Politically, I am convinced that the Russians will never start a shooting war with the United States. The basic reason is that the Russians believe they have some world-beating ideas, and the Americans are generally too busy with the American physical world to pay much attention to the mental world of other countries. So I think that peace is going to break out … I believe that all the Russians have to do to be victorious over the Americans in the next hundred years is to allow the Americans to continue to watch television.
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> Yes, the struggle of this century, it seems to me, is a struggle of ideas. It looks as if no war can be won any more with guns or bombs or any hardware, but only with ideas … Further, before Americans can make rational judgments about the rest of the world … they have to study more perceptively and blow their mouth off less. It seems to me that the objective, comparative study of people, cultures, and social behavior – I suppose you would call it social anthropology – is the *sine qua non* of our times.[12]

Berkeley saw the 20th century as one in which ideas were stronger than nuclear bombs and guided missiles. These conventional weapons had outgrown their usefulness once they could destroy the world many times over. After people developed weapons that allowed one country to annihilate the world, national leaders had to choose alternative strategies to total war. The era of World Wars had ended. In the future, wars of ideas could be contained and psychological, as we experienced in the Korean War. They could be waged by implied threat, economic strategies, and propaganda, as we experienced in the Cold War between the United States and the Soviet Union. Wars of ideas could be contained and ultimately determined through mass media, as we experienced in the Vietnam War that ended through the pressure of international protests. These wars of ideas occasionally turn into localized battles with physical weapons. But whether the fighting is hot or cold, computers and the people who develop them are implicated in these battles.

With the Perspective of Time

Edmund Berkeley worked with computers nearly a century ago, at a time when people made intelligent machines on their kitchen tables. These machine generations later, what would Ed Berkeley have to say, for example, about the relationships we have with our intelligent machines at the beginning of the 21st century? Berkeley built robots, but worried that people could use these machines as superhuman soldiers. What would he say today about the ethics of using drones to replace humans on the battlefield or to interrogate/torture prisoners? Currently, more than "50 nations have or are developing military robots like we have [in the U.S.], including China, Iran, Libyan rebels and others."[13] Are robot drones subject to the same international humanitarian laws that apply to human beings? This is a question of social behavior – of the social responsibility that robot developers have to the rest of us. It is not a question of physical or mathematical laws, which are trivial to solve compared to the social questions facing us.

In the 1950s, Ed Berkeley developed robots and made them available to anyone who was interested and who could pay $20 for the mail-order kit. He believed that the people who built these kits would learn about computers, logic, and sound reasoning. They would learn modern methods of scientific thinking. Berkeley believed that people would apply what they learned from these robot kits to social questions, and they would choose to apply their knowledge for the benefit of humanity. But he was faced with evidence to the contrary as he watched computer scientists increasingly work on weapons to wage war rather than applying their expertise to wage peace.

For Berkeley, the important question about computers and robots was "How shall they be used?" He asked this question before there was software, at a time when people still questioned how to store programming internally in a machine. Today, Berkeley's question is still relevant. We currently ask this question about "big data," for example, especially when people's civil rights are threatened by these "intelligence gathering" operations. Chris Soghoian from the American Civil Liberties Union recently questioned whether we can control the intelligent systems we have developed to collect data on ourselves: "The availability of the data leads to more tools to analyze it, and the availability of the tools leads to more collection of data. It's an unpleasant circle."[14] In *Time Magazine*, Bryan Walsh posed what he found to be the most important "big-data challenge, one that can't be answered with algorithms: how it should be used."[15] We might be on the verge of developing fully autonomous and adaptive machines using robotics based on biological evolution.[16] Who will control these intelligent machines once they have "learned" their own metaheuristic, evolutionary algorithms? In a *Smithsonian Magazine* article on identity theft, Joseph Stromberg voiced a common plea: "We create these machines. The least they could do is recognize us."[17]

In a *Forbes* article, Milo Jones and Philippe Silberzahn questioned whether our reliance on big data "is a legacy of 1950s positivism, the naïve belief that human systems are amenable to Newtonian solutions, and that complex geopolitical situations and social movements can be understood by counting physical devices or parsing Internet log files. They can't … God gave Physics the easy problems, and social "science" is a false metaphor."[18] These authors argued, "Far from enabling counter terrorist strategy, such technical programs erode civil liberties and cloud the minds of counter-terror strategists. … No volume of data will generate of the right questions or the right analytical focus, so no amount of data will keep America safe, either physically or economically. In fact, the opposite is true."[19]

To create a safer world, Ed Berkeley advised us that the "best kind of help the common man could have … is a return in conversation (and in all mediums of communication) to free, honorable, and friendly discussion, where each person is free to say what he thinks without punishment, and everyone concerned investigates, the more scientifically the better."[20] Berkeley's conversations place human beings at the center of the debate about the social impacts of computer applications. Perhaps we are reaching the time when we will need to include our intelligent machines in such conversations, too. This is a question Ed Berkeley would surely have enjoyed discussing. His focus was on the future.

Ed Berkeley envisioned that humans and machines working together could save the world. So did Doug Engelbart.[21] People might have found Doug Engelbart to be "kooky," but he became a hero of computer history. Ed Berkeley was largely written out of that history. Why was Engelbart lionized and Berkeley forgotten? I believe it was Engelbart's fortune and

Berkeley's misfortune to live during the times into which they were born. Their historical and political contexts created dilemmas and opportunities that shaped the rewards and punishments they received for their ideas and actions. They were products of their times, as are the stories we tell about them.

The Myth of Autonomy

"Secrecy is best understood as a form of regulation." So wrote U.S. Senator Daniel Patrick Moynihan in his 1996 introduction to sociologist Edward Shils' book *The Torment of Secrecy*. Moynihan continued, "[T]he bureaucracy of the national security state that developed in Washington in the course of the twentieth century decrees what may be had as information concerning foreign and military affairs. It controls, not without lapses, the amount of knowledge and kinds of knowledge available for public discourse … unavoidably the public has … virtually no say … in the decisions as to what it may and what it may not know."[22] In the 1950s, the bureaucracy of national security became organized and routinized under the military-styled leadership of President Eisenhower. After people around the world realized the horror of the U.S. atomic bombs dropped on Japan in 1945, the threat of scientific knowledge – and the people who held this knowledge – seemed acute. Shils, who co-founded the *Bulletin of the Atomic Scientists*, realized that "every strain of the postwar world has been accentuated by the atomic bomb."[23]

In the political sphere, Soviet expansion in Europe and China immediately following the end of World War II resulted in a credible threat to U.S. security. Domestic infiltration by the Communist Party USA threatened to spread atomic secrets to Soviet scientists, who could then use this scientific knowledge to develop weapons that would threaten the entire world. Ironically, U.S. scientists who had helped to develop atomic weapons, like Robert Oppenheimer and Albert Einstein, by this time regretted the deadly applications of their "pure" science. Moreover, they knew that the secrets of their weaponry would not remain secret for long:

> The scientists, who had worked on the bomb and knew its monstrous powers, felt perhaps more than a little guilty over their role in having produced this necessary tool of destruction and they also knew enough about the inner nature of science and scientists to foresee that the American monopoly of the scientific and technological knowledge which went into the making of the bomb could not be indefinitely maintained. The years in which the monopoly could last, they insisted, were few, and even the military men who worked with the scientists acknowledged this … For this reason many of the scientists, with a hopeful pessimism, supported the establishment of a system of international control which would both protect America and keep atomic bombs from being used.[24]

Ed Berkeley was among those scientists and technology developers who believed that the best way to ensure international cooperation in the political sphere was to openly share information in the scientific sphere. Advocacy of an open exchange of scientific information was very much in an internationalist scientific tradition, through which scientists from different parts of the world could collaborate and share information. It was this model of open information sharing that ensured the most efficient and productive scientific and technological

developments. Edward Shils argued that in a social sense, this model represented "an inner affinity between science and the pluralistic society. The conduct of scientific research requires a pattern of relationships among scientists which is the prototype of the free society. In microcosm, the scientific community mirrors the larger free society."[25] But what happens when the open sharing of scientific information is curtailed to protect national security? What happens when politics reins in autonomous science?

In general terms, Thomas Kuhn argued that rather than being autonomous, science is always constrained by expectations and values held by a dominant group of "insiders." These scientific "paradigms," or models of accepted knowledge, "gain their status because they are more successful than their competitors in solving a few problems that the group of practitioners has come to recognize as acute. To be more successful is not, however, to be either completely successful with a single problem or notably successful with any large number."[26] In arguing that practitioners use paradigmatic understandings to determine acceptable and unacceptable "scientific knowledge," Kuhn inherently argued that science is practiced within political contexts. In other words, scientists do not operate in free and open societies; they necessarily operate within community constraints. It is within this tension between scientific, physical truths and political, social values that Ed Berkeley's story resides.

In his 1956 sociological exploration of the tension between science and secrecy, Edward Shils articulated the altruistic hope of logical positivism:

> The standard of truth in science has nothing to do with the criteria of political success or of political loyalty. … Whether a scientific proposition is true or false depends not at all on whether the person who asserts it is a loyal American, a loyal Russian, a disloyal American, or a politically indifferent Frenchman or Pole. A member of the Communist Party might be a poor scientist, but the determination as to whether he is a poor scientist can be made only by qualified scientists who would not consider his Communist affiliation in arriving at their judgment.[27]

In practice, this idea that scientific autonomy operates outside politics is shown to be an unattainable ideal. The case of Robert Oppenheimer for example, showed just how inextricably linked these worlds of science and politics are. In his re-examination of the 1954 Oppenheimer security hearings, sociologist Charles Thorpe argued that "the incorporation of science into the administrative apparatus of government has involved disciplining scientific experts and fashioning scientific authority after the bureaucratic model of the state."[28] Considering this hearing within a tension of scientific autonomy and national security, Thorpe found that it was "a contest for legitimacy and for the right to define the cultural and political role of science. It was an event which crystallized tensions between competing understandings of the legitimate place of scientists and scientific expertise in the operations of the state and in civil society. Questions of Oppenheimer's character, associations, and loyalties, and arguments about the propriety of his opposition to the H-bomb, were also arguments about the legitimate characteristics, scope, and political role of scientific authority."[29]

Before this security hearing, Oppenheimer was "America's foremost scientific advisor to government."[30] After the hearing, his character was disgraced, he was stripped of all security clearances, and he "emerged from the trial broken, humiliated, and visibly aged."[31]

Oppenheimer's was a highly visible case of politics disciplining scientific knowledge. His hearing took place under the glare of publicity and his downfall was equally public. But many more people's lives were affected by hearings that took place in secured rooms away from the public eye, as the case of Ed Berkeley illustrates.

Ultimately, Ed Berkeley's story is one of mathematics and politics. Ever the inventor, Berkeley transformed his visions of the future into intelligent machines to help people make good decisions. Ever the raconteur, Berkeley transformed his trials into parables to help people tell truth from falsehood. With the perspective of time, his story lies somewhere in the grey areas between true and false.

Chapter 1: The Association of Computing Machinery Silver Anniversary, August 1972

The man at the podium looked up to see a stream of people walking out on his talk. This wasn't unexpected. He was accustomed to being unpopular for the things he said. But this time Grace Hopper was so upset that she was leading the walk-out. Ed Berkeley and Grace Hopper had worked together in Howard Aiken's lab at Harvard during World War II and now, 28 years later, she turned her back on him.

Berkeley continued speaking. He told the audience that anyone who was working to further military uses of computers should quit their jobs. He talked about the social responsibilities of computer people and his belief that computers should be used for peaceful purposes, not war. "He said that it was a 'gross neglect of responsibility' that ACM was not investigating whether computer applications were good or evil and how computers cold be used to increase the good of society."[32] After he was through speaking, the evening's toastmaster, Eric Weiss, stood up and proposed a toast, "Charge your glasses. To Ed Berkeley, founder of ACM!" And everyone who was left in the room drank a toast to the man at the podium and his unpopular message.[33]

It was 1972 and TV sets brought the Vietnam War into homes around the United States via the evening news. Video images of American soldiers carrying stretchers with bloodied comrades onto helicopters hovering in jungle clearings made for contentious conversations around dinner tables. Sounds of thumping helicopter blades, wounded moans and shouted commands from traumatized soldiers half a world away joined family discussions of current events. It was a time of disagreement over the morality of the decades-long war halfway around the world.

More and more Americans knew these soldiers personally, as troop numbers in Vietnam increased from 23,000 in 1964 to over 549,000 in 1968 and 1969. Draft boards across the country called up young men to learn if they would join more than half a million U.S. soldiers whose families dreaded to see them on the evening news. As bombing intensified in Southeast Asia, General Westmoreland warned President Johnson that "the war could go on indefinitely."[34] Draft-age men waited to learn their fates. Hushed discussions among friends shared information about how to get over the border into Canada to start a new life there – just in case. Thousands of young men, choosing safety over war, left their families and futures in the United States to cross that border.

By 1972, U.S. troop numbers had fallen to 24,000 but the fighting had degenerated into chaos. Death tolls in this ongoing conflict included nearly 58,000 U.S. troops killed or missing in

action, combined with over 1.3 million Vietnamese deaths.[35] In an end-of-year wrap-up, the United Press International reported that in 1972, "American deaths were only about 300. South Vietnamese troops suffered by their own official count more than 25,000 deaths. Communists killed total 140,000. Civilian dead is, of course, unknown."[36] Sickened by images of carnage, frightened by the prospect of losing loved ones to death in a jungle or to exile in another country, shamed that the United States was using technologies of modern warfare to fight civilians and people in black pajamas, increasing numbers of citizens began to question why we had taken on this war effort in Vietnam. Thousands of draft-age men became conscientious objectors. Hundreds of thousands of people demonstrated against the Vietnam War. One of those protestors was ACM-founder Edmund Berkeley, who had been active in anti-war efforts since 1958.

On that August evening in 1972, Berkeley had been invited to address the Association of Computing Machinery (ACM) Founder's Dinner on the Silver Anniversary Evening of the annual conference at the Sheraton Hotel in Boston. He and Franz Alt were being honored as founders of this organization at its 25th anniversary. Franz Alt's topic was "Reflections" and Ed Berkeley was to address the future-looking topic of "Horizons." After Alt's speech, Berkeley was "formally identified with some pomp and ceremony …as [the ACM's] singular founder."[37] He rose to give his keynote remarks. Up to this point, no one had seen his speech, so the audience undoubtedly expected to hear a standard banquet talk celebrating the organization's bright future. ACM President Walter Carlson, though, knew that Berkeley could be an unpredictable choice for a keynote speaker:

> The organizers of that special session were well aware of Ed's outspoken nature and of the many views he had espoused, especially in the [*Computers and Automation*] periodical he was publishing. In fact, some members voiced their objections to the conference committee and urged that he be kept off the program.
>
> So everyone waited expectantly to see what Ed was going to say. Predictably, he picked up an armload of verbal baseball bats and laid about with great vigor. He hardly missed any of his favorite targets, and no one was surprised to see who the people were that arose in the middle of his talk and left the room.[38]

In his keynote remarks, Berkeley returned to his abiding concern with social justice and activism, saying that it was a "gross neglect of responsibility" that the ACM did not have committees investigating whether computer applications were good or evil.[39] Eric A. Weiss, who was the evening's toastmaster, described what happened next:

> He encouraged data-processing professionals to use "social enterprise" to head off his prediction that mankind would be extinct in 500 years. He said that use of nuclear weapons and irreversible environmental changes, such as an increasing amount of carbon dioxide in the atmosphere, made the situation "too hard to analyze." His ferocity increased as he predicted that vested interests of large corporations would "checkmate" any possible solutions, and he called for the formation of an "association for the

> Prevention of Doomsday." He said that the use of computers in the Vietnam War made him "ashamed of belonging to the computer field.[40]

In less than seven minutes, Berkeley called out people in the ACM who worked at companies making bombs to kill people in an unjust war. He condemned everyone in the room who was employed at any company making weapons to kill people in Vietnam. Berkeley's "audience became increasingly restive as his condemnations became specific, and when he finally criticized Honeywell, by name, for its 'atrocity engineering' in designing antipersonnel bombs, several prominent members followed Grace Murray Hopper as she ostentatiously stood up and walked out while he was speaking."[41]

After Berkeley finished his talk, toastmaster Weiss tried to restore order, but the event was in disarray. At the end of the dinner, Weiss overheard Berkeley comment to his wife, "These people hold two opposing ideas in their minds at the same time." They worked on lethal weapons of war, believing they advanced the computing profession. These two ideas were incompatible in Berkeley's mind.[42]

Berkeley's speech did not go unnoticed among his colleagues. For example, *Computerworld* summarized it in a front page article on August 23, 1972, which they reprinted ten years later. Eric Weiss described Berkeley's speech in a biographical sketch published in *Computer Pioneers*:

> In 1972 ACM honored Berkeley as its singular founder at its 25th anniversary dinner. His acceptance speech was a direct denunciation of those in computing who worked on the killing devices used in the Vietnam War, or computing companies that made such horrors, and of ACM for ignoring this immorality. He said that it was a "gross neglect of responsibility" that ACM was not investigating whether computer applications were good or evil and how computers could be used to increase the good of society. Several prominent ACM members, employees of the firms and government military agencies that Berkeley had pointed to, ostentatiously walked out of the banquet room while he was speaking. The leaders of ACM were clearly embarrassed by their honoree, and the ACM never publicly referred to his speech in any way.[43]

Berkeley made his point, but over his career he paid a high price for his principled stand.

Using Computers for Peaceful Purposes

For most of his adult life, Ed Berkeley had worked for the cause of world peace and on that evening in 1972 the world had come to his doorstep. He believed that if people worked together, they could make their voices heard. But Berkeley found that rallying people to work together for the cause of peace and disarmament often resulted in political scrutiny. His work with The Committee for a SANE Nuclear Policy, the Boston Committee for Disarmament and Peace, the American Friends Service Committee, and other peace groups convinced him that even if a message was unpopular, America people had a right to voice their opinions. In his work with computers, Berkeley raised questions about how these machines were implicated in war and how they could be used instead to promote peace.

Berkeley understood the importance of high-speed, large-scale computing capacity for addressing strategic and tactical wartime needs. He had worked in Howard Aiken's Harvard Lab

during WWII to develop the Mark II relay switch computer for Navy operations. Yet after the U.S. dropped atomic bombs on Japan and the war ended, Berkeley chose a pacifist's path in search of peaceful uses of computers. In a 1952 article on "Machine 'Intelligence'" in *Astounding Science Fiction*, he made his view clear: "An automatic computing machine which has developed a wonderful facility in … [the meaning of words] is the military deciphering machine, of which persons like myself, who do not wish to be contaminated with classified information, know very little."[44]

Rather than primarily considering computers as control mechanisms for weapons and war, Berkeley chose to focus on computers as aids to human decision-making. As early as 1958, Berkeley published editorials on this question in his monthly magazine *Computers and Automation*. In one editorial, "Cooperation in Horror," he called for a general discussion of "social responsibilities of computer scientists and engineers"[45] as part of professional discussions in this developing field. In a January 1958 editorial statement written under his pseudonym Neil Macdonald, Berkeley posed these questions for discussion in the pages of *Computers and Automation*:

> Are computers and automation a curse or a blessing? Are hydrogen bombs, atomic bombs, intercontinental ballistic missiles, and the rest of the tribe (with their computing brains), a curse or a blessing?
> Have Americans lost "face" from the sputniks' appearance? Are Americans going into a mood that regards all scientific endeavor as a race to be won or lost against a potential enemy?
>
> What is the social responsibility of scientists for the scientific developments which they produce?[46]

Berkeley wanted to provide a public forum in *Computers and Automation* for a robust discussion encouraging computer professionals to examine the social implications of their work. A sizeable number of people responded to this call for an expanded discussion, but about half of them did not agree that this was their concern. Writing as Neil Macdonald in the May 1958 issue, Berkeley responded to these objections by presenting a parable likening the computer scientist to a locksmith:

> Once there was a man who was in the business of making locks and keys, and who was very skillful. One day a stranger walked into his shop and said to him "I want you to make a key which will open a certain safe." The locksmith said to him "Whose is the safe?" The stranger said "Never you mind whose is the safe. I will pay you handsomely for the key. I'll blindfold you, and take you to the place where the safe is. You can have all the tools you want – I'll pay for them – and you make me a key. ... Think it over, I'll be back tomorrow."
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> So the locksmith wondered about the remark "Never you mind," and the blindfolding, and the secrecy; but he knew it was hard enough to earn a living; and the promises of the stranger sounded attractive and exciting. So he said to himself "Well, that fellow

would just get another locksmith if I did not go," and so he decided to would go. And the next morning the stranger came for him, and he allowed himself to be blindfolded and went.

For several years the locksmith tried to open the safe, and then at last he succeeded. But the stranger did not allow him to look inside; all the locksmith saw was the door swing open. The stranger then said to him, "Here is your pay – now go away – and remember not to talk about this – or you will get into a lot of trouble."

After a few more weeks, the locksmith read in the newspaper that what the stranger had taken out of the safe was a supremely intelligent directing mechanism for flying weapons, from the size of a wasp to the size of an eagle, which would enable him to pinpoint and exterminate any person, any community, any town, any city in the whole world. And he read the stranger's declaration that henceforth the world was to do exactly what he commanded, and that any opposition to his commands or dictates would be precisely and completely destroyed.[47]

Berkeley presented three questions about the locksmith's decision in this parable: 1) Was the stranger a criminal? 2) Could the locksmith have recognized the stranger as a criminal? 3) Did the locksmith do what was right? He answered the first question by pointing to the devastating wars of the first half of the 20th century: "We know with sadness the many points where [the parable] agrees with the facts of past and current history, and predictions of the future."[48]

As to whether the locksmith should have recognized the stranger as a criminal, Berkeley appealed to the Nuremberg trial after World War II to argue that exposure and conviction of Nazi activities should provide a model for condemning similar behaviors in the parable. Quoting the military tribunal, Berkeley found that the stranger was a criminal because he consolidated power by employing technology developers, but not disclosing how he would use the technologies they developed: "War is essentially an evil thing. Its consequences are not confined to belligerent States alone, but affect the whole world. To initiate a war of aggression, therefore, is not only an international crime; it is the supreme international crime different only from other war crimes in that it contains within itself the accumulated evil of the whole."[49]

By pointing to the Nuremburg Trial, Berkeley's parable implied that the danger of the Cold War between the United States and Soviet Union could be as dangerous as the Nazi threat that began in 1933 with secrecy and suppression of civil liberties in Germany. Berkeley's quote came from the 1954 book *Tyranny on Trial: The Evidence at Nuremberg* by Whitney R. Harris, who was a trial counsel for Nuremburg prosecutor Justice Robert H. Jackson through the trial, appeals, and executions. Berkeley described this book as an "extraordinary, breath-taking, and bloodcurdling story, worth careful reading today to show how and in what way the German state under Hitler planned, prepared, and carried out aggressive war under a thick screen of lies."[50] Berkeley feared that the Cold War "screen of lies" would result in another world war, which would involve more powerful nuclear weapons than the last one.

In his lengthy and detailed account of the Nazi regime and its downfall, Harris carefully described how Hitler consolidated his power and began his campaign of lies from the first day he was elected as Chancellor of the German Reich in January 1933:

> The immediate tasks were the elimination of all political enemies and the welding of Germany into a totalitarian state. The larger plans of world conquest could not be undertaken until Germany had been unified. …
> The domination of Germany by National Socialism was the result of bold planning and ruthless measures. The spirit of democratic resistance was broken and the natural idealism and aspirations of the people were corrupted and abused. The consolidation of power by the Nazis was a perfect demonstration of totalitarian technique.[51]

At the end of the book, in the aftermath of the horrific revelations and verdicts, Harris put the wars of the first half of the 20th century into a historical context:

> The first two thousand years of Christian civilization have constituted an Age of War. War has been a tolerated, even an accepted, method of adjusting differences among nations. Like the plague, it has come, men have suffered and died, and it has passed temporarily away. … There is no greater challenge to modern man than to find that cure and to bring humanity into the Age of Peace.
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> … In the first few years of the thermonuclear age there has been placed in the hands of men a new power potential capable of such destructiveness as to threaten the users of the power as well as the intended victims. War has always been homicidal; now it has become suicidal.[52]

Berkeley included these remarks from Harris' book in his *Computers and Automation* editorial:

> … The killing of innocent human beings by order of heads of states is subject to substantially the same moral blame whether it is the killing of civilian populations in connection with war or the killing of troops resisting unlawful aggression.
>
> …Of course, no one should be heard to assert absolute immunity for acting in accordance with the orders of anyone else, even in such a fundamental matter as war."[53]

In his editorial, Berkeley concluded that the stranger's criminality in his parable was equal to that of a war criminal. In other words, when organizations asked computer developers to create lethal weapons, they acted in a criminal manner; so did individuals who carried out those orders.

Berkeley reasoned that the answer to this question meant that, under long-established law, the locksmith/computer developer had the responsibility to determine whether the stranger/weapons manufacturer was a criminal before agreeing to work for him: "[T]here is no doubt that according to law a locksmith has to satisfy himself that a customer has a bona fide

right to the locksmith's help in opening a safe…The more valuable the goods in the safe, the more necessary is the examination of the stranger."[54]

Questioning the social responsibilities of computer people, Berkeley found that in the case of "intercontinental ballistic missiles with hydrogen bomb warheads, three groups of scientists play the role of locksmith: the men who make the nuclear warheads, who are the atomic scientists; the men who make the rocket motors that will propel the missiles; and the men who make the guidance systems, the computer scientists."[55] Berkeley concluded that the "computer scientist, according to law and morality, does not have the right to shut his eyes in regard to the stranger, no more than the locksmith has."[56] He called on his colleagues to shoulder their social responsibilities instead of resisting their culpability.

Berkeley proposed a concerted, profession-wide effort in this regard: "And if a single computer scientist has trouble thinking all this out logically, then let's have a committee of computer scientists to get together and think this out, and study the social responsibility of computer scientists, with due regard to objective evidence, the toughest of sound logic, and the most practical of common sense."[57]

During 1958, Berkeley continued publishing editorials and articles about the social responsibility of computer people. In September, he sent out a survey to the editors of 92 trade and technical magazines, asking about their editorial policies on coverage of "the social responsibility of scientists in regard to the scientific developments which they produce."[58] In a December news release, Berkeley reported the results of this survey showing that 60 percent of respondents said that 'they would on at least some occasions present discussion and argument on the social responsibility of scientists." Berkeley stated, "This unexpected state of affairs seems to be the result of the undeniable fact that science nowadays is penetrating further and further; and so more and more attention must certainly be given to the influence of science in human society."[59] He repeated his rationale for this broadened scope of discussion among computer scientists:

> … we have become convinced that the "ivory-towerness" of "science for science' sake" or "technology for technology's sake" must inevitably give way to the goals "science for humanity's sake" and "technology in the service of human beings". Accordingly, the responsibility of scientists is not only to do good work in … their employer's and profession's interests but also in the broader field of the interests of their country and the whole world. … a scientist or engineer has special knowledge and perhaps special wisdom, and so has a special opportunity to be a help or a hindrance in the social applications of his science, and a special duty to be informed and to spread information.[60]

Because computer scientists had special knowledge, Berkeley clearly felt that this group had a heightened responsibility to examine their professional motivations. He saw one opportunity to foster this discussion in the pages of *Computers and Automation*. But he didn't stop there.

Computer Developers Should Shoulder Social Responsibilities

In June 1958, Berkeley spear-headed an effort to create a Committee on the Social Responsibilities of Computer People within the Association for Computing Machinery (ACM).

Building on the editorial work he had started in *Computers and Automation*, Berkeley sent a letter to ACM Secretary Jack Moshman asking that a committee be formed to study and report on the following questions:

1. Do computer scientists have a special social responsibility for helping to advance socially desirable applications of computers and helping to present socially undesirable applications of computers – in much the same way as the atomic scientists have recognized that they have a similar special social responsibility (by publishing the Bulletin of the Atomic Scientists and in other ways)? …
2. Irrespective of the answer to this first question, can the committee study and recommend new applications of computer science that are socially desirable, as for example the use of computer science to help reduce unemployment in the United States during the current recession?[61]

A committee was formed in September, 1958 to discuss these questions with four initial members: Chair Saul Gorn (Computation Laboratory, University of Pennsylvania), Arvid Jacobson (Department of Mathematics, Wayne State University) , Mel Shader (IBM, New York City), and Ed Berkeley. In a September 17 letter welcoming members to the Social Responsibilities Committee, Gorn posed five questions to be considered at an October 1 meeting. His last question and comment foreshadowed an ongoing tension that finally erupted at the Silver Anniversary dinner fourteen years later:

> A large portion of the ACM membership is involved with government work. There might be quite a difference of opinion as to whether applications considered socially undesirable for private companies should also be so considered for government work. Questions of patriotism, etc. will arise.
>
> My personal reaction … is that the Association has a purely scientific function and that as scientists we should be concerned with discovering the scope of computer applications regardless of whether others might use such applications for good or ill.[62]

On September 22, Berkeley responded to Gorn's five questions in a letter sent to committee members:

> As a first draft, I would propose that "socially desirable applications of computers" are computer applications which enable more socially useful work to be done with less effort or push forward the frontiers of knowledge or increase the happiness of human beings generally, and which do not lead to widespread death, destruction, unemployment, poverty, famine, and disease, nor the abridgement of the democratic freedoms of individuals.[63]

Berkeley added a sixth topic for discussion: "Patriotism (Loyalty to One Country) and Internationalism (Loyalty to the United Nations)." Arguing that the principles of international justice established at the Nuremberg Trials applied to this question, Berkeley quoted from

Justice Jackson's findings, as he had in his *Computers and Automation* editorial: "In the first few years of the thermonuclear age there has been placed in the hands of men a new power potential capable of such destructiveness as to threaten the users of the power as well as the intended victims. War has always been homicidal; now it is suicidal."[64] Berkeley then concluded in his own words:

> The Association for Computing Machinery is … an international society with members in the United States, Canada, England, and elsewhere. Our committee needs to bear in mind the interests and responsibilities of the international community of computer people which the ACM represents.
>
> We know that intercontinental ballistic missiles will not work WITHOUT the contribution of computer scientists to the devices that guide, direct, and navigate them. We must not lose sight of this stubborn fact which affects us.[65]

Jacobson responded to Berkeley's position, weighing in with his belief that "ACM should discuss the problems relating to the kinds of applications made of computers." He stipulated, though, that these efforts should be based on persuasion, education, and general discussion rather than through dictates or coercion. He continued,

> We must be mindful of the fact that the computer is an instrument of general social advance. It is an indispensable tool in practically all areas of research, thus, contributing to the increase in knowledge and technological progress. In this broad sense, the computer constitutes a social good.
>
> In the discussions that I have read … there is some confusion relating to the problem of our national defense and patriotism. While ACM has members in other countries, we must think of it in the context of national rivalries as an agency belonging to our nation. While one may speak of loyalties to UN and so on, one can do so only after one has accepted the loyalties to one's community and to one's country. Since this subject is controversial, I believe that we should not directly include it in any resolution.[66]

Committee members gathered at the Computing Laboratory of the University of Pennsylvania on October 1 with an eight-point agenda. Three of the items questioned whether members of the ACM had a social responsibility to be "concerned with discovering the scope of computer applications regardless of whether others may use such applications for good or ill."[67] Another item asked about "Patriotism vs. Internationalism. … Should the ACM act as a national United States society, or act as an international society, paying due regard to the interests of its members in foreign countries?"[68]

Distributing his six pages of notes after the meeting, Berkeley restated committee members' concerns that computer scientists not become social scientists, because they questioned whether it was possible to make mathematical models in the social sciences. As a student of symbolic logic and former insurance company actuary, Berkeley made mathematical models of groups of people throughout his career. His arguments about the potential for

computer scientists to do socially beneficial work was based on his own work with symbolic logic and developing computers as aids to thinking. In his meeting notes, Berkeley connected these ideas to cybernetics and "re-structur[ing] the communication flow in society:" "The unified society of mankind will begin to disintegrate if we don't have a means for the proper balance of communication and controls among all the elements of society."[69] He suggested that the "control function of society is a much broader question than ethics – there are also laws and statutes for example."[70]

Berkeley then asserted that algorithms could be applied to social science questions by using computers to analyze "any organism in its cybernetic aspect": "An analysis can be done syntactically, by symbol manipulation, without meaning, without semantics. ... If computers think, then you can ask a computer questions in the sublanguage of the social sciences." He went on to describe what "differentiates a thinking machine from a non-thinking machine is 'loop control' … the ability of a machine to modify its own instructions. Or linguistically, the 'command language includes its own syntax.'" He concluded, "[P]eople have to be trained to be non-routine thinkers" and proposed that the ACM convene panel discussions on these topics at their meetings.[71]

One argument against Berkeley's line of reasoning was that people would make weapons, and other undesirable social tools, with or without computers. Therefore, computer scientists could not prevent socially undesirable outcomes. Berkeley responded that if a question could be solved with or without computer assistance, it was "trivial…But the use of a computer to answer the question 'What sort of information shall you read?' is not trivial, and is filled with social consequences. This is the application of a computer where a computer is given a pattern that characterizes a person's needs and interests, and then the machine selects the information to fill these requirements…This machine (not yet built) is a 'general information transmitter'; it is also an example of a machine that does not 'compute' as such, but processes data, and can have a serious social implication."[72] Berkeley insisted that his colleagues look beyond the mathematical aspects of computer applications in 1958 and plan for future, more intelligent computers programmed to learn and adapt to responses from humans, systems, the environment, and other machines.

Jacobsen felt that Berkeley's notes over-estimated "the general understanding and acceptance of the problem" regarding computer scientists and their social responsibilities. In response, Jacobsen submitted his own two-page synopsis entitled "Social Responsibilities of Computer Scientists." He proposed a position statement that began, "There is a dynamic interdependence between [the computer scientist's] behavior and society…In particular then, computer people must try to be cognizant of the consequences of their behavior. This is especially so since they are the 'components' that most sensitively influence the response of the whole system."[73] Jacobsen asserted that the computer was a "means of control, especially as a system element in self-regulating, self-directing mechanisms" and that it was "an instrument of prediction and conscious control over the course of larger units. Man is thus acquiring the means of directing his own destiny."[74] It was this ability to affect people's destinies that also concerned Berkeley.

Although Berkeley viewed the work of computer scientists as international in scope, Jacobsen did not agree with this perspective: "Relative to whether ACM is a national or international organization, I think that it must first be the former before it can be the latter. The

computer and computing people being so intimately related to the well-being and defense of our country, I don't see how else we can view it."[75] In response to the question of who computer people served, Jacobsen came down on the side of national defense.

On October 25, Saul Gorn, Mel Shader, and Ed Berkeley met in IBM's New York City offices on Madison Avenue. They discussed Jacobsen's comments and decided to have Shader draft a 1,000-word statement from the Committee on the Social Responsibility of Computer Scientists to the ACM Council. After defining responsibility as "value systems," the committee argued that an individual's responsibility would vary based on "the kinds of machines and their applications," as well as "computer people's loyalties and value systems (for example, differences arising from the loyalties and value system of a computer salesman)."[76] This situation of varying responsibilities and values would mean that sometimes an individual could experience conflicting responsibilities, in which case that person should not "ignore" or "delegate his responsibility…There is a point of demarcation between what does not matter and what matters a hell of a lot."[77] The committee concluded, "In our report to the Council, we should mention the scientist's credo, 'knowledge for knowledge's sake', and show how easily it comes into conflict with other responsibilities…Given human society in our century, and the ethical value system we are using in our century, it is possible to decide definitely some classes of work which can be labeled as obviously socially undesirable, and other classes of work which can be labeled as obviously socially desirable, even if there is a large middle ground which cannot be clearly classified."[78]

On November 19, 1958 the committee's statement on "The Social Responsibility of Computer People" was finalized for submission to the ACM Council. The five-page report began by restating the committee's charge to "consider 'the social responsibilities of computer people to advance socially desirable applications of computers and to help prevent socially undesirable applications….The committee agreed that its assignment did not include defining or recommending an official position to be taken by the ACM.'" [79]

In the first of three sections of the report, the committee began by stating a case for the special social responsibilities of computer people:

> While every human being has social responsibilities, their nature and degree vary from individual to individual. A highly trained scientist in an influential position, for example, has responsibilities different from those of a fur trapper in the north woods …
>
> We must look at ourselves (computer people) as being in control of a tremendously powerful tool. … Computers are becoming an essential part of the social organism itself, particularly its communication and control system. … When one reflects upon the great forces that we computer people are associated with, it is no longer difficult to grasp, and perhaps to accept, our heavier-than-average share of responsibility.[80]

In section two of the report, the committee set out their findings relating to the computer scientist's social responsibilities:

a. He cannot rightly ignore these responsibilities…
b. He cannot rightly delegate his responsibilities…

c. He cannot rightly neglect to think about how his special role as a computer person can benefit or harm society. Therefore, he should think about how his special capacities can help to advance socially desirable applications of computers and help to prevent socially undesirable applications. …
d. He cannot rightly avoid deciding between conflicting responsibilities. Therefore, he must think how to choose.[81]

They included examples of computer applications that could be termed "desirable" and "undesirable." Desirable applications were listed as "analysis of causes and processes contributing to cancer; analysis of mental and emotional illness; solution of metropolitan traffic problems; mechanical translation of languages to aid in scientific understanding." An undesirable application was quoted from Dr. W. J. Pickering, (Head, Jet Propulsion Laboratory, Calif. Institute of Technology): "This is the prospect we face: the decision to destroy an enemy nation – and by inference our own – will be made by a radar set, a telephone circuit, an electronic computer. It will be arrived at without the aid of human intelligence. If a human observer cries 'stop, let me check the calculations', he is already too late, his launching site is destroyed, and the war is lost."[82] The committee clearly singled out missile guidance systems as an undesirable application of computer technologies. Thus, computer people who were involved in making such systems clearly had an ethical dilemma to resolve; they contributed to work that was harmful to society-at-large.

The committee report ended with four recommendations for action by the ACM Council:

a. approve releasing and publishing … the report of the committee without binding or committing the Association;
b. …encourage the study and discussion in various publication media of topics related to the social responsibilities of computer people;
c. …approve the establishment of forums on this subject at meetings of the Association for Computing Machinery;
d. …continue this committee on a stand-by basis[83]

On December 11, Committee Chair Gorn reported the Council's reaction: "The question was tabled at that meeting on the grounds that the council had not had enough time to study it."[84] The report was "bottled up"[85] temporarily, but in March 1959 the ACM Council accepted the committee's report and continued the committee "'on a stand-by basis.'"[86]

It is not surprising that Ed Berkeley had a guiding hand in crafting the report and its examples. Advocating for socially desirable applications of computers – and against socially undesirable applications – was his life's work. In 1959, he saw a number of avenues open to him to further this advocacy: as the secretary of the ACM Committee on the Social Responsibility of Computer people, as the editor of *Computers and Automation*, as one of the first people to write about computers for a popular audience (*Giant Brains, Or Machines That Think*, 1949), and as a member of the national board of directors for The Committee for a SANE Nuclear Policy. Berkeley used all the available avenues to urge computer scientists to attend to their social responsibilities.

Abbreviations used for archival collections

COH-SI Computer Oral History Collection, Smithsonian Institution, Archive Center, National Museum of American History, Washington

EBP Edmund Berkeley Papers, Charles Babbage Institute, Center for the History of Information Technology, University of Minnesota, Minneapolis

HUA Harvard University Archives, Harvard University, Cambridge, Massachusetts

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[1] Edmund Berkeley, *Harvard Class of 1930 25th Anniversary Report*, 1955. (HUA).

[2] Ibid.

[3] Ibid.

[4] Edmund Berkeley, "Modern Methods of Thinking," (EBP).

[5] Frances Fox Piven and Richard Cloward, "1930-1939: The Unemployed Workers' Movement." Libcom.org at http://libcom.org/history/1930-1939-unemployed-workers-movement.

[6] Christopher Gray, "Streetscapes: Central Park's 'Hooverville'; Life Along 'Depression Street," *New York Times* (August 29, 1993).

[7] Anonymous, "American Experience: Timeline of the Great Depression," PBS.org at http://www.pbs.org/wgbh/americanexperience/features/timeline/rails-timeline/.

[8] Berkeley, *Harvard Class of 1930 25th Anniversary Report*.

[9] Ibid.

[10] Ibid.

[11] Ibid.

[12] Ibid.

[13] See Patrick Lin, "Drone-Ethics Briefing: What a Leading Robot Expert Told the CIA." *The Atlantic*. Online at http://www.theatlantic.com/technology/archive/2011/12/drone-ethics-briefing-what-a-leading-robot-expert-told-the-cia/250060/.

[14] Bryan Walsh, "The NSA's Big Data Problem," *Time Magazine*, June 24, 2013, v. 181, no. 24, page 12.

[15] Ibid.

[16] See Josh C. Bongard, "Evolutionary Robotics," *Communications of the ACM* 56.9 (August 2013), page 74-83.

[17] Stromberg, Joseph. "Your identity can be stolen, but never truly duplicated," *Smithsonian Magazine* (July-August 2013), pages 13-14.

[18] Milo Jones and Philippe Silberzahn. "Snowden and the Challenge of Intelligence: The Practical Case Against the NSA's Big Data," *Forbes* (July 11, 2013). Online at http://www.forbes.com/sites/silberzahnjones/2013/07/11/snowden-and-the-challenge-of-intelligence-the-practical-case-against-nsa-big-data/

[19] Ibid.

[20] Berkeley, *Harvard Class of 1930 25th Anniversary Report*.

[21] Anonymous, "Doug Engelbart, Computer Engineer, Died on July 2nd, Aged 88," *The Economist* (July 13, 2013). Online at http://www.economist.com/news/obituary/21581696-doug-engelbart-computer-engineer-died-july-2nd-aged-88-doug-engelbart.

[22] Daniel Patrick Moynihan, "Introduction," *The Torment of Secrecy: The Background and Consequences of American Security Policies*, Chicago: Ivan R. Dee, 1956/1996. Page xi.
[23] Ibid, page xiii.
[24] Ibid. page xiii.
[25] Edward A. Shils, *The Torment of Secrecy: The Background and Consequences of American Security Policies*, Chicago: Ivan R. Dee, 1956/1996. Page 176.
[26] Thomas Kuhn, *The Structure of Scientific Revolutions*, Second Edition, Chicago: University of Chicago Press, 1970. Online at https://www.lri.fr/~mbl/Stanford/CS477/papers/Kuhn-SSR-2ndEd.pdf.
[27] Shils, *The Torment of Secrecy,"* page 178.
[28] Charles Thorpe, "Disciplining Experts: Scientific Authority and Liberal Democracy in the Oppenheimer Case," *Social Studies of Science* 32.4 (August 2002), pages 525-562.
[29] Ibid. page 528.
[30] Ibid, page 525.
[31] Ibid, page 528.
[32] Eric A. Weiss, "Edmund C. Berkeley," *International Biographical Dictionary or Computer Pioneers*, (IEEE, 1995), page 87.
[33] "The Founders of the ACM," *IEEE Annals of the History of Computing* 27, no. 4 (2005): 91-92.
[34] William Conrad Gibbons, *The U.S. Government and the Vietnam War: Executive and Legislative Roles and Relationships Part IV: July 1965 – January 1968* (Princeton University Press, 1995), page 611.
[35] Vietnam War Casualties, Vietnamgear.com, available at http://www.vietnamgear.com/casualties.aspx
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[37] Eric A. Weiss, "The Founders of the ACM."
[38] Jim Adams, "Obituary for Edmund Berkeley, ACM Founder," *Communications of the ACM* 31, no. 6 (1988): 781-782.
[39] Adams, "Obituary"; Anonymous,"Founder Hits Social Role: ACM Blasted for 'Neglect,'" *Computerworld* Vol. VI, no. 34 (23 August 1972) (COH-SI), 1; Anonymous, "Data Past: Ten Years Ago Today," *Computerworld* Vol. XVI, no. 34 (23 August 1982) (COH-SI), 32.
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[41] Ibid.
[42] Personal conversation with Eric A. Weiss, 19 February 2012.
[43] "Founder Hits Social Role...," *Computerworld* 1972.
[44] Edmund C. Berkeley, "Machine Intelligence," *Astounding Science Fiction* 48(5) (January 1952): 82-95. Also mentioned in Eric A. Weiss, "Edmund Berkeley" in *Computer Pioneers*, ed. John A. N. Lee (Piscataway: IEEE Press, 1995), 82-85.
[45] Edmund Berkeley, "Editorial: Cooperation in Horror," *Computers and Automation,* (February 1958) (EBP).
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[47] Neil Macdonald, "An Attempt to Apply Logic and Common Sense to the Social Responsibility of Computer Scientists." *Computers and Automation*, (January 1958) (EBP).

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[50] Ibid.
[51] Whitney R. Harris, *Tyranny on Trial: The Evidence at Nuremberg*, (Dallas: Southern Methodist University Press, 1954): 44.
[52] Ibid, 514.
[53] Ibid, 529-531.
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[62] Saul Gorn, Correspondence to Arvid W. Jacobson, M.A. Shader, and E.C. Berkeley, ACM Social Responsibilities Committee (17 September 1958) (EBP).
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[84] Saul Gorn, Correspondence to E. C. Berkeley, Arvid W. Jacobson, and M.A. Shader (11 December 1958) (EBP).
[85] Edmund Berkeley, Correspondence to Saul Gorn (24 December 1958) (EBP).
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