Nuclear Information: One Rhetorical Moment in the Construction of the Information Age

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Information is humanly created for human purposes in specific historical situations. This study examines how an anti–nuclear test activist group in the Cold War period, to foster public opposition to government policy, asserted an alternative understanding of information against centralized governmental definitions of information. Such citizen information, validated by citizen scientists to serve the needs and concerns of citizens, pervaded the antiwar, environmental, and consumer movements of the second half of the 20th century. An enthymematic analysis of the newsletter of the Greater St. Louis Citizens' Committee for Nuclear Information and successor journals reveals multiple assumptions embodied in beliefs and practices of citizen information. These beliefs and practices concern threats to everyday life, orientation toward threat-reducing action, large interested institutions that limit access to relevant information, science as an independent and objective source of information, and the responsibilities of a citizen to be informed.

Nuclear Information

One Rhetorical Moment in the Construction of the Information Age

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Since the late 1970s, we have been said to be living in the information age, and that name has stuck, with the phrase increasingly appearing throughout the closing decades of the millennium.[1] The slogan, like all slogans, attempts to assert unity in the face of complexity; nonetheless, it captures, better than most such slogans, a dominant theme of

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almost all aspects of our everyday life. The slogan has its visual icons in advertising and journalism: binary bits flashing across the sky, tied to no location and independent of the humans who may need or use that information. Information has become an abstract universal, like atoms and electrons, to create or serve any entity, in no particular configuration, serving no particular purpose, gathered and used by no particular people (but of course provided or facilitated by specific companies who make this information their business). Information, however, is a human creation for human purposes, even if our devices now produce terabytes of signals that travel only to other devices, never to be seen or touched by humans. It is useful, then, to consider the intentional design of particular forms of information in particular historical circumstances to influence individual and group action—that is, particular aggregations of information should be open to rhetorical analysis.

Moreover, information, for most purposes, takes the form of a written record, of signs inscribed on a durable medium. This information may then be displayed in graphic, oral, or tactile formats, particularly as digital technologies facilitate the transformation of the archived inscriptions into various means of gaining human attention. But preceding and underlying the archiving and consequent display are informational technologies of writing developed within knowledge-forming disciplines over the millennia of literacy. Consequently, the production and use of information can be examined through the rhetorical frame of disciplinary and professional written genres within the activity systems of modernity (see, for example, Bazerman, 1988, 1994, 1997, 2000; Russell, 1997a, 1997b; Smart, 1993, 2000; van Nostrand, 1997). The widespread accessibility of disciplined archives for use and transformation within other forms of activity, facilitated by new information technologies, further can be considered as part of the continuing issue of recontextualization of knowledge and utterance from one site to another (Linell, 1998) and the multiplicity of activity systems that are invoked by complex interdisciplinary projects in the modern world (Bazerman, 1999).

This article recovers a small piece of the history by which we constructed our understandings and uses of information, so that information has become pervasive in everyday life, needs, and action. It considers how information came to have major governmental and military meanings to the U.S. public during the Second World War and after, and how an anti–nuclear test activist group asserted an alternative understanding of information to foster public opposition

to government policy. This understanding of information crystallized in an activist newsletter called at first *Information* that was to evolve into a scientific journal called *Environment*. A study of the rhetoric embodied in this newsletter reveals the construction of a particular understanding and rhetorical practice of citizen information, validated by citizen scientists to serve the needs and concerns of citizens, which pervaded the anti-war, environmental, and consumer movements of the second half of the twentieth century. Such citizen information embodies multiple assumptions about threats to everyday life, the necessity of reliable and up-to-date information for action to oppose the threats, the large institutions whose interests are served by the threatening situation and that limit access to relevant information, science as an independent and objective source of information, and the responsibilities of a citizen to be informed.

From a rhetorical point of view, I want to recover some enthymematic assumptions that lie behind our invocation of information in any particular situation. But because so many things are characterized as information, which we use and talk about in different ways in different situations, any piece I recover here will only be a fractured and partial piece, sometimes relevant and sometimes not—and hardly a uniform or universal characteristic of the protean world of the information age.

METHOD

This study analyzes the set of enthymemes that underlie the written representations of information in the early issues of a newsletter that was at a major juncture in the formation of Cold War activist organizations in the United States and then uses that analysis to identify generic assumptions that underlie consequent citizen information. To understand the rhetorical valences of information prior to the emergence of this newsletter, I examine the history of the understanding of information in American politics within the twentieth century, and especially the heightened meanings of information in the World War II and early Cold War period. To establish the immediate rhetorical situation within which the St. Louis Citizen's Committee for Nuclear Information asserted rhetorical presence, I examine the immediate events leading up to the formation of the committee and the history of the production of the newsletter. These historical reconstructions are based mostly on secondary historical accounts supplemented by

occasional primary materials. The detailed enthymematic analysis is based on close examination of the first three issues of the newsletter to identify the unspoken elements in the text that are necessary for readers' reconstruction of the self-evident argument and to consider the stance and style of presentation that also evoke unspoken understandings about the information presented. The findings are then confirmed against a reading of the entire first 10 volumes of the periodical until its emergence as the journal *Environment*. Finally, the influence of the particular implicit construction of information established in this journal is suggested by a quick sketch of the genealogy of information-based nuclear test ban, anti-nuclear power, anti-war, and environmental movements in the following years. After a draft of the paper was written, I confirmed the account of historical events and rhetorical strategy with two of the people participating in the early years of the newsletter, Barry Commoner and Joel Snow. An ensuing telephone interview with Dr. Commoner provided additional background.

INFORMATION AS PERSONAL, IMPERSONAL, CENTRALIZING, AND DECENTRALIZING

One approach to recovering the complexity of what we consider information is to examine the history of the term *information* and its uses. Some obsolete meanings concern the internal formation of a person's mind, soul, or consciousness, and others concern complaints, rumors, legal accusations, and other pejorative characterizations of individuals (Compact Edition, p. 1432). In these meanings, the term information seems to have been tied historically to the formation of private and public personhood, though we no longer regularly think about such issues, except perhaps in the kinds of studies carried out by Turkle (1984, 1995). In addition to these archaic meanings, something like the current meaning of information as a snippet of knowledge about a person, subject, or event has been in use for five centuries; however, earlier usage emphasized the communication of this knowledge snippet between people, whereas current uses typically are divorced from the communication within which the information snippet is framed and transmitted. The ways information forms personhood and creates links between persons have become obscured in the shifting meanings of the term, leaving us without an

explicit understanding of how information is related to our identities and communications.

Another approach to understanding information is to explore the historical emergence of the technologies that create, support, and circulate those knowledge snippets we call information (e.g., writing, printing, file cabinets, telecommunications, and more recently, computers, programs, databases, and electronic storage media). Studies of the history of these technologies have helped us understand the material basis of the symbolic artifacts of information, the social organizations that have supported the use of these technologies for their own purposes, and the practices that have arisen using the technologies of information (see, for examples, Lubar, 1993; Media History Project). During the Second World War and consequent Cold War, in particular, the term information was associated with gaining information about the enemy, transferring information among allied forces securely and secretly, and disrupting the communication among the enemy forces. In these instances, information became associated with cryptography, Allan Turing, the Enigma Machine (which broke the German coding system), electronic computation, radar, Shannon and Weaver's information theory, Arpanet (the precursor to the Internet), and bandwidth. Such associations lead us to think about information as the data in the communication system. Information, from this perspective, appears to create an ever increasing and bounded world of symbolic collection within larger forms of social organization, so that more and more of life gets drawn into bureaucratic systems of information. To understand information as used in these instances, we may contemplate inscription systems, social organizations, forces having an interest in regularization and inscription, and the way individuals are caught up in these inscribed worlds. The forms, processes, and motives of inscription are multiple and complex, as fascinating as Yates' (1988) account in *Control Through Communication* of the invention of vertical filing cabinets, reporting forms, the memo, mimeography, and corporate chart rooms as being the necessary and mutually supporting tools to coordinate and control the work of large organizations. Equally fascinating stories have been told of the growth of the bureaucratic state, the rise of reformist social agencies, or the massive military mobilizations of the World Wars and the Cold War developing procedures, technologies, and practices for information gathering, storage, and use (cf., Dickson, 1976; Porter, 1995).

These centralizing aspects of information technologies certainly form a large part of the meanings we associate with information, perhaps most dramatically encapsulated in our fears about the aggregation of personal data, misuse of information, and constant surveillance by Big Brother government agencies and international corporations. Concerns about coordinated databases, panoptical monitoring, and centralized control of information have found an institutional home in such organizations as the Electronic Frontier Foundation and have crystallized around such issues as government access to encryption, sharing of databases, and censorship on the Net. Given the American traditions of individualism, private rights, freedom of speech, freedom from self-incrimination, anti-institutionalism, and hostility to centralized monitoring and control, resistance to the centralizing and controlling forces of information into which we are constantly being drawn is hardly surprising. What is surprising is that those most concerned about the centralizing force of information technologies are precisely some of those most committed to an electronic future and who find realms of freedom within the exchange of information within cyberspace. Many whose lives are most embedded in the information age style themselves as rebellious free spirits, libertarians who make novel and ad hoc alliances across boundaries of nations, organizations, corporations, governments, financial interests, and civic and activist groups. Slogans like "Information Wants to be Free" and metaphors of rhizomatic networks suggest the perception that information, its circulation, and the social groupings that form through the communication of information are larger than the information systems themselves.

One local, but defining, moment for this anticentralizing view of information occurred as part of the anti–nuclear testing movement in the late 1950s, when information became a powerful rhetorical tool to unite citizen interests and pose those citizen interests against the interests of more centralized governmental and military institutions. The Greater St. Louis Citizens' Committee For Nuclear Information was formed in 1958 and began publishing a mimeographed newsletter called *Information*, soon renamed *Nuclear Information*. In this case, the definition of what counted as information, who produced it, and who had access to it was crucial in contesting who had the right to make informed policy choices. The redefinition of information in this case had immediate political and policy consequences and identified the rhetorical force and meanings of information for subsequent activist movements.

THE OFFICE OF WAR INFORMATION

The St. Louis Committee's use of the term *information* was formed against military- and government-determined meanings of the term developing since the First World War. During World War I, the Committee on Public Information, run by the journalist Paul Creel, reported directly to President Wilson and worked to advance domestic support and morale and international cooperation with Wilson's vision of the goals of the war. This overtly propagandistic effort relied on negative stereotypes of the enemy and inflated visions of postwar harmony (Winkler, 1978, pp. 2-3). These excesses of wartime propaganda were fresh in the communal memory as the United States moved toward involvement in the Second World War. Prewar initiatives to inform the public self-consciously tried to forge more open and trustworthy channels for engaging public support. The Office of Government Reports provided a two-way flow between government and the citizens, letting citizens know of government actions and the government know of citizen reaction. The Division of Information in the Office of Emergency Management coordinated the representations of several different defense agencies with the aim of candor.

The Office of Facts and Figures (OFF) and the Foreign Information Service (FIS) (Winkler, 1978, pp. 21-22, 26) in particular sought citizen support through full disclosure and public response. These two agencies had grown out of the vision of the poet and Librarian of Congress Archibald MacLeish and the playwright Robert Sherwood. Defining their goals in opposition to what they considered repellent Nazi propaganda, they hoped to persuade Americans of the importance of the war effort by using reliable and unbiased facts (Winkler, 1978, pp. 18-19). They saw a fact-filled national deliberation and an honest presentation of the facts internationally as in themselves the best arguments to indicate what was worth fighting for, and anything less would undermine U.S. reasons for military engagement. However, the OFF, formed in October 1941 and headed by MacLeish, was soon hampered by security needs and the desires of government and military to influence public opinion. Similarly, the FIS, created in August 1941 and headed by Sherwood, soon ran into conflict with its boss, "Wild" Bill Donovan, the coordinator of information, who was directed to provide information to the president and other unspecified operations. Donovan was soon to carry out this function in a newly-formed Office of Strategic Services (OSS) and, later, the postwar Central Intelligence Agency (CIA).

In June of 1942, the FIS and the OFF were brought together with several other operations in a new Office of War Information (OWI) (Winkler, 1978, p. 35) headed by Elmer Davis. Both MacLeish and Sherwood had by this point stepped down. Although the OWI no longer had the ambitious vision of open public debate and full access to all information, it did attempt to provide Americans as truthful and as complete a picture as possible, but access to information was limited by other agencies. As the war continued, the OWI became more involved in maintaining national morale and war support. For example, it worked with Hollywood to produce documentaries about the war effort and attempted to encourage a more serious approach to war movies. The foreign section of the OWI became even more engaged in psychological warfare. So what was to be a channel for informed citizenry and an international representation of the United States as a bearer of truth became tied into maintaining cooperation on the home front. There was little consideration of the meaning, progress, purposes, or outcomes of the war. The OWI did stay fairly close to the truth, avoiding propagandistic distortion, but the use of truth was limited to deliberately creating pictures of American will and success.[2]

THE MANHATTAN PROJECT AND SECRET NUCLEAR INFORMATION

The wartime restriction of information (and information was the term used) was both heightened and brought into tension with the top secret development of atomic weapons in the Manhattan project. Scientists, used to open publication and control of their own work, were enlisted to produce secret information during the war, even though some of the scientists argued at the time that their findings should be made generally available as part of the open scientific literature.[3] Further, as Bohr argued, a number believed that openness was the best hope of world peace (Smith, 1965, pp. 5-11). During the war, the issue was resolved by restriction of all scientific, public, and international information, even up to the moment of the Hiroshima explosion (Smith, 1965, pp. 34-67). Even scientists working on restricted projects only had limited knowledge of immediately relevant aspects of the full range of scientific information generated as part of the Manhattan Project.

Soon after the surrender of Japan, the military control of classified scientific information again became an issue for scientists wishing to carry out open research for other nations so that they could share in a division of world power to maintain the peace and for Congress and other governmental agencies to assert civilian control over atomic policy. Civilian control was first framed as an issue of congressional control of policy, rather than military control under the president as the commander-in-chief. A number of scientists, assuming responsibility for their research on nuclear weapons, wanted civilian control to include their participation, which of course meant they also needed full access to information. They naturally also felt they had most ability to understand that information. At no point, interestingly, did the definition of *civilian control* seriously include the actual voting citizenry of the United States or other nations, nor did the issue of access to information become framed in relation to general public access.

The linked issues of access to information and control over policy decisions came to a head in mid-October, 1945. Congressional hearings of the May-Johnson Bill and the later alternative McMahon Bill continued through the first half of 1946. This latter bill became law as the Atomic Energy Act of 1946, which established civilian control of atomic power through the Atomic Energy Commission (AEC), composed of five citizens appointed by the president with the advice and consent of the Senate. The membership of the AEC has come from a variety of professions, but always includes one or more scientists. Civilian control, however, was still exercised in a regime of classified information where the commissioners made decisions based on information not available to the general public for open discussion, evaluation, and critique. The Atomic Energy Act of 1946 showed some awareness of the scientific need for the exchange of information, but such access remained limited by calibrated secrecy under the control of the AEC (Hogerton, 1963, pp. 37-54).

During this period, the Atomic Scientists of Chicago (with their publication *The Bulletin of Atomic Scientists*) emerged as an authoritative voice for the dissemination of information along with the Federation of Atomic Scientists. The Federation of Atomic Scientists also enlisted the broader public in the legislative struggle for civilian control through the creation of the National Committee on Atomic Information and a short-lived bulletin entitled *Atomic Information* (Smith, 1965, pp. 323-324), which vanished after the McMahon bill passed. Although the still-published *Bulletin of Atomic Scientists* in the

ensuing years has remained concerned about the dissemination of information to the public to advance citizen control, it has been directed only to a narrow and elite audience in the policy and scientific communities, who were assumed already to be informed on the basic issues.

INFORMATION IN THE COLD WAR

Throughout the late 1940s and 1950s, as the Cold War emerged, the public was not provided much detailed information about nuclear weapons, and much passion was expressed in the press and government proceedings about the threats that spies and the release of information posed to national security. Concern for the future of atomic policy was for the public carried out in vague and awesome terms, heightened with controlled release of information about the development of the super bomb. Yet, as documented in the 1995 Report of the Presidential Advisory Committee on Human Radiation Experiments, extensive secret research gathered information on the consequences of nuclear radiation and fallout (see also Lindee, 1994).

Although such research was classified, citizens were given sanitized glimpses that information was being gathered by the government and military, often in contexts designed to reassure the population that current policies were not endangering the population of the United States or the world. For example, on January 19, 1956, Walter F. Libby, member of the AEC and University of Chicago chemist who was to win the Nobel Prize in 1960 for developing radioactive carbon dating, gave a speech published in *Science* on "Radioactive Fallout and Radioactive Strontium" in which he argued that the fallout hazard from nuclear bomb tests is limited to a region a few hundred miles from the test sites. Following abstract explanations and calculations concerning the mechanisms of fallout production and diffusion to show that the fallout hazard could not be great, the last sixth of the speech presented general findings of studies conducted by the AEC as Project Sunshine in 1953 (though the date was not mentioned in the article, misleadingly suggesting that the results incorporated the effects of the greatly increased tests of 1954 and 1955). The studies were described as having collected fallout "on gummed papers, milk and cheese, alfalfa, animal meat and bone, and even human bodies" (Libby, 1956, p. 659). The results were presented largely qualitatively and in aggregate as part of argumentative assertions, for example,

that radiation gathers in bones, far from reproductive organs, that milk and cheese have only one fifth to one tenth the radiation of the grass eaten by cows, and that the grass itself seems to prefer to take up soil calcium rather than the strontium 90. All this led to the conclusion that

> the radiostrontium content of human bodies is the lowest of all animals measured and is lower than the average soil and average foliage by tenfold. The Sr90-to-calcium ratio in young people—whose bones are still forming—corresponds to about 1/1000 of the maximum permissible concentration for adults—1 microcurie per standard man containing 1000 grams of calcium. (p. 659)

The article ends by asserting that the precautions taken in bomb tests "should be entirely adequate and the worldwide health hazards from the present rate of testing are insignificant" (p. 660).

Even with no hint of the secret, more gruesome aspects of this study (i.e., collecting stillborn human cadavers and human flesh samples), the lack of detailed method and detailed local findings made the assertions far less convincing and reassuring to opponents of the testing and the general populace than Libby and the AEC might have hoped.[4] On the one hand, the article did indicate that the government and military were studying the potential danger, but, on the other hand, it indicated that the detailed data were being kept secret from citizens, preventing them from making their own judgments. Further, the use of the generalized findings in such an argumentative context serving the interests of the military made suspect the information gathered and the selectivity of the release. If the military had information and the populace were not given access, assessing the extent of the threat and establishing tolerable levels of fallout would remain entirely in the hands of the military.

In 1955, the American Association for the Advancement of Science (AAAS) established an Interim Committee on the Social Aspects of Science in recognition of the increasing role science was playing in matters of public policy and welfare and of the lack of knowledgeable public engagement with science.[5] The preliminary report of this committee, printed in *Science* in early 1957, pointed to three areas of public concern (i.e., radiation, food additives, and natural resources) and called for scientific responsibility in producing and distributing data to inform the public, particularly about radiation, with fewer secrecy restrictions.[6]

CITIZEN CONCERNS ABOUT NUCLEAR POLICY

Government-controlled information on issues of most pressing interest to citizens was received in a political climate of increasing suspicion about nuclear policy. By the mid-1950s, a worldwide civilian anti-nuclear movement developed, finding its roots in traditional pacifist organizations and scientific opponents to the bomb. Some well-publicized incidents, particularly the Bikini tests in 1954, the irradiation of the Japanese fishermen on the Lucky Dragon, and the 1955 trip of the "Hiroshima Maidens" to the United States for plastic surgery, stirred up a more widespread concern about what this new military technology was bringing to the world. The vague and self-interested reassurances from an AEC committed to U.S. military policy did not satisfy the increasing worldwide concern about what nuclear tests were doing to humans. After an AEC report of February 15, 1955, "The Effects of High-Yield Nuclear Explosions," concern coalesced around the radioactive by-product strontium 90 that was taken up as a calcium equivalent in dairy products and bones—thus seeming to provide a direct pipeline for fallout to invade vulnerable, developing infants. Were parents encouraging their children to become radioactive by urging their children to drink milk? Should they stop feeding milk to their children?

On April 21, 1956, Democratic presidential candidate Adlai Stevenson proposed a halt to H-bomb tests; his proposal brought anti-nuclear sentiment to the heart of U. S. politics, although it was hardly a winning issue (Wittner, 1997, pp. 13-14). Early the next year, the National Society for a Sane Nuclear Policy (SANE) was formed. This concern over testing and nuclear policy was to take a special form in St. Louis, foregrounding the role of reliable scientific information to serve the interests of citizens in guiding their own actions and in exerting political pressure on the government.

SCIENTISTS AND CITIZENS IN ST. LOUIS

In the postwar decade, many top scientists with an orientation toward civic accountability were gathering in St. Louis at Washington University under the leadership of Chancellor and Nobelist Arthur Holly Compton, who had been active during the postwar struggle for

civilian control of atomic power (Sullivan, 1982, p. 3). Among them were the physicists Edward U. Condon, Michael Friedlander, and John Fowler; professor of medicine Walter Bauer; and plant physiologist Barry Commoner. Compton, from his leadership positions, created several conferences on science and human responsibility. Commoner, who was on the AAAS Interim Committee on the Social Aspects of Science and who strongly felt that the "scientists had a duty to inform the public," began a series of community presentations on the frontiers of science. Out of this atmosphere came strong faculty support for Adlai Stevenson's test-ban proposal, though by that time Compton no longer supported this issue. The public debate that ensued on campus (mirroring a larger national debate) was linked to a continuing series of public events, brought to a climax at Linus Pauling's address on May 15, 1957, the day of the first British H-bomb test. Pauling had been brought to campus by Condon and Commoner; immediately after the talk and with their help, he launched a national petition to ban testing (Sullivan, 1982, p. 11).

In St. Louis in 1956, in conjunction with some of the community panels presented by the Washington University faculty, several community groups, including the St. Louis Consumer's Federation and the local branch of the International Ladies Garment Workers Union (ILGWU), expressed concern about strontium 90 levels in dairy products and requested testing to be done by the St. Louis Department of Health. A number of women who were leaders of these organizations were also active in the Stevenson campaign. In a well-publicized letter, they increased pressure on local officials; the city and county health commissioners turned aside the requests days before the election, passing responsibility for testing to the U.S. Public Health Service (USPHS).

In the meantime, the activism around the public need for information continued beyond Stevenson's failed campaign. Just after the election, on November 12, 130 science faculty members of Washington University wrote to the Joint Congressional Committee on Atomic Energy, requesting public release of authoritative scientific information to help resolve for the public the questions raised by the campaign. The alliance of community groups on this issue expanded, and the USPHS, after being urged by a local congressman, agreed to test milk for strontium 90 in St. Louis and four other cities. Initial USPHS reports, though stating the levels were low in relation to the maximum permissible dosage, hardly reassured the community. The

fact that any strontium 90 (which did not occur naturally) was present in milk raised alarms, as did the admission that dosage was cumulative. The samples measured were small and aggregated across eight counties, so the contamination of any particular source was uncertain. Further, continuing data were not reported consistently, giving the impression that the government was hiding something. When the Senate Foreign Relations Subcommittee on Disarmament took testimony in St. Louis in December, anti-testing activists (including Gertrude Faust of the St. Louis Consumers' Federation and Edna Fischel Gellhorn, former president of the local League of Women Voters, along with several faculty members from Washington University) expressed their concern. Mrs. Gellhorn in particular spoke of the lack of information and the alarming nature of the information that was available.

GREATER ST. LOUIS CITIZENS' COMMITTEE FOR NUCLEAR INFORMATION

Over the ensuing year in St. Louis, several groups and alliances formed to carry forward the opposition to nuclear tests and nuclear policy, and alliances were made with similar groups forming in other cities. For both community activists and scientists, the key vehicle for building a strong political movement seemed to be obtaining and publicizing the information that would focus public attention and enlist support. With this background in March 1958, the Greater St. Louis Citizens' Committee for Nuclear Information (GSLCCNI) was formed from an alliance of community leaders such as Gellhorn, Faust, Virginia Browdine of the ILGWU, and Reverend Abele, and scientist activists, such as Commoner, Bauer, and Fowler.[7] The first elected president was Alexander Langsdorf, dean of the Washington University School of Engineering. After much debate, it was agreed that the organization would not take any overt political stand but would rather work to provide information to the public and stimulate discussion. Despite some strong support for a more partisan stand, the majority of the founders agreed that the information they provided would have more credibility if it came from a nonpartisan source. Although this issue was to persist through the life of this and consequent organizations, the commitment to providing independent and reliable information set it apart from other scientist organizations that opposed testing, along with its alliance with citizen groups.

The organization would carry out its mandate to inform the public by operating a public speakers' bureau, encouraging the release and dissemination of government and other information, spreading available information through its own publication, and verifying information through its own scientific advisory committee.[8]

The logic of this nonpartisan partisanship—this political action by disavowing political stances—was based on the assumption that if the public were informed about the effects of nuclear weapons and fallout from tests, their concerns would increase, as would their opposition. Information in this case would make people aware of the threats to the safety and health of themselves and their families and would lead people to act on the now-understood threat. What would provide the validity of the information would be its source in the scientific community and, increasingly, its independence from government-commissioned and-controlled science. This was to be science that came from citizens and served the needs of citizens—science in the public interest.

In October 1958, the GSLCCNI began issuing a typed and mimeographed, 4- to 8-page monthly newsletter called *Information*. Beginning in January 1959, it was printed and more professional looking, and in March 1959, the name was lengthened to *Nuclear Information*. Although at times it appeared irregularly, the length of the issues increased, and it turned into a regular journal with the publication of volume 5 in October 1962. Its concerns broadened, its publication became more regular, and the journal took on the name *Scientist and Citizen* in August 1964. With the start of volume 11 in 1969, it adopted its current title, *Environment*. At the center of the nuclear and environmental movements, it helped set terms and define roles for information in citizen-activist movements of the second half of the century, which were to find especially large presence within the Internet and other information technologies. Indeed, the meanings and uses of information developed during this episode helped set the conditions and assumptions for the democratic hopes many were to pin on the Internet's ability to make information widely available.

THE RHETORIC OF INFORMATION

The first three issues of *Information* (October 24, November 24, and December 24 of 1958), typed and mimeographed by Commoner's assistants in his lab, have a distinctive format and logic that

clarify the basic uses and meanings of information projected by this organization as they developed in subsequent publications. The cover sheet of each sets the tone and purpose of the six or seven pages to follow. These cover sheets are headed by a dark banner masthead in which plain, white, sans serif letters, ½-inch high, spell out INFORMATION. Information, plain and unadorned, universal in its geometric simplicity, light against a dark background, bold in its clarity. Beneath this banner in enlarged typewriter script ran: "from the Greater St. Louis Citizens' Committee for Nuclear Information." A local address, phone number, and date follow in ordinary 12-point typewriter font. The typography and name suggests the information has a human source, is inscribed by real people—local citizens—devoted to providing information. The information is "from" them. Their local community service role authenticates the information, beyond whatever institutional source the information may be drawn from.

IMPLICIT ARGUMENTS

In the first two issues, the front page, below this header, is organized as a series of three or four claims in capital letters, each followed by a block indented paragraph of elaboration. The layout is strikingly concise, with substantial white space around each headline and on the sides of each block of elaboration. Each of these headlined claims is expanded upon on the subsequent pages, through summaries of government and scientific reports. At all three levels of elaboration (claim, paragraph expansion, and extended summary), the statements all point to the clear and present danger arising from current nuclear tests. The link between the statements and the danger is made most visible, but still only implicitly, in the sequence of the truncated front page claims. The implied logic of the first page becomes an embedded understanding that directs and motivates all that follows, but it becomes increasingly invisible in the specificity of the data that follow. Thus, what we have is a mechanism for constructing a set of enthymemes—unspoken linkages and assumptions—that turn all that follows into an implied argument. What follows are reported facts that seem not to argue but only state what is, leaving readers to draw their own conclusions. Yet the embedded logic is so strong that readers are easily drawn into a "common sense" that seems self-evident. This allows the articles to soon settle into the presentation

of facts or data or findings (i.e., apparent, nonrhetorical, unmotivated, and unpurposeful bits of information) but whose importance is immediately understood, leading readers to come to policy-relevant and perhaps politically engaged conclusions.

In classical rhetoric, *enthymemes* are arguments that leave parts of the reasoning unspoken. This technique allows the speaker to draw on community values, invoke some beliefs that are best left unspoken, engage the audience in a kind of thinking as they provide the missing links in the argument, increase the audience's commitments to the conclusions they seem to come to on their own, avoid appearing to urge the audience too strongly, and yet still reliably control the overall argument. Further, the unspoken invocation of community understandings bonds the audience and rhetor together as people who quite apparently believe the same things and see the world in similar ways. Finally, the presentation of the matters that are spoken about, which rely on the enthymemes for their interpretation and evaluation, strengthens those community values, understandings, and bonds by their very invocation in a public performance of mutual understanding.

We can see this enthymematic process at work most strikingly in the first page of the first issue, which relies on unspoken understandings and establishes some new premises upon which subsequent articles and issues rest. The overall enthymematic logic of the 7-page newsletter is most strongly projected on the first page preview of the contents under three headings, the last with two subheadings:

- Rate of Nuclear Explosions Highest in History
- "Clean" Bombs may be more Dangerous than "Dirty Bombs"
- World Scientists Agree:
  On Fall-out Danger
  On a System for Detecting Nuclear Tests.

The unspoken argument is clear:

> We are increasingly poisoning the atmosphere with fallout, supposedly clean bombs notwithstanding. The fallout is dangerous, so we must stop the testing. And we can do this through an effective test-ban treaty because violations can be detected.

Yet the relationships among the claims are never spelled out. Immediate assumptions we use to infer the reasoning are that nuclear tests

(the military project of our government) produce radiation fallout harmful to humans, that the U.S. government claims to be producing a bomb with less fallout and less danger to those not at the site of explosion, and that scientists are the acknowledged experts on radiation and its measurement. More fundamental assumptions evoked by these claims are that the government is strongly directed by military priorities to the point where it may endanger its own citizens and civilians elsewhere to accomplish its military objectives, that the government does not provide us with the full facts and maintains major secrets in relation to nuclear weapons and atomic policy in general, that government statistics may be manipulated and selective to maintain public morale and national security in war and war-like situations, that the Cold War was understood to be a war-like situation, and that world scientists are more credible than U.S. scientists, who are constrained by government secrecy guidelines and perhaps are in government employ.

FACTS AS ARGUMENTS

Because the enthymematic dots are never fully connected, each claim stands apart as a verifiable set of apparently objective facts, based on the most current and reliable sources. But in interpreting the logic of the claims, the assumptions are invoked, rehearsed, and strengthened by the seeming common sense of the self-reconstructed conclusions.

As we move further into the details of the presentation, the controlling logic that orients one toward the meaning of the facts becomes further embedded and assumed, and the details take more of the central focus. Thus, the cover-page expansion of the first headline, "Rate of Nuclear Explosions Highest in History," is simply a statistical account of the numbers of tests in recent years, noting that "test explosions of the three nuclear powers rose from 3 in 1948 to 32 in 1957 and to 69 in 1958 (as estimated up to October 31)." Numbers are presented assigning national responsibility for the tests: United States 129, USSR 55, Great Britain 28. No comment or judgment is made, but the conclusions about who is responsible and how testing is accelerating appear self-evident pieces of information.

On page 2, these figures are expanded, and a table detailing the tests by nation takes all of page 3—the data for the table are attributed

to the *Bulletin of Atomic Scientists*, Ralph Lapp (a well-known physicist who was also an antitest activist), and a *New York Times* article. The narrative of statistics is sandwiched between two paragraphs that together form a logical argument. The opening paragraph consists of a single sentence:

> Although the health hazard resulting from every additional nuclear explosion has now been confirmed by the international scientific committee that prepared the United Nations Report on the effects of atomic radiation, although East-West experts have recommended a system for detecting nuclear explosions that makes an enforceable test-ban feasible, and although all the nuclear powers have introduced U.N. resolutions urging the establishment of such a ban, explosions continue at the highest rate in history.

The sequence of *although* clauses and the final blunt statement of the continuing action has the typical form of a petition for redress in the face of an outrage. But rather than immediately demanding the redress or explaining the enormous harm done by morally unacceptable acts in condemnatory language, the middle paragraph (along with the full-page table that follows on the next page) spells out the facts of the outrage as a simple year-by-year count of tests by the three nuclear nations. The last paragraph expresses the uncertainty about the actual fallout yield and recognizes the AEC's claim to attempt to reduce fallout, but notes that this will not lead to any decrease of carbon 14.

Following immediately are details on the increasing carbon 14 in the atmosphere and the impossibility of eliminating it from fission weapons because of the mechanisms by which fission is produced. The information here concerns the atmospheric carbon 14 levels (attributed to Libby of the AEC and a United Nations [UN] commission), the mechanisms of carbon 14 danger (attributed to Linus Pauling), and the mechanisms of carbon 14 production in bombs (again attributed to Linus Pauling). Each item is the subject of one paragraph, comprising a 3-paragraph explanation of what carbon 14 is, how it is produced in fusion explosions, and how its lengthy half-life poses a long-term danger. On the cover page, this material is summarized in one paragraph under the second heading: "'Clean' Bombs May be More Dangerous Than 'Dirty Bombs.'"

Next, three short headlined paragraphs tell of three "Other Recent Scientific Reports" on radioactivity in milk, new fallout data, and new

estimates of fallout hazard. This last item introduces a 1-page article on a UN report confirming fallout danger. Five paragraphs of conclusions are quoted from the report, covering difficulty of protection from radiation, mutation of genes and other health risks, increase of radioactive contamination of the environment, and need for controls on all uses of radioactivity. The story ends with notes about the uncertainty of the extent of damage and about how new data has shown that earlier assumptions regarding radiation dilution were incorrect. This report, along with the next, provides elaboration of the last of the front-page claims: "World Scientists Agree: On Fall-out Danger/On a System for Detecting Nuclear Tests."

The last story in the bulletin tells of the Geneva Conference of Scientific Experts, which concluded that a detection system was technically feasible. The article reports that the conference was supported by actions of both the U.S. and Soviet governments and that the U.S. president praised the work of the conference. This report reflects back to the opening complaint of the first article and provides the details to elaborate the reasoning of the cover-page headlines. These various pieces of information from science, governments, and the United Nations ineluctably lead to the conclusion that a test-ban treaty is necessary. The final page of the last story is devoted to current negotiations that were beginning with U.N. involvement.

Despite the strong argument that emerges from the sequence of reports, the bulletin seems only to report authoritative, impartial facts. In coming to conclusions, readers appear only to be facing the facts. After presenting their facts, the articles do not return to any kind of conclusion, argument, or further urging. Rather, they each stop with the last fact. The last statement of the entire issue is, "Note: The information in this bulletin is based on the data available October 15." Credibility is made accountable to precision and honesty in a constantly changing and incompletely known situation, a situation that calls for timely action. This last statement reflects not only on the ethos or authoritative presence managed by the writers, but it also suggests that the concerned citizen needs to stay informed with the most up-to-date information.

STRONTIUM 90 AS A LOCUS OF CONCERN

The second issue focuses on the specific topic of strontium 90 in milk. It again projects its argument under a front-page set of headlines:

- Latest Report on Strontium 90 in St. Louis Milk: 17.6% of MPC
- Radioactivity in Milk Rises Rapidly in Past Year
- Other Sources of Strontium in our Diet
- Antlers in the Laboratory

Again, each headline is surrounded by white space and elaborated with a block of a couple of sentences of key facts to be presented in greater detail in subsequent pages. Again, the headlines all point to increased fallout. The reasons for attending to this fallout invoke as assumptions the arguments enthymematically established in the first issue—that there is a fallout threat from testing; that scientific measures can specify the existence and growth of the threat; that despite agreement among nations, international organizations, and scientists that the testing must stop, testing continues and produces more fallout; that testing is a willful policy act carried out by military interests in the government; and that responsible citizens need and want to stay informed so as to be able to make informed judgments about policy and to act for the interests of themselves, their families, the nation, and the world.

Moreover, each particular claim in the headlines and block summary evaluations relies on more specific assumptions. The first headline pointing to 17.6% of the maximum permissible concentration (MPC) of strontium 90 in the St. Louis milk not only relies on people's attunement to monitoring fallout levels but also their understanding that strontium 90 is not naturally occurring and accumulates in the bones, so that 17.6% is a substantial amount. The second headline, that radioactivity in the milk has been rapidly rising in the last year in the region and is higher than in other regions, furthers the argument that the threat is substantial and growing, implying that the threat needs even greater attention and action. Both of the first two items further suggest the threat is immediate and local. The third item takes the threat further by pointing to other sources of strontium 90, one of which has already gone beyond the maximum permissible concentration. The final item drives home the extent and extremity of the threat by reporting on findings from a Scottish laboratory that indicate an 11-fold increase of strontium 90 in deer antlers since 1952. Nonetheless, words like *threat* are never used. The measures and evaluations are entirely quantitative, with no overt evaluation. They are simply scientific measurements.

The logical ties between the last item and the previous three foreshadow what is to follow in the next issue. First, the earlier items raise

the issue of geographic variation and local threat, which the last item about Scotland extends to widespread geographic threat. Second, the last item moves from direct measure of radioactivity in the food supply to measurements of accumulation in bone-like matter. Third, it points to a method for reconstruction of a historical record that will show the severity of change in radioactivity in recent years. Finally, the reported study suggests that the radiation moves from the food supply into bone matter and, consequently, would likely be accumulating in humans—although this argument is never made, leaving readers to make the connection.

On the remaining five pages of the second issue, there is greater detail of the milk measurements made by the USPHS, with a table of readings over the last 18 months. Under the subheading, "Is this dangerous?" (p. 1), there is an explanation exceeding a page in length of what is known and not known about the effects of strontium 90. Its collection in the bones and its association with bone cancer and leukemia lead to a discussion of the way dosage is measured and the current uncertainties over what dosage can be tolerated without harm. This is directly interpreted through the example of the dosage that would be received by children with growing teeth and bones in current and future years under the current increasing rates of strontium 90 in milk and other foods. The use of the example of children is not commented on, and no specific comments about the threat to the next generation are made. Rather, the example is left to evoke concerns and feelings within the readers without any further argument or urging.

The results of other studies are used to indicate that more detailed data and further studies are needed that are both more geographically extensive and locally intensive. Additional data are provided on strontium 90 in other foods. All this serves as prelude to the antler data, which provides a direct measure of bone accumulation. Although the link is not explicitly mentioned, the alternative method of study solves some of the uncertainties of previous knowledge and studies.

Within the general fallout concerns in the first issue, the second issue establishes strontium 90 as a specific focus and concern because it collects in the bones and teeth of growing children and animals. Thus, it is this specific threat that calls for knowledge and serves to evoke the most immediate and engaged concern of the citizens and parents who read this journal.

THE BABY TOOTH SURVEY AS A LOCUS OF MOTIVATED, PASSIONATE ACTION

This strategically focused set of concerns and need for knowledge is brought home in the third issue, which introduces and focuses entirely on the Baby Tooth Survey. Rather than reporting already gathered data, this issue lays out a research project and enlists citizens in gathering new data, which will provide needed detailed information. The project, as explained in the bulletin, entails collecting 50,000 baby teeth of children in the St. Louis area each year. The analysis of the teeth for strontium 90 levels would create a historical record stretching back 10 years to when the teeth were first formed. That 10 years in fact went back to the early days of nuclear testing, providing an essentially complete record of the level of fallout from its inception. The survey was to be assisted by two major dental schools in the city (St. Louis University and Washington University) and would be analyzed by a committee of dentists headed by a professor of dentistry. The idea for such a survey already appeared in a scientific article the previous August by a "prominent biochemist at Johns Hopkins University." So local children and their parents would be contributing to an authenticated "scientific" study, not a political movement. But this scientific study was still grounded in community leadership and concern, for its steering committee would be composed of an alliance of local physicians, local women from community organizations, and local university professors. Further, the project was first suggested early in the previous summer, even before it appeared in the scientific literature, by a local pediatrician. Finally, "The Committee for Nuclear Information will inform the St. Louis public about the results of these analyses as they become available" (p. 3). The project is presented as a community-based initiative, accessible to the community and serving community needs, even while it is authenticated as a valid scientific study.

The dating of the idea in the committee and in prestigious scientific literature several months before the first issue of the bulletin in October and the obvious level of organization of the project presented in the third or December issue suggests that the intention to carry out this survey was already in place before the bulletin began and may have been one of the motivating factors in creating the bulletin. Further, the first two establish the knowledge, orientation, and exigency—the assumptions—necessary to build understanding of and

commitment to the project by local citizens. The first two issues (a) asserted and repeatedly evoked the fallout threat, (b) provided basic science about fallout to explain the nature of the threat, (c) focused the threat on strontium 90 and its collection in the bones through the ingestion of radioactive milk, (d) asserted scientific authority over the issue, (e) established the limits of existing knowledge and need for further studies, (f) demonstrated that government-sponsored research was not adequately responsive to the informational needs of the local community, (g) identified appropriate data-gathering methods, (h) indicated international concern of the United States and failure to act, and (i) asserted a local alliance of concern among citizens and scientists to find and distribute the facts so the threat could be faced forthrightly. If a reader were to accept all the representations made in the first two issues, she would perceive and urgently feel a situation of greatest seriousness affecting the lives of herself, her family, and her community—a situation that needed action in the face of institutional failure to act, so that responsibility fell back onto her and her neighbors. Participation in the community-organized survey, then, provided a vehicle for taking needed action.

Even more deeply, the previous two issues had evoked concern for children and fear that parents might be responsible for irradiating their own children by condoning tests and then feeding children tainted milk and other foods. Although the bulletins avoid heightened emotional language, the situation, the scientifically described processes, and the facts presented were designed to mobilize parental responsibility, dread, and guilt. Again, the survey provided a means to be able to act on these powerful motives. In acting through participation in the survey, parents themselves would become more committed to the authority of the facts collected and more attentive to the results and conclusions. They were being drawn into increased activist opposition to fallout and, by extension, to the testing program that produced the fallout. The previous issues had created a rhetorically powerful subject position for the readers, especially the parents of the St. Louis community, insofar as they found the representations authoritative and trustworthy.

The subject position is so rhetorically powerful, motivating, and directive toward action that the actual presentation of the tooth survey could be rather matter of fact, with no introductory argument, statement of need, or urging, as is typical of requests for cooperation in a survey. Nor is the bulletin organized around a series of argumen-

tative claims, as were the previous two issues. Nor is there any summary cover sheet headlining the key points as in the previous issues. Below the masthead is only the informational headline, "BABY TOOTH SURVEY LAUNCHED IN SEARCH FOR DATA ON STRONTIUM 90." If not for the prior understandings established and by now being reinforced in the conventional newspapers and newsmagazines, this headline could be reporting some small study being done elsewhere on some arcane bit of nuclear chemistry. With these understandings in place, however, the description, request for participation, and instructions can be presented entirely in the passive voice, not seeming to involve any local agents, not even the parents who are to send in their children's teeth:

> Plans to collect 50,000 baby teeth a year to provide an important record of the absorption of radioactive strontium 90 by children in the St. Louis area have been made by the Greater St. Louis Citizens' Committee for Nuclear Information.
>
> Parents and children in the St. Louis area are being asked to participate in this project by mailing deciduous (baby) teeth to Baby Tooth Survey at the Committee's address, 4484 West Pine Boulevard, St. Louis 8, Missouri.
>
> To provide data on the dietary source of tooth-building materials containing strontium 90, the teeth should be mailed in an envelope together with a slip of paper containing the following information:
>
> Name of child:
> Date of Birth:
> Birthplace:
> Where mother lived during pregnancy: City: State:
> Was the child breast fed? How long?
> Was the child bottle fed? Type of milk used: How long?
> Year in which tooth came out:
> Name of Parent:
> Address:

The only intensifier in this first section is *important*, which is applied to the term *record*. Participation involves bureaucratic record keeping, the supplying of personal information in the format of clinical data, as one might do in a doctor's office. The passion of the issue is channeled into distanced, objectified information, which participants then have a stake in. This transformation of personal information into impartial but community-based information is made explicit in the methodological comment, "Since a number of teeth from different children

must be pooled for each strontium 90 analysis, no individual reports of strontium 90 content of separate teeth can be made" (p. 3). Concern is to be channeled through science and communal public action, not through individualistic self-protection.

The following three pages of text explain the logic of the survey under the headings:

- WHY BABY TEETH
- COLLECTION MUST BEGIN AT ONCE
- VALUE OF TOOTH ANALYSIS
- SCHOOLS OF DENTISTRY OFFER ASSISTANCE
- IMPORTANCE OF DIETARY INFORMATION

The last page is a graph showing when, just prior to and after birth, calcium and strontium 90 are deposited in the crowns of various teeth.

The tone throughout is factual and explanatory, even when considering the increasing levels of fallout and the levels of strontium 90 measured in the St. Louis area. Again, urgency and intensification appear only concerning collection of data, which "must begin at once" because of "the importance" of constructing a historical record going back to 1948 from teeth currently being shed. Evaluative language assesses only the quality of data sources: "Bone samples are *difficult* to obtain and involve long delays. . . . Baby teeth are *most favorable* because their mineral content. . . " (p. 2).

There are two other indirect heightenings: First, the amplification of the hazard to children underscores how current actions are putting children under unprecedented risk:

> To assess the possible strontium 90 hazard to the present generation of children—*the first to experience this danger* [italics added]—scientists need to follow the strontium 90 content of the body from year to year. (p. 2)

Second, the identification of the committee as "the first group to initiate a large scale collection of baby teeth" provides an avenue for pride through the participation in science by which threats to the community are being faced directly by citizens and citizen-scientists of the community.

THE ETHOS OF INDEPENDENT CITIZEN SCIENCE

Establishing a citizen science for information for the public interest, apart from government, creates an alternative authoritative position from which to evaluate the actions of the United States and other bomb-testing governments. This position stands alongside the other positions of criticism and evaluation by international science and international bodies such as the UN. The very action of creating this citizen science by U.S. citizens in effect is an evaluation of the policies, representations, and science of the U.S. government, for it implies a suspicion that the government is either keeping something from the citizens or acting without the full knowledge it needs to act in the best interests and safety of its citizens.

The contrast between citizen science and government science is brought out keenly in the contrast between the public survey of baby teeth collected benignly by parents and the top secret Project Sunshine, which harvested the cadavers of unwanted stillborns. Although, of course, this irony was invisible to most citizens because details of Project Sunshine were not made public until much later, it may not have been lost on some of the scientists who first proposed the tooth survey, for Project Sunshine would have been a clear model for the method of calcium body-part collection. Kalcker, who proposed the method in *Nature*, commented that "At present important, although rather erratic data exist, based on autopsy samples derived mainly from adults" (p. 2). This passage was quoted in the *Information* article. In the new context, it hints, though maybe inadvertently, at the contrast between autopsies and the life-affirming wholesomeness of the Baby Tooth Survey.

The Baby Tooth Survey was to become a signature project of the committee and the publication. A progress report appeared in the March 1959 issue, an issue devoted entirely to strontium 90–related stories, indicating that teeth were arriving in large numbers and from as far away as Calcutta. In volume IV, issue 1, November 1961, the first results were published based on a sample of the 67, 500 teeth that had been collected so far, results that were published the same month in *Science*. These results indicated that strontium 90 intake in teeth did indeed increase in the first years studied, 1951 through 1953. A further report of findings appeared in volume V, issue 5 (March-April 1963).

After the first announcement of the survey, the bulletin in the next issue was printed with an increased quality of typography and graphics. In the masthead, *Greater St. Louis Citzens'* was reduced and *Committee for Nuclear Information* was expanded, both no longer in a script font. After two more issues, the title was focused as *Nuclear Information*, and by June 1961, the organization's name was dropped from the masthead. The publication, though still coming out of St. Louis, had taken on a national presence, and the concept of citizen's information was well established, no longer needing the local connection to make it meaningful.

WIDENING ISSUES, CONTINUING STANCE

In the early years of the bulletin, strontium 90 fallout remained a crucial issue, with major stories on "Milk and the Strontium Problem" (taking up most of the February 1959 issue), "Strontium 90 and Common Foods" (taking up most of the March 1959 issue), new standards for strontium 90 accumulation and estimates of projected Sr90 accumulation (all of April 1959), new estimates of fallout likely to affect St. Louis based on new AEC and other data presented to Congress (May 1959), and most bluntly, in October a four-page article in question and answer format, "Mothers Ask—What Should We Feed our Kids?" The last article sets the scenario of neighborhood women drifting over to the author's house for their usual afternoon gatherings, but this time the talk turned to her involvement with the committee. They began asking questions like "Should we still give our kids milk?" and "How much harm will fallout cause?" The answers are equally straightforward and simple. The next issue (November 1959) directly addresses similar concerns, though in a bit more sophisticated way, in the issue-long story, "Radiation—How Much is Too Much?" Fallout, food, and defects remain a central focus of many of the issues for the first 5 years, until a test-ban treaty was signed in 1963.

Information about fallout from tests soon extended to effects of possible nuclear war. The September 1959 issue was devoted to projections of destruction and radiation from a nuclear attack on St. Louis, using data from congressional hearings to create fictionalized narratives of survivors a year after a hypothetical attack. Over the next several years, discussions of the impact of nuclear war, including an

additional postattack fiction, became an increasingly central concern. Strategic weapons are discussed in July 1962, and civil defense is analyzed in March 1962, October-November 1962, and many issues to follow. Nuclear proliferation is examined in December 1962, the social effects of nuclear war in July 1963, and chemical and biological warfare in February 1963.

Radioactive waste (particularly Hanford's impact on the Columbia River) gets attention in December 1959, birth defects in January-February 1960, and nuclear test detection in March 1960. Government initiatives to develop peaceful uses of atomic power come under scrutiny in the June 1960 critique of Project Plowshare's plans to use nuclear explosives for large excavation projects, the production of electricity, and creation of radioactive isotopes to be mined. Project Chariot, to create a new harbor in Alaska through an atomic blast, is examined closely in a quadruple June 1961 issue. Information about the impact of nuclear waste and of nuclear excavations extended concern to hazards to animals and the environment, which are also examined in a September-October 1963 issue on "War and the Living Environment."

Thus, by the start of volume 7 (October 1964), the journal was renamed *Scientist and Citizen* to reflect the broadening scope of issues addressed on its pages. Articles began focusing directly on environmental concerns, such as air and water pollution and pesticides. By volume 11, environment had become its sole focus, the journal was renamed *Environment*, and the sponsoring committee was renamed the Committee for Environmental Information.

The history of the St. Louis committee and its publications suggests that the transformation of citizen movements, from anti-nuclear testing, to nuclear disarmament, to opposition to peaceful uses of the atom including nuclear power plants, to environmentalism, was constant in its attention to information. In the middle of this same period, opposition to the Vietnam War swelled, along with suspicions of government-provided information and government suppression of information. The anti-war movement was committed to developing independent sources of citizen-based information, with teach-ins and public release of classified documents becoming central weapons of political action.[9] More recently, information for the citizen produced by citizens and citizen scientists, access to government information, and opposition to classification have continued to provide major themes in the emergence of the culture of the Internet.

THE CHARACTER OF CITIZEN INFORMATION

In all these information-based citizen movements, the precedents set by the St. Louis committee have had continuing influence, even though the uses and meanings of information have varied and evolved. The following list of propositions reflect some of the assumptions and understandings that typically underlie information presented in and around these movements and are thus enthymematically evoked by people who use such information regularly. The normative, evaluative, and interpretive nature of these propositions reflect the communal understandings and values of the communities that give rise to and use this information.

1. Information is specific, even atomized, and stripped of its overt rhetorical import. Because the meaning of information is based on a nexus of public understandings (as elaborated below) and is directed toward specific areas of threat already understood as areas of concern within specific contexts of the life world, most of the understandings and assumptions that give rhetorical meaning to the information are not made explicit. The information has rhetorical power because it is already largely understood as crucial to important situations. Only occasionally are some of the argumentative links explicitly developed to explain and urge the argumentative importance of the information.

2. Information reveals a threat and evokes a response to that threat. Information provides knowledge of a threat (to the lives and well-being of oneself, one's family, or community) suspected to be a threat and associated with some substantive object or situation understood as a threat. Thus, quantitative or qualitative data about the presence of that object is taken as evidence of the presence of the threat. And the data themselves then are information, evoking an active orientation to a perceived threat.

3. Information orients the reader to action, and the receiver sees that information as necessary for effective action. If the information reveals a threat, knowledge of that threat provides the opportunity and motive to act in the interests and security of oneself, one's family, and one's community. Without information, people are in unwitting danger; therefore, to protect oneself and one's near ones, one must have the information. That information must then be adequate to allow one to know how to act. Less than that amount of information leaves one requiring more.

4. Information should be up to date. Because threats change rapidly, information about those threats must be current, and the informed citizen must stay up to date with the latest information about threats.

5. Information reveals malign actions of powerful institutions. The threat is perceived to be the result of the actions and policies of a government or other large organization. Thus, the threat revealed by the information is perceived as a threat from particular institutional agents whose actions cause the threat, whether intended or not.

6. Information has policy implications and suggests political action. If the information reveals a threat and that threat is caused by institutions, particularly governments, then one of the areas of action is to change those policies that give rise to the threat. This often calls for political action.

7. Information ordinarily emanates from interested institutions that create and control information for their own uses and benefit. Those same institutions responsible for the threat are those who know the most about it and, therefore, are the first and most apparent sources for information about it. But because of their interests and most specifically their interests in the policies that result in the threat, they are likely not to release all the information about the threat (i.e., secrecy), may avoid gathering information that is likely to reveal their actions as threatening (i.e., intentional ignorance), and may even mislead the public by misinformation. Thus official information is unreliable and will minimize or hide the threat.

This has several corollaries:

7a. Institutions ought to reveal as much information as they have to their citizens.

7b. Multiple and independent sources of information provide greater reliability.

7c. Citizen information collected for citizen purposes has greatest reliability.

8. Science is a more reliable source of information. Insofar as science appears to be independent of government and institutional interests and insofar as it appears to derive its information from technically accurate and objective means, it provides a greater validity to the measure of the threat. This has several corollaries:

8a. Science ought to be open and share its findings with the public, particularly where the public interest is concerned.

8b. Science ought to address issues of public concern.

8c. Scientists may conceive of themselves as citizens responsible to other citizens, instead of as agents of institutions, even institutions of science.

8d. Disciplines and sciences may then be conceived of as forms of citizenship, creating knowledge for public welfare.

8e. Alliances between citizen groups and scientists have special authority.

9. Informed citizens are good citizens. Good citizens are informed about threats so that they can act wisely as citizens influencing policy, and they therefore will be better informed if they affiliate with citizen-based, information-producing groups. Because those citizens who stay informed are aware of the current threats, they will cooperate for resolution of those threats and will bond within their mutual cooperation and shared information.[10]

CONCLUSION

Insofar as citizen-based information is also meant to join public issues against people of opposing interests and views within public debates in public forums such as the courts, the press, or legislatures, there are further strictures and understandings other than those proposed above that will shape the meaning and uses of information. These further considerations will have to do with being useful, persuasive, and compelling across boundaries of communities, belief, interests, and commitments. That, however, is a matter for a different study, using materials more directed at joining public issues than building and serving a community of shared knowledge and orientation, as this study is.

In all cases, nonetheless, information is neither disembodied nor neutral. Information is rhetorical. It is created and deployed in particular historical circumstances for the use of particular individuals and groups. In presenting their case through information, authors construct a role for themselves as particular kinds of information givers and offer to readers particular roles as information seekers or recipients. Around these representations characterized as information coalesce social interactions and a joint cultural action. In the case we have examined here, information mediates the relationship between the citizen scientists and the citizens as citizens and then provides a vehicle for the two to assert their interests as citizens. To understand

what information is, we need to unpack the entire sets of relations, actions, and texts within which information is formed and deployed.

NOTES

1. Among the earlier uses of *information age* and the related term *information society* I have been able to locate are three futurological documents within the technology industry: Slamecka (1965), North (1970), and Helvey (1971). By the late 1970s, the term gained currency in the world of library science, in such documents as Hammer (1976), Josey (1977), and Giuliano et al. (1978). Two government reports in 1977 mark a growing awareness of the implications of living within an information age: United States Privacy Protection Commission's *Personal Privacy in an Information Society* and United States Department of Commerce's *The Information Economy*. The term seems to have moved into the more general world of economics and politics by the time of Dizard's (1982) widely circulated *The Coming Information Age*. The term had very wide circulation by 1989 when *information society* became an index term in the *Readers' Guide to Periodical Literature*, with 8 items that year, 12 the following year, and 18 the year after that. Over the period from 1982 to 1994, the listing of items for all information terms expands from less than a half column to over nine columns.

A search on MAGS (the California Digital Library online magazine index) shows a similar pattern of rapid growth of the general use of information age terms in the late 1980s so that their use was general and ubiquitous through the 1990s:

Title Word Mentions of Information Society–Related Terms on the California Digital Library, Magazine and Article Database

Year	Information Society	Information Age	Information Highway	Information
1988	20	44	1	1,886
1989	58	215	2	3,428
1990	153	780	4	6,922
1991	161	901	16	9,444
1992	158	238	24	9,763
1993	192	242	107	10,919
1994	189	246	261	11,028
1995	241	260	144	15,749
1996	244	350	72	15,808
1997	233	271	62	16,279
1998	216	428	49	17,267

2. Similarly, during this entire period, the British Office of War Information maintained a vigorous but low profile effort to mobilize and draw on the "special relationship" with America (Brewer, 1997).

3. Between the two world wars, the term *information* was associated with bibliographic access to the scientific literature by such events as the foundings of the Research Information Service by the U. S. National Research Council (1918), the British Association of Special Libraries and Information Bureaux (1924), and the Berlin Technische Hochschule's Informationstelle (1931) (Reynolds, 1994, pp. 26-33).

4. After a cleaned-up version of the Project Sunshine report was declassified, the report was critiqued by the physicist Ralph Lapp (1959). Among other comments he made at that time was that there was no need to keep the document secret when it was first produced.

5. This movement to support public discussion of science-related policy issues was in tension with the previous and continually dominant view within the American Association for the Advancement of Science (AAAS) that the purpose of informing the public about science was to enable the public to appreciate and support science (Lewenstein, 1992, 1999).

6. Members of this interim committee were Ward Pigman (chair), Barry Commoner, Gabriel Lasker, Chauncey D. Leake, and Benjamin H. Williams.

7. Commoner stated that "in essence, the St. Louis Committee was an effort to put into practice the extensively discussed and debated approach" to inform the public developed in the AAAS Interim Committee. Commoner then further elaborated these ideas in a paper on "The Fallout Problem" at the December 1957 meeting of the AAAS. The paper examined the lack of adequate scientific research, the public confusion, and the inadequate communication of what information was available so that the public could make informed decisions. The paper in particular points to the necessity of policy choices being made by informed citizens, and that it was only "lag in the spread of the necessary information to the rest of the citizens that has given the scientists their apparent monopoly" on opinions on "the wisdom of continued [nuclear] testing." To provide the public "a reasonable basis for independent judgment" Commoner (1958) recommended an educational campaign to bring "the essential facts and ideas . . . to the people through the media of public communication" (pp. 1025-1026). During this period, Commoner also regularly met with Walter Bauer, John Fowler, and Alec Pond over lunch at the faculty club to discuss the formation of the Greater St. Louis Citizens' Committee for Nuclear Information (GSLCCNI) as a test of the ideas about informing the public that he had developed in the AAAS committee. (Barry Commoner, personal communication, October 20, 1999.)

8. See also Commoner's (1966) personal account of the activity of the committee in *Science and Survival*, pp. 110-120.

9. Commoner organized an early Vietnam teach-in at Washington University because "the information approach" had worked so well "in the nuclear business." He then helped organize the first national teach-in. (Barry Commoner, personal communication, October 20, 1999.)

10. For an elaboration of this trend in contemporary citizenship, see Schudson (1998), particularly chapter 5.

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