The Potentials and Limitations of Civil Society Research:

Getting Undone Science Done

David J. Hess

Science and Technology Studies Department
Rensselaer Polytechnic Institute
110 8th St.
Sage Building 5th Floor
Troy, NY 12180-3590
518 276 8509
518 276 2659 fax
hessd@rpi.edu

Citation: Hess, David J. 2009. "The Potentials and Limitations of Civil Society Research: Getting Undone Science Done." *Sociological Inquiry* pp. 306-327.

David Hess is a professor of science and technology studies at Rensselaer Polytechnic Institute. His most recent books are *Alternative Pathways in Science and Technology* (MIT Press) and *Localist Movements in a Global Society* (MIT Press).

Keywords: Science, social movements, civil society, public participation, environmentalism

Abstract

The term “undone science” refers to absences of scientific research that social movement and other civil society organizations find when attempting to make epistemic claims in the political field. The existing literature has identified various pathways for addressing the knowledge needs of civil society organizations, including asking elected and appointed political leaders to shift funding priorities and directly seeking support and partnerships with scientists. Here, a third pathway is identified and explored: civil society organizations that have the resources to fund their own research. A sample of such “civil society research” from large, mainstream, U.S. environmental organizations demonstrates that although the large organizations do engage in such research, most of it is not published in peer-reviewed journals. The peer-reviewed research is found almost exclusively in large preservation and conservation organizations that have staffs of scientists. Most of the other research reports are oriented toward documenting environmental problems and providing policy and management solutions. The research is highly applied and does not represent fundamental contributions to large mainstream scientific fields. Comparisons with civil society research in the author’s previous research projects on religion, health, and economic development are discussed to assess applicability of the concept for other sociological subfields.

When social movement organizations and other civil society organizations challenge elites with the goal of making social change that serves a broad public benefit, they confront a variety of problems, such as repression, lack of media coverage, internecine struggles, and underfunding. Among the many problems that social change agents face is an often lopsided field of scientific research. With so much money available from government and industry to support research in tune with military and industrial interests, and with the industrial shaping of university research through donations and partnerships, mainstream research agendas tend to reflect the priorities of political and economic elites. Those priorities are evident in the selection of which scientific research questions are worth pursuing and which should be designated as best left undone. As a result, when social change agents attempt to make epistemic claims, such as claims about the safety of a new technology or an industrial process, they often confront a lack of knowledge or an area of "undone science" that does not exist but would have been valuable to them (Hess 2007a; Woodhouse, Hess, Breyman, and Mar tin 2002). This study explores the challenges and potential for "civil society research," that is, research funded by nonprofit organizations linked to social movements, to address the gaps represented by undone science. Although the issue represents an understudied area in the sociology of knowledge, attention to undone science and civil society research could have implications for a variety of sociological subfields.

Civil Society and the Problem of Undone Science

The sociology of science and sociology of scientific knowledge both recognize the importance of various types of ignorance or absences of knowledge in the scientific enterprise. In the sociology of science, researchers studied the existence of both "extrinsic" factors, such as industrial and military interests, and "intrinsic" factors, such as theoretical commitments, that shape the decisions that scientists make in the selection of problem areas (Gieryn 1978; Hagstrom 1965; Merton 1978). In the context of this work, sociologists began to conceptualize the existence of absences of knowledge in science. For example, Merton (1987) identified "specified ignorance" as a prelude to "newly focused inquiry," and Zuckerman (1978) noted that theoretical commitments could lead scientists to "preempt" some problem areas as not worth studying. The sociology of scientific knowledge also examined the role of uncertainty and interpretive flexibility in the generation and resolution of controversies, both within the scientific field and in broader public fora (e.g., Collins 1985, 2002).

Other discussions, especially those concerned with environmental and policy issues, have drawn attention to the importance of uncertainty in the context of technological decision-making. To some degree uncertainty can be quantified and articulated within a framework of risk assessment and statistical analysis, but the unanticipated consequences of ignorance may be excluded from such analyses (Hoffmann-Riem and Wynne 2002; Levidow 2002). Some problems are also so complex or "wicked" that they always involve mixtures of uncertainty and ignorance (Rittel and Webber 1973), and some problems may also require for their solution forms of science

that are "undoable" given existing methods (Frickel, Gibbon, Howard, et al. 2010; see also Hilgartner 2001).

In a review of the literature on the sociology of ignorance, Gross (2007, 2010) developed a typology that builds on previous discussions. His work clarifies distinctions among, for example, non-knowledge, which is specified in the sense of assessments of uncertainty and risk and can be taken into account in planning; negative knowledge, which is considered irrelevant or even dangerous; and nescience, which is a complete lack of knowledge or the awareness of the limits of knowledge and as such is a precondition for surprises. In terms of Gross's typology, "undone science" might be conceptualized as one form of "negative knowledge." When civil society organizations identify research that has not been done by academic, governmental, or industrial research groups, they are pointing to negative knowledge, which may be the result of intentional decisions not to select a problem area for research or the result of less explicit structural conditions that shape the agendas of research fields.

However, to some degree civil society organizations may also confront the problem of "nescience," or unknown unknowns, because future research that addresses the problem of undone science may not turn out to support the assumptions of civil society organizations. For example, environmental organizations concerned about the toxic effects of a pollutant on ecosystems or human health may learn that the pollutant has no identifiable effects at a specific level of exposure. As a result, the relationship between the political advocacy role of civil society organizations that engage in reform efforts and their quest for answers to research questions that have been systematically

underexplored may result in “ambivalence” when the undone science eventually gets done (Yearley 1992). Social movements and public-interest civil society organizations also face uncertainty in the interpretation of the research that does exist (Gunter and Kroll-Smith 2007) and in the broader “knowledge gaps” that they face when attempting to solve public policy problems (Frickel 2008).

The politics of drawing attention to “undone science” and calling for modifications of research funding and research agendas are likely to be hotly contested. Activists, government agencies, academic researchers, and industrial corporations frequently disagree over what research is needed and deserving of funding. Furthermore, there can also be internal disagreements, for example, among scientists or among activists over research funding priorities. Sociologists of science have long recognized that some problem areas in science are targeted for greater or lesser funding depending on their alignment with military, governmental, and industrial research priorities (Blume 1974, Cummings 1984, Hessen 1971). Those decisions can shape the general contours of a research field and therefore generate areas of undone science, even when scientists have not explicitly targeted the areas of undone science as dangerous or irrelevant. Industrial and political interests can also explicitly target some areas of research for defunding and engage in the politics of intellectual suppression, as sometimes occurs in the environmental and health sciences when researchers identify potential risks of profitable technologies (Martin 1999). Furthermore, industrial elites are not the only source of explicit targeting of research fields for defunding; religious groups have also identified areas of research, such as stem cell research, that they believe would be best left undone

(Frickel, Gibbon, Howard, et al 2010). Likewise, scientists themselves have sometimes targeted areas of research for moratoria, especially weapons-related fields (Moore 2008).

The problem of undone science raises a specifically political question about the history of the scientific field as undergoing a process of uneven development, where greater investments are made into research that is beneficial to military and industrial elites but not always in the best interest of the broader society, the environment, or the poor and other historically disempowered groups. Because of the focus on the political dimensions of how research agendas are selected and shaped, the study of the problem of undone science represents a contribution to the political sociology of science (Blume 1974). The new political sociology of science draws attention to the politics of research agendas and the ways in which choices about scientific knowledge are outcomes of broader societal conflicts and coalitions involving not only research communities but also governments, industries, and social movements (Frickel and Moore 2006). The study of civil society research from the perspective of the politics of which research is prioritized or defunded is best understood as part of the new political sociology of science, with implications for the study of social movements and specific sociological subfields, such as environmental or medical sociology, depending on the specific topic of research. This research project focuses on environmental knowledge.

Civil Society Research

There are various pathways for resolving the problem of undone science and other types of ignorance and knowledge gaps that social movement groups face. The pathways

are not mutually exclusive and should be viewed as ideal types that can appear in hybrid forms. The traditional or conventional pathway is for civil society organizations to bring the matter to the attention of elected political leaders and appointed leaders of government funding agencies and to ask them, or pressure them, to include more research on a specified topic. Although the approach may upon first glance appear to smack of the naiveté of a high-school civics class, its effectiveness should not be underestimated. For example, AIDS patients ended up finding a place on agenda-setting panels of the National Institutes of Health, and alternative cancer therapy advocates won Congressional support for what eventually became the National Center for Complementary and Alternative Medicine (Epstein 1996; Hess 2004). Although well-organized social movements have a good track record of affecting research agendas, the funding shifts that they achieve can end up becoming Pyrrhic victories, because researchers can recapture the funding and reshift it in other directions. For example, with alternative cancer therapy research, most of the government-funded research has been directed toward complementary rather than alternative therapies, that is, therapies used in addition to conventional therapies rather than instead of them. As a result, the fundamental challenge to cytotoxic chemotherapies that the movement for alternative cancer therapies supported was diverted (Hess 2004).

The second pathway for solving the problem of undone science involves a direct appeal to scientists to select problem areas that social movement and related civil society organizations identify as both undone and important. Researchers in private industry have more constrained limits on their agenda choices than do those in the academy, and consequently most of the examples involve alliances with academic researchers. In

Europe the alliances have been institutionalized through the development of science shops, which enable civil society organizations to find contacts with university-based researchers for support, although funding has become increasingly precarious (Farkus 1999; Wachelder 2003). In the United States participant-action research and citizen-science alliances represent a parallel type of relationship (Brown 2007). Sometimes such collaborations emerge from some preliminary data based on local or lay knowledge (Brown 1997; Couch and Kroll-Smith 1997). If successful, the lay research may help motivate the involvement of an expert research group, which can bring to bear on the problem the technical methods that will allow the research to have broad credibility, and the collaboration will proceed as a citizen-science alliance.

Although this second pathway of direct collaboration with experts can be effective at generating new knowledge that addresses the problem of undone science, it also has some limitations. One problem is the definition of the object of research, which can involve significant translation problems between lay and expert knowledges (Kroll-Smith and Floyd 2000). Another is the lack of funding and status rewards for sympathetic researchers. As Albert (2003) has explored, scientific research fields are divided between a higher status side oriented toward internal consumption, such as the work of high theorists and well-funded empirical research teams, and a lower status side oriented toward applied or non-producer consumers of the research of the field. The alliances that civil society organizations can form with research communities will tend to be with the lower status researchers. For higher status researchers who take on such projects as a pro-bono portion of their research portfolios, there is a risk of status dilution. As a result, the

effects on overall agendas of the research field will likely be limited and temporary, therefore requiring constant renewal of ties and requests.

A third pathway is open to the larger and wealthier civil society organizations: to fund and direct research. This category of research, termed here "civil society research," can be viewed as analogous to industrial research and development, but often opposed to it as a countervailing force in the politics of knowledge. Civil society research is likely to be outfunded by comparable industrial research, but a well-positioned study may undermine the credibility of industrial claims and open up the agenda-setting process for greater scrutiny.

One category of civil society research appears in civil society organizations that were developed by scientists who disagree with the dominant research agendas of their fields and form what Moore (2008) calls "public interest science organizations" (PISOs). Through an analysis of different types of PISOs, Moore showed how scientists may disseminate an alternative picture of the state of a research field, generate new and original research studies, and call for shifts in research funding agendas. For example, the members of the Committee on Nuclear Information contributed to the Baby Tooth Survey, which measured the effects of atmospheric nuclear weapons testing on American children (Moore 2008).

PISOs are voluntary organizations led by scientists, and therefore their research may be considered one type of civil society research, but in the intervening decades since the formation of the post-World War II PISOs studied by Moore, the tremendous growth of the number and scale of civil society organizations has created opportunities for a new

type of epistemic enterprise to emerge. Building on Moore's work but also taking a slightly different direction, I focus on organizations that have originated not from the scientific field on the model of the PISO but more directly as part of social movements. As the organizations developed over time, they came to possess the budgets to hire and direct scientific and other research projects, such as investigations into corruption and corporate malfeasance. In contrast with lay knowledge such as popular epidemiology, the distinguishing feature of civil society research is its parity with peer-reviewed scientific research and the expert reports of policy think tanks, a characteristic that grants the research potential epistemic and political credibility. Clearly, distinctions such as "lay knowledge" and "civil society research" are typological, but they serve as a useful guide to mapping out different types of knowledge produced outside the mainstream laboratories of industry and academia.

The emergence of civil society research is one example of the broader historical transformation that the new political sociology of science explores. A well-recognized aspect of the transformation of the university is the increasing connection of corporate research with product development, the "asymmetric convergence" of industry and the academy, and the alignment of government funding agendas with industrial competitiveness goals that has opened up the scientific field to new sources of both resources and interference (Etzkowitz, Webster, and Healy 1998; Kleinman 2003; Kleinman and Vallas 2001; Slaughter and Leslie 1999). The countervailing process of "epistemic modernization" signals another aspect of increasing external influence on science: the political action of the less powerful sectors of society as organized through

social movements (Hess 2007a). The emergence and development of civil society research is one aspect of this broader historical change.

Civil Society Research in Mainstream U.S. Environmental Organizations

The environmental movement in the United States is a vast organizational field that includes an estimated 30,000 organizations (Kempton, Holland, Bunting-Howarth, et al. 2001). Although there are many ways to classify the diverse organizations, one common strategy is a very broad division into three large groups: conservation and preservation organizations, many of which date back to the early twentieth century; environmental reform organizations that address issues of industrial pollution and sustainable alternatives, many of which were founded during the 1960s; and environmental justice organizations, which grew dramatically during the 1980s and 1990s. Even this categorization is not exhaustive; Brulle and Jenkins (2005) include wildlife management alongside the preservation and conservation organizations, and they also include deep ecology, ecofeminist, and ecotheological organizations among nonmainstream organizations.

Within the broader field of environmental organizations, the present analysis focuses on large, national organizations because they are presumed have the financial resources to fund civil society research. The research presented here is largely qualitative and exploratory; the goal is to map out a concrete example of "civil society research." To do so, I developed an inventory and an analysis of research reports in a sample of

national organizations in the U.S. in the "mainstream" environmental movement, including conservation, preservation, and environmental reform organizations.

Environmental justice organizations were not included because they tend to have limited budgets and therefore limited capacity to do civil society research; the modes of knowledge generation have historically been based on the local, lay knowledge of communities exposed to toxics; and the types of knowledge generated in those organizations has been amply studied elsewhere (e.g., Brown 2007). PISOs were also excluded because they may be considered science organizations rather than environmental organizations, and again they have been studied in detail elsewhere (Moore 2008). Although scientists were central in the formation of some of the organizations that were selected for this study, they often worked in concert with people with other professional backgrounds, and the organizations cannot be classified as PISOs. Still, the organizations are capable of generating research or funding research in ways similar to the PISOs, and consequently they provide a good source of empirical material for understanding what civil society research is and what it can achieve.

From the universe of possible national, mainstream environmental organizations as defined above, a selection was made of organizations that were likely to be large enough to be able to afford support of independent research. One common list of such large organizations is the "Group of Ten," a list of national environmental organizations that formed a defensive coalition after the election of Ronald Reagan in 1980 (Cahn 1985; see also a similar list by Mitchell, Mertig, and Dunlap 1991). Another source for identifying the large organizations was a list of nineteen of the largest U.S. environmental

organizations by membership (Moyers 2001). The “Philanthropy 400” list also provided access to the largest environmental organizations by revenue (Chronicle of Philanthropy 2005). Together, a list of 25 organizations was developed (24 after the Environmental Policy Institute was dropped due to its merger with Friends of the Earth), as presented in Table 1.

Insert Table 1 about here

Organization Name	Group of Ten	Largest Membership	Highest Revenue	Reports Identified
African Wildlife Federation		x		1
American Forests		x		2
Conservation Fund			x	5
Conservation International			x	20
Defenders of Wildlife		x		6
Ducks Unlimited		x	x	3
Environmental Defense	x	x	x	14
Environmental Policy Institute (merged with Friends of the Earth)	x			--
Friends of the Earth	x			4
Greenpeace USA		x		42
International Wildlife Coalition		x		0
Izaak Walton League	x			3
National Audubon Society	x	x	x	4
National Parks and Conservation Association	x			9
National Wild Turkey Federation		x		3
National Wildlife Federation	x	x	x	6
Nature Conservancy		x	x	7
Natural Resources Defense Council	x	x	x	5
Ocean Conservancy (Center for Marine Conservation)		x		1
Pheasants Forever		x		0

Sierra Club	x	x		5
Trout Unlimited		x		7
Wilderness Society	x	x		9
Wildlife Conservation Society		x	x	10
Worldwide Fund for Nature (World Wildlife Fund)		x	x	36

Table 1

Large National U.S. Environmental Organizations

Through an exploration of publicly available information on the organizations' web sites, an inventory was developed of all research reports produced during the year 2006. It would be interesting to extend this project to cover other years and chart longitudinal trends, but that question is beyond the scope of the present study. Research reports were identified by searching for a section of the organization's web site with a relevant label such as research, publications, or reports. Press releases, Congressional testimony, and opinion statements were not counted; instead, the sample focused on peer-reviewed publications, literature reviews, non-peer-reviewed presentations of new research, and policy briefs that presented new data and/or analysis. The boundary between research reports and other kinds of publications was fuzzy and is discussed in more detail below. Where research reports were not listed in a readily available manner, a second-order strategy involved searching the organization's annual report, studying the news releases for the year in question for mention of new reports, examining dozens of topical web pages for links to reports, and running other types of searches on the web

site. Because of the difficulty in obtaining a clear count of research reports, the quantity of reports listed in Table 1 should be interpreted as a rough estimate.

A preliminary analysis of four preservation-conservation organizations and four mainstream reform organizations identified 108 reports. Issues discussed included new species or risks to existing ones (N=16); ecosystems, habitats, wildlife refuges, forests, oceans, rivers, and other place-based environmental issues (N=28); climate change, greenhouse gas emissions, air pollution, and global warming (N=16); sustainable technology and development, including renewable energy, clean buses, and recycling (N=14); toxic exposure and risk of industrial technologies, such as nanotechnology, nuclear energy, and genetically modified food (N=20); and general analysis of policy issues that have an environmental impact (N=14). Classification was based on reading the report and/or the executive summary. Because many of the reports covered multiple topics, the categories should be interpreted as ideal types and are presented here as background to give a sense of the range of topics covered.

A more comprehensive inventory of reports was then undertaken of the long list of the 24 large, national, mainstream environmental organizations. Various problems in defining and including reports arose and were addressed. One major problem was that for some of the organizations (especially the National Audubon Society, Ducks Unlimited, and the Sierra Club), research appeared to be located in regional chapters or affiliated centers in addition to the national, umbrella organization. It was impossible to go through all the local chapters, and as a result the reports identified consisted of those mentioned in the national organization's press releases and other pages. A related problem involved

distinguishing between U.S.-based reports and those completed by foreign affiliates in the organizations with multiple national branches, such as Greenpeace and World Wildlife Fund. In this case I accepted all reports by the organization. As a result, a different decision criterion might have resulted in an inventory with more reports in the case of organizations such as the Sierra Club and fewer in organizations such as Greenpeace.

A third problem was that in some cases the web sites were incomplete. Listings of science publications for 2006 were not complete for two organizations (World Conservation Society and the Nature Conservancy), which resulted in undercounting for two organizations, and information from the International Wildlife Coalition was not available. The National Audubon Society also had a database of over 100 "important bird areas," but the reports were not dated and were therefore not included.

A fourth problem involved confirming the status of a research report as a product of the organization. Reports that were completed by other organizations or even an individual who was not clearly affiliated with the environmental organization were not included. This criterion resulted in a reduction of reports from the preliminary analysis for Environmental Defense. However, research reports that involved shared authorship and sponsorship were included, unless the authorship was shared with other environmental organizations in this group of 24. Shared authorship within the group of 24 occurred in only a few cases, and in those cases the report was only counted for one organization.

Results

The inventory identified 202 research reports, an estimate of the total number of research reports produced by the organizations during the year 2006 (Table 1). The number is itself of interest, because it provides the first estimate of the gross research output of the sector. Although smaller environmental organizations would be expected to produce additional reports, it appears that the level of productivity of the large mainstream environmental sector might be comparable to that of a few, medium-sized academic departments. This level of output is enough to influence some subfields, so it is potentially of interest as a pathway for solving the problem of undone science, but only in very limited and well-defined areas.

However, the capacity for civil society research to shape the direction of a research field is limited by the small number of peer-reviewed studies. Once a report was identified, peer-reviewed research published in scientific journals or presented at scientific conferences was identified and tallied separately. Only 36 reports (18%) were identifiable as peer-reviewed research. Furthermore, the peer-reviewed research was concentrated in a few organizations. The bulk of the peer-reviewed reports were articles published in scientific journals by scientists at Conservation International and the Worldwide Fund for Nature, but a few conference presentations and other organizations were also identified. Had the listings of science publications for the World Conservation Society and the Nature Conservancy been up-to-date, perhaps another 20 articles might have been evident. Because many of the studies were contributions to conservation

biology, the potential was probably greatest for environmental civil society research to influence that field. Assessment of influence is beyond the scope of this study.

To give an example of what peer-reviewed research means in this context, consider a study published in *Ecology and Society* (Chomitz, Fonseca, Alger, et al. 2006). This was a multiauthored study with a coauthor from Conservation International and cofunding from that organization, in the tradition of transdisciplinary, mode-2 knowledge networks (roughly, "problem-oriented" or "mission-driven" research; Nowotny, Scott, and Gibbons 2001). The article addressed the problem that conservation reserves often require "reserve networks" of contiguous habitat areas in order to ensure species survival. However, landowners in contiguous areas often do not comply with guidelines, and consequently voluntary, incentive-based arrangements have been tested. The article then modeled an incentive-based system in Bahia, Brazil. Most of the peer-reviewed articles were similar to this example in the sense that they involved multiple authors and explored topics in conservation research. A follow-up question would be to assess the impact of the funding and research of conservation organizations on the field of conservation research.

The division between peer-reviewed versus non-peer-reviewed publications was used as a way to distinguish between "scientific" research and other types of research. The problem of how to demarcate the boundaries of science has received substantial attention in the sociology and philosophy of science (Gieryn 1995), and no single method of demarcating science and nonscience is noncontroversial. In this project, I used the social accreditation process of peer review as a relatively noncontroversial marker of the difference between civil society science and other types of civil society research.

Although the definition may be conservative, the publications by scientists at the Center for Applied Biodiversity Studies of Conservation International in peer-reviewed journals such as *PLOSBiology*, *BioScience*, or *Ecology and Society* would, based on my experience serving on numerous promotion and tenure committees, likely pass as "science" in a tenure and promotion review committee at most universities. Clearly, other boundary definitions are possible.

The broader concept of "civil society research," which includes civil society science as a subcategory, is intended to draw attention to the existence of non-peer-reviewed reports that generally make use of peer-reviewed literature and methods associated with the natural and social sciences. The non-peer-reviewed reports generate new knowledge that is oriented toward identifying and understanding environmental problems and interventions that could solve them or reduce their negative effects. In other words, considerable expertise and knowledge is often evident in the reports, but the knowledge is more oriented toward solving problems than advancing a research field. Even the peer-reviewed research funded by civil society organizations tends to do double duty as work that advances a research field, such as conservation biology, and that directly contributes to the understanding of environmental problems and solutions. But the non-peer-reviewed research appears to be almost entirely concerned with having a policy impact, either directly via influence on policymakers or indirectly via the media and public opinion.

The concept of non-peer-reviewed civil society research is perhaps best understood as a continuum, bounded on one side by peer-reviewed research and on the

other side by informal knowledge that appears in investigative journalism, policy advocacy statements, Congressional testimony, press releases, and related endeavors. I faced this second boundary issue when deciding whether to count a particular "report" or "publication" as research or whether to ignore it. Recognition of the fuzziness of boundaries presents both problems for quantitative analysis and opportunities for qualitative inquiry into the social significance of an interstitial category of knowledge that is neither wholly science nor wholly political ideology or journalism.

Because the number of peer-reviewed studies turned out to be small and the category of non-peer-reviewed research reports was large, one might reasonably ask what kinds of subcategories can be used to characterize the non-peer reviewed research. In the preliminary analysis of eight organizations, I divided non-peer-reviewed research into five subcategories, again ideal types, as follows:

1. critical studies, often similar to investigative journalism, of the practices of large corporations and governments that pose severe environmental risk to tropical forests, wildlife refuges, and other ecologically sensitive areas;
2. analyses of the human impact on specific ecosystems, from greenhouse gases to off-road vehicles, often oriented toward local or state government audiences;
3. review articles of existing scientific literature with a focus on its policy implications, of use to policymakers and the media;
4. analyses of the economic and environmental impact of proposed or existing public policies; and

5. analyses of more sustainable policies and environmental management practices, including evaluations of the progress or lack of progress of corporations and governments in achieving more sustainable alternatives.

Because of type overlap, the categories were difficult to maintain. As a result, in the larger analysis of the 24 organizations, I used only two main categories: reports on ecological and environmental science issues, usually the deterioration of ecosystems and species survival threats caused by human impact such as pollution and climate change (N=58, 29%); and analysis of environmental policies and management practices ranging from policy analysis to reviews of specific organizations and their environmental practices (N=108, 53%). As I indicate in the discussion of two cases below, even the broad dichotomy was ambiguous because the reports of the deterioration of ecosystems often came with policy recommendations. I was interested in the distinction because I suspected that environmental reform organizations might produce the bulk of the policy reports, whereas conservation and preservation organizations produced reports mostly on ecological and environmental science issues. One can test the hypothesis by pulling out environmental reform organizations that focus most on industrial pollution issues. When I separated Environmental Defense, Friends of the Earth, Natural Resources Defense Council, Greenpeace, and Sierra Club and contrasted them with the conservation and preservation organizations, I found both types of organizations engaged in both types of reports (see Table 2). There is some association (a gamma, or Yule's Q, of .67), but it is mainly due to Greenpeace (.27 without Greenpeace).

Table 2 about here

	Analysis of ecological systems and environmental science	Policy and Environmental Management Reports
Conservation and preservation organizations	47 (49%)	49 (51%)
Industrial reform organizations	11 (16%)	59 (84%)

Table 2. Organizational Type and Report Type

For the purpose of exploring in a preliminary way the variation of a social phenomenon that has not yet been studied, qualitative analysis is more appropriate. A few examples of non-peer-reviewed research provide a better picture of what this category of civil society research entails. One example is an Environmental Defense report that I would characterize as a policy-oriented study concerned with industrial pollution, but not focused on an ecosystem (one of the 59 studies in the lower right quadrant of Table 2): the fifty-page study *Smokestacks on Rails: Getting Clean Air Solutions for Locomotives on Track* (Scott and Sinnamon 2006). The study analyzes the effects of diesel exhaust from locomotives in the tradition of *Exhausted by Diesel*, the study by the Natural Resources Defense Council (1998) that influenced efforts to control emissions on buses. Political opportunities for environmental reform of diesel emissions regulations have been relatively open in the United States, partly because the health implications are well documented and the air quality problems are particularly concentrated in low-income neighborhoods, making the issue one of civil rights and environmental justice (Hess 2007b). The Environmental Defense study opens with some rather stunning statistics, such as the claim that the emissions from locomotives in a city such as Chicago are equivalent to that of thirteen million automobiles. The report examines in detail the

growth of rail transportation, the health and environmental impact of diesel exhaust, and technologies and policies that would mitigate emissions. The sources used are mostly government documents and research reports.

Another example, drawn from the preservation and conservation organizations, is more a study of ecosystem impact (one of the 47 studies in the upper left quadrant of Table 2): the National Wildlife Federation's thirty-page report *Fueling the Fire: Global Warming, Fossil Fuels, and the Fish and Wildlife of the American West* (Glick 2006). Drawing on many peer-reviewed publications as well as some journalistic sources and government documents, the report examines the effects of heat waves, droughts, fires, invasive species, wildfires, and habitat loss on the fish and wildlife of the region. Although global warming is used in the introduction to frame the study, the scope of human impact is not limited to climate change. For example, there is a section on the effects of oil and gas drilling on habitats. The report also includes a discussion of policy changes that could mitigate the destruction of the Western ecosystems (an example of the difficulties of categorizing reports). The plan of action is comprised of four main areas: carbon caps with trading, a shift from fossil fuels to renewable energy sources, habitat improvement measures such as migratory corridors and buffer spaces, and minimizing the negative effects of wind farms and carbon sequestration projects through improved design.

Some of the Greenpeace reports were outliers in the sense that they constituted a fuzzy border between a research report and investigative journalism. An example is the twelve-page report *Partners in Crime: A Greenpeace Investigation into Finland's Illegal*

Timber Trade with Russia (Greenpeace 2006b). The report explores the impact of Finnish imports of Russian timber on Russian forests and on European Union sustainable forestry policy. Because Finland held the European Union presidency at the time and also claimed to exercise substantial influence on the forestry industry in Europe as a whole, the fact that it imported 80% of its timber from Russia, including what Greenpeace believed was a significant percentage of illegal timber, was deemed to have implications for continental forestry policy. The report not only provides a survey of the policy field but also provides photographic documentation, in the manner of investigative journalism, of the importing of illegal timber into Finland. There is no detailed policy analysis, but the report does call on the governments of Finland and Russia, the European Union, and associated companies to end the practice. Another example is a six-page report on a genetically engineered, herbicide-tolerant rice (LLRICE601) that was developed by Bayer and under consideration for approval for human consumption by the U.S. Department of Agriculture (Greenpeace 2006a). The report questions the company's assumption that the type of rice is substantially similar to two other types of genetically engineered rice already accepted for human consumption in the United States. Covering some very technical material, the report develops the rationale for not allowing the rice to be approved.

In all four cases, the studies review and synthesize existing research and relevant background literature in order to define the scope of an environmental problem and provide a basis for motivating policy solutions. The research reports have footnotes that lead to peer-reviewed literature, government research studies, and other sources, and they

present technical material in a way that is accessible to the lay reader. Yet, the audience is only partially a lay reader. The reports are probably best understood as policy science or policy briefs oriented toward technically difficult issues that require the expertise associated with environmentally relevant natural science fields. The reports provide guidance to policymakers and administrators of conservation or other environmental programs, as well as information for the media and environmentalists. Levels of media coverage, public opinion shifts, and policy responses would constitute more accurate metrics of success than conventional measures for scientific research, such as the number of citations in the peer-reviewed literature.

Although an examination of the relationship between the publication of a research report and press coverage or legislative outcomes is beyond the scope of this study, it is probably the case that most of the research reports end up having limited media and policy impact. Occasionally there are some cases where civil society research has a very evident impact. For example, in 2000 Friends of the Earth and a coalition of other organizations that were opposed to genetically modified foods issued a report that documented the contamination of human food products with a type of genetically modified corn known as StarLink, which contained the bacterial pesticide Cry9C and had been approved for animal consumption only (Friends of the Earth 2001). The StarLink study generated explosive media coverage and various secondary analyses from government agencies and other sources, probably because the issue fit with the general pattern of extensive attention that the media gives to food scares, such as salmonella poisoning. The report was successful in the sense that it drew attention to the problem of

undone science regarding the contamination of the human food supply by genetically modified food and, secondarily, to the undone science on the health and environmental risks of genetically modified food in general. It was less successful in the policy arena, where U.S. Representative Dennis Kucinich responded with proposed legislation for mandatory labeling of genetically modified food. The proposal was defeated, but more careful procedures were instituted to separate human and animal food products, and the report did leverage additional research by government, university, and industrial groups that sought to explore, support, or debunk the claim. Although not representative of the civil society reports that I have read, the Starlink case is suggestive of the effects on public opinion, regulatory policy, and industrial practices that civil society research can have.

Conclusions

Some civil society organizations can marshal the expertise needed to produce scientific reviews, generate new and surprising research findings, produce research that has credibility among policymakers and the media, and, in some cases, even challenge the fundamental assumptions and research agendas of a research field. The work is published largely outside the peer-reviewed forum, and hence I have adopted the term "civil society research" rather than "civil society science." However, as I have indicated, about 20% of the studies are published in peer-reviewed journals.

Two main hypotheses emerge from the research. First, most of the research generated by civil society organizations is not oriented toward peer-reviewed networks of

researchers but instead toward the media, policymakers, and public for the purpose of identifying and characterizing problems and analyzing and influencing policies and practices. Second, even the peer-reviewed research tends to be oriented toward applied fields, and it does not represent fundamental criticisms of the assumptions of large mainstream research fields. In other words, this research is not the stuff of major consensus shifts in science.

The two hypotheses might be used to ask questions about the role of civil society organizations in a variety of fields, thereby contributing to other sociological subfields. Although it is not possible to explore in detail the portability of the concept of civil society research across other sociological subfields, a brief discussion based on three of my other long-term research projects on civil society organizations and knowledge provides an indication of how the hypotheses might guide future research. The projects were the Spiritist religious movement in Brazil (Hess 1991), the alternative cancer therapy movement in the United States (Hess 1997, 1999), and the "buy local" and related localist movements in the United States (Hess 2009). In all three one can identify research projects that support the reform efforts of civil society organizations: psychical research investigations by Brazilian Spiritist organizations, clinical and subclinical research by independent research organizations and clinics in the case of alternative cancer therapies, and studies of local multiplier effects funded by independent business associations and other advocates of localism.

The three other examples of research sponsored by civil society organizations can be used to provide a preliminary assessment of the utility of the concept of "civil society

research" across a broader spectrum of organizational fields. As for mainstream environmental organization research, the research produced in these other cases is supported by sources outside the world of academic, government, and industrial funding networks and is channeled through small, independent organizations. The organizations and individuals have identified areas of undone science that are not addressed by mainstream research fields, and they have endeavored to address some of the gaps. In the Spiritist and localist cases, the research is almost all non-peer-reviewed, but in the alternative cancer therapy case there are dozens of peer-reviewed studies (see Hess 1999 for a review). There are also clinicians in private practice who fund their own research or fund research organizations and researchers located in universities. This case may approximate some of the relationships seen in the peer-reviewed conservation science studies, but together the three additional cases suggest that peer-reviewed research may be entirely or almost entirely absent in other cases of civil society organizations that conduct or fund research.

With regard to the second hypothesis, in the cases of alternative cancer therapies and localism the research is part of broader reform projects that would significantly change, respectively, clinical practice for cancer treatment and local economic development policies. Put briefly, the research for cancer would reorient clinical practice toward nutritional and vaccine-oriented interventions instead of or in addition to conventional chemotherapy and radiation therapy, and the research on localism would reorient economic development policies toward an import-substitution frame that emphasizes the development of the production and circulation of goods by locally owned,

independent businesses. In the case of Brazilian Spiritism, the research was more oriented toward combating skeptical critiques from Jesuit intellectuals and the medical community, and consequently it might be characterized as theoretical rather than applied. However, the Spiritist movement is widely engaged in various spiritual healing techniques for mental ailments, and consequently there is a reformist agenda oriented toward psychiatry, an agenda that is particularly interesting given the ownership of many Brazilian psychiatric hospitals by Spiritists. In all three cases, the examples of civil society research suggest potentially deep theoretical disjunctions with mainstream research communities, and consequently my second hypothesis—that the research does not represent fundamental criticisms of the assumptions of large mainstream scientific fields—may not hold up in a broader comparative analysis of civil society research.

Another issue raised by the comparative analysis of civil society research is its relationship with a broad public interest. From the perspective of civil society organizations that engage in such research, their projects speak for a broad public interest, but it is possible for civil society research, like industrial and academic research, to serve narrower interests. One should avoid presupposing an equation of civil society research and public interest research. One can imagine cases in which industrial research represents a broad public interest and civil society organizations work against them. For example, one might argue that the use of Spiritist mind-body therapies in psychiatric treatment does not represent a broad public interest because there is little evidence that the therapies are effective (an argument that relies on the existence of undone science). Even less controversial knowledge claims, such as those of environmental organizations

that define an environmental problem and policy solutions, such as wilderness conservation and management research, may be interpreted as benefiting only a segment of society and harming other segments. For example, conservation efforts may place restrictions on long-term land-use patterns by rural inhabitants, and consequently issues of broad public benefit involve complex choices and trade-offs.

As a result, one should be careful about assuming that civil society research addresses the broad societal benefit that the organizations sometimes claim. More work needs to be done to determine ways of distinguishing civil society research that serves a broad public interest versus research that serves a narrow segment of the public. One option is to define "public interest" in a manner analogous to nonprofit law, which lists specific types of activities as qualifying for nonprofit status because of their public benefit. Thus, one might define serving a broad public interest as research that contributes to enhanced environmental sustainability and/or greater social equality or opportunity.

The study of civil society research may also have policy implications because it suggests a way of approaching public participation in science through mechanisms other than recruiting excluded groups for scientific training, developing social movement/ scientist collaborations, and building demarchic institutions such as lay consensus conferences. Those are all important developments that deserve ongoing attention and experimentation, but the research project developed here suggests additional possibilities. One policy implication is to consider modifying research funding to enable a portion of government and foundation funds to be earmarked for large civil society organizations with some scientific expertise and a desire to address areas of undone science that affect a

broad public interest. Although there would likely be significant political opposition to public funding of the more controversial proposals, the funding of civil society research proposals could address some of the problems of undone science that are not being addressed by academic, industrial, and government researchers.

In the absence of greater access to resources, research directly sponsored by a public-interest civil society organization may be primarily limited to low-budget empirical research or research reports that draw on and aggregate pre-existing data. Because funding is highly limited, the research selected is also likely to be targeted to be of direct relevance to current policy issues. The constraint may limit the ability of civil society organizations to fund more general and theoretical inquiry into the assumptions of a dominant research field, but the other examples of civil society research suggest that the constraint can be superceded under some conditions. Furthermore, even when a civil society organization produces a surprising result that generates significant media coverage, e.g., the StarLink case, the response from industry may be new and better funded research that generates confusion and dissensus. Consequently the civil society organization can be drawn into an uneven spending war, and the only hope for a fair contest of knowledge would be for some university-based researchers and government laboratories to join the controversy with their own resources. Even so, the outcome may be stalemate and continuing controversy. The fundamental issue of undone science may achieve general public awareness, but the basic research questions may remain unanswered. Nevertheless, the creation of controversy might be considered at least a partial success, in contrast with the status quo of silence and undone science.

Furthermore, the media space opened by controversy creates opportunities for the civil society organization to reframe the issue away from a specific knowledge gap to a broader social problem that needs to be addressed. The limited moves that social movement and other civil society organizations have available may not result in a perfect outcome, but in an imperfect world, such outcomes may be better than ignorance.

References

Albert, Matthieu. 2003. "Universities and the Knowledge Economy: The Differential Impact on Knowledge Production in Sociology and Economics." *Higher Education* 45(2): 147-182.

Blume, Stuart. 1974. *Toward a Political Sociology of Science*. New York: Free Press.

Brown, Phil. 1997. "Popular Epidemiology Revisited." *Current Sociology* 45(3): 137-156.

_____. 2007. *Toxic Exposures: Contested Illnesses and the Environmental Health Movement*. New York: Columbia University Press.

Brulle, Robert J. and J. Craig Jenkins. 2005. "Foundations and the Environmental Movement: Priorities, Strategies, and Impact." Pp. 151-174 in *Foundations For Social Change: Critical Perspectives on Philanthropy and Popular Movements*, edited by Daniel Farber and Deborah McCarthy. Lanham, MD: Rowman & Littlefield

Cahn, Robert, ed. 1985. *An Environmental Agenda for the Future*. Washington, DC: Island Press.

Chomitz, Kenneth, Gustavo da Fonseca, Keith Alger, David Stoms, Miroslav Hanzk, Elena Landau, Timothy Thomas, W. Wayt Thomas, and Frank Davis. 2006. "Viable Reserve Networks Arise from Individual Landholder Responses to Conservation Incentives." *Ecology and Society* 11(2): 40 + 18 (online). http://www.ecologyandsociety.org/vol11/iss2/art40/.

Chronicle of Philanthropy. 2005. "The Philanthropy 400." 18(2): 10-25.

Collins, Harry. 1985. *Changing Order: Replication and Induction in Scientific Practice*. Beverly Hills, CA: Sage.

_____. 2002. "The Third Wave of Science Studies: Studies of Expertise and Experience." *Social Studies of Science* 32(2): 235-296.

Couch, Stephen and Steve Kroll-Smith. 1997. "Environmental Movements and Expert Knowledge: Evidence for a New Populism." *International Journal of Contemporary Sociology* 34(2): 185-210.

Cummings, Scott. 1984. "The Political Economy of Social Science Funding." *Sociological Inquiry* 54(2): 154-170.

Epstein, Steve. 1996. *Impure Science: AIDS, Activism, and the Politics of Knowledge*. Berkeley, CA: University of California Press.

Etzkowitz, Henry, Andrew Webster, and Peter Healy. 1998. *Capitalizing Knowledge: New Intersections of Industry and Academia*. Albany, NY: State University of New York Press.

Farkus, Nicole. 1999. "Dutch Science Shops: Matching Community Needs with University R&D." *Science Studies* 12(2): 33-47.

Frickel, Scott. 2008. “On Missing New Orleans: Lost Knowledge and Knowledge Gaps in an Urban Hazardscape.” *Environmental History* 13(4): 634-650.

Frickel, Scott, Sahra Gibbon, Jeff Howard, Joanne Kempner, Gwen Ottinger, and David Hess. 2010. “Undone Science: Charting Social Movement and Civil Society Challenges to Research Agenda Settings.” *Science, Technology, and Human Values*, in press

Frickel, Scott and Kelly Moore. 2006. *The New Political Sociology of Science: Institutions, Networks, and Power*. Madison, WI: University of Wisconsin Press.

Friends of the Earth. 2001. “Chronology of the Exposé of Genetically Engineering Corn Not Approved for Human Consumption.” Accessed January 5, 2008. www.foe.org/safefood/overview.html.

Gieryn, Thomas. 1978. “Problem Retention and Problem Change in Science.” *Sociological Inquiry* 48(3-4): 96-115.

_____. 1995. “The Boundaries of Science.” Pp. 393-443 in *Handbook of Science and Technology Studies*, edited by Sheila Jasanoff, Gerald Markle, James Peterson, and Trevor Pinch. Thousand Oaks, CA: Sage Publications.

Glick, Patty. 2006. *Fueling the Fire: Global Warming, Fossil Fuels, and the Fish and Wildlife of the American West*. Washington, DC: National Wildlife Federation. http://www.nwf.org/GloblWarming/pdfs/FuelingTheFire.pdf.

Greenpeace. 2006a. *Health Risks: Bayer’s Genetically Engineering Liberty Link (LL) Rice 601*. http://www.greenpeace.org/international/press/reports/health-risks-bayer-s-genetica.

_____. 2006b. *Partners in Crime: An Investigation into Finland's Illegal Timber Trade with Russia*. Crime File, September. http://www.greenpeace.org/raw/content/international/press/reports/forest-crime-finland.pdf.

Gross, Matthias. 2007. "The Unknown in Process: Dynamic Connections of Ignorance, Non-Knowledge, and Related Concepts." *Current Sociology* 55(5): 742-759.

_____. 2010. *Ignorance and Surprise: Science, Society, and Ecological Design*. MIT Press.

Gunter, Valerie and Steve Kroll-Smith. 2007. *Volatile Places: A Sociology of Communities and Environmental Controversies*. Thousand Oaks, CA: Pine Forge Press.

Hagstrom, Warren. 1965. *The Scientific Community*. New York: Basic Books

Hess, David. 1991. *Spirits and Scientists*. University Park, PA: Pennsylvania State University Press.

_____. 1997. *Can Bacteria Cause Cancer?* New York: NYU Press.

_____. 1999. *Evaluating Alternative Cancer Therapies*. New Brunswick, NJ: Rutgers University Press.

_____. 2004. "Medical Modernization, Scientific Research Fields, and the Movement for Complementary and Alternative Cancer Therapies." *Sociology of Health and Illness* 26(6): 695-709.

_____. 2007a. *Alternative Pathways in Science and Industry: Activism, Innovation, and the Environment in an Era of Globalization*. Cambridge, MA: MIT Press.

_____. 2007b. “What is a Clean Bus? Object Conflicts in the Greening of Urban Transit.” *Sustainability: Science, Practice, and Policy* 3(1): 1-14.

_____. 2009. *Localist Movements in a Global Economy: Sustainability, Justice, and Urban Development in the United States*. Cambridge, MA: MIT Press.

Hessen, Boris. 1971. *The Social and Economic Roots of Newton’s Principia*. New York: Howard Fertig.

Hilgartner, Stephen. 2001. “Election 2000 and the Production of the Unknowable.” *Social Studies of Science* 31(3): 439-441.

Hoffmann-Riem, Holger and Brian Wynne. 2002. “In Risk Assessment, One Has to Admit Ignorance.” *Nature* 416(March 14): 123.

Kempton, Willett, Dorothy Holland, Katherine Bunting-Howarth, Erin Hannan, and Christopher Payne. 2001. “Local Environmental Groups: A Systematic Enumeration in Two Geographical Areas.” *Rural Sociology* 66(4): 557-578.

Kleinman, Daniel. 2003. *Impure Cultures: University Biology at the Millennium*. Madison, WI: University of Wisconsin Press.

Kleinman, Daniel and Steven Vallas. 2001. “Science, Capitalism, and the Rise of the ‘Knowledge Worker’: The Changing Structure of Scientific Knowledge Production in the United States.” *Theory and Society* 30(4): 451-492.

Kroll-Smith, Stephen and Hugh Floyd. 2000. *Bodies in Protest: Environmental Illness and the Struggle over Medical Knowledge*. New York: NYU Press.

Levidow, Les. 2002. “Ignorance-Based Risk Assessment? Scientific Controversy over GM Food Safety.” *Science as Culture* 11(1): 61-67.

Martin, Brian. 1999. “Suppression of Dissent in Science.” Pp. 105-135 in *Research in Social Problems and Public Policy,* Volume 7, edited by William Freudenburg and Ted Young. Stamford, CT: JAI Press.

Merton, Robert. 1978. *Science, Technology, and Society in Seventeenth-Century England*. Atlantic Highlands, NJ: Humanities Press.

_____. 1987. “Three Fragments from a Sociologist’s Notebook: Establishing the Phenomenon, Specific Ignorance, and Strategic Research Materials.” *Annual Review of Sociology* 13: 1-28.

Mitchell, Robert Cameron, Angela Mertig, and Riley Dunlap. 1991. “Twenty Years of Environmental Mobilization: Trends Among National Environmental Organizations.” *Society and Natural Resources* 4(3): 219-234

Moore, Kelly. 2008. *Disrupting Science: Social Movements, American Scientists, and the Political of the Military, 1945-1975*. Princeton, NJ: Princeton University Press.

Moyers, Bill. 2001. “Earth on Edge: Twenty Largest Environmental Organizations by Membership.” Washington, DC: Public Broadcasting System. http://www.pbs.org/earthonedge/resources2.html.

Natural Resources Defense Council. 1998. *Exhausted by Diesel: How America’s Dependence on Diesel Engines Threatens Our Health*. Washington, DC: Natural Resources Defense Council.

Nowotny, Helga, Peter Scott, and Michael Gibbons, eds. 2001. *Re-Thinking Science: Knowledge and the Public in an Age of Uncertainty*. Malden, MA: Oxford University Press.

Rittel, Horst and Melvin Webber. 1973. “Dilemmas in a General Theory of Planning.” *Policy Sciences* 4(2): 155-169.

Scott, Jinea and Hilary Sinnamon. 2006. *Smokestacks on Rails: Getting Clean Air Solutions on Track*. Washington, DC: Environmental Defense.

Slaughter, Sheila and Larry Leslie. 1999. *Academic Capitalism: Politics, Policies, and the Entrepreneurial University*. Baltimore, MD: Johns Hopkins University Press.

Wachelder, Joseph. 2003. “Democratizing Science: Various Routes and Visions of Dutch Science Shops.” *Science, Technology, and Human Values* 28(2): 244-273.

Woodhouse, Edward, David Hess, Steve Breyman, and Brian Martin. 2002. “Science Studies and Activism: Possibilities and Problems for Reconstructivist Agendas.” *Social Studies of Science* 32(2): 297-319.

Yearley, Steven. 1992. “Green Ambivalence about Science.” *British Journal of Sociology* 43(4): 511-532.

Zuckerman, Harriet. 1978. “Theory Choice and Problem Choice in Science.” *Sociological Inquiry* 48(3-4): 65-95.