Epistemic Communities, Norms, and Knowledge

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Abstract

Epistemic communities are defined and identified by their shared sets of causal and principled ideas coupled with a common knowledge base and policy goals. It is not surprising that causal ideas and principled beliefs travel together as scientific paradigms combine principled beliefs or world views (core assumptions) with casual ideas (empirically testable hypotheses). It is also not surprising that experts who share intellectual paradigms arrive at a consensual knowledge base. The key question regarding the formation and consolidation of epistemic communities is how does this process begin. Which comes first: information or norms? While we need epistemology to interpret facts, and facts only become knowledge within a normative framework (paradigm), norms form as an idea becomes commonly accepted by a community which stops testing this idea against facts and accepts it on principle. This paper examines epistemic communities in the United States and Great Britain concerning the issues of ozone depletion and nuclear disarmament as prototypical examples of the ideational and normative processes at work in the formation, evolution, and consolidation of an epistemic community. I focus on the sequence by which the community reaches shared causal and principled beliefs and agrees upon appropriate policy goals using methods of process tracing in order to understand the evolution and emergence of ideas, knowledge, and norms within epistemic communities and international affairs.
Peter Haas defines epistemic communities by their common characteristics: shared sets of causal and principled beliefs, a consensual knowledge base, and a common policy enterprise. (Haas and Adler, 1992) Logically causal ideas and principled beliefs travel together, as paradigms have at their core assumptions about how the world works or shared worldviews. (Kuhn 1996) It is also not surprising that experts who share worldviews and causal ideas would arrive, over time, at a common knowledge base. What we consider to be knowledge is strongly influenced by our epistemological positions and methodological approaches, both of which depend on prior normative commitments. The question is then how this process unfolds within an epistemic community. How are information and ideas developed, diffused, and then institutionalized as norms and knowledge in the formation of an epistemic community? While epistemology is needed to interpret facts, and facts only make sense as knowledge in light of normative positions, norms form as ideas become commonly accepted by a certain community which then stops testing this idea against fact and accepts it on principle. A better understanding of the ideational processes involved in the creation and consolidation of epistemic communities can also help us to understand the emergence of ideas and norms in international relations and their effects on foreign policy. To what extent do epistemic communities influence policy-makers because they disseminate norms and frame issues making some policy alternatives more appropriate than others or because they provide decision-makers with information which reduces uncertainty about the problem and alternative solutions?

To trace the evolution of knowledge and norms within an epistemic community, I examine two influential international epistemic communities which emerged around the issues of ozone depletion (culminating in the Montreal Protocol to phase out ozone depleting substances) and nuclear arms control and disarmament (culminating in the Nuclear Non-Proliferation and Comprehensive Test Ban Treaties). I argue that epistemic communities begin from an empirical finding (or the likelihood that an empirical outcome will result given theory and initial testing), but these facts evoke ethical or moral feelings due to the social, culture, or environmental implications of these findings. The shared principles which emerge define the center of the nascent epistemic community and attract new members. The epistemic community then expands from the scientific community to other relevant expert groups, including think tanks, NGOs, and government decision-makers. Shared principles enable members to define and defend the bounds of the epistemic community. Strong normative commitment also drives continued scientific experimentation and testing, motivated by a vested interest in seeing the issue through. Members with other types of expertise (political as well as scientific) begin to elucidate and refine the presentation of the issue, political strategies, and policy recommendations for the epistemic community. While scientific findings (empirical facts) provide clarity about the issue and its significance for international affairs, without a strong central principled belief, the epistemic community is likely to fragment or diffuse overtime particularly in a prolonged policy struggle.

In contrast to previous work on epistemic communities (Hall 1989; Haas and Adler 1992; Evangelista 1999), I focus on the formation of the epistemic community and the elaboration of its ideas, including the collection of scientific evidence, reduction of uncertainty by the testing of causal ideas, and consensus building around facts, ideas, norms. These are necessary steps prior to the epistemic community’s development of policy recommendations. I stop short of examining concerted efforts by the epistemic community to directly influence the policy-making process by lobbying decision-makers outside of the epistemic community. Haas and Adler et al. (1992, 1995) have already examined how epistemic communities gain access to and influence
policy-making. This later part of the epistemic community story is now commonly accepted and seems relatively unproblematic once the first part (the emergence of shared ideas and beliefs) is complete. Narratives about the Montreal Protocol and the Kyoto Protocol focus on the creation of relevant knowledge and the arrival of an acknowledged group of experts at a consensus regarding the nature of the problem, the need for a policy response, and the policy alternative most likely to solve the problem as diagnosed. These narratives suggest that the formation, early evolution, and consolidation of an epistemic community are key to the creation of knowledge, the framing of the issue, and the eventual political outcomes. And yet these stages are relatively under appreciated within the epistemic community literature.

Do epistemic communities start from a common knowledge base (or the sense that this knowledge base is problematic or incomplete), a shared normative commitment that something must be done about a certain issue (a call to action), or as an offshoot of a pre-existing community of experts which moves from a technical field into politics (from an academic forum to political ground)? Haas’ argument that epistemic communities are recognized by four central elements—shared causal ideas, shared principled beliefs, shared notions of validity, and a common policy enterprise—is widely accepted (Haas 1992: 3). But there is little sense of the order in which these develop.

Examining the internal dynamics of an epistemic community allows us to focus closely upon important issues at play in broader international relations, particularly the emergence of norms, the diffusion of ideas, and the contribution of expert advice to foreign policy-making. Epistemic communities provide a laboratory to examine the relationship between information, ideas, and norms. While these relationships can be unclear or undocumented in international relations, epistemic communities tend to provide excellent documentation as members are prone to introspection and publication. Epistemic communities also provide a window into questions about the relative importance of expertise and the application of scientific principles to foreign policy. Debate rages as to whether foreign policy is influenced more by expert information or framing effects, questions which are addressed directly within epistemic communities. Applying the idea of paradigmatic incommensurability to foreign policy may also explain why it is impossible to have reasoned debates on certain policy issues, such as abortion and genocide, and why the idea of an ethical foreign policy is so thorny. (Risse 2000) If the arguments and evidence presented by epistemic communities and absorbed into policy-making are as much normative as they are positive, then it is impossible to weigh evidence objectively in order to decide which position is superior. Rival epistemic communities, which each contain their own norms, ideas, and information, are unable to engage in intellectual exchange nor productive empirical analysis across paradigms.

At the core of the epistemic community, uniting its members and providing its raison d’être, are shared ideas and beliefs. Without a clearer understanding the way in which an epistemic community forms, it is difficult to understand the process by which these ideas and norms develop and become shared within the community. The next section examines understandings about the interaction between ideas, norms, and information more generally and the roles of epistemology, methodology, and norms in the development of a paradigm. This paper begins from the premise that the creation of an epistemic community is similar to the
creation of a paradigm,¹ and thus philosophy of science as well as international relations literatures help to fill gaps in existing understandings of epistemic communities.

**The Evolution of Ideas, Norms, and Information**

The study of international relations and the study of the philosophy of science use different sets of terms to discuss what are similar ideas in different contexts. The purpose of this paper is to bring together these ideas and these contexts in order to better understand epistemic communities. This section first examines these ideas in their own contexts and then overlaps between them. Philosophy of science examines the interrelationships of epistemology and methodology, and the ways in which these are affected by the values or principles held by a community of researchers. The research process, as well as the conclusions reached, and the organization of researchers into communities, and findings into bodies of knowledge, are fundamentally affected by the principles, theories, and empirical methods employed. In international relations, there is now a great deal of concern about the interaction of causal ideas, norms, and information as they affect decision-making and policy. These three elements have parallels to debates within philosophy of science—norms and principles, ideas and theories, and information and raw data. Our understandings of what is (ontology) and how we should understand what is (epistemology) are fundamentally impacted by our principles (norms) as well as how we seek to understand the world (methodology and causal ideas). Because epistemic communities are social, scientific groupings seeking to influence policy, and because our understanding of international relations (and foreign policy) are affected by the epistemological, methodological and normative positions we hold, the study of epistemic communities and philosophy of science become tightly linked. This section looks at debates about interrelationships between epistemology, methodology and links to normative (or principled) positions. This is then mapped onto similar debates about the links between norms, theories or causal ideas, and facts. The goal is to answer (at least in theory) two questions: 1) how norms, ideas, and information affect one another and 2) which comes first (norms, ideas, or information).

Epistemology, as the theory of knowledge, and methodology, as understandings of techniques of the process of inquiry or gaining such knowledge, are closely linked. (Kaplan 1964, 23) If you reject the epistemology underlying a set of knowledge claims then you must almost always reject the methodology as well as the conclusions (the actual knowledge claims). The interpretation of facts producing the so-called knowledge claim would be fundamentally incorrect and in need of revision according to an alternative epistemology and methodology. These challenges to epistemology and methodology would most likely be made on normative grounds—the shoulds and oughts of science—rather than on empirical grounds. Answers to the question of how to best approach a topic are often independent of the empirical reality (or any particular findings) and have more to do with a sense of what is appropriate or inappropriate in the study of this material. This is a normative decision and prior to debate about actual empirical reality. This very debate underlies battles between constructivists and realists, positivists and post-modernists. (Rosenau 1992, chapter 1) “Positivist, empiricist, rational-logical” are linked epistemologies, methodologies and principled positions about how best to understand the world. They refer to “a specific philosophical perspective replete with epistemological assumptions,

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¹ As Haas says in a footnote, “It also somewhat resembles Kuhn’s broader sociological definition of a paradigm, which is ‘an entire constellation of beliefs, values, techniques and so on shared by members of a given community’ and which governs ‘not a subject but a group of practitioners.’” (Haas, IO, pg. 3, fn. 4)
methodological preferences, and substantive foci” (Rosenau 1992, 17). Post-modernist social science scholars reject the positivist package in favor of another set of linked ideas: nihilist, critical, interpretivist.

Johnson, Joslyn, and Reynolds advise novice political science researchers that if they follow a certain process or “methods of using empirical research—research based on the actual, ‘objective’ observation of phenomena” they will “achieve scientific knowledge about political phenomena.” (2001, 1) “Scientists believe that their finding are based on objective, systematic observation and that their claims can and must in principle be verified or falsified by a shared set of standards and procedures.” (JJR 2001, 23) Even in this description of the research process in a methods textbook we see strong elements of shared beliefs and norms as underlying methods and the ability to generate knowledge. While JJR differentiate “scientific” and “normative” knowledge based on whether the goal is to answer questions such as “what is, why, and what might be in the future” or “what is good or bad or what ought to be” (JJR 2001, 24), they nevertheless explicitly acknowledge shared principles at the basis of scientific inquiry (although this is likely missed by most of their readers). The very process of conducting research, and the choice between inductive and deductive research, is fraught with “unscientific” decisions—epistemological, normative and methodological biases.

There is a short cognitive leap from this view of scientific inquiry to the emergence of paradigms. Paradigms are the dominant means by which research is conducted and organized in science and social sciences, and the supreme example of the intertwining of methodology, epistemology, and norms. As Kuhn says “the early developmental stages of most sciences have been characterized by continual competition between a number of distinct views of nature, each partially derived from, and all roughly compatible with, the dictates of scientific observation and method….An apparently arbitrary element, compounded of personal and historical accident, is always a formative ingredient of the beliefs espoused by a given scientific community at a given time.” (Kuhn, 4) Paradigms are based on “strong network of commitments—conceptual, theoretical, instrumental, and methodological” thus paradigms have at their center “shared rules, assumptions, and points of view”. (Kuhn, 42) The core of the paradigm, consisting of a hard core of assumptions, reflecting the common beliefs which unite the researchers, seen to be beyond empirical testing, are surrounded by a periphery of falsifiable theories which in turn produce hypotheses that are then tested against empirical reality. While the hypotheses at the outer edges of the paradigm are infirmed, rejected, and replaced, the core of the paradigm remains fixed until the entire paradigm is challenged. While the central norms are fixed within the community, the methodology and epistemology may be debated among paradigms. “The preparadigm period, in particular, is regularly marked by frequent and deep debates over legitimate methods, problems, and standards of solution, though these serve rather to define schools than to produce agreement.” (Kuhn p. 48)

International relations tends not to engage in debates about epistemology and ontology per se when it comes to analyzing the sources and outcomes of foreign policy, although these do apply to the evolution of research programs within international relations as a whole. When looking at particular foreign policies, and the forces which produced these decisions and actions, IR scholars focus on the role of information, ideas, and norms (alongside power and interests.) In the topic of epistemic communities these two themes become intertwined. The epistemology, methodology, and normative commitments of the epistemic community reflect and influence the information, ideas, and norms they use to influence government decision-makers. As Miller and Fox write “knowledge or truth claims make sense only when they fit into some preexisting
conceptual scheme taken as coherent by an epistemic community.” (Miller and Fox, 676) In examining the ways in which the epistemic community forms, we can thus examine interrelationships between information, ideas, and norms in international relations.

I define information as concrete pieces of evidence which can be fit within a larger ideational framework in order to make a rational decision between alternative courses of action or policies. The degree to which any particular piece of information is acknowledge to be fact, and the size of the group which considers it a fact, may vary by issue, ideology, and interest, but some number of objective observers could agree that this information is to some extent a reflection of empirical reality. Information must thus be in some manner observable, measurable, and verifiable. “If science is to tell us anything about the world, if it is to be of any use in our dealings with the world, it must somewhere contain empirical elements…For it is by experience alone that information about the world is received.” (Kaplan 1964, 34)

Causal ideas are “beliefs about cause-effect relationships which derive authority from the shared consensus of recognized elites, whether they be village elders or scientists at elite institutions. Such causal beliefs provide guides for individuals on how to achieve their objectives.” (Goldstein and Keohane, 10) More broadly speaking, causal beliefs are theories. “A theory in political science consists of broad generalizations together with a set of assumptions or axioms, definitions of concepts, and a commitment to a particular methodological approach.” (JJR 2001, 29) Theories serve to “to organize, systematize, and coordinate existing knowledge in a field” and “to predict an empirical generalization—predict what a particular relationship holds” (Martin Hollis 167, 169 in JJR 2001, 29)

Norms (or shared principled beliefs) defined as “collective expectations about proper behavior for a given identity” (Jepperson et al., 1996, 54; Legro 1997) serve as social facts which constrain the range of individuals’ choices or prescribe appropriate behavior for a given context (Kratochwil 1984, 686; Checkel 1997, 474; Finnemore and Sikkink 1998, 891). In serving these purposes, norms can act like general principles helping to define actors or actions (contextual standards for behavior) or else as more specific rules prescribing or proscribing behavior (provide direct guidance for behavior) for a given actor and situation (Jepperson et al. 1996, 54; Kratochwil 1984, 686). “Our current habits were once new skills we had to learn, ways of doing things developed through struggle perhaps—but now they seem like second nature. Past experience and tradition have a greater hold on us than most decision models, public policy models, and research protocols allow.” (Miller and Fox, 678)

While norms originate as either aspirational standards for behavior or as summaries of past practices, these commonly become institutionalized into some concrete fashion. This may take the form of domestic or international law or domestic or international organizations created for the purpose of overseeing and/or expanding the norm. (Acharya 2004; Legro 1997; Cortell and Davis 1996) Contestation over norms often takes place between rival platforms (either distinct organizations which each institutionalized an alternative norm or between alternative organizational subcultures each in control of distinct parts of one organization). Epistemic communities institutionalized in research centers or labs at universities, private corporations, or government agencies; think tanks; and non-profits may serve as competing organizational platforms to extend contesting norms. (Sell and Prakash 2004; Finnemore and Sikkink 1995; Grundmann 2007)

While information, causal ideas, and norms can be independently influential in policy-making, they directly impact each other. Norms affect the legitimacy attributed to causal ideas (prior belief in the accuracy of the theory). Norms also serve as a screen on information and
policy solutions. Theories and evidence which accord with prevailing norms are accepted as knowledge, while those that do not are seen as incomplete and requiring further investigation. Debates within international relations reflect an even more basic impact of norms on the production of knowledge. The norms held within a community of scholars or policy-makers impacts what is seen as appropriate and/or important research. The norms at the core of a paradigm impact the direction the paradigm takes and the types of research that will be conducted. As Kuhn writes (1996, 24) “No part of the aim of normal science is to call forth new sorts of phenomena; indeed those that will not fit the box are often not seen at all. Nor do scientists normally aim to invent new theories, and they are often intolerant of those invented by others. Instead, normal-scientific research is directed to the articulation of those phenomena and theories that the paradigm already supplies.” Without shared normative commitments and causal ideas, it is difficult to call information knowledge. This feature of norms in epistemic communities explains why some good ideas (causal ideas which are both logically and empirically valid) do not enter policy-making, even if they have a powerful sponsor and fit current policy needs (provide a feasible solution). Shared principled and causal beliefs strengthen the interpretation of data and the salience of that information.

Information (about empirical reality) is also used to weight, test, and reject theories. “Every fact is sufficient unto itself; it is just what it is…A theory is therefore conjectural or hypothetical, contrasted in its uncertainty with a statement of ‘fact’ as known truth”. (Kaplan 1964, 296) The use of information to falsify theories helps to separate causal beliefs (beliefs because they have not been confirmed yet) from principled beliefs (beliefs which are held to be true independently of empirical reality or scientific testing). “Changes in the conceptualization of cause-effect relationships take place more frequently and more quickly than do changes in either worldview or principled beliefs.” (Goldstein and Keohane, 10) Theories which have survived repeated testing may take the status of norms and be seen as givens rather than theories which still need to be tested.2

The general sense given by the philosophy of science literature (particularly motivated by Kuhn) is of a cyclical pattern to the evolution of paradigms, beginning with ideas about empirical reality, solidifying into a hard core of normative, methodological, and epistemological beliefs, which is then resistant to direct challenges. This is the case until the paradigm begins to fail, and previously closed questions are reopened as another paradigm emerges to challenge the previous one. Facts are only made into patterns and explained from within a paradigm, but paradigms take time to form and around them will be academic debate about standards of evidence, available information, normative predilections (and the biases that result), and the consistency and usefulness of theory and assumptions. This sort of activity will be particularly prevalent in periods of scientific revolutions or in new fields.

2 This view of shared principled beliefs (norms), causal ideas, and information is similar to Tetlock’s view of foreign policy belief systems. “Philip Tetlock argues that foreign policy belief systems are organized hierarchically, with fundamental assumptions and policy objectives at the highest level, strategic policy beliefs and preferences at an intermediate level, and tactical beliefs at the bottom. He argues that most learning takes place at the tactical level, that political decision makers reconsider their basic strategic assumptions and orientation only after repeated failures to generate a tactical solution to their foreign policy problems, and that fundamental learning is so psychologically difficult that it is likely to occur only in conjunction with massive personnel shifts.” (Levy 1994, 286; Tetlock ‘Learning in the US and Soviet Foreign Policy,” p. 27-31)
This leads to several expectations about the emergence of epistemic communities as institutions which resemble paradigms in their formation and evolution. In their initial stages, participants in a nascent epistemic community should debate efforts to explain empirical regularities and the application of alternative theories to solve new problems. These members are likely to realize a shared set of normative beliefs around which a community begins to crystallize. These shared norms are likely to emerge naturally from the larger domestic and international implications of emerging research findings for either society, nature, or the universe. Without this common core, the various research projects are likely to go disparate directions and only produce a short term dialogue rather than a sustained organized research effort. Shared principles also provide the boundaries which define the community as it expands from purely scientific expertise to include other kinds of experts who bring in knowledge about politics and society. It is certainly possible that alternative communities might developed based on competing efforts to solve the same problem or address the same aberration but with alternative normative perspectives. Temporally, information is likely to precede theory, which will likely be linked to normative commitments and a predilection towards certain explanations over others, based upon common principled beliefs. The normative core becomes necessary to sustain the epistemic community (and for its identification). Once this normative core has solidified, it is likely that it will have a strong influence over subsequent theorizing, information collection, and analysis, although this will not be absolute and will not interfere with precepts of good research according to this normative commitment.

The Formation of Epistemic Communities

Haas defines an epistemic community as “a network of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area.” (Haas, 3) This presents two interrelated questions: how does this network form and upon what is its authoritative claim and knowledge based? The goal of the authors in the Haas and Adler volume is to examine the process by which epistemic communities use their authoritative expertise, technical uncertainty, and access to policy making in order to first interpret a policy problem and then provide a solution in line with their principles and understanding of the problem to produce international policy coordination institutionalized in domestic policy. (Haas 1992, 3-7) This task is set out in the introduction: “describe the membership and shared beliefs of an expert community, trace the community’s actions, and discuss its impact” toward the goal of “analyzing the processes leading to policy coordination in a specific issue area.”(Haas 1992, 5)

To the extent that this volume addresses where a particular epistemic community comes from and how it forms, the logic provided is functional. The community arises to provide the knowledge that decision-makers demand of it. But how do decision-makers know where to turn in the first place? And if experts have already been identified by decision-makers, why do they need to form an epistemic community? Creating a community of experts would cause expensive collective action problems and diminish the prestige and rewards of the scientist originally identified to provide expert information. While Haas, Adler, et al. consider changes in the nature policy-making, particularly the professionalization of bureaucracies and the rise of the modern administrative state, to have increased the political space and importance of experts and expert

3 Several others make the link between paradigms as envisioned by Kuhn and epistemic communities, including Haas and Dunlop.
knowledge in solving complex transnational problems (Haas 1992, 7-16), they do not satisfactorily explain the emergence of epistemic communities.

Explanations for the origins of epistemic communities come not from international relations but philosophy of science. Any epistemic community must have a core set of both causal and principled ideas because the facts are subject to multiple interpretations and the theories which might fit these facts are numerous. (Miller and Fox 2001; Knorr-Cetina 1982; Henderson 1990) A shared normative commitment is thus necessary to bring the group together in order to create and maintain a common interpretation of the evidence and to build a shared narrative which incorporates normative beliefs with empirical evidence and causal theories to create knowledge. (Goldman 1986; Van der Sluijis 1998; Rip 2003)

A norm serves as the center of the belief system of the epistemic community, much as basic assumptions about the way the world works sit at the center of a paradigm, and works at deep levels to unite the diverse members of the group, including technical experts as well as policy experts and government decision-makers. (Dunlop 2000; Gough and Shackley 2001) Causal ideas then form a connective layer between the norm and empirical reality. The norm helps members sort through conflicting causal ideas by predisposing them towards some over others. These theories, once tested, move closer to the center of the belief system, putting them above contestation (again according to dynamics seen within paradigms). (Kuhn 1996; Levy 1994)

While professional networks, academic journals, conferences, joint research committees or taskforces, and meetings connect researchers and policy experts physically, shared beliefs connect them cognitively and allow the easy exchange of information. Journals like Nature and Science serve to connect disciplines in the exchange of information, while publications like the Bulletin of Atomic Scientists connect even wider non-technical audiences interested in a common theme. Epistemic communities often have official institutional affiliations or homes within research institutes, committees, think tanks, or non-governmental organizations such as the Union of Concerned Scientists, the Federation of American Scientists, the World Resources Institute, and the Intergovernmental Panel on Climate Change. These organizational platforms provide necessary infrastructure and resources to the community, including a name and reputation, funding, publication venues, and work and meeting space.

The collection of empirical evidence is an ongoing process as the epistemic community seeks to further their ideas (often against competing theories held by other communities). Evidence which supports favored theories is used to show their strength, while disconfirming evidence is stimulus to continue further research. (Van der Sluijis 1998) Only in the face of overwhelming amounts of disconfirming evidence does the community begin to revisit its primary causal beliefs. Shared principled ideas only come under scrutiny within the epistemic community after a catastrophic failure of a theory (e.g. the Gaia hypothesis) or external events that so affect an issue as to change the enterprise entirely (e.g. the need to develop a nuclear weapon in light of Germany’s loss of WWII). Members of epistemic communities as committed individuals and complex thinkers are particularly prone to “develop more elaborate and perhaps tortuous justifications in support of their existing judgments and decisions. They engage in bolstering, belief system overkill, and various defense mechanisms to block or distort discrepant information and thereby avoid confronting value trade-offs that are cognitively difficult, emotionally wrenching, or politically costly.” (Levy 1994, 295)

Epistemic communities rarely exist in isolation and thus the central ideas and beliefs of one community are contested by a second community. This process of contestation helps to
reinforce and reiterate the principled beliefs with the community, spur further empirical investigation of the core causal idea, and more deeply institutionalize the norm. Proponents within an epistemic community are forced to self-identify and speak up or risk losing the contest. The institutional platforms which support the community (such as a university, think tank, or NGO), by providing material, normative, and political resources, must reinforce their support for the community project, or the community will falter and even fade without new institutional support.

Information is exchanged less easily between epistemic communities, as the conceptual categories and analytic assumptions differ between these groups, making it hard for them to agree upon the meaning of information (and even the basic acceptability of the methods used to produce this data) as well as the implications of the findings or the need for further research. Active debates on norms, methods, and the appropriate theories to analyze policy problems occur between epistemic communities, but these may not be very productive due to the fundamental incommensurability of their normative cores. (Kuhn 1996; Miller and Fox 2001) Contrary to Risse, I argue that interaction and communication rarely allow these actors to change their fundamental beliefs such that they are capable of holding meaningful conversations. “When actors engage in a truth-seeking discourse, they must be prepared to change their own views of the world, their interest, and sometimes even their identities.” (Risse 2000, 2) The consolidation of epistemic communities prevents rather than encourages this sort of change and thus constrains or at least complicates any sense of truth seeking. Discussions between epistemic communities, either at professional meetings or in public debates, are less about each side seeking to change their understandings of reality than propagating their versions of reality.

I now turn to two case studies of epistemic community formation and consolidation to examine the ideational process behind the formation and consolidation of an epistemic community by examining the sequence by which the community reaches shared causal and principled beliefs. In particular, is there an ordering to this which resembles that posited above—information, theory, norms, which then consolidate the epistemic community and direct future theorizing, information collection, and analysis.

The cases of the nuclear disarmament epistemic community and the ozone depletion epistemic community were selected because they feature prominently in the existing literature. (Haas 1992b; Adler 1992; Litfin 1995; Evangelista 1999) These provide the prototypical examples of influential epistemic communities, and yet we have a relatively limited knowledge of their initial creation and formation. If, as I posit, it is in the process of formation that epistemic communities access government via decision-makers’ membership in the community, and if the epistemic community consolidates around norms which strongly influence all future research and information processing, then the formation period may be as important to the eventual influence of the epistemic community as any later activities.

**Ozone Depletion Epistemic Community**

Typical accounts of the emergence of a scientific community around CFC-related ozone depletion begin from the initial scientific finding, published in *Science* in 1974. Mario Molina, working as a post-doc in the atmospheric chemistry laboratory of Sherry Rowland at the University of California, Irvine, discovered that chlorofluorocarbons, man-made chemicals used in refrigeration and aerosols, rose to the upper atmosphere and reacted with ozone to become oxygen and chlorine monoxide, producing a thinning of the protective ozone layer around the earth. Rowland began this research based on a meeting he attended organized and funded by his
granting agency, the Atomic Energy Commission. This meeting brought together chemists with meteorologists, at the time distinct fields with little overlap. Rowland attended a presentation by James Lovelock, a British scientist, about his use of an electron capture gas chromatograph, which detected concentrations of several CFCs in the atmosphere. Rowland was struck by the fact that the concentrations detected were close to the total amount produced, indicating a surprisingly stable and long-lived chemical which seemed resistant to the atmosphere’s normal mechanisms of eliminating chemicals. (Roan, 2-5; Dotto and Schiff, 8-9) Molina joined Rowland’s research group the next year, and in search of a new project following his dissertation research, selected to examine the persistence of CFCs in the atmosphere. Molina determined that it took CFCs about 100 years to rise through the atmosphere to the stratosphere and then to react with ozone. Thus the damage done by the first CFCs (produced in the 1930s) was just being felt and, by the time CFCs currently being used reached the stratosphere, 7-13% of the ozone layer would be gone. This degree of ozone depletion would be sufficient to cause numerous other problems. (Roan, 6-11; Benedick, 10-11) Rowland and Molina sent their calculations for confirmation prior to publication to Dieter Ehhalt, a German atmospheric chemist working at the National Center for Atmospheric Research in Colorado, Al Wolf, a radiochemist at Brookhaven National Laboratory, and Harold Johnston, an atmospheric chemist at UC Berkeley.

Harold Johnston had made his reputation with his 1971 work on the exhaust from supersonic jets, which he demonstrated to have similar effects on the ozone layer as Rowland and Molina found for CFCs. This research sparked heated debate, given its implications for industry, as Rowland and Molina expected with their findings. This earlier debate about the ozone layer also made the initial connection between ozone depletion, the thinking ozone layer, increased UV penetration to the earth’s surface, and rising rates of skin cancers. Debate around Johnston’s paper on this topic led to Congressional hearings and the establishment of the Climatic Impact Assessment Program (CIAP) within the US Department of Transportation to study the impact of human activities on the atmosphere. The CIAP, like the Atomic Energy Commission, sponsored meetings to bring scientists together to discuss emerging issues. (Roan, 12-15)

At a meeting held by CIAP in Tokyo in 1973, Ralph Cicerone, an electrical engineer at Michigan with a contract from NASA, and Richard Stolarski, a physicist from Michigan, became interested in chlorine chemistry and its implications for the atmosphere as part of their interest in the impact of space shuttle exhaust on the atmosphere. (Roan, 15-7) While NASA was not particularly concerned about their initial findings, the government continued to fund their research. The results of this research were published in a special edition of the Canadian Journal of Chemistry alongside similar work by 2 other participants at the CIAP meeting in Tokyo, Michael McElroy and Steven Wofsy from Harvard, who had picked up the topic after hearing Stolarski at the CIAP meeting. (Roan, 16-17)

Cicerone and Stolarski initially dropped their research on the ozone problem because they estimated a small amount of chlorine would be released from a limited number of sources. This changed after they were introduced to Rowland and Molina by David Garvin, of the National Bureau of Standards, who knew of each from his past positions and scientific meetings. The four meet at a conference of the American Chemical Society in San Diego in 1974.

This meeting could be said to have launched the core of the epistemic community with a press conference given by Rowland about the CFC-ozone hypothesis. (Roan 19-25) While this initial press conference and news releases from Michigan and Berkeley attracted a little attention, the issue received its real boost from the American Chemical Society which broadly publicized
the ozone-CFC link (using DuPont’s brand name Freon) to the media prior to the ACS meeting in September 1974. By this time, Rowland and Molina had calculated that ozone loss was proceeding at a faster rate than initially expected, 5-7% by 1995 and 30-50% by 2050, and that this rate of loss would produce a drastic increase in skin cancers as well as new climate patterns due to temperature changes in the atmosphere. They concluded that CFCs should be banned (despite acknowledging an $8 billion dollar industry in the US alone.) (Roan 29)

These conclusions were repeated and reinforced in articles in *Science* by Cicerone and Stolarski as well as articles in the *New York Times* quoting McElroy at Harvard. (Roan, 29) This attention sparked the interest of the National Academy of Sciences, a government-sponsored group, which convened a panel, including Rowland, to discuss whether CFCs were a serious problem and what should be done. (Benedick, 11) The connection between Cicerone and Ann Arbor, Michigan, the home of the University of Michigan, led to even stronger links between the scientists and the US government. Mayor Jim Stephenson contacted Representative Marvin Esch, the Republican representative of the city and a member of the US House Committee on Public Health and the Environment. Esch convinced committee chairman Paul Rogers (FL) to hold hearings on the CFC-ozone linkage, to which Cicerone, Rowland, Molina, and McElroy were invited to testify. (75 CIS H 50128; Roan 29-30) It is at these hearings that Du Pont executives testified “If creditable scientific data….show that any chlorofluorocarbons cannot be used without a threat to health, Du Pont will stop production of these compounds.” (75 CIS H 50128; Benedick, 12)

The Natural Resource Defense Council, at this point a newly formed environmental NGO with a legal bent towards using existing EPA regulations to alter firm behavior and government practices, was attracted to the issue. They launched their CFC campaign with a petition to the US Consumer Products Safety Commission to ban nonessential uses of aerosols containing CFCs. (Roan 31-2) Dr. Karim Ahmed of the NDRC contacted Rowland, Cicerone, McElroy and Johnston about the science prior to their campaign, to gauge the evidence and strength of support for the theory. Dr. Karim Ahmed as well as other representatives of the NDRC testified before Congress alongside the scientist in the initial 1974 hearings, as well as multiple other times. (CIS 76-H701-10 and CIS 76-S121-3 in1975) Scientists, economists, and political analyst from the World Resources Institute as well as the Union of Concerned Scientists and Friends of the Earth joined NRDC in their campaign against ozone depleting chemicals based upon the Rowland-Molina hypothesis of CFC-induced ozone depletion. (Bloodgood 2002 Benedick, 165-66)

This account of the emergence of CFCs as an environmental problem and the early consensus on the CFC-ozone depletion hypothesis demonstrates several interesting patterns in the emergence of an epistemic community. First, the scientists involved were closely networked by annual meetings, personal contacts, and publication venues. Papers were easily passed around and individuals working on a brand new area of atmospheric science in distant parts of the US were quickly connected. This network enabled the compilation of a quick body of evidence and independent confirmation of a theory which otherwise might have been dismissed as impossible. Multiple publications in different venues, with publicity provided by the ACS and home universities, then attracted the attention of newspapers, government decision-makers and NGOs. Decision-makers and NGO representatives checked the evidence and the theories themselves (to the best of their ability, using multiple scientists with reputations for excellence in their field as well as personal meetings with and connections to the key researchers). The NDRC was helpful in increasing awareness to popularize the issue in ways the scientists alone could not within their usual forums (the ACS and other professional societies and government sponsored research
The third important finding is the extensive role of government in the initial formation of the epistemic community. Rowland and Cicerone received government grants, the Atomic Energy Commission and CIAP held the initial meetings that put scientists with overlapping ideas and expertise in the same place to hear each others’ ideas, and Representatives Esch and Rogers quickly organized Congressional hearings to gather further information, sway Congressional opinion, and debate policy solutions.

The epistemic community that emerged around the Rowland-Molina-Cicerone-Stolarski center clearly included strong shared causal and principled ideas as well as shared standards of validity. Policy recommendations were quick to emerge. Although initial research was based on theoretical chemistry, measurements from Lovelock’s electron capture gas chromatograph provided empirical confirmation that CFCs were stable chemicals with long duration in the atmosphere. After independent confirmation from several scientists, the key scientists within the community were convinced the scientific theory was sound even without direct physical proof (although this was to come). Empirical evidence about the time it took CFCs to decay as well as the quantities of CFCs being released into the atmosphere, and medical research into the connections between UV radiation and skin cancer, connected the theoretical chemistry with the need for political action. Given the economic incentives facing the CFC industry, and the wide application of CFCs in aerosols, fast food packaging, refrigeration, and construction, government intervention was necessary. Given the long life span of CFCs, the quantity of CFCs already released, the extent of the effect on the ozone layer, and the link between ozone depletion and skin cancer, only a ban on CFCs was an acceptable policy response. While different candidate norms have been discussed in the literature on this epistemic community, including the precautionary principle and an anti-corporation sentiment (Roan 25-29; Litfin 1995) and a preservation versus a conservation norm (Haas 1992, 190-192), the scientists seemed most strongly motivated by a fear of permanently damaging the atmosphere in ways that would be detrimental to life on earth. While the scientists continued to refine their models, re-estimating the extent of damage to the ozone layer caused by CFCs, eventually concluding that there would be seasonal effects and ozone depletion would likely be concentrated over the poles, this norm drove their efforts. As new types of scientists joined the community, the research expanded to include the medical, agricultural, and ecological effects of CFC depletion on humans, plants, wildlife, and oceans. (Bloodgood 2002, chapter 6) But all were motivated by the desire to stop these effects to avoid disrupting natural ecosystems and environmental processes. Overtime, the basic theory (the Rowland-Molina CFC-ozone depletion hypothesis) became increasingly accepted outside of the epistemic community (it wasn’t challenged within the community after 1976). Researchers in the epistemic community continued to gather evidence to support the link between CFCs and ozone depletion and to demonstrate the extent and scale of the effects of increasing UV radiation on humans and their environment. Researchers also continued to present their findings and argue their case to external audiences, including the press, Congress, and the UNEP.

The story is, of course, far from over in 1974. Over the next five years the National Academy of Science continued to conduct research and gather data. While the majority of atmospheric scientists were convinced by 1976, not until 1979 did the National Academy of Science acknowledge a connection between CFCs and ozone depletion. (Roan 1993; Bloodgood 2002) Only in 1985 did governments meet to reach an international agreement on action to be taken on ozone depletion (the symbolic Vienna Convention, an agreement to collect more information about the extent of the problem of ozone depletion and CFC release prior to actually
moving to freeze or eliminate the chemical). Not until 1986 can NASA and the British Antarctic Survey conclusively link CFCs and a growing hole in the ozone layer, the clearest sign of threatening ozone depletion, beyond any government, industry, or popular doubt. (Roan 1993; Rowland 1995; Bloodgood 2002) Given the speed with which scientists agreed upon the evidence, and the theory to explain the evidence, and even a policy recommendation, the 13 years prior to the Montreal Protocol seem surprising. This gap can, in part, be explained by the emergence of competing bodies of evidence and expertise. As different epistemic communities rose and fell in prominence and as scientific research continued in different forums, the predictions of ozone layer depletion also rose and fell, from an initial estimate of 15% depletion within 50-100 years (1974) to a high of 19% (1979) and a low of 3% depletion (1983), stabilizing around 10% (1985). (Benedick, 13; Parsons, 30; Gribbins, 17)

Although it is difficult telling how consolidated the competition was, there clearly were scientists with active theories seeking evidence to support their theories motivated by the conviction that government intervention to stop the production and use of CFCs was unwarranted. As early as 1970 James Lovelock argued that the levels of CFC concentrations he measured in the environment were not high enough to merit concern. He based his argument upon his theory, known as the Gaia hypothesis, that the earth is a self-regulating organism which has built in mechanisms to protect itself from pollution. Lovelock presented his ideas in some of the same scientific conferences as Rowland, Molina, and Cicerone and gave interviews to journalists, particularly in Britain. In 1975, an article in the British journal the New Scientist featured an interview with Lovelock, who argued that American concerns with CFCs in aerosols were based on hysteria rather than science. (Roan, 41) Industry scientists working for corporations like Du Pont and General Electric concurred with Lovelock that the scientific findings in 1974 and 1975 (indeed up until 1986) supported the conclusion that CFCs posed “no appreciable danger” to humans and thus CFCs should remain in use. (Roan 41; Benedick, 111) The Chemical Manufacturers Association spent more than $18 billion on research into the safety of CFCs between 1972 and 1985. (Haas 1992b, 196; Parsons, 36) The primary CFC industries in the US formed their own NGO, the Alliance for Responsible CFC Policy, with Richard Barnett as its representative to numerous Congressional committees on CFCs along side industry scientists. (CIS 86-S321-36 1986) The industry epistemic community focused on the lack of empirical proof for the Rowland-Molina theory linking CFCs and ozone depletion and argued that without empirical evidence, there could be numerous natural processes which would help to remove CFCs from the atmosphere. Officials of the Reagan administration, most notably Ann Burford Gorsuch, EPA Administrator, favored this view of ozone depletion and argued strenuously against environmental regulation prior to empirical verification of the CFC-ozone linkage. The wait and see approach accorded nicely with the pro-economic development norm of the Reagan administration as well as the industries. (Parsons, 36) There has been less research conducted on this side of the story and so there is less of a sense about whether this was a consolidated epistemic community. On face value, there does seem to be a common scientific and policy enterprise, shared by scientists, industry and government officials with many of the same features as characterized the pro-protection epistemic community.

Many scientists were reluctant to get involved in the political debate surrounding CFCs for fear of both their credibility and reputations as academic scientists. “Many of the scientists involved in the CFC-ozone debate were asked for their opinions on how the government should proceed regarding regulations. While most were willing to perform their public duty by testifying before lawmakers about their scientific research, many of the scientists were uncomfortable
when the discussion turned toward solutions. The scientists were untrained and ill prepared to
speak out on political matters and considered it inappropriate to answer questions outside of
science...” (Roan 119, 121) In the case of British scientists receiving funding from the British
government, many were coerced not to speak by the threat of withholding their funding.
Although he does not directly say this, Joe Farman, the head of the British Antarctic Survey
argues that he was afraid to release any of his findings prior to his final conclusive survey in
1986 for fear of his funding. Indeed, even after his findings were accepted internationally,
Farman had a difficult time finding further funding from the British government, a problem he
attributes to the influence of the chemical manufacturer ICI. (Roan, 125, 133) In 1988, Martin
Holdgate, chief scientist and head of research in Britain’s Department of the Environment in
charge of the British Antarctic Survey, resigned to become the director general of the
International Union for the Conservation of Nature and Natural Resources (ICUN). (Haas 1992,
888; Environmentalist interview) Again, while he does not attribute this directly to pressure from
the British government, the timing is suggestive.

While epistemic communities regarding ozone depletion first formed in the United States,
the UNEP played an important role in the dissemination of ozone theories and evidence and
promoted the broadening of their membership. As Haas writes, “The epistemic community was
transnational, consisting of officials of the United Nations Environment Program (UNEP), the
U.S. Environmental Protection Agency (EPA), and the U.S. State Department’s Bureau of
Oceans and International Environmental and Scientific Affairs (OES) as well as atmospheric
scientists in the international scientific community.”4 (Haas 1992, 190) “While atmospheric
research was predominantly an American activity both in terms of federal support for
investigation (NASA’s ozone budget was about $100 million per year) and in terms of the
number of active researchers, atmospheric scientists conducted vigorous studies in Belgium,
Britain, France, Japan, Norway, Sweden, W Germany, and the Soviet Union.” (Haas 1992b, 193)

The fight between the pro-protection and pro-industry epistemic communities was
conducted in the UNEP, US Congress, and EPA, Department of Environment, and executive
offices of the US and Britain as well as in media through the 1970s and early 1980s. Testimony
by both sides to various government bodies, including Committees on the Environment, Public
Health, Atmosphere, and Commerce continued through 1987. A shift occurred in the nature of
debates and testimony however, from presentations by scientists on the basic theories and
evidence of ozone depletion to NGOs’ testimony about the economic and popular impact of CFC
regulation, including the NRDC, Environmental Defense Fund, World Resources Institute,
Friends of the Earth, and the Alliance for Responsible CFC Policy. (Bloodgood 2002)
Throughout the debate we see activism by corporations and their scientists indicating a
competing epistemic community. The tenor of debate from these groups shifted in accordance
with the scientific evidence and the arguments used by the pro-regulation side. Science was
countered by science, economics with economics, and public interest with public interest.

The initial scientists involved in the pro-regulation epistemic community remain engaged
throughout the entire time period from 1974 until the passage of the Montreal Protocol in 1987.

4 Again, the ambiguity about the relevant size and membership of epistemic communities arises, particularly in
regard to the formal membership of government officials. In this case, Haas argues pretty clearly that government
officials from the US State Department and EPA were at some times members of the epistemic community. The
argument is clear for NASA scientists and members of the National Academy of Science (although this is a private-
public hybrid). It would be worth further study to see when and how Richard Benedict from the OES and John
Negroponte from the State Department as well as Lee Thomas of the EPA joined the epistemic community or if they
worked alongside it in a political alliance.
While Molina moved to NASA’s Jet Propulsion laboratory, he remained engaged in the debate and followed the literature. Sherry Rowland remained at UC Irvine and continued to testify before Congress, speak at national meetings, serve on national and international research panels, and conduct his own research into the CFC-ozone theory. His decision to engage in field research in order to accumulate empirical evidence of ozone depletion most likely slowed his career (at least until the mid-1980s) as chemists put more stock in theoretical research, leaving field work to meteorologists. (Roan, 122-3, 129) Rowland found himself particularly isolated by his political predilections, which many colleagues and universities viewed with distrust. Ralph Cicerone stayed at Michigan and also remained involved in testifying before government and international bodies and publicizing findings in support of the CFC-ozone depletion theory. Farman as well continued his research, despite funding obstacles. (Roan, 133) The continued involvement of these initial members of the epistemic community seems a strong indication of their normative commitment and provides evidence for the importance of a strong norm at the center of a community to provide coherence to maintain the epistemic community over a long hard fight.

The epistemic community around the CFC-ozone depletion hypothesis solidified quite quickly. Within a year, key members had shared ideas, tested and retested models, developed networks via conferences, and made links to both interested government officials and NGO representatives. Within 2 years there was consensus within the community on the CFC-ozone depletion hypothesis and the policy recommendation that followed from this (ban CFCs). The debates that defined this issue, and explain the long delay between the formation of an epistemic community and the Montreal Protocol, occurred between epistemic communities over their standards of evidence, empirical findings, scientific theories, and, most importantly, conflicting norms—economic development versus environmental protection.

Nuclear Disarmament Epistemic Community

Stories of the emergence of a strong epistemic community in opposition to the widespread development and deployment of nuclear weapons center on two individuals: Joseph Rotblat and Leo Szilard. Both physicists immigrated to the United States to work on the Manhattan project, were employed by the US government, worked under the US military, and played important roles in raising awareness about the implications of nuclear warfare. Most stories which feature one of these two scientists make little mention of the other, despite the fact that they worked on the same project, knew the same scientists, presented and published in the same forums, and held similar normative convictions. This is a small puzzle in the larger story of the emergence of a strong epistemic community in favor of international nuclear disarmament. While this community has not had the success of the ozone case, and many of its original members have passed away, core elements of the group continue to pressure governments to tighten disarmament provisions within international regimes and enact new measures towards total disarmament. Despite differences of issue area, time period, scientific discipline, and final outcome, there are remarkable similarities between the formation of the ozone and disarmament communities, including the progression from initial information and theories to the development of a strong normative core, which then affected later research, the initial role of government funding and officials within the community, and the later inclusion of non-scientific experts to aid the political development of the epistemic community.

Leo Szilard began his career as a physicist in Berlin, Germany, studying under Albert Einstein and Max von Laue. His major scientific break through came in 1933 in London after
reading an article in the *London Times* including a statement by Ernest Rutherford (a physicist at Cambridge) rejecting the potential for a sustained nuclear chain reaction of the sort that might release enough energy for industrial or military applications. On the advice of another physicist F. A. Lindemann, Szilard applied for a secret patent for the “laws governing such a chain reaction” (Szilard in Wittner 1993, 5) which he then gave to the British admiralty to protect, given its implication for the development of a new weapon. As early as 1936, Szilard contacted the leading atomic physicists in Britain, France, the US, Germany, and Italy in an effort to convince them that the nature of their work was such that it must be kept secret (contrary to prevailing norms promoting publication and dissemination) in order to forestall the development of weapons, particularly by German scientists working for the German government. (Wittner 1993, 6-7) In 1939, Szilard, Enrico Fermi (from Italy), Edward Teller (from Hungary) as well as Victor Weisskopf (from Austria) were all working at Columbia (in what was to become the Manhattan project). Their combined efforts nearly produced an agreement by top scientists internationally (including Nils Bohr in Denmark and P.M.S. Blackett in Britain) to circulate papers privately in order to keep information out of German hands (despite the belief of some, including Bohr and Joliot-Curie that it was not feasible to use nuclear fission as a weapon) until rumors led the French research team, headed by Frederic Joliot-Curie, to publish their own research on neutron emission in *Nature* in April 1939. Despite this defection, American physicist Gregory Breit, who belonged to the National Research Council of the National Academy of Sciences, used his position to secure a blackout on nuclear research in the US. (Wittner 1993, 9) Nevertheless fear of the German nuclear program led Szilard, Albert Einstein (at the Princeton Institute of Advanced Studies), Eugene Wigner, and Edward Teller to draft a letter to President Franklin Roosevelt, leading Roosevelt to establish a scientific advisory committee to consider the development of an atomic weapons program. In 1940 the Manhattan project was launched, involving research at Columbia, the University of Chicago, Los Alamos (DoE-UC Berkeley project), and Oak Ridge (DoE-UT project), with funding from the US government, military oversight, and strict information control (security clearance classification of all research findings). In 1941, the US government earmarked $2 billion for the Manhattan project. (Wittner 1993, 8-9, 11)

Key players in what was to become the disarmament epistemic community worked together at these labs and exchanged ideas about the technology, as well as concerns about its human implications, at conferences at the labs sponsored by the US government. The primary exception was Albert Einstein. Despite his international reputation as a physicist, and his offer to the US government to work on the project, his reputation as a pacifist led the FBI to monitor his activities, label him as “dangerously peace-minded,” and deny him access to the Manhattan project and its findings. (Wittner 1993,10) Szilard was also viewed with caution by the US government, which feared he may harbor pro-German leanings (despite his writings and activities to the contrary and his continuous activism against the development of nuclear weapons post-1942) and was removed from the project temporarily in 1943. (Wittner 1993, 11)

Upon his return to the Met Lab in Chicago in 1944, Szilard continued discussions with other scientists (including Franck and Rabinowitch) about the social and political ramifications of using a nuclear weapon in Japan and wrote letters to Roosevelt and Truman to press his case against the use of such a weapon. The failure of these efforts led to a petition drive, first at the Met Lab and then other government labs. Project officials at Oak Ridge and Los Alamos (Robert Oppenheimer) suppressed further petitioning, but many scientists expressed concerns about the use of their technologies in Japan. (Wittner 1993, 28-32)
At the suggestion of Eugene Rabinowitch, scientists began actively organizing a campaign to prevent the further use of nuclear weapons following the public display of their existence, power and destruction in August 1945. The Committee on Social and Political Implications of Atomic Energy at the Met Lab took the lead, with a $10,000 grant from the University of Chicago to organize a conference between Manhattan project scientists. From this meeting came the Federation of Atomic Scientists. Although technically independent of FAS, the *Bulletin of the Atomic Scientists*, edited by Rabinowitch, became the voice of the scientists’. A related organization was founded by Szilard, the Emergency Committee of Atomic Scientists (ECAS) to raise money for the disarmament campaign, based upon the prestige and appeal of scientists like Einstein, Victor Weisskopf, Hans Bethe, and Linus Pauling. (Wittner 1993, 59-60)

While Szilard later said that he felt no guilt over his involvement in the development of nuclear weapons, he did feel a responsibility to stop the ensuing arms race, a sentiment shared by Einstein, Weisskopf, Rabinowitch, and Harold Urey. This seems the likely norm at the center of the emerging epistemic community.

Joseph Rotblat worked on similar problems, both theoretical and normative, as Szilard but on the other side of the ocean. Rotblat, like Szilard, began his career in the lab of an eminent scientist (Ludwik Wertenstein, who had trained under Marie Curie, in Poland). In early 1939, Rotblat choose to leave Warsaw to join the lab of James Chadwick in Liverpool, England (despite a similar offer from Frederic Joliot-Curie in France). Working with the cyclotron, Rotblat experimented with fission and uranium 238 reactions in search of a self-sustaining nuclear chain reaction. His fear of a German victory in World War II drove Rotblat to research the possibility of creating a fission bomb. After Roosevelt and Churchill reached an agreement to combine their nuclear programs, Rotblat relocated to Los Alamos in 1943. Here Rotblat met General Leslie R. Groves, the head of the nuclear weapon project at Los Alamos, and learned the US intent to use nuclear weapons to restrain the Soviets after WWII. Upon the defeat of the German army in WWII, and the discovery that Germany physicists were far from inventing an atomic bomb, Rotblat decided to Los Alamos. (Landau 1955, 50) Rotblat returned to Liverpool (despite objections from the US government) to run Chadwick’s lab. He subsequently changed his research from atomic physics to medical research on the effects of radiation and relocated to St. Bart’s Hospital in London in 1949. While in London, Rotblat became involved in a new British group, the Atomic Scientists Association, which was dedicated to shaping British policy and public awareness regarding nuclear weapons, in particular to press for international control. While an independent organization, the ASA worked closely with the FAS towards the same ends—disarmament. (Landau 1995, 51; Wittner 1993, 88-90)

This case reveals several interesting patterns to the development of the membership and norms of an epistemic community. In this case scientists (some with prior connections to government via funding, friendship, or employment) went to the British, American, French, and Russian governments with the basic scientific findings to argue for the construction of a nuclear weapons program, based upon their fear that without concerted public-private action, Germany would build an atomic bomb first. The US and British governments were already funding research in labs that would eventually comprise the Manhattan project, including the Met Lab in Chicago and Clarendon labs in Oxford. This enabled the rapid organization and advancement of atomic research, as well as the organization of scientists around disarmament norms. In theory the potential for a chain-reaction nuclear explosion was known well before the war. The international race to develop a self-sustaining nuclear reaction, between French, American, German, Italian, and British scientists (Soviets scientists were aware of the research but lagged
behind), led to the evolution of nuclear physics via the development of theory, testing against empirical reality, the refinement of theory, and then consideration of the implication of this new technology (knowledge) for both military uses and the human race.

At this point scientists split into several camps around different norms, eventually producing competing epistemic communities. Adler examines two other epistemic communities which formed around norms of deterrence and the utilization of nuclear weapons. (Adler 1992, 110-115) I examine a third group (organized via the efforts of Szilard and Rotblat, Einstein and Russell) around the strict control of nuclear technology and nuclear disarmament. The consolidation of British and American research programs into international research teams in Chicago, Columbia, Los Alamos, and Oak Ridge during the early 1940s helped to promote the organization of communities, the exchange of ideas, and the identification of like-minded scientists. Concerns among top scientists about the implications of their research, particularly in light of new information about the German nuclear program, led to a strong norm of disarmament/abolition. While their aversion to threatening large civilian populations was dampened by an even larger fear of a rising Nazi Germany, the defeat of Germany in World War II quickly led to new efforts by the disarmament community to reassert control over nuclear technology and work to eliminate its military applications. (Landau 1995)

A major obstacle to the expansion of the disarmament epistemic community were regulations on information exchange regarding nuclear weapons (classified by the US military). During WWII, there was an on-going battle in the research labs between the scientists (many of them international) and the military commanders in charge. In general, the non-technical, military administrators controlled the science, and the scientists, using coercion (the threat of losing their clearance, jobs, and even jail time) to keep opponents from sharing information about the state of nuclear technology, its military applications, and the potential effects of nuclear weapons. Scientific proponents of deterrence were rewarded with increasing access, higher positions in the labs, prestige, and more research funding. (Wittner 1993, 264-268; Adler 1992) Constraints upon the activities of the disarmament epistemic community were eased with the actual use of nuclear weapons in Nagasaki and Hiroshima in August 1945. The existence and effects of the weapons were clearly displayed public knowledge. While the actual process leading to the production of the weapon was still classified, scientists could discuss the implications of nuclear explosions and radiation.

In July 1955, Bertrand Russell (a British philosopher and mathematician) and Albert Einstein released a manifesto calling for the peaceful resolution of international conflicts and the abolition of nuclear weapons in the face of their destructive effect on humans and the environment (particularly the newly developed hydrogen bomb). This document was signed by 9 Nobel laureates in chemistry, physics (and the 10th for peace—Rotblat in 1995) from seven countries, including Max Born, Percy Bridgeman, Leopold Infeld, Joliot-Curie, Linus Pauling, Joseph Rotblat, Hideki Yukawa as well as Einstein and Russell. (Russell-Einstein Manifesto 1955) Based upon the ideas in this manifesto, Rotblat organized what became Pugwash—small, private meetings of top level scientists from around the world to discuss the political, social, military, and technical aspects of nuclear weapons. The first meeting was funded by Cyrus Eaton, a Canadian industrialist, on the condition that the meeting be held in his hometown of Pugwash, Nova Scotia. (Landau 1995) Annual meetings continue today on the same principles as the original meeting. Small gatherings of eminent scientists and scholars, from academics and governmental and intergovernmental agencies, meet as scholars (not in their official capacities) in discussions held off the record to exchange of ideas about disarmament and nuclear control.
with people they couldn’t otherwise meet for frank discussions. (Landau 1995; Wittner 1995; Spencer 1995)

The disarmament/abolition epistemic community expanded in the 1950s to include not only physicists and chemists, but also biologists concerned about the medical effects of nuclear fallout/radiation and political activists/government officials interested in preventing nuclear war. Following the release of the Russell-Einstein manifesto, Bertrand Russell and Kingsley Martin (the editor of the New Statesman) arranged a meeting of scientists (including Rotblat), religious leaders (such as Canon L. John Collins of St. Paul’s Cathedral), and Labor party politicians (including Aueurin Bevan) to discuss the founding of a national movement for disarmament in Britain. Bertrand Russell became the first president of the resulting Campaign for Nuclear Disarmament (CND), intended to combine elements of a mass movement to mobilize popular support for disarmament and a political pressure group to push the British government for political change. (Jones, The Guardian, 3/19/94) A similar group formed in the United States in 1957, based on the efforts of Norman Cousins, Saturday Review editor, under the name SANE, or the National Committee for Sane Nuclear Policy. Like CND, SANE combined mass mobilization with political lobbying, particularly appealing to liberals, churchmen, scientists, businessmen, writers, and scholars. (Katz 1987, 22-25) In both cases, new information about the effects of nuclear weapons and fallout, combined with the moral sentiments in the Einstein-Russell manifesto, drove the group.

The final outcome of the disarmament campaign differs from the ozone depletion campaign in that it is still unknown. Many of the initial scientists in the epistemic community, including Einstein, Szilard, and Rotblat, remained involved in the campaign until their deaths, however. Both Rotblat and Szilard felt the need to change the focus of their research following their experiences in the Manhattan project and ended up working on the medical implications of radiation, both as a threat to human life and as a medical tool. (Landau 1995; Szilard 1987) Joseph Rotblat ended his academic career at St. Bartholomew’s Hospital Medical College at the University of London in the 1960s and 1970s before moving full time towards political involvement at high levels in Pugwash (including serving at its President) and the World Health Organization. (Rotblat CV) Leo Szilard became an itinerant academic with stints at Brandeis University and the Salk Institute while attempting to engage in public diplomacy and the creation of new anti-war non-governmental organizations, including the Council for a Livable World. (www.dannen.com/chronbio) The Federation of American Scientists, Campaign for Nuclear Disarmament, PeaceAction (which emerged from SANE), and Abolition 2000, an international network of more than 2000 disarmament NGOs, continue to work towards the goals of these scientists around the world in national and international forums. (Bloodgood 2002)

Conclusions

In this paper I have argued that the research program surrounding epistemic communities needs to take several steps backwards in order to examine their initial founding and early evolution. The process by which scientists group together in an initial research program and then extend to include government officials, non-governmental organizations, and think tanks into the growing epistemic community provides key insights into the eventual shared causal and principled beliefs held by the group as well as the policies it wants implemented. This paper has thus examined how epistemic communities form, focusing on the evolution of information, theories, and norms within the group.
These cases demonstrate that epistemic communities, like intellectual paradigms, include three crucial elements necessary to produce what becomes common knowledge within the epistemic community—information/empirical evidence, theories, and norms. In both of these cases, empirical evidence combined with theoretical science in order to produce a shared understanding of a physical phenomenon (ozone depletion by CFCs and the explosive potential of nuclear fission). This was soon accompanied by a strong norm about the acceptability or desirability of this physical phenomenon (or in both of these cases, the unacceptability) and thus the need to regulate or control human behavior in order to prevent or reverse the initial finding. It was on the basis of a strong norm that the epistemic communities solidified and gained members from outside of the immediate and highly technical starting research. While scientific theories and empirical evidence start the process, the norm directed further research to reaffirm the theories held by the community, amass overwhelming amounts of evidence to support policy change in line with these theories, and maintain the interest and support of the members of the community. A strong central norm keeps the community from falling apart, once the initial science is clearly established, when scientists might otherwise move on to other research projects in order to further their careers. In both cases, the scientists stuck with the epistemic community until the end, and faced set backs to their careers as a result.

This research has shed light on additional questions within epistemic communities research, in particular competition between epistemic communities (and norms). First, it is clear in these cases that there was never one monopolistic epistemic community, but in fact multiple competing communities with their own ideas, norms, and interpretations of empirical reality vying for policy-makers attention and support. This is not a terribly new or surprising finding, as Risse-Kappen identifies four “intellectual communities” within the issue of arms control over the period including the 1960-1980s, and Adler identifies at least 3 potential epistemic communities during this same time period. (Risse-Kappen 1994, 196-8; Adler, 110-115) Nevertheless, there seems to be a predilection to focus on one epistemic community (generally the one which proves to be influential in the end) with little explicit attention paid to the others. One of the interesting findings from the arms control and ozone depletion cases presented here is the fierce rivalry which existed between epistemic communities. Rather than coexisting peacefully, these groups were actively engaged in undercutting and outdoing each other in a bid to influence policy.

It is clear in each case that the fortunes of the different communities waxed and waned over time based upon scientific evidence, government disposition, and research funding (or boosts in donations by members). It would be worth further investigation to see if political patronage determines the final success of an epistemic community, and whether this patronage must come from official sources, or if foundations, corporations, and NGOs can fill this role. It should not be surprising that those epistemic communities which are funded can keep researching, meeting, and advocating, while those which are not have little professional success or attention, much less political interest. Yet the economic aspects of epistemic community activity has been largely ignored within existing literature (except within philosophy of science, for instance Knorr-Cetina). Funding is important not only for day to day operations of members of the epistemic community, including continued experimentation to refine initial findings, but also because this is a source of reputation and signaling of importance within the larger scientific community. Without funding and an organizational platform, epistemic communities fight an uphill battle to survive, much less influence policy. Epistemic communities may have the best chances of survival and the most secure funding when one or more members has access to private or public sources of funding, either as a member of a granting agency, the manager of a
government agency, or an employee at a private corporation. The creation and funding of Pugwash, the Union of Concerned Scientists, and the Federation of American Scientists has enabled the creation and consolidation of epistemic communities on both the environment and security.

It is also clear from the case studies that epistemic communities go in and out of political favor. The creation of an epistemic community should be independent of its status of being in or out of political favor (as there should be no favor to have independent of the initial scientific finding and efforts to understand the implications of this). Furthermore, epistemic communities should continue to be active until policy changes. The present practice of selecting epistemic communities to study based on their record of success makes it difficult to study these questions empirically. There is more room for research into when and how epistemic communities fade away, and whether this is due to their failure or success (if their issues and members are coopted into government). Questions about the durability of epistemic communities over prolonged political battles imply that epistemic communities must be more than scientists, for it is likely that scientists will change their interests and research agendas once their theories have been proven to their satisfaction. It is the deliberate networking between scientific and policy experts around a strong central norm that helps epistemic communities sustain themselves over the longer run.
Bibliography:


