Environmental Expertise In The Age of Research: Institutional Process And Environmental Science In the American Far West, 1950-2014.

Nathan D. Woods
Graduate Center, City University of New York

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Environmental Expertise In The Age of Research:
Institutional Process And Environmental Science
In the American Far West, 1950-2014.

By

Nathan D. Woods

A dissertation submitted to the Graduate Faculty in Anthropology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

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Date
Michael Blim, PhD. Chair of Examining Committee

Date
Gerald Creed, PhD. Executive Officer

David Harvey, PhD
Avram Bornstein, PhD
Donald Breneiss, PhD
Outside Reader

THE CITY UNIVERSITY OF NEW YORK
Abstract

Environmental Expertise In The Age of Research:
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Nathan D. Woods

Advisor: Professor Michael Blim

This dissertation focuses on how academic experts have gone about creating university-based programs in Environmental Science (ES). Since the 1940’s, with the emergence of the postwar research economy, the U.S higher education system has increasingly become a vector of institutional change, innovation, and economic growth. This has had a dramatic impact on the social role of knowledge and collective expectations for faculty and expert work. In this context, academic experts in the mid 1960’s championed a movement to develop university-based programs integrating interdisciplinary environmental research with the expert use of science in decision-making. I pay particular attention to the role of science-based policy in the work of academic institution building. I argue that an evolving emphasis on the ‘use of knowledge’ rather than its production, or application, shaped how ES has been institutionalized, tying the authority of environmental experts to the creation of novel institutional arrangements to coordinate the production of knowledge with its ongoing use in integrated efforts to manage or solve environmental problems.

The research compares case studies of university based ES programming in California, Oregon and Washington State from the period 1950-2014. These cases elucidate how
programs originated and were institutionalized over time, documenting a dynamic
centered on institutional work, struggles over the definition of utility, and the articulation
of institutional strategy and capture, shaping both commonalities and variation across
cases. I identify three key trajectories in the institutionalization of ES: a cooperative
model of the environmental sciences, environmental expertise as a type of scientific
reform movement, and ES as an administrative strategy linking environmental research
programs.

In this process, environmental experts reshaped the institutional ecology of the university
in two significant ways. First we see an institutional reorganization of the relationship
between experts and citizens, and second, the gradual emergence of a tiered
administrative structure within the university, institutionalizing a ‘trading zone’ between
experts and environmental constituencies. I conclude that the institutionalization of ES
trading zones, in effect, creates an engine for institutionalization projects; a claim that
holds broader implications for understanding the neoliberal university under conditions of
epistemic modernization.
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# Table of Contents

Introduction: Cognitive Accumulation in the Environmental Sciences 1

Chapter 1: Research and the Regulatory Ideal in the Field of American Higher Education 43

Chapter 2: Rethinking Opportunism: Institutional Work as Opportunity Structure 108

Chapter 3: How Institutions Forget: Change and the Cultivation of Institutional Publics. 155

Section Two:
The Dynamics of Cognitive Accumulation in the Environmental Sciences 210

Chapter 4: Washington State: Creating a Science of the Environment, 1967-2010 211

Chapter 5: Oregon State University: Creating a Cooperative Architecture for Environmental Research, 1994-2010 262

Chapter 6: The University of California at Santa Barbara: From Environmental Generalist to Environmental Scientist, 1969-2010 303

Conclusion: Cognitive Accumulation and the Engine of Innovation 341

Appendices:
A: Research Design and Methodological Appendix 361

References 371
Introduction: Cognitive Accumulation in the Environmental Sciences

Who has the moral authority to speak on behalf of nature? This is a perennial question that, for thousands of years, has been used to think about the organization of the good, the beautiful, the just, or the valuable (Glacken, 1967, Daston and Vidal, 2007). Since the 17th century, scientific knowledge has become increasingly significant relative to the many other ways in which claims to speak for nature have been articulated (Shapin and Schaffer, 1989), and, since the 19th century, the question of who speaks for nature has been increasingly tied to the figure of the scientific expert (Shapin, 2008, Steen, 1999). When translated into institutional terms this question becomes who has the authority to act in relation to the institutional arrangements that stand for the natural order (Barnes, 1979). It is these debates over the authority of environmental expertise—over who has the moral authority to speak from knowing nature—that constitute debates over the institutional agency of experts.

The mid-1960’s witnessed the gradual emergence of a concerted effort to create a distinct body of expertise charged with the systematization of environmental knowledge, and the introduction of a distinct figure, the ‘Environmental Scientist,’ whose professional authority lay with the integration and use of an expanding body of knowledge to solve a multiplying number of environmental problems. By the early 1970’s, universities had begun a concerted effort to organize this body of knowledge, and as various centers and programs popped up in the academic landscape, efforts to institutionalize the programmatic study of the ‘environment,’ appeared under the guise of ‘Environmental Studies,’ ‘Environmental Science,’ or the Environmental Sciences, respectively. In this sense, the environmental sciences were constituted from existing
institutional structures driven by two factors that emerged during this period. The first, a powerful normative pressure to meet the demands of environmental governance, and, the second, a political imperative to make knowledge or expertise useful to environmental concerns. At the center of both processes we find the evolving figure of the ‘environmental scientist,’ as a type of institutional actor, whose cultural work of creating a new field of expertise was realized through scholarship, but also through institution building. This figure appeared among a cacophony of arguments and claims to the environment from theologians (de Chardin, 1966), historians (Collingwood, 1933; Cosby, 1986; Cronon, 1996; Worster, 1994), philosophers (Heidegger, 1949; Soper, 1993), monkey-wrenches (Abbey, 1975), deep and social ecologists (Bookchin, 1995, Foreman, 1985, Naess, 1989; Pepper, 1994) and evolutionists (Wilson, 1975). Not to mention the Gaia theorists (Lovelock, 1975), land ethicists (Leopold, 1949) and geographers (Diamond, 1997; Harvey, 1996).

This study examines the history of the early efforts to build ES programs from the mid-1960’s, through the institution building efforts to create stable institutional homes for environmental science in the 1970’s through the 1980’s, and into the first ten years of the 21st century. I examine the emergence of these environmental science programs and

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1 In this study I use the term ‘environmental science’ to refer broadly to three types of institutional categories concerned with research and training for the study of the environment—environmental science, environmental studies, and the environmental sciences, the three nomenclature utilized throughout the empirical and archival record consulted for this study. This usage is broadly consistent with the definition proposed by the National Center for Education Statistics (NCES, 2000). I draw a distinction between ‘environmental science’ (ES) and environmental research (ER) where ER is concerned with the disciplinary based investigation of the environment, and ES study and management of environmental problems. Much of the research that was done on environmental issues in ecology, or prior to the late 1960’s is properly called ‘environmental research’ and is not ‘environmental science’ per se.
their institutionalization over a period four decades as a type of institutional movement aimed at producing ‘useful’ environmental knowledge and linking the production of knowledge to decision making. I argue Environmental Science emerged as a distinct body of expertise through collective efforts to realize and coordinate ‘relevant science for policy’ in the field of environmental research. The outcome of this effort to institutionalize ES has been twofold. First, we see an institutional reorganization of the relationship between experts and citizens and, second, the gradual emergence of a tiered administrative structure within the university, institutionalizing a ‘trading zone’ between experts and environmental constituencies. By approaching the construction of ES in this way, I emphasize the role of academics and experts as institution builders and, hence, approach the history of ES as a history of institutional agency. I review some of the issues this brings up in relation to other standard historical accounts before moving on to a discussion of institutional process.

The History of the Environmental Sciences:

As compared to other areas in the historiography of science, such as physics or biology, the issue of environmental expertise has received disproportionate attention. A survey of the literature tends to downplay the issue of emergence to treat the environmental sciences as emblematic of longstanding environmental concerns or ecological ideas (Bowler, 2000) or to treat the environmental sciences as a specific set of sciences that have developed over a long-duree but lack definitive identity (Soule and Press, 1998). Often the sciences are examined simply as a collection of distinct
disciplines, such as forestry science or hydrology or range science. (Hays, 1985, Dole, 2003) At other times we find the environmental science demarcated by association with the ecology concept, and, hence, in relation to the discipline of ecology, as it developed in the United States (Kingsland, 2005). Indeed, if we take up the issue of ecology per se, the literature is abundant, but often limited by its disciplinary focus (Bocking, 1995). ² For the unique configuration of expertise that emerged in the late 1960’s and variously called ‘Environmental studies’ or ‘Environmental science,’ the available literature on this process of emergence is limited (Maniates and Whissell, 2000, Romero and Silvi, 2006, Focht and Henderson, 2009, Focht and Abramson, 2009, Auer, 2010, Clark et al, 2011, Biber 2012). Two distinct bodies of literature can be identified: the policy literature, and the historical literature on environmentalism, and two analytical problems can be identified in both sets of literature: the problem of institutional definition and the problem of historical causation. That is, what is environmental science and what caused it to emerge?

In the policy literature, there is a general concession that programs in environmental science lack “unifying principles and clarity of identity”(Romeri and Silver, 2005). As one study notes:

...Although precedents existed for environmental studies programs in schools of forestry, and natural resources, colleges and universities did not begin imitating free standing programs in the field until the 1960s. But even as environmental programs evolved and diversified, a definition of environmental studies and clear

² Very little attention has been placed on systematically examining areas of interdisciplinary overlap around the diffusion of the ecology concept, or other associated concepts such as the ‘environment’ or ‘ecosystem.’
statements about curricular content and educational objectives have remained elusive. (Soule and Press, 1998)¹

The dominant approach in this literature concerns the issue of program demand as used to frame the issue of identity. Some studies tie the emergence of ES programs to the growth of environmental awareness (i.e., environmental politics), identifying three successive waves. For example, for the period between 1900-1958, Romero and Silveri (2006) note only 14 programs were created, but for the period from 1959-1999, two increases are observed, with the first wave emerging between 1965-1976, reaching a high peak in 1970, and the second expansion, beginning in 1988 and continuing into 2006 (and possibly into the present) with a high peak in 1997. The study notes a rough correlation between the historical growth of environmental science programs and major events of the environmental movement. The publication of Rachel Carson’s Silent Spring, for example, corresponds to the first peak of environmental studies programs, and the big peak in 1970 corresponds to the creation of the Environmental Protection Agency. The rise of environmental science programs, particularly in their peak years, is correlated with a “rise in environmental awareness,” resulting, in fact, from increased competition “for students with expectations to graduate with a degree in that area.” Although an interesting conclusion, it is not one that provides much insight as to the timing or origin of the emerging programs. It is indicative, however, of a generalized assumption in the historiography of this field that it is with the rise in ‘environmental awareness’ that we find demand for environmental expertise, and this corresponds with a spike in program

³ This is an important issue particularly with respect to the distinction between environmental science and environmental studies.
creation.4 By contrast, Auer 2010 ties programs growth to styles of disciplinary communication as a response to changing academic fashions rather than to deep social changes in demand.

In a similar way, the historical literature on Environmentalism, or environmental politics, attributes the emergence of environmental expertise to a generalized shift in the values of U.S. society, and the transition, after WW II, to a service economy. Hays is perhaps the most articulate exponent of this view, as he suggests the origin of environmental concern is “rooted in the vast social changes that took place in the United States after World War II,” (Hays, 1987, 2) amounting to a generalized change of social values. Rising incomes, a preoccupation with amenities, as socially expressed in a new appreciation for ‘quality of life,’ and the resultant cultural shift towards the supply of goods and services, correspond with a higher standard of living. In emphasizing values, Hays portrays the emergence of environmental expertise as a history of scientific controversy. He suggests that “if environmental politics has revealed anything, it is the politics of controversy within science,” as technical and expert matters affecting the environment are “laden with dispute over what problems are to be chosen for attention,

4 This study been frequently cited as evidence for both the strength, and ambiguity of environmental science education, broadly construed, emblematic of an approach to environmental science that leaves the actual history of Environmental science programs largely unexamined. This is particularly problematic as the early programs in the study’s sample were largely derived from professional forestry programs, and were hence decidedly oriented towards a ‘conservation’ focus. From this perspective the author’s treat the ES programs as synonymous with the conservation movements of the 19th century, and without distinct epistemic orientations or values. They assume an unproblematic historical progression where the core of environmental knowledge is at some level unchanging. This begs the question: how is it that the environmental science programs were so distinctive that they should warrant a new name? Why were they not simply named programs in ‘conservation science?’
how they will be examined, and how to assess the available knowledge.” (6)

Controversies among environmental experts are played out in management and administrative decisions, which are subject to controversy, and political contention, “technical experts...become major participants in political controversy.” (Hays, 1987; 6). A history of environmental politics is thus one that is organized by an axis of social interest, with one side comprised of “widely shared environmental values” and on the other, that of “professional experts,” defined by policy debates and specialized values. He notes:

Whereas the world of environmental experience and action amid the general public was shaped by the geographical context in which people live, the world of environmental expertise was shaped by thought and professional organizations dominated by the specialization of knowledge. That experience was derived not from where one lived and worked but from specialized training and ability that tended to establish personal ties with others of similar specialized knowledge to create many but different and separate worlds of expertise. (Hays, 1987; 9).

We may note here, for Hays, there is nothing distinctive that distinguishes environmental expertise from other forms of expertise but rather what makes expertise ‘environmental’ is its relationship to values derived from ones relationship to environmental politics. While I accept the broad contours of this portrait as a plausible account of the growth of environmental awareness, I would argue that in the case of environmental expertise per se, particularly in the transformation of the relationships between governance and science, there was in fact a more proximate set of causes to be found in the transformation of the
University, and the organization of Higher education.\textsuperscript{5} In this dissertation, I suggest that interdisciplinary or multidisciplinary programs in Environmental Science have a very concise history, and one that cannot be treated in isolation from the systemic history of higher education in the United States. While it can be argued that the Environmental Sciences have roots in the specific programs of disciplinary research, such as biology or geography; or applied science, such as Forestry, or soil or Fishery science, this sort of focus does not accommodate the issue of multi-disciplinary emergence or institutional coordination which comprise these programs’ distinct history.

Rather, I focus on an evolving emphasis on policy and the use of science in decision-making as the organizing imperative for these programs and for the foundations of the environmental research more generally. To do so, I refer to the proliferation of institutional models in the 1950s for linking science with action that emphasized the coordination of expertise as framed by questions of decision-making (Laswell, 1951, Pilke, 2012). In this study I define institutions as regularities at the level of conduct, where conduct is defined as the use of cultural signs in co-activity. What I refer to as ‘use models’ are institutional schemes or policy that are formally synonymous with ‘science for policy models,’ but where the cultural content of such models—the combination cultural and epistemic assumptions and preferences—is empirically variable.

\textsuperscript{5} Indeed, an account of university-based expertise is a notable if not striking absence in both varieties of history, as they equally ignore the role Universities played in the cultivation of ‘environmental expertise’ as a widely perceived policy problem. Similarly, neither considers the changed relationship between Universities after WWII and other institutions of governance, relative to the exponential growth of the non-profit sector. See Chapter 2 for a discussion of the university as an environmental problem.
It is important to understand that models of useable knowledge are not easily reduced to applied science but rather span the distinction between basic and applied science. The operative distinction here is between how to apply science towards particular ends and how to utilize expertise in an ongoing fashion as a part of institutional conduct linking science to decision making. The distinction turns on how knowledge is engineered for use at the point of production and, thus, constitutes an institutional distinction rather than an epistemological one. For example, models of applied science proliferated, most often in contrast to models of ‘pure’ or basic science, in the late 19th and throughout the 20th century, often associated with engineering departments, in association with technological production, and through the proliferation of institutional movements like the Agricultural Extension Service, charged with bringing existing science to industrial and organizational constituents. By contrast, useable science refers to the co-production of science and policy, or, more specifically the ongoing production of science in the context of decision-making. Usable science models, thus, consist of institutional models that conjoin the research and decision making processes, and thus involve the coordinated activity of multiple actors across many institutional domains.

While in the environmental field ‘usable science’ is a contemporary formulation, gaining notable traction after 2000 (Pilke, 1995, Dilling and Lemos, 2000), I trace the genealogy of use models in the environmental field to the science policy that preceded and accompanied the passage of the National Environmental Policy Act of 1969. I subsequently examine the proliferation of usability models and their role in the institutionalization of environmental expertise in the field of higher education from the late 1960s forward. I suggest that the emergence of these models constituted a broader
shift in how the moral authority to speak on behalf of environmental issues has been distributed and, hence, who is authorized to act in relation to the environment. The emergence of the environmental sciences was, in this sense, part of a protracted socio-cultural struggle over how expert agency is defined, or institutionally delimited. These debates concern the constitution of moral authority by other means, and its institutionalization, as a politics by other means.

In this respect I document a process I call ‘cognitive accumulation,’ or the institutionalization of cognitive authority. Patrick Wilson (1983) suggests that people construct knowledge in two ways: either based on their first hand experience or on what they have learned second-hand from others. However, not all second-hand knowledge is treated with equal weight, and those that are said to “know what they are talking about” are understood to possess cognitive authority.⁶

I extend Wilson’s concept to focus on the cultural work of cognitive authority, building off theories of ‘boundary-work’ (Gieryn, 1999). If we assume social life is defined by a multiplicity of perspectives, the role of science in society is delimited by the organization of ‘credibility contests’, whereby “bearers of discrepant truths push their wares wrapped in assertions of objectivity, efficacy, precision, reliability…” (Gieryn,1999). Accordingly, ‘science’ often stands in for credibility or legitimate knowledge where actors are faced with questions of ‘epistemic authority,’ construed as

⁶ Since Wilson’s original formulation, the concept of cognitive authority has been subsequently employed in library and information science (Rieh, 2000, 2002) to examine how expertise is institutionalized as durable features of cultural taxonomies in Universities, as features of professional distinction (Bohme and Stehr, 2012), and on the internet (Fritch and Cromwell, 2001), through the proliferation of information architectures, and search taxonomies.
“the legitimate power to define, describe and explain bounded concerns of reality” (Gieryn, 1999). In a paradoxical way, Gieryn suggests the autonomy of scientific credibility lay with its ‘extra-scientific’ influence. By extension, I suggest that in institutional terms the organization of this extra-scientific influence leads to the creation of ‘institutional publics,’ or constituencies, defined by their collective participation in institutional conduct.

The boundaries of science—what are described as cultural maps of credibility—are not simply delimited through the process of attributed epistemic authority, but formalized as a feature of expert action and the coordination of expertise. Epistemic or cognitive authority is not a pre-given aspect of a particular method or technique, but rather “enacted as people debate (and, ultimately, decide) where to locate the legitimate jurisdiction over natural facts.” (Gieryn, 1995:115-116). Science, as a type of cultural space, is a “vessel of authority” (115) whose contents are always under re-description. Scientific knowledge is not something scientific communities possess, but rather a type of cultural authority legitimating practical action. It, thus, becomes a shared cultural resource in the organization of social life and cultural practices. That expert credibility is highly valued means that a great deal of effort (and capital) goes into credibility contests.

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7 These arenas of contention often include questions regarding the legitimacy of science, whereby representations of science are deployed in favor of one or another version of scientific reliability. On this account science is not simply the assemblage of practices, techniques, and machines bounded in laboratory spaces, but is rather culturally constructed, as an active move of practical action, outside of the spaces of science by non-scientific actors and scientists alike.

8 Both of these approaches thus draw a distinction between knowledge, as a form of cultural legitimacy, and expertise, construed as a type of practical knowing, or practical action. In this sense they jibe well with Weinstein’s (1989) epistemic and performative expertise, and recent studies of expertise (Collins and Evans, 2002, Jasanoff, 2002) that
Gieryn further divides this contestation into three genres or dynamics of boundary work: expulsion, expansion, and production of autonomy. Expulsion refers to contests between rival parties, each claiming to be scientific, and involving the authority to state what is and is not scientific knowledge. Expansion on the other hand refers to the form of boundary work where rival forms of authority compete to maintain control over the same cultural space. Finally, boundary work involving the production of autonomy occurs when scientists attempt to protect their resources and privileges from outside challenges or the perceived exploitation of scientific authority.

By framing Gieryn’s scheme regarding the struggle over boundary work in terms of co-activity, we can analyze how cognitive authority is institutionalized vis a vis institution building. I argue that environmental experts—and groups laying claim to environmental expertise—have built the cognitive authority for the environmental sciences upon claims regarding the use of knowledge. Thus unlike ‘disciplinary’ claim to authority—most often defined in terms of exclusive claim to a method or subject matter—environmental expertise is awarded on the basis of an ability to combine varieties of expertise to be used in the examination, diagnosis, and resolution of

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draw a distinction between substantive expertise—the tacit knowledge linked with knowing how to do something—and interactive expertise (Collins and Evans, 2007, Gorman, 2010), or being able to discourse about a field of expertise without being able to ‘do’ that expert work.

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9 This variety of boundary work hence involves the question of who rightfully has access to the cultural authority associated with science. As compared with expulsion, expansion occurs when the issue is distinguishing science, and scientific authority, from other forms of cultural knowledge, such as religion. This boundary pertains to stakeholders invested in the control of science, and in this respect involves the scientific status quo, and questions of social change—how it is that scientific authority is legitimated as a resource for social action.
environmental problems. Environmental expertise is, thus, predicated on a type of institutional work, or institutional agency, expressed through the combination of cultural elements in the coordination of action, or co-activity. Reframed as such, we can identify genres of institutional agency defined by institutional strategies, the dynamics of institutional capture, and the formation of institutional publics.  

With this scheme in place: I isolate two major processes at play in emergence of the environmental sciences and their chronology of institutionalization. First, the environmental sciences were built from existent expertise to both bridge disciplinary divisions as well as an ongoing institution building effort to link knowledge with action, a dynamic that I analyze in terms of institutional opportunity structures. Second, over the long term, these institution-building efforts converged upon models of useable science the institutional expression of which I call expert knowledge systems (ExKS). I employ in this study the term ‘expert knowledge systems’ (ExKS) to refer to a type of institutional project linking knowledge with action as a constitutive aspect of knowledge production. ExKS constitute a distinct variety of expert project concerned with the

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10 Again these claims are to be distinguished from the application of knowledge per se, where existent knowledge is applied to develop practical applications, often in the form of technology or inventions.

11 I loosely adopt Emirbayer and Mische’s definition of human agency as a “temporally embedded process of social engagement, informed by its past (in its habitual aspect), but also oriented towards the future (as a capacity to imagine alternative possibilities) and toward the present (as a capacity to contextualize past habits and future projects within the contingencies of the moment.” (Emirbayer and Mische, 1998; 964). I would stress here the potential, under this definition, for actors to ‘recompose’ their temporal orientations to a given order is what is meant, for my purposes, by institutional agency. For any given institutional order I contend this act of re-composition is crucial for understanding how institutional actors in plural institution environments navigate, engage with, and potentially redefine institutional orders and processes through institution building projects.
systematic, institutionalization of different varieties of expertise including policy analysis, decision support, organizational expertise, legal expertise, administrative work, computational work, etc. We see examples of such configurations, in the wild, as policy networks, integrated watershed management projects, and ecological knowledge systems, to name but a few. Such configurations can be institutionalized in multiple ways and across multiple scales. Here, I examine the ExKS dynamics at the scale of the university with particular attention placed upon the pedagogical role ExKS have played in environmental science programs, and the institutional strategies by which ExKS models were variously institutionalized. 12

While these first two points of examination focus on institutional agency of expert work in the field of higher education, this dissertation analyzes these expressions of institutional agency as aspects of broader cultural and institutional dynamics in the U.S. I isolate two such dynamics: the construction and transformation of the post World War II economy for research and the emergence of the post-war environmental movement. In the process of emergence and the subsequent process of institutionalization, the environmental sciences were linked with two sets of problems or perceived crisis—the crisis of the environment and the crisis of the university. By the start of the 1970’s, the crisis of the environment seemed to outweigh, in terms of complexity of scope if not

12 ExKS thus refer to a class of institutional models or arrangements that have been convergently discussed in several different literatures concerned with the relationship between knowledge and action. My discussion here primarily addresses ExKS in the environmental sector (Van Kerkhoff, 2005, 2006, 2012) This includes the literature on ‘ecological knowledge systems’ (Roling and Engel, 1998) on knowledge networks in agroecology (Warner, 2007, Brookfield, 2009), and for the work on knowledge systems (Cash, 2000, Cash et al., 2003, Kelsey, 2003, Cash et al. 2014), distributed assessment, and adaptive governance (Folke et al, 2005) in sustainability studies more broadly. For similar discussion in the field of health science see (Fox, 2010), and for innovation studies see (Conway and Steward, 2010 and Van Kerkhoff, 2012).
urgency, the Nation’s collective effort to manage human relations with the environment. Similarly, from the 1960’s forward, the U.S. system of higher education suffered a number of crises stemming from its rapid postwar expansion and centered upon the continued relevance of the University to questions of public interest.

These two dynamics converge around efforts to construct a cognitive authority specific to environmental expertise. In this context environmental scientists attempted to define a new terrain of conduct for research, education, and service and to provide responsive answers to the persuasive sense of environmental crisis as well as productively shape the path of the University’s endeavors to provide solutions. By focusing on this dual sense of change, this study suggests that the emergence of environmental research was in fact part of a broad transformation of the contours of knowledge production, fundamentally altering the relationship between expertise, the University, and institutions of governance. For environmental scientists this alteration took shape as an increased set of interrelationships between law, social movements, scientists, and an array of institutional experts located in a seemingly endless proliferation of organizations concerned with management of the environment which was conceived both as a problem and a complex system. I refer to the efforts to collectively coordinate action around environmental issues as the ‘jurisdiction for environmental expertise.’ It was the response to this emergent ‘expert jurisdiction’ that shaped the burgeoning efforts to reorient the conduct of a great variety of experts towards the use of ‘environmental research’ in decision-making. We see in this trajectory of institutionalization two subsequent outcomes: a. with the emergence of ExKS a formal reorganization of the institutional ecology of U.S. universities, resulting in new
institutional publics, or constituencies for environmental research; and b. the transformative incorporation of oppositional or social movement through a reconstruction of the relationship between experts and citizens in the production of expertise.

**Universities as Nested Institutions:**

Although the transition to the ‘environmental era’ is most often described as an outcome of the emergence of environmental values, at the level of the University, the transition to the environmental era was construed by some policy makers, administrators, politicians, and administrators as a debate over the utility of knowledge production and a crisis over the relevance of university science and education to solve social problems. This sense of crisis derived from an intensified concern with the availability of information about human impacts on the environment, an assumption predicated on an emerging conception ‘the environment’ as a complex relationship between humans and social systems. At hand was the issue of how environmental knowledge is to be defined, produced in a problem relevant manner, and made actionable for use in the application of knowledge, where the overall question was formulated as to how to transform the institutional arrangements of the postwar-university system to accomplish this orientation.

The background to these changes in the postwar world (1945-1968) lay with how the U.S. academic enterprise was radically transformed by the emergence of two interrelated processes—the consolidation of an expanding U.S. system of higher education, and the construction of a postwar research economy. The tumultuous effect

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13 I define the research economy in two ways. First, I define it as “regular, recurrent sources of funding explicitly for research” (Geiger, 17) and, second, as the market in information and research-based services. The first definition speaks to the political
of WWII produced widespread economic, political and demographic change resulting in an unprecedented expansion of the U.S. system of higher education in the years following WWII. Additionally the informal alliance between government research, academic science, and industry that had been built before the war was successively translated into a postwar compact for research that resulted in the birth of the National Institute for Health, the National Science Foundation, and an unprecedented level of peacetime cooperation between the universities and Federal defense interest. These trends were additionally bolstered by the regional expansion of the higher education enabled by increased student enrollment and growing demand for university degrees.

Both the post-war reconstruction of the research economy and the expansion of the U.S. higher education system were variously centered upon a compact between Federal agencies, the university system, regional state interests, and corporate investments. Under these conditions the conduct of academic and scientific professionals was reoriented towards a new institutional environment that actively eroded old patterns of institutional conduct through a reconstruction of how experts pursued the production of knowledge. The enrollment of universities in the war-effort resulted in new partnerships, new avenues for research, and a renewed social role focused on technological production, the consolidation of new areas of engineering, and the role of science and technology in solving issues of social policy. With more money available for research and a new demand for the results of research, new domains of expertise developed, as well as new ways to discuss the importance of research, and changed economy of science, and the means by which Universities, as organizations derive revenue to support their missions of teaching, research and service. The second definition speaks to the political economy of consultation, technological production, information and knowledge management.
expectations for how academic and scientific professionals were to pursue research and why that research was important.

The result was a massive organizational and institutional expansion that has come to be called, ‘the Golden Age’ of the U.S. university system. In this study, I refer to this period (1945-1968) as the ‘age of research’ because although the U.S. research university had been in existence since the 19th century it was during the postwar period that ‘research’ became a normative, widespread expectation of academic conduct, as well as a widely circulated commodity, central to the bourgeoning postwar economy. Under these conditions, organizations throughout the system of higher education engaged in an expansive cycle of institution building as academic and scientific professionals increasingly began to utilize the university as a resource to develop professional projects. And it was during this period that we see the expansion of both independent and university-based nonprofit research institutes creating a new vibrant ecology for academic and professional labor and a new context for academic conduct. What we now

14 In this sense, the long standing role of the university, to produce and certify knowledge, and to oversee training and education, became balanced against the expectation that institutions of higher education ought to participate in the research economy, either through the certification of professional experts, the cultivation of an expanding body of research-based expertise, or through the actual production of research per se.

15 As Orleans observed in 1972: “The Critical distinction between intramural federal laboratories and federally sponsored research centers is that the former are staffed by civil servants and the latter by private citizens.” (9) This distinction, he notes, stands in for the dimensions of a historical shift, “…before World War II, intramural laboratories were the accepted site for most federally financed R&D outside of agriculture”, and after the war, “research centers and the entire sector of private industrial, educational, and research institutions became the accepted alternative.” Factoring in the postwar growth of the nonprofit sector, we could add to this distinction, ‘applied research institutes,’ ‘operating foundations,’ ‘endowed institutions,’ and what Orleans refers to as ‘cushioned institutes,’ or organizations, and the “variegated array” of project institutes subsisting on contracts, grants, as well as “their wits and reputation” (Orleans, 1972,9).
call the environmental sciences similarly participated in this growing research economy through both big science endeavors and in the expanding nonprofit research sectors.16

In this context the growth of the research economy transformed the culture of academic and scientific professionals by creating new conditions for institutional agency in two ways. First, at the level of academic and scientific custom, academic and scientific professionals developed new ways to engage with the research economy and the changing institutional conditions of the research University. Here, for example, I refer to research enterprise and the postwar adaptation to new sources of funding, new pressures to conduct research, new demands for expertise, and new sources of prestige. Second, these changed circumstances allowed expert professionals to utilize institutional resources to carve out career niches, build research programs, and organize new pedagogical endeavors. This study places particular emphasis on academic scientists and professionals as institutional agents acting in relation to institutional and organizational

16 Environmental research was consolidated with the consolidation the of Earth Sciences and Oceanography during the Cold War, under the auspices of cooperation with the U.S. military (Doel, 2003) and the successful organization of the International Geophysical Year (IGY), spurred on by the launch of Sputnik, as well as the International Biological Program (IBP) between 1964-1974, and the Hubbard Brook ecosystem study, conducted between 1963-1968. Both resulted in several large scale ecological studies, contributing to consolidation and funding of ecosystem ecology as a discipline (Hagen, 1992). While these studies helped to establish the legitimacy of large-scale environmental interventions, they present only one half of the picture for the context of the emerging environmental sciences, with the other half resting properly on an intensified reorganization of knowledge production enabled by the establishment and proliferation of the nonprofit research institutes. Indeed, the emergence of environmentalism in the 1960’s resulted in an organizational revolution with the proliferation of non-profit organizations centered on the use of science as a resource for governance, organizational action and politics (Lacey, 1989).
changes, to shape and respond to the transformed organizations of higher education during this period.\footnote{During the postwar period there was a great degree of explicit reflection on this point. Consider, for example, the opinion of one extension outreach specialist from Idaho State University, a cooperative partner Washington State University: “All of us are confronted at present with the task of rebuilding our culture. Culture and social organizations, with all of their historical roots, are human creations which can be rebuilt on a new framework of concepts and beliefs. The rebuilding of our culture is an obligation and the responsibility of educated people. It is no small undertaking. It should be done under the guidance of men of wisdom and understanding. At least a few agronomists should be active participants.” (Anderson, 120)}

As I discussed above, I refer to the cultural projects of expertise as ‘cognitive authority.’ Here I suggest that the cognitive authority of scientific and academic professionals took on new dimensions in the work of institution building. Specifically I argue that during this period the work of academic and scientific professionals was increasingly expressed through organization of the research enterprise--through program building, and the proliferation of institute or non-profit formation--and made durable through institutionalization, which in turn became the basis for discreet institution building projects. For environmental science, I argue that the dynamics of these institutional projects were organized around concerns over the use of knowledge—the coordinated use of expertise in decision-making—the institutionalized form of which I have introduced as ‘expert knowledge systems.’ (ExKS)

Analytically the challenge here is to treat experts as institutional actors rather than ‘simply’ as knowledge producers per se. Although expert agency is often defined by the production of new knowledge, it is equally defined by the ongoing creation of cultural projects, and hence by the institutionalization of cognitive authority. Similarly the use of knowledge by experts in institutional settings relies on the institutionalized nature of
cognitive authority as a resource. This dual dimension is crucial for understanding the emergent role of environmental scientists as institutional actors in the university setting, as well as in a great variety of organizational contexts.\textsuperscript{18}

Appeals to the utility of knowledge were, of course, not new, since the utility of scientific expertise has long been appreciated as a matter of cultural fact in circles of commerce, in the military, and, as a practical matter, for the State. However, we see an increased concern with science policy, and, since the late 1940’s forward, we see a progressive interest in the intensive production and circulation of research aimed at building an applied evidentiary basis for decision making, for knowledge and technology transfer, and for the systemic application of research to organizational and social problem domains. Since the late 1970’s scholars have noted that an increased need for “policy to be underpinned by rigorous scientific analysis” (Parsons 2002, Boswell, 2009) and, thus, with the growth of evidence based policy, we see an increased demand for expert knowledge on the part of the formal organizations involved in developing or circulating policy. Similarly, since the 1980’s, the discourse of U.S. science policy has become much more concerned with ‘innovation’ construed as both process and outcome, drawing increased attention to the problem of knowledge delivery or transfer. In the immediate post war period, the relationship of knowledge to action was viewed, normatively, in what some have come to call the ‘trickle down’ model (Van Kerkhoff,\textsuperscript{18}

\textsuperscript{18} It also places us squarely in the grips of the so-called paradox of institutional agency that lay at the heart of our taken for granted conceptions of institutions. Or, expressed in the idiom of social history, “How do groups of actors constituted and constrained by social and cultural structures act so as to transform the very structure that constituted them” William H. Sewell Jr., Terrence J. McDonald, Sherry M. Ortner, Jefferey M. Paige, “Program in comparative Study of Social Transformation.” CRSO #344/CSST#1, May 1987, 7. Quoted in David Pederson, “Step into Anthrohistory” (66)
2012). On this account, researchers were in a distanced relationship between knowledge production and those who might come to use the research. However, by the 1970’s, with the emergence of the field of ‘knowledge management’ or “research utilization” (Booth, 1988), a broadened appeal to ‘knowledge or technology transfer’ was promoted in contrast to the linear model of innovation. In particular, new models linking knowledge to action, or research to practice, have come to emphasize models centered upon the knowledge-action link, as not only conceived as a process that entails attention to complex interaction between knowledge producers and knowledge users in specific cultural and institutional contexts, but one that is properly measured in terms of social outcomes, such as degree of participation, institutional learning, or integration across outcome scales. It is this emphasis on the distribution of expertise and its use as a point of widespread institutional governance that became the central problematic of the environmental scientists. Thus, in the late 1960s, for academics, activists, lawyers, bureaucrats, and scientific administrators, the problem was one of how environmental knowledge should be organized and the subsequent problematic that framed this question in terms of content and distribution—that is, ‘how to organize the wide diversity of existent expertise so that it may be utilized, on an ongoing basis, to monitor, and manage environmental problems?’ A necessary inference from this question was: how to produce new knowledge in line with this goal?

Formally, then, ExKS refers to the great diversity of efforts to meet and answer this question. As ExKS are concerned with the organization of distributed expertise, they are involved with boundary work by definition and, hence, the demarcation of science and non-science, and the distinctions between disciplinary forms of knowledge.
Similarly, boundary objects (Star and Griesemer, 1989) such as artifacts, conceptual models, and classification systems are defined as objects that allow divergent groups to interact or coordinate activity despite differing cultures or perceptions. ExKS may act as boundary objects but also as boundary organizations, which are defined as organizations that are “designated to facilitate collaboration and information flows between research and public policy communities.” (Parker and Crona, 2012; 265)

In the environmental field, however, as institutional models, ExKS have evolved with a characteristic emphasis on ‘integration’ and hence on the coordinated dissolution of boundaries—both disciplinary and organizational—towards a particular problem solving or decision-making end. The ExKS concept, or the use models as they have evolved in the environmental sphere, empirically complicate the analytical distinctions in the boundary literature in several ways. First, while emphasis on boundary demarcation has been, at various points in the history of environmental science, a central constituent factor, there has also been, at various points, models of environmental expertise that collapses the distinctions between science and non-science and between disciplines in favor of integrative or synthetic definitions of expertise. Second, while ExKS may act as boundary organizations, I argue that they are in fact the outcome of an institutional process, for which there is a continuum of forms. Thus, by looking at the institutionalization of ExKS, I offer a more nuanced examination of how boundary work, boundary objects, and boundary organizations stand to institutional process.

By drawing on historical and ethnographic data I offer a ‘thick’ institutional history of the role of ExKS in the institutionalization in the environmental sciences. This history asks us to re-think the notion of the university as a formal organization in favor of
viewing universities as dense institutional ecologies subject to multiple institutional processes. Building off of the work of Robbins (2012) I define ‘institutional ecologies’ in a similar manner to the notion of ‘nested institutions,’ defined as “a group of interdependent yet unlinked citizen-cultures and organizations occupying a larger society that is a kind of university-state, over which an administrative super-structure governs.” (2012; 254) In this definition, the university-state would be the basic organizational mission of the university as wed to its political economy, the administrative-structure a reference to the administration, and the citizen-cultures and organizations a reference to discipline based-departments and research institutes.

This approach helps to re-frame both the expansion of the post-war research economy as a complex cultural and institutional process by which ‘the university’ as institutional ecology was assembled within the context of the research economy, and as a type of scaffolding upon which institution building played out. Analytically this approach helps to reframe the literature on boundary organizations and their relationship to universities as well. Although the institutionalist approach to science (Merton, 1973) emphasized institutionalized norms in the structured production of science, it has been critiqued for presenting an over-determined view of social action and, hence, not focusing on questions of culture or history. Indeed, in many ways Gieryn’s work was part of these debates and an extension of the institutionalist approach, reframing action in cultural terms in institutional places.

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19 The concept of the institutional ecology is analytically similar to Rosenberg (1976) and the concept of the ‘ecology of knowledge,’ which he utilizes to examine the history of academic institutions. I examine this concept, and its overlap with Rosenberg in Chapter 2.
By approaching the university as an institutional ecology, I build off of these arguments but with a critical eye towards the history of institutional processes. Rather than examine how universities act as a home for knowledge transfer, or boundary organizations, I examine the ‘incorporative dimension’ of this institutional ecology by examining how groups lay claim to institutional order through institution building. I note that while there have been many studies of boundary organizations in relation to specific issues (Guston, 1999, Guston et al., 2000, Guston, 2001, Agarwala, 2001, Cash, 2001, Miller, 2001, Baker, 2010) there are few studies of their history within particular university settings. In this sense their relationship to universities is often simply assumed, where the relationship between universities and policy communities is presented as complex but organizationally stable. But, as Parker and Crona note, “Boundary Organization theory first assumes the existence of two clearly separated groups of principles occupying distinct positions within either the scientific or policy community.” (2012, 265). They subsequently offer two productive critiques of this guiding assumption. First, they highlight the problematic distinction between science and policy communities, noting that universities are increasingly linked to politics and industry, and that academic, professional, and industrial interests consistently overlap. Second, they argue against the notion that boundary organizations serve only two constituents, suggesting, by contrast, that university based research units “attend to the interests of the university, industry and outside funding agencies” as well as “university administration and academic departments.” (Parker and Crona, 2012). Based on the research presented in this dissertation I would add non-profit groups and government at multiple scales of governance.
Rather than treat the university as a constant I examine the university as a changing institutional space of conflict and creation. Departments, for example, look less like enduring features of universities than particularly powerful disciplinary ‘stakeholders.’ Similarly, we see this within the professions and, in the post-war period, increasingly with interdisciplinary or multidisciplinary research units. The strength or purchase of these ‘cognitive stakeholders’ rests with their broad claims to epistemological or social relevance, and, hence, with the formation of constituencies for their expertise, or institutional publics. For Robbins the expansion of this institutional ecology is a layered process of addition and subtraction as new institutional strata are added or compressed as new constituencies are brought into relationship with universities. I demonstrate that this is also a process of translation and transformation, as well, where old knowledge and existing institutional projects are refashioned towards new ends or new institutional orders, and existing institutional public are re-trained in new modes of cognitive authority.\footnote{This description jibes with Fligstein and McAdam’s (2011) assertion that students of institutional actors are all interested in the same phenomenon, collective strategic action. In this sense, they are argue that study of organizations and social movements amount to the study of collective actors vying for strategic advantage at meso-level social orders, which they term strategic action fields. I argue that in this dynamic, claims upon institutional order provide the means by which institutional collectivities, inclusive of collective actors and collective projects, are defined.}

I examine the institutionalization of three such projects. The first project concerns the disciplinary organization of environmental research, where environmental research is re-valorized around a cooperative model of the environmental sciences. The second project, consists of the movement to organize environmental expertise as a new type of science and, hence, the development of Environmental Science Programs as a sort
of scientific reform movement. The third project attends to the explicit construction of ‘expert-knowledge systems’ as boundary organizations. I demonstrate that the interplay between these three projects created a trajectory of institutionalization leading from Environmental Science as a type of ‘institutional movement’ to a stabilized ‘trading zone’ for expertise. Throughout the study, I demonstrate that this process was largely driven by consolidation and diversification of institutional projects and, hence, by the use of environmental research as an institutional opportunity structure.\(^{21}\) It is the institutionalization of these projects that is the means for academic scientists to engage in institution building as both a precondition and as an outcome of their research endeavors.

The ‘problematic’ basic to environmental projects in the postwar—namely, how to build the institutional means to link knowledge and action for the sake of environmental problem solving—was centered upon the distribution of expertise and its organization. This process was supported by an increased emphasis on the utility of knowledge, where emphasis on utilization derived from the importance attributed to knowledge for decision-making from the late 1950’s forward. In this context, universities progressively cultivated ‘third mission’ activities centered upon economic growth, technological innovation, and outreach where each become university mandates equivalent to teaching, research and service.

The emergence of third mission activities in higher education is part of a broader trend towards what is called the commodification of knowledge (Lyotard, 1993), inclusive of the emergence of university patenting, the transformation of academic labor,

\(^{21}\) As derived from Political Science, opportunity structures are defined as exogenous factors limiting or empowering collective actors (Macadam, 1999). See Frisk (2012) for application to science movements.
the emergence of scientific start-ups, and the generalized transformation of knowledge production, often explained as an outgrowth of a shift towards ‘Academic Capitalism’ (Slaughter and Leslie, 1997), the ‘entrepreneurial university,’ (Etzkowitz, 1997) or neoliberal science or the Neoliberal University. (Abraham, 2012; Brown, 2011; Lave, 2010)22 This trend has been examined in terms of social organization as indicative of a new Mode2 orientation to knowledge production, or the emergence of a ‘Triple-helix’ between science, industry and government, where, as a result of shifting regimes of science policy, universities are fundamentally restructured in their relationship to the market and other institutions, like the state. The result has been an emerging ‘quasi-market’ in research contracts, an emphasis on deriving commercial value for the production of knowledge, knowledge transfer, and the re-organization of academic conduct (for example, the institutional separation of research and teaching, activities traditionally aligned in the past). In this context, analysts increasingly treat expert agency in entrepreneurial terms, locating entrepreneurial activity as distributed within universities where academic conduct is framed in terms of the distribution of risk and profit of “grantsmanship, program development, and technology transfer” (6)

The focus on academic professionals as institutional builders sets this study at odds with theories of academic entrepreneurialism that tend to emphasize profit motives or market pressure in attributing entrepreneurial motives to academic actors, where

22 There is a large body of literature that examines changes to the post-war organization of science. See Hessels and van Lente 2008 for comparative discussion of competing thesis of changes to the ‘science system.’ They review the theories of the new knowledge production/mode2 (Gibbons et al. 1994, Nowotony et al, 2004), finalization science (Bohme et al., 1983, 1973), strategic research/strategic science (Irvine and Martin, 1984), post-normal science (Funtowicz and Ravetz, 1993), innovation systems perspective (Smits and Kuhlmann, 2004), and Academic Capitalism (Slaughter and Leslie, 1997).
scientific and academic entrepreneurialism is understood to result from an incorporative adaptation of academic conduct to the norms of industry or the corporate world.  

Analysis of the role of experts as institution builders—and institutional builders as entrepreneurs—is decisively lacking in the contemporary scholarship on higher education. By contrast, this study addresses two aspects of this expansion have been overlooked in the extant literature: first, the post-war push to engage in institution building as a necessary component of the postwar boom in research, and, second, the opportunity that these conditions provided scientific professionals and academic experts to engage in institution building as a constituent aspect of knowledge production and, hence, act as ‘institutional agents,’ through the construction of careers, research programs, and disciplinary organization. Both factors helped to broaden the perceived utility of knowledge.

Likewise, since the 1980’s, organizational analysts have increasingly turned to the concept of ‘institutional entrepreneurship’ to account for the role of agency in institutional change. Institutional entrepreneurs are defined as strong institutional actors exerting influence upon organizations and institutional contexts in innovative ways. In

23 Weber’s (2004) classical account of the ethos of science offers a standard gauge for thinking about the institutional conduct of experts, defined by institutional sector. Here we see a pervasive distinction between the role of the academic expert in the shaping and conveyance of knowledge and their role in public life. The use of knowledge is something that one does outside of the University in distinct institutional arenas (the market, in press, in meetings and associations).

24 For example, for Slaughter and Leslie, academic entrepreneurs, in so far as they might engage with institutional entrepreneurship, engage in entrepreneurial activity as the result of economic interest. Hence, where the question of academic institution building is broached it is most often portrayed in terms of University Presidents, administrators, or similar Captains of industry but not as a constituent feature of everyday work. (Slaughter and Leslie, 1997)
the new institutional literature, the term is most commonly associated with DiMaggio’s observation that ‘new institutions arise when organized actors with sufficient resources see in them an opportunity to realize interests that they value highly (DiMaggio, 1988:14). Here analysts have sought to reintroduce concepts of agency into institutional analysis, and the institutional analysis of organizations. Subsequently, the term has come to refer to the “activities of actors who have an interest in particular institutional arrangements and who leverage resources to create new institutions or to transform existing ones” (Maguire, Hardy, and Lawrence, 2004; 657). In this way, institutional entrepreneurs have been theorized as collective actors (Wijen and Ansari, 2007), such as state actors (Tuohy, 2012) and professions (Kaleem and Vosselman, 2010; David, Sine and Haverman, 2013), or as individuals whose structural locations provide them with unique opportunities to affect institutional change (Battilana, 2006). Institutional entrepreneurs are treated as both drivers of institutional change, where their activity is treated as a source of structural change (Eisenstadt, 1980) either based on skills (Fligstein, 1997), through strategic action (Beckert, 1999), or in the perception of structural opportunity structures (Dorado, 2005).  

More recently this work has been supplemented by incorporation of social movement frameworks, where institutional agency is framed in terms of social movement

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25 Institutional entrepreneurs are treated as both drivers of institutional change, where their activity is treated as a source of structural change (Eisenstadt, 1980), either based on skills (Fligstein, 1997), through strategic action (Beckert, 1999) or in the perception of structural opportunity structures (Dorado, 2005). Critics have focused on failures to account for the effects of institutions on actor’s behavior (Seo and Creed, 2002; Battilana, 2004), and hence for failing to deal forthrightly with “the paradox of embedded agency,” or the question of how agents (both individuals and organizations) can initiate change or innovation if “their beliefs and actions are determined by the institutional ends they wish to change.” (Lou, Battilau, Boxenbau, 2008; 4).
dynamics, although often in ways that confirm or support institutional change as an exogenous variable.\(^{26}\) While other analysts have examined the effects of social movement work on the construction and trajectory of development, they have tended to hold the organized elements of knowledge production as static. In this sense they have examined the politics of influence on the production of disciplinary knowledge (Frickel and Moore, 2004, Henke, 2004, Morello-Fosch, 2004) or the trajectory of development for research agendas (Jasanoff, 1992, 2004, Fujimora, 1998, 1999, 2003. Hess, 2004a, 2004b, 2005, 2007, 2010, 2015, McCormick, 2009). But what happens if we factor in, for example, disciplinary or professional interest as a form of institutional agency? For many of the academic and scientific professionals, the question of how to create a ‘green knowledge,’ or a truly environmental science was precisely the question at issue with the early founding of environmental science programs. For some, the issue was one of political consequence and, for others, an intellectual dilemma, but both orientations found a

\(^{26}\) Institutional models have been enhanced through analogy to social movement research (Schneiberg and Lounsbury, 2007), where collective actors are said to mobilize resources, new actor relations and collective identities in institutionally relevant ways that sum to organizational outcomes in relation to specific organizations and at the level of organizational fields (Hardy and Maguire, 2008). Salient parallel comparisons can be made between the social movements literature and the literature on institutional entrepreneurs, in that “both emphasize agency, deliberative or strategic action and self conscious mobilization around alternatives.” Here analysts have examined the effects of social movements in fields, as agents of institutionalization (Schneiberg and Soule, 2005), and in field creation and change (Hoffman, 1999), as well as the stabilization of field level conflict (Davis and Thompson, 1994; Fligstein, 2001, Armstrong 2005), as field reconfiguring agents (Clemens and Clark, 1999; Streeck and Thelen, 2005; Schneiberg, 2007, Lounsbury, Ventresca and Hirsch, 2003) or as the basis for new activities or emergent fields (Morrill, 2006). This has been particularly relevant for the analysis of the relationship between movements and professionals, and movements amongst professionals (Greenwood, Suddubay and Hinings, 2002; Moore, 1996; Frickel and Gross, 2005; Moore and Hala, 2002).
degree of common cause in taking up environmental science as an institutional movement.27

With an explicit focus on the emergence of new expertise, this study is concerned with the issue of continuity and change. How do we explain the emergence of new expertise? What is it that is new, and what remains the same? As seen from this angle the uniqueness of the environmental sciences, as institutional configurations, does not stem simply from their association with a charged sense of environmental values but rather an intensified re-construction of the relationship between experts and citizens around the production of environmental knowledge.

The Conservation Movement—framed in terms of natural resource use—was largely a question of balancing natural resource extraction against the economic needs of communities and, later, aesthetic interests. By contrast, the emergence of the environmental movement was facilitated through a re-evaluation of the political basis of

27 There are three analytically salient distinctions at issue here in the relationship between scientists and social movements. First, there is the role of scientists and professional participation in social movements to shape political interest (McCormick, 2009, Moore, 2012) or to shape the agenda or methods of science (Allen 2003, Epstein 1990, Frickel, 2004, Jasanoff, 2005). I would include here work that falls under ‘counter publics’ (Hess, 2011) defined as public arenas of scientific contestation, including opposition to social movement based knowledge claims (Hoffman, 2001, Oreskes and Conway, 2011, Ottinger, 2013) and the increased role of citizen scientists in the construction of expertise (Corburn, 2005, Brown, 2012, Hess, 2007, Smith, 1971), second, the work of activist movements from within the professions whose goal is to transform professional work (Hoffman, 1989,), and, finally, expert or professional movements—what Frickel (2005) refers to as “scientific-intellectual movement” or ‘SIM,’ defined as “collective efforts to pursue research programs or projects for thought in the face of resistance from others in the scientific or intellectual community.” (206) Examples of SIMS would include (Smuts 2012), (Frickel, 2004, 2004a), O’connor (2012), Ross (1991) and Silva and Slaughter (1984) in so far as intellectuals or scientists act as professionals, see Abbott (1988), and Abbott (1999) for academic schools. The concept of the ‘institutional movement’ would cover all of the above examples in so far as they are aimed at the construction of institutional order.
environmental institutions based on ‘environmental information’ or knowledge. From the beginning, the crisis of the environment was variously constructed as a crisis of knowledge. For example, if we consider the clarion call to action inaugurating the transition to the environmental era, Rachel Carson’s *Silent Spring*, we did not know enough about the effects of DDT, and, in our ignorance, our actions produced damaging effects. The solution to this scenario was more knowledge both about natural systems and the unanticipated effects of science and technology on the environment and human activity. In this sense, the environmentalist critique of science and technology was part of a larger body of critique stemming from social movement analysis that began in the late 1960s and was progressively formalized emphasizing the diversity of knowledge, where knowledge is construed as for and by ‘situated knowers’ in a particular cultural, social, and political location (Harding, 1987). These debates, critical of the methods of science, as well as the social and political construction of scientific expertise, promoted

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28 See Hays (1982) and Davis (2003) for discussion of the transition between the Conservation and Environmental movements. At issue is the expanding social relevance of ecological models, and the sense that humans and nature are not separate but part of an interconnected system. Understanding these interconnections as a basis for action became the defining feature of the environmental movement.

29 In contrast with Hays (1987) and Gottlieb (1993), Sellars (1999) the rapid emergence of ‘environmental imaginary’ after World War II, noting that the “movement we now call environmentalism did not genuinely exist before 1960.” He argues that a cultural imaginary formed during this period around biological and bodily threats, reframing many of the earlier conservationist emphasis on land and wildlife. In this sense, “cultural precedents and resources for an environmentalist imaginary lay not just in conservation or urban reform but in other less familiar locales: in mid-century institutions dedicated to industrial hygiene, in movements for ‘organic gardening’ and anthroposophy, and in the efforts to contend with a syndrome of “environmental disease”….” (3) It is from this background that the ‘environmentalist’ identity emerged from a variety of ‘preexisting networks, movements and subcultures.” (3)
an engaged scholarship, concerned, for example, with the feminist analysis of scientific institutions (Haraway, 1989, 1991; Harding, 1986, 1987, 1991), the raced economy of science (Harding, eds. 1993) and a post-colonial critique of ‘techno-science.’ (Harding, 2006). In the environmental sphere, we see similar critiques in two forms: first, a critique of the scale of ‘western’ science, and the environmental effects of technology, in favor of small-scale economies and “appropriate technologies” (Schumacher, 1973, Dunn, 1979) and, second, a critique situating citizen scientists and environmental stakeholders—that is, invested local environmental actors, often opposing placed environmental interests to that of professional experts (Fischer, 2000). Thus the newly emergent environmental social movement additionally framed the issue in terms of the constitution of access and distribution—who had access to expertise, who as involved in its constitution, and how was the expertise distributed in existent communities.30

In this sense, the force of the social movement critique intervened “in opposition to the effects of power” by linking power with “knowledge, competence and qualification” as a struggle “against the privileges of knowledge…”31 However, as Hess (2007) has observed in his study of ‘alternative pathways,’ social movement activity at the level of science and technology need not be defined solely by ‘contentious politics’ or

30 Understanding the interaction amongst these various oppositional knowledges is an important element in appreciating the evolution of the environmental field, particularly relevant for the emergence of environmental justice. (Sellars, 1999)

31 A paraphrase of Foucault (1982) linking social movements to ‘power/knowledge’ as cited in Fisher (2005) The full quote reads: “[New social movements]…are an opposition to the effects of power which are linked with knowledge, competence, and qualification: struggles against the privileges of knowledge. But they are also an opposition against secrecy, deformation and mystifying representations imposed on people…what is questioned is the way in which knowledge circulates and functions, its relations to power.” (109)
oppositional critique but by institution building, voluntary activity, and other social change activities act in and shape a diverse number of institutional domains. Hence, in characterizing agency in social movements as a type of collectivity, we face similar analytical challenges as with the study of institutions, where social movements stand to institutions and organizations in complicated ways.

For our purposes it is the question of how institutional agency stands to cultural processes in particular institutional ecologies that is at issue. The ES programs examined in this study were the outcome of multiple efforts to both shape cognitive authority as well as influence the institutionalization of expertise. I argue for a reconsideration of the link between institutional agency and institutional change, as mediated by institutional work (Lawrence, Suddaby and Leca, 2009, Rojas, 2010, Zietsman and Lawrence, 2010, Suddaby and Vale, 2010, Hwang and Congras, 2011, Willmott, 2011) or institution building. In so far as institutional analysts have examined the link between institutional agency and change, analysis has overwhelmingly emphasized the structural dimensions of institutional change, often framing agency as a response to exogenous circumstances. Theories of institutional entrepreneurship examine agency in relation to institutional change in terms of the mobilization of institutional resources but where this is unproblematically framed in terms of economic interest, or advantage, and framed exclusively in terms of an actor’s structural propensity to leverage resources. In this respect, theories of institutional work often remain divorced from theories of institutional entrepreneurship as well as other cultural processes or forms of cultural agency.  

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32 An important precedent, however, does explore the expression of institutional entrepreneurship in cultural terms to examine the dynamics of new practice creation (Lounsbury and Crumley, 2007; 994), and the creation of collective identities through
The institutionalization of environmental expertise has been a complex process involving both the progressive incorporation of differing constituencies, as well as their collective transformation over time. It is in this respect that we find an interesting divide between the cultural expression of social movement critique and environmental concerns as expressed through an institutionalist idiom. While we may analytically draw a distinction between these two constituencies as competing voices, it their mutual institutionalization that I explore in this dissertation. The influence of ExKS on the trajectory of institutionalization of environmental expertise has resulted, I argue, in the cultivation of institutional strategies linking environmental research, outreach, and teaching in support of ExKS and, hence, in the subsequent institutionalization of environmental science as a type of ‘trading zone’ for environmental expertise.

ES programs have gradually converged towards a model of institutional organization that combines an expert emphasis on institution building—vis a vis use models of science, or ExKS—with an administrative architecture that cultivates institutional linkages between experts and institutional constituencies. In this sense, cognitive accumulation—the ongoing institutionalization of expertise—in the institutional ecology of the university has been wed to an effort to carve out ‘institutional geographies,’ or cultivated institutional linkages between communities and organizations.

It is in so far as this institutional process is concerned with a transformed ‘institutional geography,’ that I suggest that along with, or through, the ‘marketization’ of cultural entrepreneurship (Lounsbury, 2011). Institutional entrepreneurs have thus been said to enact agency as influence or opportunity through a variety of ‘cultural mechanisms’, including rhetorical strategy (Suddaby and Greenwood, 2005,), story telling (Zilber, 2006), and through cultural tool kits or repertoires (Sweden, 1986; Boltanski and Thevenot 1991).
the university, contemporary universities are brought into a more dense set of organizational affiliations whereby the progressive incorporation of institutional publics is managed.

Plan of the Dissertation:

For U.S. universities, the transition to the ‘environmental era’ was linked by a common problematic: how to remedy a perceived shortage of environmental information and to organize environmental expertise to produce useful knowledge aimed at solving environmental problems through ongoing intervention. The figure of the environmental expert that emerged in the late 1960’s was thus charged with transforming the university to meet the goal of renewing the evolving mandate to produce socially relevant knowledge. The struggle to institutionalize this mandate shaped the history of the environmental sciences in three significant ways. First, we see a consolidated effort to construct science for decision-making in the existent environmental field. This enabled a reconstruction of the relationship between experts and citizens over the contested terrain of cognitive authority, or who was authorized to act in relation to the environment. Over time, as this link was institutionalized it worked at cross-purposes, to become the basis for further expert projects, as well as the means by which environmental constituencies were cultivated. The outcome of this process has been a tiered administrative structure creating an instituted ‘trading zone’ between experts and citizens, concerned with the ongoing construction of expert projects.

In this dissertation, I analyze the interplay of these processes at multiple levels of analysis, utilizing a combination of methods, including archival research and analysis of
historical documents, participant observation, semi-structured interviews, and social network modeling. See Appendix A for detailed discussion of my data collection methods. The dissertation examines the efforts of academic professionals to create and institutionalize discrete programs of research and training from the late 1960’s to 2012. I examine the organization and institutionalization of three environmental science programs during this period: The Environmental Science Program at Washington State University; the Environmental Sciences Program at Oregon State University; and the Environmental Studies Program at the University of California at Santa Barbara.

The first section introduces the issue of academic and expert professionals as institution builders within the institutional ecology of each university to examine how efforts to construct cognitive authority created an emphasis on expert knowledge systems (ExKS), as a discrete class of institutional project, concerned with the utilization of expertise in decision-making. In Chapter 2, I describe the history of the ‘research ideal’ in the U.S. field of higher education and the role it played in translating a ‘regulatory science’ mandate into the mission of U.S. Universities. I trace the growth of basic research capacity in the liberal arts setting at UCSB and in the context of land grant university research at OSU and WSU to highlight how the social relevance of basic research was woven into the institutional order of university life. I subsequently analyze how science policy tying basic research to regulatory ends began, in the late 1960’s, to describe basic research as an institutional resource for environmental problem solving or decision-making.

In Chapter 3, I examine how academic and expert professionals variously translated this focus on ‘useful research’ into discrete institutional projects. The specter
of environmental crisis and the public outcry that resulted in the environmental legislation of the early 1970’s gave impetus to efforts to create institutional links between universities and the evolving programs for environmental governance at the level of the state. At Oregon State University, this imperative took up the question of how to organize environmental experts on campus to provide sound, responsive, and timely advice to the office of the Governor, a program that was subsequently transformed into a county-wide environmental education program conducted through the auspices of Cooperative Extension. Here the ‘environment’ served as a form of opportunity structure for academic professionals concerned with imbuing their research with both environmental legitimacy as well as a basis for mobilizing institutional resources in the form of grants, extension service programs, and educational campaigns. I analyze these projects and their evolving administrative infrastructure, as shaped by debate over the proper role expertise should play as a resource for institution building. Chapter 4 continues this analysis through examination of the ACCESS program, active in Santa Barbara from 1969-1979. Like the programs in the prior chapter, ACCESS sought to organize institutional resources to capture and utilize existing distributed expertise to build a county level monitoring program integrating computer based modeling, citizen input, and expertise. ACCESS is an interesting case that illustrates institutional activity at the boundary of the university concerned with the expansion of the institutional ecology and the formation of institutional publics but also because of the degree of institutional impermanence instanced by this case. Here I theorize this impermanence as a constituent feature of ‘institutional forgetting’ looking at the dynamics of emergence and incorporation.
The second section of the dissertation focuses on the institutionalization of environmental expertise as a field of higher learning through examination of ES program building. I examine how an evolving emphasis on useful knowledge has been institutionalized in the design, maintenance, and gradual reconstruction of environmental training and research programs over time. Chapter 5 examines the efforts to create an Environmental Science Program at Washington State in 1968. Of the three cases WSU is unique for its emphasis on environmental science as a synthetic, integrative science distinct from the organization and research focus of disciplinary science, or the cooperative research models of the Extension based research programs. Chapter 6 examines the case of Oregon State that pursued the creation of the institutional architecture for environmental research that, unlike the other cases, focused on maintaining a cooperative format between disciplinary and applied research programs. On this model, the development of a synthetic research program was intentionally resisted in favor of creating a broad cooperative foundation for environmental research, inclusive of training opportunities for graduate education. Indeed, it was not until the 1990’s that OSU created an undergraduate program in environmental science. I examine the structure of OSU’s cooperative structure and trace the slow development of a program in ES, examining how, in this cooperative context, the environmental science was legitimated and eventually institutionalized as a degree offering.

Finally, chapter 7 looks at the ‘Environmental Studies’ program at UCSB, perhaps the most well known of our cases for its explicitly political origins. Created by a cadre of concerned academics in the aftermath of the 1969 Santa Barbara oil spill, the program drew broadly from UCSB faculty as well as from the local Santa Barbara
community to create a dynamic undergraduate program focused on the interdisciplinary use of knowledge for environmental problem solving. But, by the late 1980’s, the success of this program was challenged by a push to create a professional school of environmental science, and, with its subsequent institutionalization, we see the emergence of a tiered administrative structure, essentially absorbing the ES program in a division of labor whereby graduate education and research were conducted through the auspices of professional education and undergraduate training in environmental expertise became the province of the ES program.

These chapters provide a detailed empirical and historical look at how environmental expertise has been institutionalized as a distinct institutional niche concerned with the use of science in decision-making. Throughout the study, I demonstrate how program development has been institutionalization along four typified routes, where ES is constructed as the cooperative interaction of environmental sciences (OSU), or as a singular synthetic model of environmental expertise, conceptualized as environmental science (WSU), or environmental studies (UCSB). However, by 2012, all three models had been variously combined around a model of coordinated environmental research as wed to institutionalized trading zones for environmental expertise. In conclusion. I argue that the organization of expert agency as expert knowledge systems provides grounds to rethink two prominent approaches to the study of university transformation: the so-called transition to the Neoliberal University (Slaughter and Rhoades, 2000) and the emergence of ‘epistemic modernization.’ On the first account, a neoliberal mission has displaced the mission of the university, where markets are assigned “central social value” (Slaughter and Rhoades, 2000, 1) and university research
is wed to corporate interests and market dynamics through patenting and the pursuit of technology transfer. By contrast, the epistemic modernization thesis refers to the institutional challenges ‘from below’ that open up science to new scientific or democratic goals, often by social movement actors opposed to political elites or mainstream science. In this way, I contrast these concepts with the notion of ‘cognitive accumulation,’ or the ongoing institutionalization of cognitive authority, to introduce a third outcome. In this dynamic, these two processes have been combined and effectively institutionalized as administrative ‘trading zones,’ or incubators for institution building projects linking the use of expertise to the ongoing cultivation of institutional publics or constituencies.
Chapter 1: Research and the Regulatory Ideal in the Field of American Higher Education

This chapter examines how the cognitive authority of environmental experts has been instituted through an effort to re-imagine the university as a type of imaginary social collective (Anderson, 1983; Appadurai, 1990; Castiadoris, 1999; Taylor, 2003), or what I refer to in this dissertation as the ‘institutional imaginary.’ I argue that this effort occurred at two interrelated levels, at the level of science policy and through the ongoing work of university-based experts engaged in institution building. I analyze two phases of this work of the imaginary: the effort to outline basic research as a university ideal and, second, the work of imagining the university as a home for environmental knowledge, conceived under the aegis of a regulatory ideal. Both phases provided support for the cognitive authority of environmental science as premised upon the use of scientific expertise in decision-making. In the first phase, university science, and by extension academic expertise, was re-constructed as a type of programmatic investment. In the second phase, university basic research was reconstructed to include programmatic efforts to link knowledge with action. I explore both phases as a constituent feature of the institutional ecology of universities. While this institutional ecology is structured by the institutionalization of cognitive authority, I argue that a constituent feature of this process is a persistent reconstruction of the university by appeals to what I call genres of relevance.
An Ethnographic preliminary:

Fieldwork for this study was conducted over a period of two years, with a total of four months spent consecutively at each field site. My original research interests were framed by years of formative study in the philosophy of science and the critical science studies tradition. My early research interests were hence focused mostly on questions of the production of knowledge, on theory change, and on questions of social influence. Coming to this research, I was curious to understand how institutional forms and expert concepts diffused amongst expert populations, in a sense, to look at regional economies of ‘knowledge transfer’ between innovative environmental science programs and expert professionals outside of the university. I chose to focus on IGERT programs at three universities with long standing environmental science programs, reasoning that these programs would give me a clear indication of how university based innovations in the environmental sciences were integrated into regional science.

IGERT stands for Integrative Graduate Education and Research Traineeship Program. Initiated in 1998 as an NSF flagship program, IGERT was created in response to two reports—a 1995 National Academy of Science Committee on Science, Engineering, and Public Policy Report and the report on Graduate Education and Postdoctoral Training in the Mathematical Physical Sciences. The goal of the IGERT programs was to fund innovative interdisciplinary research and training propels in graduate education, providing opportunities for graduate students and faculty to conduct interdisciplinary research, implement collaborative designs, and provide opportunities for internships and cross-disciplinary collaboration. The program was archived by the NSF in 2013, but many of the IGERT programs continued after their initial IGERT funding. The three
universities that I chose for my case studies had long-standing, highly regarded environmental programs, and at the time, all had IGERT programs up and running.

As is common with field-based research, I was quickly disabused of many of these analytical preoccupations. Indeed, a turning point in my research came early when, on a reconnaissance trip to each field site, I realized the ‘messy’ nature of university landscapes. To begin with, my initial solicitation for interview participants produced some interesting results. There were three varieties of response that, while they might simply be seen as a methodological cost of the interview process, revealed something important about the nature of my study. I distinguish five separate types of refusal:

**Refusal 1:** “I don’t really have much to do with the environmental science program…”

**Refusal 2:** “I’m not really an environmental scientist…”

**Refusal 3:** “I haven’t lived here [or] worked at the university long enough to be useful to your study…”

**Refusal 4:** “I don’t know much about regional environmental research.

**Refusal 5:** “I’m sorry, but I have moved. Good luck with your study….”

What I learned from this early exchange was that the academic and scientific professionals that I was attempting to enroll were highly mobile. And, secondarily, there was an immense amount of variation at each field site as to what was considered ‘environmental.’ In my field notes from my first month of fieldwork, I summarized some of my concerns with the following questions:

**Question 1:** “how to compensate for the high degree of faculty mobility?”

**Question 2:** “how to interrogate the apparent unfamiliarity of researchers with regional environmental research?
Question 3: “why is there so much diversity in environmental programming, and why, at first glance is so much of it seemingly unrelated?

Question 4: “how to understand the reluctance to identify as an environmental scientist?”

I do not, in this study, take up these questions to provide systematic answers. Rather, I find reflection on these questions useful for how they helped to orient me, as a researcher, to each field-site and, in some ways, provided a critical touchstone for ethnographic reflection. As I implemented my data collection methods, they led me to open up some of my initial research presuppositions to fully inquire what was happening, not only with the data that I was collecting, but rather how I went about locating answers to my research questions. Why was it there was so much diversity of environmental programming? And how is it that it is so unrelated? How could one be listed in the directory of environmental research and yet not view oneself as an environmental scientist?

Another similar episode helped frame my understanding of the place of the university as a field-site. During another early reconnaissance trip, I fully realized the ‘relational’ nature of the IGERT programs that were to be the focus of my study, when, upon arrival at the first university field site, I grabbed a campus map to orient me to the facilities, largely on the assumption that the IGERT programs, like departments could be easily located on campus demarcated by offices, administrative assistants, common rooms, etc. Much to my frustration, I spent the good part of the afternoon trying to track down the IGERT program, finding traces in the form of pamphlets, mailboxes with no mailbox, and an office location that was, in fact, a shared graduate student cubicle located in a basement maze of offices. I then realized the ‘administrative nature of the IGERT programs.’ I found similar arrangements in my two other field sites, where, with one
notable example, the advertised physical location of one program was what appeared to be a closet. It was engaging with the messy realities of university life, encountered afresh, that I realized many of my initial research assumptions would need to be re-examined in light of the field. Just as I began to ask critical questions about the identity of environmental scientists and the distribution of environmental programming, so I found myself asking questions about my received view of universities as organizations.

In retrospect, I see now that I had cut my theoretical teeth in STS on Laboratory Studies (Lynch, 1997, Latour and Woolgar, 1986, Knorr-Cetina, 1999) and entered fieldwork with visions of privileged access to the nitty-gritty, day-to-day work of scientists, observing the quotidian production of knowledge in situ. I was firmly in the grips of Latour’s methodological dictum to study science “in action” or “in the making” where discoveries are made, contextualized, and refashioned as a matter of practice (Latour, 1988). My goal was simply to expand this dictum to include the professional projects and relationships of scientific actors as a site of co-production, tracking these sites over time. I aimed to follow scientists ‘in the wild’ as they went about the work of producing knowledge as a part of their professional networks and to further understand how this expert knowledge diffused through institutional networks centered on the university as a durable site of production. The challenging aspect, in retrospect, was to follow scientists outside of the university, not in understanding the place of academic work as an institutional space.

However, in the field I found universities to be a labyrinth of storage spaces, laboratories and offices, classrooms and facilities, all held together by administrative requests, inter-department memos, program proposals, meeting minutes, budget requests,
and grant proposals, and tacitly formal standards of conduct. What I discovered was the university as a type of institutional palimpsest, with institutional spaces and programming designed for one purpose, later refashioned or reused for later purposes. In place of scientists in the wild, I met with academic and scientific professionals dreaming up ‘paper institutions’—or, the articulation of rules, programs, and procedures for conduct—holding everything together. Approached in this way the university—what I had always perceived as a durable, stable, order—became mysterious or mercurial, under constant re-examination and change. This changing institutional geography equally frustrated my effort to locate and define stable institutional networks.

My aid in making sense of this preliminary research turned out to be a critical dialogue with the University Archives at each of my field sites. My original intention was to approach the archives as a resource in which to contextualize the historical narratives I was collecting in interviews and discussions with environmental scientists and scholars in order to reconstruct historically persistent patterns. But I increasingly found that the archival aspect of my research helped to provide a critical orientation to my questions about university organization that was missing in my interviews with faculty. Although many faculty had a very clear sense of their career histories, often times they lacked a critical overview of university history. There were two very clear reasons for this. First, faculty careers are highly mobile, and many faculty simply felt they had not been employed at their universities long enough to offer long-term perspectives. And, often, as I demonstrate throughout this study, when read against the archival record their insights proved (not???) to be true. While these faculty networks demonstrated something about the nature of faculty careers, they did not help me to
understand the regional networks, the purported aim of my research. Secondarily, because of the interdisciplinary nature of environmental research, faculty involvement in the environmental sciences—in terms of research, or teaching, or committee work—proved to be highly localized. That is, folks who had served on program committees had a sense of the work involved in those committees but may not have taught an environmental class or participated in the full evolution of all of the various environmental programs. To make sense of the environment, I increasingly came to examine the deep history of each university as well as how these universities have been variously imagined, and successively redefined. The reconstructed history of the university, of environmental programs, and often forgotten environmental projects, became a critical map for approaching what I observed on campus. In this sense, this critical dialogue between interviews, ethnographic examination, and archival research constitutes something of an ‘ethnographic re-education’ regarding the institutional geography of university life. And, throughout the study, I explore how the tension between these strata—the university archival record and participant historical self-reportage—helped to illuminate what I understand to be the ‘institutional unconscious’ that underlay so much of what is typically referred to as ‘the production of knowledge.’ By institutional unconscious I refer two overlapping qualities of institutional order: first, the taken for granted practices of co-activity that make institutional life possible and, second, the effort to imagine institutions as a feature of coordinated action. The first quality refers to the ‘raw’ stuff of institutions—how patterns of co-activity hang together over time—social practices and technologies that coordinate activity in meetings, classrooms, through administrative budgets, and the work of research. The second
feature concerns how institutions, as a form of human collectivity, are imagined as collective goods, as directed towards or away from or towards desirable futures, as instruments of legitimation and vessels of hope. In STS these are often referred to as ‘technoscientific imaginaries’—that is the imaginative efforts to frame the nature, or purpose or significance of knowledge, science, and expertise. Science is painted as a ‘republic’ (Polyani, 1962) and as a bearer of universality (Latour, 1990). Similarly, studies of technoscientific imaginaries reveal science as deeply gendered (Keller, 1985) or raced (Harding, 1993) or as sources of epochal anxiety (Marcus, 1995) or ‘civic inspiration’ (Fortun and Fortun, 2005). In this chapter, I am interested in how universities are imagined as institutions, and, in turn, how university based actors—scientists, professionals, workers, administrators—utilize these institutional imaginaries to navigate the institutional dynamics of university life and to engage in institution building in dynamic institutional orders. I analyze this imaginative work of institutional agency as comprised of two parts: first, as a type of ‘genre of relevance,’ or a rhetoric of utility, whereby the university became of the focus of new found attention from policy makers and a diverse variety of social actors concerned with its social relevance and, second, as a type of ‘conceptual vocabulary’ employed in the organization of institutional projects. In this sense, I approached the history of university-based institution building as successive strata in the effort to re-imagine the university and, hence, to re-imagine the possibilities for cognitive authority for academic work and for social relevance.

**Dynamic Institutional Orders**

As previously argued, it is crucial to understand that the environmental sciences were largely carved from existent disciplinary and institutional concerns. Here I explore
how the programs were created as a preface to the question of how they were re-imagined as repositories of environmental knowledge. The dynamics involved in the creation of environmental programming involve the shifting definitions of institutional capacity and regional perception of relevance. As I learned at the start of my fieldwork, to understand these dynamics, we must re-orient ourselves to the university as a site of continuous institution building.

In all three cases, the universities examined in this study assumed their role as ‘universities’ as a relatively new feature of their organizational identity. All became universities after WWII. Washington State University (WSU) was created in 1890 as Washington State College, shortly after the passage of statehood, as authorized by the Morrill Act and the creation of the state land grant colleges. In 1905, reflecting a shift in institutional capacity, the schools name was changed Washington Agricultural School of Science, and, by 1959, it had changes its name again to Washington State University. Oregon State University’s had a comparatively similarly progression from ‘land grant college’ to research university. Created in 1856 as ‘Corvallis Academy,’ under the authority of the Methodist Episcopal Church, the school formally incorporated in 1858 to become Corvallis College. In 1868, after being named the recipient of Oregon State’s land grant money, it was renamed Corvallis State Agricultural College. In 1937, its name was changed to Oregon State College, and, after WWII, with the expansion of basic research and academic programming, Oregon State College became Oregon State University in 1961. By contrast, the University of California at Santa Barbara (UCSB) had a different, although still distinctly land grant, trajectory of development. Started in 1891 as the Anna Black School for Home Economics and Industrial Arts, it was
transformed into the Santa Barbara State Normal School in 1909 after being taken over
by the State of California. The School was later adopted into the University of California
System, under protest from the State College System, in 1944 after intense lobbying by
prominent and wealthy Santa Barbara citizens. Under this model, the College was
originally planned as a small liberal arts college and designated the Santa Barbara
College of the University of California. This trajectory was quickly abandoned, however,
as it became clear that the Post-War II boom would require conversion to a general
campus to accommodate the swelling number of degree seekers and, in 1959, the name
was changed to the University of California at Santa Barbara.

All three schools thus share in the land grant heritage but with notable differences.
Similarly, all three were involved in a shift of institutional capacity after WWII as they
transitioned to university status and assumed roles in the post-war research economy.
UCSB’s conversion to the post-war research model was dramatic, but less defined by the
prior decades of applied research that were the hallmark of the agricultural science
schools. Similarly, although both OSU and WSU had had long standing specializations
in applied research, their incorporation into the post-war research economy entailed
equally dramatic ‘institutional reconstruction’ as they sought to compete for both regional
and national relevance. I outline elements of this process below. However, today all
three Universities enjoy international research ranking with notable specializations and
strengths in multiple areas of the environment.

We see for all the cases that research is fully integrated with the service and
education missions of each university. Notable, for our purposes, is the fact that research
specializations at each university are organized into discrete areas of relevance rather
than simply by research program. For OSU, research is broadly clustered around three basic themes: “Advancing the Science of Earth Ecosystems,” “Promoting Innovation and Economic Prosperity,” and “Improving Human Health and Wellness.” These clustered themes aggregate research centers, initiatives, institutes and departments on campus, so, for example, the Earth and Ecosystems cluster includes nine different organizational units on campus, including the Oregon Sea Grant, Oregon NASA Space Grant Consortium, the Oregon Climate Change Research Institute, the Northwest National Marine Research Ecology Center, the Marine Mammal Institute, the Institute for Natural Resources, and the Cooperative institute for Marine Resource Studies. Each of these units has additionally assembled researchers from academic programs, like Environmental Sciences, as well as the applied laboratories and agencies located on campus and Cooperative Extension units throughout the state. Similarly, at WSU, areas of research strength are arrayed across twelve different areas of relevance, including the Environment, Human Health, Public Policy, Security, Engineering and Information Technology, Education, Energy, Business, Brain Behavior and Sleep, Clean Technologies, Global Animal Health, and Food and Agriculture. Each theme is in turn composed of numerous research networks, centers, and institutes. We find similar conditions at UCSB, where emphasis is placed on research clusters characterized as “unique, highly interdisciplinary [and] collaborative.” These include concentrations in the Environment, on California, Social and Behavioral Research, Marine Science, Neuroscience and Nanotechnology. Additionally, while one might image that these areas of relevance are exclusive to the basic or applied sciences, I note that many of the clusters in fact include disciplinary

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33 Accountability Profile, University of California, Santa Barbara.
knowledge from the humanities and social sciences. For example, at OSU, the research cluster “Promoting Innovation and Economic Prosperity” is associated with eight centers, including the Center for the Humanities, the Center for Latino/Latina Studies and Engagement, the Center for Research on Lifelong STEM learning, the Native American Collaborative Institute, and the Rural Studies Program.

The history of program building has been shaped by the overall research climate and the institutional specializations derived from service and research commitments. For example, by 1959, all three universities had mention of environmental offerings in their respective general catalogues. Similarly, OSU and WSU both had strong histories of ‘environmental research’ stemming from agricultural and experimental research stations, although use of the ‘environmental nomenclature’ did not begin until the early 1960’s, and only then in connection with the discipline of biology and ecology, respectively. In 1966 WSU was the first to initiate researching a program in Environmental Science, subsequently launched in 1969. UCSB’s Environmental Studies program shortly followed in 1970, but the impetus to create these two programs was radically different. Whereas the architects of the WSU program called upon scholarly precedent and the need for an integrative approach to environmental data, the proximate motivation for the UCSB program was the radicalization of the faculty in response to the Santa Barbara Oil Spill of 1969. By contrast, although OSU held substantial research and education...

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34 An event that is also notable for inspiring the First Earth Day after Gaylord Nelson, U.S. Senator from Wisconsin, witnessed the tragedy of the spill. Inspired by the student protest movement, Senator Gaylord, imagined the Earth Day event as a type of bi-partisan environmental teach in. Environmental ‘teach-ins’ were, in Santa Barbara, an immediate response to the Santa Barbara Oil Spill that many faculty participated in.
programming of an environmental nature, it purposively declined to create an Environmental Science Program until 1994.

As stable institutional projects, the orientation of each program is comparatively distinct, structured around differing approaches to the scope, methodology and philosophical differences. WSU’s Environmental Science Program has been structured around the ambition of creating a synthetic model of environmental science, in the singular, and hence oriented to the image of the environmental scientist as a type of disciplinary expert. Although perhaps with similar ambitions, the Environmental Studies program at UCSB sought to establish a program focused on the ‘environmental generalist,’ less attuned to the production of a synthetic science, than a wide-ranging problem solver focused on the specificity of environmental problems and their solutions. Both programs aimed to create an interdisciplinary science of the environment through the creation of a new type of expertise, and hence a new type of expert—the Environmental Scientists, or Environmental practitioner.

OSU’s trajectory is notably different. In 1967, OSU launched an innovative Environmental Health Sciences Center, and then, several years later, it self-consciously limited the scope of its environmental programming. Rather, unlike the WSU or UCSB, OSU adopted an explicit ‘cooperative’ orientation to the construction of environmental expertise, drawing on its long history of cooperative extension programming, to pursue a path to environmental expertise that focused on creating strong, multi-disciplinary research programs. These programs were structured around the coordinative role of the Office of Research, and the culture of faculty cooperation across disciplines and mission based research programs. What’s more these multi-disciplinary research programs were
tied to graduate and undergraduate education, where degree programming was strictly organized by discipline and mission based education. This focus on cooperative education has been broadly sustained into the present. Even when OSU created an Environmental Sciences Program in 1994—25 years after the launch of WSU’s innovative program—the Environmental Sciences program that emerged, although built on an interdisciplinary imperative, continues to be organized on a cooperative model with very minimal synthetic curricula.

Drilling down on these chronologies two significant patterns stand out. First, for both OSU and WSU the chronologies of the early programs were subsequently complicated by the emergence of competing program models, with the approval in 1989, of a school for Environmental Studies at UCSB, and the emergence, in 2004, of the Center for Environmental Research Education at Outreach (CERO) at WSU. Both initiatives were organized around multi-disciplinary ‘cooperative models’ rather than the synthetic mode of expertise championed by the Early Environmental Science or Environmental Studies Model.

These development patterns can be clearly seen in the distribution of environmental expertise at each campus, as well as in the processes by which this expertise was integrated into each campus over time, where for each case, environmental expertise has pulled from an impressive array of disciplinary and applied bodies of research. On the basis of my affiliation sample, I note that UCSB environmental

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35 There are two variations on this pattern. First, all of the programs support a slim F/T faculty profile for their Environmental Science programs, including either a chair or an organizer. Second, OSU demonstrated a preponderance of faculty drawn from mission area research and, hence, affiliated with USDA or EPA etc.
faculty are pulled from twelve different departments, with the 20% pulled from Biology, and 16% devoted exclusively to environmental research, and 11% exclusively devoted to Environmental Studies. For WSU, environmental faculty is derived from thirty different departments with the greatest concentration, at 9.4% pulled from Extension programming. Here environmental science faculty account for around 4% of environmental faculty.

Similarly, at OSU, environmental faculty is pulled from thirty-five different departments, with 8.7% of the faculty derived from Forestry programming. Similar to WSU, environmental science faculty account for about 3% of environmental faculty. To understand this distribution—with small fractions of faculty involved full time in the environmental sciences and a large number of faculty pulled in from a diverse body of disciplines—it is useful to return to one of the fieldwork questions that grounded my fieldwork, “Why is there was so much diversity in environmental programming?” The answer to this question lay not with the identity of the researcher (as I first inferred) but rather with the common criteria for how environmental research is evaluated and its institutional criteria for recognition.

**Genres of relevance:**

During my time spent in conversation with environmental scientists and with my historical interlocutors in the archives, I was often surprised by the overall concern with the organization of research—Was it team research? If so, how were the teams organized? Was the research useful for policy makers? The social organization of environmental expertise was often the yardstick by which it was judged as relevant. The
estimation of expertise was often framed in non-cognitive terms and with reference to its ‘utility’ or usefulness.’ Further, usefulness seemed regularly defined in relation to other people’s ability to pick up the work at a later date. Here this was often framed explicitly in terms of governance:

**Agricultural scientist:** “We need to be better at translating our work…the ideas and what we do—several years ago I was invited over to the other side of the Mountains [Seattle] for a Governor’s dinner on climate change. I was prepared to make the case for climate change, and to present the state of my work…they…hmmm…they weren’t interested in that. They wanted to know what I could do for them. How I could make what we do here useful…for what their concerns were. [From that example] I realized we needed to learn how to speak differently and to think about policy.”

I was additionally struck by how often this preoccupation with utility was accompanied by a prevalent concern with ‘managerial issues.’ Common sentiments were less about the epistemic value of knowledge—that is, how the knowledge is produced, a common preoccupation in the STS literature--- than they were about how it is organized. I consequently became distinctly attuned to the ‘managerial’ or organizational nature of the topics we discussed. Many times in my conversation this was made explicit:

**Environmental Scientist-Administrator:** “Our students specialize as much in calculus and management as they do in hard science.”

From the context of our discussion, the implication here is that environmental scientists are trained equally and, of necessity, in management science and business as they are in bench or fieldwork since environmental scientists are concerned with, as a matter of

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36 Fieldwork interview

37 Fieldwork Interview
expertise, the organization of knowledge-based programs for action. I found a similar sentiment with scientists around the topic of teamwork, defined as a crucial component of environmental research, where knowledge is produced and distributed in multi-disciplinary teams. Thus the problem of organizing those teams was a consistent standard for evaluating ‘good’ environmental science:

**Marine Scientist:** “In many of our [multidisciplinary] projects the…to get them to work…with teams of people...uh, the arrangements…. and the language are more important than the initial ideas. We get together and all these different people have to mesh…we have to work out a common language…it’s a matter of getting people to speak the same language first to get them to work together….one example from a project, I’m uh reminded of….where we spent months working on the design….a long term project on coastal marine policy….finally, we hired a consultant who…I loved this…had us draw diagrams of what we were getting at…. [laughs]….We had to really learn how to get along because no one knew what the other was trying to say …”

Similar issues were often framed in terms of ‘relevance’ and around discussions of ‘integrative research’ and, again, in terms of ‘modeling,’ and their prevalence made me wonder what is meant by ‘utility’ and research given the great variety of research project represented in the study. What’s more, I noticed that this concern over utility or relevance inspired much more interest, if not fascination, on the part of my research collaborators than did my questions about the differences between basic or applied science. For example, despite distinct disciplinary differences in the study sample, none of the 130 scientists, experts, or professionals that I interviewed found the distinction to be applicable to their work without qualification. And only one explicitly made the case that environmental research is usefully described as ‘basic’ research.39 However, there

38 Fieldwork Interview

39 It should be noted that this particular scientist, a physicist, narrowly defined the environmental sciences as physics, chemistry, and biology. The social or policy sciences
was considerable agreement that research is never basic, in the sense of divorced or pure, but always relevant, in some way, to social, cultural, or technical problems—the question was how—and often, how was it organized. Importantly this sensibility was evident in many of my questions about why academic professionals pursue academic research. Overwhelmingly these discussions were framed in terms of each participants desire to ‘be useful,’ or to make a contribution.\footnote{One sees this clearly in the responses to section [D] of the interview instrument: “What do you value most about the pursuit of science?” and [D.10.a]: “What do you value about your current research.” Answers to these questions were overwhelmingly framed in terms of biographical details about ‘giving back’ ‘serving’ and ‘making a contribution.’}

The meaning of ‘useful’ or ‘relevant’ research is an important theme in understanding what counts as environmental work. When university-based environmental experts describe the ‘usefulness’ of their research they are typically pointing at how the work is organized, where utility is framed in terms of institutional arrangements. The conversations around these arrangements do not draw solely upon the language of application, drawing a path from knowledge production to its application at some later date. Rather, there is a frequent concern with how research is ‘integrated’ in its production; that is, how multiple disciplines can be organized into effective teams. Or, similarly, how well research is integrated with society through the organization of management systems or in terms of collaboration with policy makers.

\footnote{Interesting to note, as well, that another prominent feature in discussion of these questions was the issue of ‘freedom,’ as in “I have the freedom to think what I want to.” See methodological appendix for topics covered by the instrument script.}
As an example of this sentiment, WSU’s INSPIRE program is instructive. This training program is organized through two efforts: first, training in multidisciplinary teamwork around a specific range of problems, defined in terms of ecological systems, and, second, training in the policy process, translating multidisciplinary research into policy terms. The program description describes this in the following way:

**INSPIRE program brochure:**

One of the most difficult yet critical aspects of environmental graduate training is placing research conducted at local and regional scales in a global context and conveying this information to land managers and policy makers. This is exemplified by one of the greatest science and engineering challenges of the 21st-century: understanding the complex interactions and the impacts of environmental nitrogen in atmospheric, terrestrial, and aquatic hydrologic systems as shown in the figure below. Discussions with leaders in government and industry increasingly elicit pleas for students who have not only a strong science foundation, but also have the necessary skills to communicate and work with policy makers. Development of these skills requires first gaining an interdisciplinary perspective of N cycle processes and the ability to place this in a global context and second understanding how to communicate and use scientific research to inform and guide public policy.  

The programmatic goal of INSPIRE was to create a certain type of fluency—in terms of expert conduct—between multiple sites of activity and, hence, between research, management systems, and policy or decision makers. INSPIRE is not unique in this vision. It articulates a strong vision for achieving ‘integration’ where ‘integrated environmental knowledge’ constitutes both a prospective goal and a standard of

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41 INSPIRE program pamphlet citation. The INSPIRE program was not one of the IGERT programs that I initially profiled to examine. Rather, it began shortly after I arrived at WSU in 2009. I had originally aimed to examine the “Multiphase Environmental Research” program, but it was ending just as I arrived.
evaluation and, hence, a means to discuss or understand the proposed relevance of a
given body of research.

In this respect, as a feature of the ‘institutional imaginary’ I suggest that this
emphasis on social organization constitutes a ‘genre of relevance’ through which expert
claims are couched as appeals to social and cognitive relevance and given purpose for a
particular audience. While claims to the social and cultural relevance of academic and
scientific expertise are a long-standing feature of expert cognitive authority in the U.S.
(Kline, 1995), in the post-war period, debates over the social relevance of scientific
expertise came to center on the organization of the university (Brooks, 1996) and its
newly attributed role in the production of science to meet both social demands and
national interests.

Framed largely in terms of science policy, I treat these debates as valid genres of
scientific discourse concerned both with the organized production of science, and the
collective management of expertise. Following Brenneis (1994, 1999) I note that
workaday academic knowledge is constructed not only through investigation but in
social vectors, such as the funding nexus, where reading and reviewing grant
proposals, for example, is both an everyday feature of academic life and a form of
interpretive genre work as well as an “analytically invisible cluster of social
practices.” (Brenneis, 1999; 128) Drawing on the work of Bazerman (1988) and
Berkenkotter and Huckin (1993), I define genres as ‘actionable’ in two ways. First,
genres are assembled from and wed to broader discourses as components of cultural
repertoires. They are dynamic embodiments of a group or discourse community’s way of
knowing, being, and acting, and, thus, consist of “…inherently dynamic rhetorical
structures that can be manipulated according to the conditions of use…” (Berkenkotter and Huckin, 78) On this account of genre knowledge—knowledge of rhetorical and formal convention—thus consist of “a form of situated cognition” (Berkenkotter and Huckin, 79). Second, in institutional terms, rhetorical genres, as utilized by institutional actors, play a role in coordinating co-activity and, hence, in institution building. I draw on this distinction to examine the development and use of rhetorical genres of relevance in two ways. First, as a component of the rhetoric of science policy—as an aspect of scientific discourse—genres of relevance concern the relationship between science, expertise, and ‘society,’ informing both expert claims to cognitive authority as well as their contestation. In this sense, genres of relevance may be seen as a type of decorum for discussing features of a given institutional imaginary. Yet, in another, secondary sense, they also factor as a components in the coordination of co-activity and, hence, as features of institutional environments or projects. 42

These two orientations, thus, constitute a dual relation supporting different orientations to activity, or scales of action. On the one hand, we have discursive action performed through genre knowledge, relative to cultural projects or repertoires, relative to a given community. On the other hand, we have genres deployed in contexts to enable co-activity. Approached from this angle, when we consider the university as a focus of institution building, we see how the rhetoric of science policy, for example, plays a role

42 While it is common to construe ‘policy’ in terms of ‘public policy,’ it is important to recognize that the concept covers principles of organizational decisions as well as those basic principles—the laws and regulations—that guide the State. As used here, the concept thus covers the full spectrum from organizational activity to action on the part of state entities. ‘Policy knowledge’ or ‘policy expertise’ concerns the use of expertise to shape decisions and the institutional organization that results from those decisions. Science policy in this sense may be seen as an instrument of governance.
in establishing institutional projects around university administration, the work of department and program building, and the management of research programs, institutes, etc. Equally this holds implications for how the relationships between universities and ‘society’ are imagined in the negotiation of science policy at other scales of activity.

When genres of relevance are employed in institutional work they do so as features of what I call ‘conceptual vocabularies’—or maps of cooperative know-how—that aid in coordination and co-activity. In this respect, institutional actors assemble and employ conceptual vocabularies to navigate, work in, and create institutional order in an available cultural landscape. Genres of relevance thus take on a dual character, as components of cultural discourse and as components of institutional ecologies. We see aspects of the conceptual vocabulary in the citations above, as associated with various key words: ‘environmental’ ‘multi-disciplinary,’ ‘system,’ ‘integrated,’ ‘policy makers,’ etc. The ‘conceptual vocabulary’ of environmental science is defined as a sort of ‘trade language’ developed largely around discrete institutional problems. The ‘conceptual vocabularies’ created are elements by which institutional actors—in this case academic professionals—construct institutional projects and call upon the componential elements of institutional order to define both tacit and explicit understandings of ‘best practices,’ efficient models of organization, and standards of relevance.

University-based institution building is both a constitutive process—specifying a range of co-activity—as well as a regulative process by which normative conduct is elaborated and performed. As elements of institutional conduct, conceptual vocabularies act as a resource for enabling a range of actions, within a way of acting as part of a given institutional order. As genres of relevance, they concern the conception of knowledge—
its image for a given community—and, hence, how the conception of knowledge is iconic for academic experts who have learned or are learning, in the case of institutional change—to act and feel as institutional agents deploying institutional strategies, maintaining institutional projects, and evaluating the institutional landscape. My contention here is not to suggest that ‘genres of relevance’ or ‘conceptual vocabularies’ became the basis for action. I do not propose to treat them as akin to an ideology. Rather, I argue that, in institutional settings, they consist of ‘situated resources’ that actors may utilize or call upon in the construction of institutional projects. In this sense, conceptual vocabularies consist of durable taxonomies deployed in institutional action rather than the conceptual schemes from which action originates while genres of relevance, as components of broader cultural discourses, specify rhetorical forms of cultural and social action relative to a given audience. Both features are important for understanding how ‘environmental research’ as a form of institutional conduct, is both instantiated in concrete forms of co-activity and conveyed as a feature of durable regimes of knowledge (Pestre, 2003). Here I examine how both were employed, after WWII, in the imaginative reconstruction of university-based science as basic research.

**The Rhetoric of Basic Research:**

As Pielke (2012) has observed the term ‘basic research’ and its corollary, ‘basic science,’ are political symbols with diverse historical and institutional meanings. The research ideal of the American research university was premised on an appeal to ‘pure
science’ as opposed to professional or technological science. However, it wasn’t until the 1920’s that the concept of ‘basic research’ emerged, where the term, as used by scientists and actors in the USDA, meant something like ‘applied research’ in service to agency missions. The broader shift in meaning occurred during WWI where basic research came to mean research in service to the war effort, often in aid to industry. The importance of engineering and chemistry to the war, and later physicists in WWII, helped to promote the notion that the relevance of sciences lay with its role in providing a body of fundamental knowledge that could be utilized as a resource in a variety of applications. Kline notes “several important changes in terminology occurred in the interwar period. Although engineering science had not become an everyday expression, the terms basic science and fundamental science began to replace pure science in the rhetoric of many scientists and engineers (Kline, 1995; 112). This shift held dual meaning. Politicians and policy-makers adopted a rhetoric of basic research framed largely in applied terms, and, while scientists spoke this language with politicians, policy-makers, and funders, the older pure science language was reinforced in peer circles. These changes subsequently

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43 We find both ‘pure’ and ‘applied’ science from the early 19th century forward. But, as Lucier notes, “pure was the preference of scientists who wanted to emphasize their nonpecuniary motives” while applied science “was the choice of scientists who accepted patents and profits as other possible return on their research.” (Lucier, 2012; 1). We see yet another important distinction, where ‘applied’ may mean ‘technological’ or ‘professional.’ This is particularly important for understanding the history of agricultural science in the land-grant movement where agricultural science was distinguished from the ‘vocational education’ of farmers, the organization of mechanical education (Geiger, 1986), and its institutional elaboration as engineering education construed as a cooperative enterprise with industry (Noble, 1977) Equally, the terms meant different things at different levels of organization. In the late nineteenth century, for example, one finds appeals to both pure and applied research in the same federal agency, for example. Equally, at the level of the states, as with the California Geological Survey, pure and applied research were coded as equally practical (Nash, 1963)
became the foundation supporting a series of adaptations after WWI. In June of 1916 the National Research Council was organized into “divisions on the basis of functional scientific task,” that functionally coordinated activity committees designed to work on war-related research. This organization provided a means to coordinate philanthropic support to university-based science, and it created the conditions for linking science to national interests, transforming the patterned institutional distinction between what we would now call ‘basic’ and ‘applied research.’ (Geiger, 2004)

The success of the NRC research networks coalesced into a generalized support for basic science in the service of applied aims. Scientists had become “confident that the industrial utilization of science in the postwar world could be expected to generate tangible support for pure science in the University.” (Geiger, 2004; 98) After the war, the NRC played a crucial war in advocating for the ‘scientific community,’ in effect consolidating the interests of university-based scientists into a national lobby on behalf of research and research funding. The war effort had brought scientists and the heads of philanthropic agencies into greater contact and created the conditions for mutual trust, and the role of the NRC was to persuade philanthropists that “scientists too had purposes transcending their parochial disciplinary interests,” (Kohler, 1987; 141) in effect reassuring philanthropic organizations that grants given to scientific activities “would be devoted to strategic, not routine, academic purposes” (Kohler, 1987142) Likewise, the peer committees of the NRC assured individual recipients of grants that they “would not be directly pressured by foundation bureaucrats or forced to do applied research” (Kohler, 1987; 142)
This increased interaction also had the effect of “consecrating the direction of science policy to a private elite that represented the leadership of those institutions.” (Geiger, 99). Although the role of the NRC had been to provide scientific advice to the Federal Government, its organization during World War I had, in fact, transformed the advice of elite scientific leaders into a model for scientific coordination. From amongst this group, a ‘best science approach’ to scientific resource management, where best science was defined relative to an elite consensus of the aims of science. Finally, best science was supported by a continued effort to channel private capital to specific scientific agendas (again, defined on the basis of best science relative to national priority).  

Just as the mobilization for World War I had transformed the structure of U.S. universities so, too, did WWII transform the expansion of Federal Funding for university research. As in the previous war, scientists were called upon to participate in the War effort, forming research teams and basic science research networks that worked in an interdisciplinary way on technical and organizational problems related to war-time

44 This applies as well to the industrial character of NRC. As Noble notes, the NRC was designed, from the beginning, as “an industrial as well as a military research agency.” (1977; 154) Its original design sought, on the basis of the war effort, to bring into cooperation military, industrial and governmental research. This cooperative effort consolidated interest in these types of arrangements that preceded the war and went back to the late 19th century efforts to bring industry, government, and the military into tighter relationship with the University (Dupree, 1986). However, with the end of the war in sight, the leaders of the NRC began to shift interest away from the exclusive focus on military service to science in aid to industry. This brought the scientific and industrial elite into a new, formalized relationship: “With the creation of the National Research Council, the technical leaders of industry no longer had to rely upon periodic meetings in the faculty flubs of Universities, the executive offices of industry, or their elite social clubs to achieve the necessary coordination of industrial research activities. The NRC provided them with an unprecedented vehicle for coordinating the resources of the nation to meet the needs of industry.” (Noble, 1977; 154)
activity. This was a continuation of the team-based research conducted during WWI, but
construed at a much broader level, and included ‘basic-science,’ such as physicists and
mathematicians as well as engineers and social scientists. The success of the wartime
organizational efforts were carried forth in the post-war period.\footnote{45}

Before World War II, the Federal Government, although in fact a principle player
in applied research, stood somewhat apart from the political economy of university
research.\footnote{46} With due appreciation of the Extension tradition, basic science had been
cultivated in an explicit stance against federal support, and there was a widespread
hostility to the notion of federal support, particularly amongst conservatives in the
universities, and amongst the scientific elite.\footnote{47} As the Depression developed, however,

\footnote{45}{It is important to note that in the ‘applied’ research tradition, particularly around the
theme of ‘conservation’ a similar pattern of team-based research, was emerging. See
Chapter 3 for discussion of this organizational model.}

\footnote{46}{In the late nineteenth century the applied ideal was instantiated in the Federal Bureau
system. This approach was marked by a problem-based approach, as distinguished from
discipline-based inquiry. The Federal Bureau system has roots in the older history of
Federally funded scientific research campaigns, but its systematization is to be found in
the organization of scientific activities in the Department of Agriculture in the 1880’s.
During this period, university scientists conducted both ‘basic’ and ‘applied’ research,
but the application of this nomenclature is confusing. By basic, we mean disciplinary,
and, by applied, we mean ‘programmatic.’ Disciplinary science became the de facto
product of universities when, as a professional strategy, the disciplines moved into the
universities, and staked their autonomy on control of that organization. By contrast,
programmatic science was an artifact of the Federal Bureau system (Dupree, 1986). In
that universities conducted programmatic research they did so generally in relation to the
evolving Federal Bureau system. A similar claim may possibly be made for the social
sciences and the private philanthropic organizations of the turn of the century (See Silva
and Slaughter, 1984).}

\footnote{47}{Geiger observes, however, that “Conservatives in the National Academy of Sciences,”
were not benignly interested in the support of basic science and held the cautious belief
that “Not only did Federal intrusion into academic science threaten the autonomy of
scientific decisions, particularly in choosing problems, but it also implicitly jeopardized
the control that [the elites] collectively exercised.” (Geiger, 2004; 261)
this stance began to change in relation to the perception that the privately funded research economy was coming to the end of its usefulness, which became the basis for a renewed effort to integrate federal funds into the private research economy. The great exemplar of this effort can be seen in the passage, in 1938, of the legislation to create the National Cancer Institutes as a division of the National Institutes of Health. These new organizations authorized “grants-in aid and fellowships to researchers outside of the government” in addition to intramural research. Later the efficacy of these institutional innovations would support another development, which was itself an outgrowth of an increase in Federal funding, the Federal research contract. Both innovations---grants in aid programs and the research contract---were wed to a science policy that was itself derived from the ‘best-science model’ of the twenties, perfected at the NRC, a nod subsumed within an ends-means scheme, where the ends were conceptualized as national priorities. The evolution of this system during WWII was a by-product of the large-scale efforts to coordinate a mobilized university and industry research establishment towards greater cooperation in solving problems targeted as ends and determined by the war effort,

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48 There was an economic calculus at play as well. As Geiger notes, by 1937 “The Great fortune of the gilded agar, many of which had been instrumental in the development of research universities, were now largely committed. It seemed unlikely that anything similar would soon become available again. The Depression had taken a toll upon the country’s millionaires, and the New Deal policies promised to restrict further both their numbers and their philanthropic potential.” (255) This perception was accompanied by an awareness that it would be difficult to persuade industry to fund basic research without applied benefit, and a sense that the “inputs of the foundations to university research had leveled off and were now being directed toward rather specialized purposes.” (Geiger, 2004; 255). The forecast was focused on limited growth.
largely seen as a refinement and expansion of the networks that were formed during WWI.49

The success of the war effort during WWII fundamentally transformed the organization of universities, at both discipline based and land grant institutions. Further, the changed relationship to the Federal Government, broadly changed the scope of the university research agenda, and its ability to respond to, and, in ways, define, the organization of social problems. The mid-1950’s through the late 1960’s constituted a period of massive expansion in the university system, as the “place of university research in the total national R&D effort was significantly enlarged” (Geiger, 2004;166). Further, this growth, for the universities, constituted a “shift in the university research system from a predominance of programmatic, often applied research in the early fifties to a marked preponderance of disinterested basic research by 1968” (Geiger, 2004;166). This shift, “permanently altered the research universities by enlarging the dimensions of academic research by making the conditions of that research unavoidably more dependent on government” (Geiger, 2004; 166). The shift was later to be solidified in science policy at the end of WWII, when the wartime model of research was to be solidified by Vanevar Bush in a science policy that was largely instantiated in the post-war period. Here basic research was coordinated with programmatic goals through institutional mechanisms related to funding. The question of relevance of science hence

49 As Geiger notes, “the basic relationship between the federal government and universities for conducting war time research was governed by contracts negotiated according to the principle of no loss, no gain.” (Geiger, 2004, 168) Universities researchers were contacted to do research, and not to produce final results or specific findings. Thus, universities were reimbursed for direct costs and overhead in support of the research process. This formula became an important mechanism in the post-war expansion of higher education.
became, after 1945, tied as well to the regional relevance of universities that sought to build research capacity on the basis of post-war research funding.

**Research and the Pursuit of Relevance:**

As the pure or basic science ideal was broadly reconstructed during and after WWII, the research ideal came to mean creating a knowledge base that could be realized as a resource for technical and professional application. Although universities had always, to some extent, performed basic and applied research, after WWII, they found themselves to be eligible for new sources of federal funding, as well as subject to increased competition as new universities began to compete for research funding, and the research ideal devolved to both land-grant universities and other regional organizations, such as liberal arts colleges. In paradoxical ways, the growth of research capacity led to a type of greater regional embeddedness as the research ideal was variously enrolled into the ongoing institutional order of Universities, and their evolving roles in regional economies. On the campuses with established applied programs, realizing the research ideal, thus, had a leveling effect whereby ‘applied’ and ‘basic orientations’ were linked to common standards of institutional conduct, both equally construed as ‘programmatic’. Similarly, for those universities principally founded on disciplinary based research, the appeal to programmatic research became an important source of distinction, not only for the cultural standing of the University per se but also in the construction of cognitive authority by individual researchers.

We find the incorporation of this ideal at issue in all three of the cases examined in this study. As land-grant colleges, WSU and OSU had a long history of professional
research in agriculture and forestry. However, after WWII, the transition from college to university entailed a re-organization of institutional resources to broaden their research capacity and, hence, capture the benefits of the research ideal in the expanding post-war compact between universities and the federal government. By comparison, UCSB was created from a state college supporting a liberal arts model. Although UCSB, in converting to the UC system, was, after 1944, technically a part of the land grant system, its reconstruction as a university involved the construction of research capacity, which figured not only as a major goal in the its post-war planning but also a major administrative problem. Thus, at the university level, the incorporation of the research ideal was linked to the expansion of institutional resources; a transition that entailed new patterns of regional involvement, the administrative re-organization of university, and a re-orientation of the scholar to pedagogy and the common mission of the university. The incorporation of this ideal occurred roughly in two phases, with the first, between 1945 and 1960, revolving around the post-war expansion of research largely directed by the Federal Bureau system. The second phase, between 1957 and 1977, was shaped by two subsequent events, the launching of Sputnik in 1967, leading to a sharp upturn in basic science funding, and, second, a greater concern with regulating universities. This second concern grew out of the Sputnik crisis as well as the social unrest that rocked American college and university campuses in the late 1960’s.

Throughout the Twentieth Century, Land Grant College’s had become sources of regional economic productivity and growth. University expertise was a crucial element in identifying natural advantage and in supplementing growing practices with technical know-how, linking farmers, growers, and agriculturalists to evolving standards of
scientific competency and expectations regarding what was regionally possible. The agricultural experiment station was an economic circuit in a ‘matrix’ of relationships that worked to transform, during this period, the family subsistence farm to an organization that began to more closely resemble industrial factory production (Fitzgerald, 2003). In California, for example, farming was capital intensive. The arid land required innovative irrigation solutions, and the largely urban character of the state as well as the shortage of labor required farm-mechanization. The early 1900’s saw an expansion agricultural engineering and farm mechanization organized through the extension service (Walker, 2001). Additionally, previous patterns of land ownership meant large farms and ranches dominated agricultural production, and orchards and vineyards, part of the then new specialty crops, required innovative techniques to stabilize yield. The history of Cooperative Extension in the West was a technical resource to agriculturalists increasingly dependent on technical expertise (Stoll, 1985, Walker, 2001).

Likewise, in the 1920’s the expansion of regional universities was equally related to two other developments: first, the “trend toward wider social participation in higher education” that brought “students from diverse backgrounds onto college and university campuses” and, second, “the development of extracurricular learning, such as “athletics, student government activities, and publications” (Geiger, 2004; 119) as well as other extracurricular opportunities. While these trends largely developed in relation to residential college campuses, it was the adaptation to them by universities that was of consequence for the system of higher education as a whole. The expansion of the university by way of inclusion and in terms of student extracurricular activities largely expanded the role of the university in American society at large and provided
opportunities for universities to expand their influence as well as their ability to secure financial support. This amounted, in part, from the universities increased embeddedness in local communities, an outcome that led to increased legislative appropriations for state funded schools.\textsuperscript{50} Additionally, the period following WWI saw an influx of engineering students and an expansion of engineering departments. Although this trend remained consistent with a generalized expansion of applied research, it was also evident in another trend that took hold after the War towards the growth in occupational curricula oriented towards careers in business, teaching, home economics, and professional programs. Both trends merged with other postwar patterns, namely a surge in enrollments and a concomitant enlargement in the types of organizations offering degrees in higher education and certification, such as residential colleges and urban service universities.

For research universities, both private and at the state level, this lead to competition based efforts at curricular expansion around vocational and professional degrees as well as graduate programs and part-time curricular options.

After WWII, in the first phase of development, the pre-war patterns of growth were reinforced through ties to the expansion of regional economic activities. This is particularly relevant for the American Far West, where, along with the Southwest, many States nearly doubled their manufacturing capacity. Similar expansions are notable for

\textsuperscript{50} The 1920’s were as Geiger notes: “a decade of extraordinary expansion of the capital resources of higher education institutions, “ and this expansion of resources translated to an “unprecedented expansion of both the capital and the income of the research universities.” Geiger notes: “Donations to colleges and universities during this period came from three main sources: foundations, philanthropists, and ordinary individuals.” While universities had always been the beneficiaries of wealthy individuals, after the war, and, in addition to philanthropic wealth, universities began to organize the collective sentiment of the alumni, and regional pride, into organized fund raising drives, and the eventual adoption of university foundations to create and manage university endowments.
the long-standing regional economies, including forestry, agricultural production, and mining. As Nash notes, “the War catapulted the Western Economy from a pre-industrial stage into one characterized by technological sophistication.” (Nash, 1973) Government financing during the war not only created the conditions for economic growth but also “freed Westerners from many of the artificial restraints of ten imposed upon them by Eastern Financiers eager to protect their own vested interests” (Nash, 1973;198). As a result, Western states managed to pivot away from colonial status as a resource extraction colony of the American Empire (Robbins, 1995). These patterns of post-war growth reinforced the regional patterns of urbanization, particularly in California and along the Pacific Coast of Oregon and Washington State. Western Universities had developed important relationships during wartime with both federal agencies and the wartime industries that populated the Pacific Coast.

Universities aided existing industries in post-war expansion and held out the promise of furnishing scientific manpower and technical expertise to attract new industries to the region. Cognizant of these post-war growth patterns—and with the concern about the economic retraction spurred by the end of the war economy--regional leaders laid the groundwork for state-led efforts to capture post-war growth through regional planning. Western Governors, organized through the efforts of Governor E.P. Carville, Governor Earl Warren of California, and U.S. Senator Pat McCarren, met successively in regional conferences at the end of the war, and throughout the 1940’s, to discuss the prospect of regional planning. This topic was flavored by a new sense of regional purpose and a clear concern about the region’s return to industrial and financial domination by Eastern interests. Planning included topics such as road building,
municipal improvements, cooperative engagement with federal agencies, and power
development. Interesting, for our purposes, is the fact that Carville framed these around a
program of conservation, noting that “the very foundation of postwar planning for the
western region must be built around the conservation, development, and preservation of
all our natural resources [and] the retention and development of already established war
plants by private enterprise” (Quoted in Nash, 1985; 206).^{51}

Earl Warren was particularly active in tying post-war planning to the fortunes of
the University of California. The fear of decline in the post-war California economy
prompted Warren to create a series of programs—a New, New Deal at the regional
level—initiating public works programs, organized investment campaigns for schools,
and expand the states’ higher education network of public colleges and campuses. Under
the auspices of Warren’s interests, George Strayer would produce the ‘Strayer Report,’
the first comprehensive plan for a state system of higher education in the U.S.,
rationalizing relationships between the various educational entities in the state, project
enrollments, and plan for both funding needs and new campuses. This was California’s
“first attempt at a master plan” (Douglas, 2000). Later in 1960, California with its
‘master plan’ for higher education radically transformed the organization of the
university by broadening the criteria for access and establishing a precedent, which was
soon followed by other state schools. By the seventies, most western states would in turn
organize state level planning or coordinating systems for higher education with similar

^{51} Nash goes on to note that these western governors resolved to adopt a practical
program for regional development, urging “the transfer of federal war plants to private
ownership, a clearly formulated federal policy on reconversion, the addition of western
representatives on the War Production Board and other federal agencies, and greater
cooperation among western governors to attract private industry and to develop regional
markets” (Nash, 1985; 206).
plans rationalizing relationships between their various organizations of higher education, outlining prospective enrollments, research budgets, and outcomes for regional economies.

Two outcomes of post-war regional planning, important for our interests, are the state level expansion of higher education, and the growing importance of regional economies of research to state economies. The postwar consolidation of the higher education was partially built from a change to the university constituency. As U.S service men and their families returned to the states, the issue of how to accommodate their needs at the elementary and secondary level became a salient policy problem. This issue was blended into the efforts to create and maintain national science policy, and education was seen, in that light, as a factor in maintaining scientific manpower needs.\footnote{Two major steps were taken to tackle this issue. First, in 1956, Eisenhower approved a presidential task force, the Committee on Education Beyond the High School, “to consider the issue of appropriate support for higher education.” Geiger suggests three salient issues emerged from this report: first, “the desirability of extending widely the opportunity to attend college;” second, the need, “in light of the rising demand for college lecturers,” to raise faculty salaries, and third, “the need to provide financial assistance for the construction of additional facilities to accommodate the projected enrollment boom.” In 1958, Johnson signed into law the National Defense of Education Act. The act provided loans for college students, fellowships for graduate students, and support for language area studies (165). It also set a precedent by which each aspect of the law, in expansion, was replicated at the state level as well.}

These expansions both broadened the constituency of degree seekers enrolled in higher education and interacted with the new funds for basic research to enlarge the pool of graduate degree seekers and the capacity of Universities to accommodate their training, amounting to an explosion of graduate degree programs in both basic sciences and the professional degree.
One translation of this concern, at the regional level, was an expansion of extension personnel as well as cooperative institutional arrangements between state and federal agencies, and the proliferation of advisory boards, often mediated through extension organization, structured regional relationships between universities and leaders in agriculture and industry.\(^{53}\) During WWII extension programs at WSU, for example, were employed in managing the Agricultural War Boards. Likewise, at OSU, Extension was involved, in the immediate years following the war, in organizing programs aimed at aiding the transition of veterans, and in Oregon, at the close of the war, veterans’ agricultural advisory committees were organized by county and assigned the work of giving maximum assistance to veterans interested in farming and in acquiring the technical know-how to do so in the post-war environment.

After the war, extension programs in Oregon, California and Washington dynamically expanded in terms of personnel and programming. For example, many of the agents and staff at WSU in the post-war period took higher degrees or professional specializations in applied science.\(^{54}\) At OSU, all district supervisors or state agents were required to earn their master’s degrees. Simultaneously, in addition to personnel growth and professional improvements, post-war program development was emphasized and the administration of programming and projects rationalized.\(^{55}\) This expansion also included


new forms of expertise, new constituencies, and a greater range of institutional projects.

At OSU, for example, one extension agent observed:

It was now becoming clear that the policies and methods followed in off-campus teaching of agricultural and home economics and related subjects were effective in other academic disciplines. In fact, these methods could be successfully employed in nearly every subject matter field. This tended to bring pressures for work to the Extension staff as common interest groups requesting additional Extension help continuously increased. By this time, there was, for example, little difference between the problems of rural home and the urban home. Consequently, women in the urban setting were asking for the same subject matter that as being developed in the rural scene. 4-H Club enrollment was increasing between rural non-farm and urban youth. In fact, recently, the Oregon 4-H Club enrollment has been about one-third rural, one third rural non-farm, and one third urban. This has tended, of course, to widen the educational projects in the 4-H program. ⁵⁶

Many program areas were opened through the allocation of new research money. At the University of California, for example, during the period 1948-1960, extension programming was designed to address non-farm research and rural development programming directly. This was made possible by drawing on private foundation and Federal funding sources, reserving the major part of its California state appropriations for commodity related programs. ⁵⁷

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Similarly, all three cases in this study expanded their research activities from the mid-1950’s forward and had thus adapted to accommodate the research money supporting programmatic work in basic research. This was not simply an symbolic issue but rather a matter of building research capacity and, hence, creating an architecture for ‘research’ more generally, including strategies for capturing the institutional benefits of research at the administrative level. A useful measure of the growth of this type of activity can be found by looking at the allocation of science research contract overhead. For example, at OSU, in 1954, the Chancellor’s office began regularly allocating money from research contracts to the libraries throughout the Oregon system for the purpose of book purchases. The OSU library was one of the first to receive this money, receiving a transfer in 1953-1954 in the amount of $6,346. This amount was more than tripled reaching $37,546 for the 1963-1964 periods (Carlson, 1966, pg. 65).

Additionally, during the immediate years after the War, we see a number of projects were concerned with training academic professionals to compete for research funding and, hence, reinforce the newly emerging professional standards for academic conduct. For example, in 1952 Oregon State University established the Science Research Institute to “encourage the individual initiative of productive research in the science faculty, to encourage research grants, and to promote teamwork in research among the staff members in different fields of science,” in effect, training ‘basic’ science faculty in the new research standards that had developed during the WWII. This effort helped to reinforce a demand for ‘general science’ curriculum and the professional training of

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58 The Library of Oregon State University: its origins, management, and growth, a centennial history. Brief Series, Books and Pamphlets. Scholars Archive, Oregon State University, Corvallis Oregon.
scientists in support of regional industry. These projects supported and reinforced the efforts at regional development, which, finally, was also linked to an effort to include an expanded definition of professional education. This enlarged definition rooted occupational training in curricula leading to professional careers and oriented towards the preparatory training for careers not only in the classic professions of medicine and law but also to the enlarged programs for professional training which began to take shape after World War I in terms of business and teaching as well as a whole host of new professional groupings which began to appear after World War II.\textsuperscript{59}

The transition to a ‘research ideal’ was in many ways a malleable ambition, corresponding to both the aims of expert actors as well as regional actors. With the reconstruction of scientific expertise as basic research, we see, as well, a transition to new standards of professionalism within the existent institutional orders. At WSU, the transition to the post-war period was led by the faculty when, in 1946, empowered by then President Wilson Compton and with the approval of the Board of Regents, began to transition the State College to a land grant university. While the transition was promoted as a means to realize the university in service to regional agricultural and technological interests, Compton’s ambition was also to see WSU as “the intellectual center of the Inland Empire.”\textsuperscript{60} In this sense the WSU, would not only fulfill its land-grant mission but the curriculum would also be geared towards a broad class of individuals, most notably the general populous returning from the war effort. To this end, the liberal arts


\textsuperscript{60} “From College to University: Washington State University’s Pivotal years, 1944-1951.” Paper Read by George A. Frykman, Professor of History, April 6, 1979. WSU Written Histories. WSU Digital Collections. Pullman, Washington.
and sciences were to be integrated with the agricultural professional schools that had been at the center of the State College. For example, Geology was moved from the School of Mines to the College of Arts and Science, along with Mathematics and Physics, which had been previously housed in the College of Engineering. Similarly Psychology was removed from education to join the Music department, once an independent school, now housed in the College of Arts and Science as well. The power of the professional schools of agriculture and technology were further denuded by the organization of the College of Arts and Sciences, as this College was to be organized under four new chairmen representing the discrete research areas of biological and physical sciences as well as the humanities and social sciences. These new administrative roles not only acquired duties within the College but acquired, as well, advisory and approval roles that extended into the agricultural and professional areas of the University.

At UCSB, the transition to the research model was short and abrupt, when, over a period of 12 years, the Santa Barbara State College transitioned to a university. This transition not only created pressure to accumulate funding but also entailed pedagogical changes as well. As a liberal arts college, the emphasis was on teaching in the liberal arts tradition. In the years following 1945, as the college was incorporated into the UC system, a great deal of attention was committed to transforming the institutional environment of the now University and cultivating an adapted faculty. Many of the faculty “were of the view that research was a barrier to good teaching,” but the new expectations of the UC system were “built around the belief that an active research program, carried on by every professor, at a level at least equal to the effort put in to teaching made for better and more demanding teaching” (Kelley, 1981; 10). The
incorporation of this assumption entailed broad changes for students and faculty alike. Here, research meant not simply the maintenance of formal programs of inquiry but rather a disposition towards the disciplined, critical mastery of a given body of knowledge with an eye towards innovation at the dynamic cutting edge of a given discipline.

As this transition took root, a new variety of student was encouraged to apply, and between 1945-1962, the admissions policy was successfully reformed as the now University of California, Santa Barbara gradually incorporated a research-based curriculum, and the UC entrance exam was gradually phased in. Emphasis on the liberal arts was phased out, over time, as the UCSB implemented an extensive general education program that took students through both broad and deep training in a given body of knowledge. The faculty who stayed with the transition equally felt the pressure to transition to a research ideal when, in 1956, they became a part of the state-wide academic senate, where academic standing was conveyed in relation to the pursuit of research. The faculty acceptance of this situation gradually led to two outcomes: first, from an immediate pursuit of more extensive resources—including larger enrollments—to support creative research endeavors and, second, the cultivation of a faculty base—built from hiring and recruitment throughout the 1960’s attuned to the research ideal. In the mid 1960’s, this approach took a more dramatic turn as the climate on campus again transitioned to an intensified conception of the meaning of the research scholar-scientist, as a new model of academic research was cultivated. Here, “natural leadership in the growth of knowledge, rather than simply journeyman contribution” became the new ideal. This second transition was reinforced in the 1970’s as faculty and administration in turn
focused on translating this research acumen into grantsmanship and funds-gathering to bring UCSB on parity, in terms of research funds, with the rest of the UC system.

The postwar transition and the emerging federal research compact were translated into the institutional order of American universities in multiple ways, roughly covering two phases. In the first, universities built on the momentum of their involvement in the war effort, drawing on both the increased availability of organized research funding within universities, where academics encountered and realized new opportunities for research and institution building, as well as regionally, where a variety of interests parlayed the relevance of university research into regional institutional projects. After the launch of Sputnik1 in 1957, a ‘science panic’ ensued, launching the second wave of the transition that additionally bolstered the funding for basic research. The reality of the Sputnik moment amplified Cold War fears that, when translated into political agenda’s and public policy, squarely focused on the deficiencies of the American higher education system. Universities were portrayed as uncoordinated and disorganized and as a hotbed of mediocrity. In large part, the outcome of this moment were the intensified funding gains of the early 1960’s that fueled a wave of research programming, facilities expansion, and an even larger wave of academic institution building. However, these political circumstances augmented the sense that universities required greater regulatory oversight, given their crucial importance to national agendas. The so called ‘civil unrest’ of the 1960’s, associated with the War in Vietnam, the Civil Rights movement, the

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61 In terms of regional development institutional projects were largely designed by regional constituencies, such as the Agricultural Advisory Council, but served as well the interests of state and local governments, as well as state citizenry in helping the post-war transition.
emergence of the student movement, and the ‘new’ social movements, subsequently heightened the already intensified regulatory scrutiny of higher education. Coupled with the stagnating economy and the shock of the energy and oil crisis of the 1970’s, the post-war exuberance for higher education drifted into a new set of regulatory circumstances that came to fruition in the 1980’s. I review, this transition, in terms of science policy and the implications it held for institution building in Chapters 5 and 6. Here, I transition to examine the emerging expert jurisdiction for environmental expertise that began to emerge in the late 1960’s, centered on the role of universities in the regulation of the environment.62

**Research and Regulatory Capacity:**

In the late 1970’s, the conditions for expert relevance shifted as science policy began to de-emphasize the generation of new knowledge in favor of policy schemes that emphasized linking knowledge with action (Brooks, 1973). At the university level, this coincided with a general shift towards the role of science in broad ‘social’ problems—

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62 This period has been characterized as “the age of adjustment” (Graham and Diamond, 1997), stemming from the dissolution of the belief that “as a matter of necessity, the federal contribution to higher education would continue to rise.” (84) By the late 1960’s, multiple policy groups were reporting the multiple financial strain that institutions of higher education were experiencing, and, by the 1970’s, these pressures were experienced symptomatically as “budget deficits, declining applications, unsteady enrollments, mandatory cost reductions, and decreasing educational quality.” (84) The result was an outcry for increased federal funding. However, the expansion of funding during the 1960’s, accompanied by the campus volatility during and the politics associated with the Vietnam War, was also accompanied by University financial difficulties caused by “overbuilding of facilities and programs,” that led to claims about the mismanagement of American universities. This scenario led to a regulatory environment insistent on institutional accountability, including compliance requirements that accompanied funding, the expansion of student aid programs, affirmative action policies, the extension of health and safety standards to university employees, and the emergence of the Human Subject Review standards. Combined, these led universities economic burdens in a Federal climate that largely sought to curtail the Federal funding compact.
poverty, race, urbanism, and the environment (Geiger, 2004; 299). In this final section, I outline the emergence of rhetoric of relevance concerned with environmental expertise that began to take shape in the late 1960s.\textsuperscript{63} Between 1950 and 1976, the U.S. experienced a veritable deluge of legislation designed to act upon environmental problems and regulate an evolving sphere of environmental activity in the public domain.\textsuperscript{64} The most far reaching, however, was the National Environmental Protection Act of 1970, an expansive and consequential piece of regulation, which established a broad framework of goals for how environmental problems should be managed and evaluated. This legislation was built on an expanding social conversation about the need for environmental regulation and the ways to re-imagine the university in order to achieve this.

For our purposes, this conversation was channeled in two complimentary directions comprising what we may call, following Abbott (1988), the professional

\textsuperscript{63} Data for this section was derived from a systematic review of the grey literature concerned with the science policy of the environmental sciences. The sample for this review was constructed on the basis of two sources. First, I drew upon the report \textit{Environmental Science and Engineering for the 21st Century}, reviewed in this section, which repeatedly referred to me by fieldwork participants in interviews at all three of my university field sites. This report was itself based upon a comprehensive review of environmental research that consisted of some 296 reports, beginning in 1945 and ending in 20000. I treat this list as a natural sample, and selected from this list of reports those dealing with the organization of the environmental sciences in general terms, as distinguished from those on specific sub-topics, like biodiversity, or forestry etc. Second, of this slimmer list of reports I cross-referenced those that had come up in my archival research, cited as relevant precedents, or mentioned in my interviews. The three reports constitute the basis for my review here.

\textsuperscript{64} The earliest outliers in this process was 1948 federal water pollution control act, followed closely by the 1955 Air Pollution Control Act, both designed to curb the air and water pollution associated, with industry and, automobiles. The Clean Air Act of 1963, the Solid Waste Disposal Act of 1965, the Water Quality Act of 1965, and the Air Quality Act of 1967 quickly followed these early forays.
jurisdiction: the infrastructure for environmental research and the articulation of environmental legislation. In 1961, Kennedy formed the Office of Science and Technology (OST) in the Executive Office to advise the President on matters of science and technology. Although short lived, the OST had a decisive impact in the early emergence of environmental expertise. A growing concern over the environment forced Nixon to develop a position on environmental problems during his campaign. As a result, the early tenure of his presidency is marked by the expansion of a number of environmental policy objectives and their rapid implementation. Nixon created the Environmental Quality Council (NEQ) in 1969 as a cabinet committee overseen and coordinated by the OST. In 1973, Nixon dismantled OST in response to opposition to his administration’s policies. Its functions were transferred to the National Science Foundation, and it wasn’t until 1976 that Congress passed the National Science and Technology Policy, Organization and Priorities Act of 1976, creating the Office of Science and Technology Policy (OSTP) to advise the Executive office on matters of science and technology.

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65 This is, to some degree, a point of historical contention. What is clear is that Nixon eliminated the Office of Science and Technology, along with the Office of Science advisor to the President, and the President’s Science Advisory Committee in his reorganization efforts beginning in 1972. Some note, “He almost seemed to be punishing elite universities for the part played by factitious students and faculty in the storms of protest that had swept the nation’s campus over the handling of the Vietnam War. He certainly was trying to reprimand university scientists for what he and his staff perceived as their criticism of the war and its weaponry” (Slaughter, 1990) While Nixon was never a fan of the academic community, contention rests with how retaliatory the science reorganization efforts were, or if these were an effort to redesign science based social programming.
The passage of NEPA had an undeniable effect on the emergence of environmental expertise, particularly in its interaction with this nascent environmental infrastructure. It mandated that:

(2) All agencies of the federal government shall—(A) Utilize a systematic, interdisciplinary approach which will ensure the integrated use of the natural and social sciences and the environmental design arts in planning and decision-making which may have an impact on man’s environment. (NEPA Section 102(2)(A))

NEPA required that federal agencies promote an interdisciplinary approach to decision-making that drew on expertise derived from cooperation amongst “engineers, planners, landscape architects, ecologists, economists, lawyers and representatives of other disciplines, many of whom never worked together prior to NEPA (Phillips, 1997, Adams, 193). The inclusion of this mandate set off a series of institutional efforts—at the level of science policy—to fashion institutional resources for the design of programmatic research. However, sources of scientific information about the environment were not limited to the scientific advice of the science community. Rather, Federal agencies were mandated that they incorporate environmental values into their decision-making process and the mechanism of environmental impact assessment (EIS) became a principle source of scientific information for environmental planning.

The effect of this legislation, and the Executive reorganization plan, was to consolidate standards and expectations for scientific research on the environment. NEPA established the Council on Environmental Quality (CEQ) to study and develop policy recommendations for the President regarding the protection of the environment. Along with Nixon’s Reorganization Plan no. 3, the Nixon administration proposed creating a single, autonomous regulatory body to oversee the enforcement of environmental policy.
This organization was designed to have broad power that included research capacity; the gathering and dissemination of information through technical assistance, and provision of assistance through grant allocation, and coordination of environmental policy.\textsuperscript{66}

Significantly this knowledge base did not draw from the university networks, as we saw during WWI and WWII, but was, in the early 1970’s, immediately located in the evolving agencies of environmental governance. The resultant effect on university administrators and academic and scientific professionals was a scramble to determine both how university research would be affected by this evolving federal architecture in terms of required standards of training as well as how researchers might benefit from new sources of research funds. A crucial, and unique, feature of this emerging federal mandate is that, unlike the effort to instantiate programmatic approaches to research, the programmatic intent stipulated clear organizational and institutional criteria for evaluating ‘environmental research’ in that environmental research was to be both ‘interdisciplinary’ and ‘integrative.’ Here we see the emergence of a clear rhetoric of relevance, defined first in the NEPA legislation and, subsequently, re-defined as a feature of science policy. Below I review three examples of this genre, looking in a detailed way how these notions are constructed and drawing out several variations on these two themes. I refer to these typifications as ‘the cooperative model,’ the ‘synthetic model,’ and ‘the managerial model.’

\textsuperscript{66} The proposed agency was to be carved from the existing Federal bureaucracy—the interior department would contribute the Federal Water Quality Administration, the National Air Pollution Control Administration would be transferred from the Department of Health, Education and Welfare, as would the Food and Drug Administration’s Bureaus of Solid Waste Management, Water Hygiene, and the Bureau of Radiological Health. Additionally, the Agricultural Department transferred pesticides activities, the Atomic Energy Commission transferred radiation standards research, as would the newly established Council on Environmental Quality transfer its ecological research.
The Cooperative Model:

Before Nixon was to dismantle the Office of Science and Technology in 1973, it was instrumental, in the early stages of his presidency, at establishing a baseline for how the universities should best respond to the perceived crisis of environmental quality. In September of 1969, a study committee for OST outlined the problem of environmental quality to investigate the organizational options the university system might take in mobilizing research around environmental issues. The report was published in 1969 under the title ‘The Universities and Environmental Quality: A commitment to problem focused education: A Report of the President’s Environmental Quality Council.’ (Steinhart and Churiak, 1969, 5) Based on a review of existing university programs dealing with environmental issues, the report is a summary of recommendations for building organizational capacity around environmental problems as a mobilization of national resources. It analyzes two discrete scales of scientific organization—one concerned with the organization of expert problem solving and, hence, with the appropriate means to train faculty and students to produce reliable information. The other level concerns the organization of the university. The two issues intersect around the general premise that in the search for organizational precedents in science policy circles and in public discourse, the two national exemplars of science-based problem solving—the recent success of the space program and the success of World War II. Yet, the authors quickly sets aside both precedents, noting that he World War II efforts

\[67\] This is not to be confused with the Council on Environmental Quality directed by Russell Train. The Environmental Quality Council was a short-lived council created by Executive Order 11472, May 29, 1969. March 5, 1970 the Environmental Quality Council was renamed the Cabinet Committee on the Environment, under Executive Order 11541, and later terminated, on July 1 1970, and its functions apportioned to Ehrlichman’s Domestic Council.
occurred under a suspension of “the university “rules” in which everything was put aside, until the War effort ended, and things returned to normal.” (Steinhart and Churiak, 1969, 4) As for the Space Program, the Committee concedes “this has been primarily an effort of the Federal Government and Industry with important, although with modest contributions from the Universities.” By contrast, the report recommends what is perceived as the more appropriate option of taking agriculture and public health as exemplars for environmental practice.

The challenge of creating an appropriate scientific response to the problem of environmental quality is hampered by institutional precedent in that the success of early precedents are stigmatized particularly amongst university professionals for being “second rate intellectual efforts” (5) In this sense, the biggest impediment to the issue of environmental knowledge rests with a perceived resistance on the part of universities to the problem-based approach. Overcoming this perception to create “new problem focused programs at universities,” is in fact the real task of solving the environmental quality issue, despite the clear need for “environmental professionals.” (Steinhart and Churiak, 1969, 5)

On this point, the report quotes generously from an open letter by Dr. J. Kenneth Hare, Professor of Geography at the University of Toronto and the Former President of the University of British Columbia. In his letter, Hare describes the mood and environment of the university as seen from Environmental Studies. He notes “The status quo is defended in depth by the vested interests of a large number of able people.” (Steinhart and Churiak, 1969, 6) These interests, he suggests, stem from “traditional departments and the largely analytical disciplines they profess,” as well as from the
“numerous special institutes and centers started “in spite of the resistance of the
departments.” (Steinhart and Churiak, 1969, 6) Adding that the difficulty for
environmental studies, as a “synthesizing effort” is that it runs straight into these interests
at its point of inception. The problem, as described by Hare, rests not with the disciplines,
per se, but in their “incompetence” in tackling problems not of their own choosing. 68

The bulk of the committee’s report amounts to a review of existing programs for
environmental research with some discussion of how to develop, or augment, “problem
focused” research in these settings. I find it significant that they chose Hare’s letter to
open their review, and it will help us to understand the policy recommendations for
increasing interdisciplinary, problem-focused education. His analysis does not speak to
an ‘action-orientation’ alone as simply defined by the examples of public health or
agricultural research. Although both programs were action-oriented, the history of both
research areas were, in fact, shaped by a spirit of multidisciplinary cooperation between
what were disciplinary-based bodies of knowledge. However, nestled in Hare’s letter is
an appeal to ‘synthesis’, which became critical to the Environmental Studies endeavor.
The parameters of this notion remain undefined by Hare, but we might gain an
appreciation of his meaning if we look at how he envisions the disciplinary change
required to achieve an action-orientation in the university setting. He suggests:

68 He notes in particular: “The political interest in the environment demands proposals for
action—on all times scales, from the immediate assault on pollution problems…to the
long term reconstruction of society in better relation with the environment.” To this, he
concludes: “The essence of our thinking is that we cannot tackle problems that don’t fit
the competence of our discipline,” adding, somewhat acrimoniously, “Construed with a
new problem we spare no effort to improve our methods. But if we don’t succeed, we
don’t tackle the problem, and we tend to condemn colleagues who try.” (Steinhart and
Churiak, 1969, 6)
Humanists, social scientists, natural scientists, and professionals like lawyers and engineers may fight like cats within the clan, but they close ranks and hitch up their kilts when someone questions their loyalties. Environmental Studies have to involve many of these clans, which are not used to combining in the way required. If we suggest, as I do, that some of them—notably humanists—may be utterly transformed by such combinations we alarm the timid and anger the Tories among them. (Steinhart and Churiak, 1969)

Cooperation, on this account, does not simply amount to disciplinary cooperation but a type of interaction that potentially changes the disciplinary knowledge base, and, we can infer, the interests associated with that discipline-based knowledge. On this point, the remainder of the report, in its appeal, to some degree, deviates from the cooperative focus of the land grant ideal, where knowledge is organized around problem-focused application. Rather, it seems that the concern with establishing a haven for environmental professionals in the university in fact serves as the basis for creating a mélange of the cooperative and what I will call, following Klein (1990) ‘the synthetic.’ Synthetic knowledge here refers to the taxonomies of knowledge that appeal to synthesis, integration, or unified knowledge, rather than discrete discipline-focused bodies of knowledge. Although not mutually exclusive, the two entail differing forms of practical organization. Indeed, these two images of expertise, as represented in the report, indicate differing degrees of scale--cooperative organization between disciplines at the level of the university organization and synthesis at the level of the working group.69

69 While most of the committee’s arguments are pitched at the level of cooperation, and, in this respect, primarily focused on the issue of identifying prospective organizational conditions for encouraging cooperation, they do momentarily touch upon an aspect of ‘synthesis’ as described by Hart. They note: “Those trained to different disciplines develop a collection of technical terms, ways of approaching problems, and analytical tools which differ more in description than in substance.” They add that the development of this type of disciplinary language is not solved “instantaneously by bringing together a variety of disciplines,” but, rather, through the evaluation of a common language for a
These two taxonomies, the synthetic and the cooperative, are not systematically related in the report, but their failure to do so provides some clues as to how they conceive of the goal to establish problem-based action-oriented research within the university, presented as a stronghold of academic interest. They conclude the report with the observation that “the faculty seem well qualified…the supply abundant for an expansion of ten times or a hundred times the present level of activity. What is lacking is an institutional willingness to try, and most of all, there is a shortage of money with which to start.” (Steinhart and Churiak, 1969, 27) We can infer from this that the issue of synthesis seems to be a lesser problem, and one naturally worked out by scholars in the process of disciplinary interaction. The issue, rather, is creating the institutional conditions for cooperation.\(^7\)

In some ways the generalized conclusion of ‘Universities and Environmental Quality’ sums to an argument about organizational precedents. Although the appropriate image for environmental knowledge is akin to the work of agricultural cooperation, or public health, other productive precedents include professional knowledge more generally. Here they note “other analogies to be drawn to the professional schools of business, medicine and law” (Steinhart and Churiak, 1969). Clearly, the goal is the production of problem oriented expertise rather than the production of disciplinary knowledge per se. While not challenging the autonomy of the university, the

\(^7\) I leave aside the empirical results of the study to focus on the recommendations they make, and hence with their evaluative language in its prospective modality.
cooperative endeavor is to be achieved by bringing universities into tighter relationship to Government and private partnerships. In terms of expertise, universities must provide appropriate institutional designs for achieving cooperation between disciplinary objectives, and in relation to other (exterior) institutions. Likewise, government and industry must support these university endeavors through targeted funding in support of such endeavors. We see here the research ideal—best science in service of national interest—re-specified in relation to a regulatory mandate.71

The Synthetic Model

By January of 1971, the tenor of the scientific sentiment towards environmental quality had changed entirely. The question was no longer how to simply fund existing science to achieve cooperative solutions to the problem of environmental quality. The issue became, rather, a question of scientific efficacy. At the start of that year, the National Science Board, the evaluative arm of the National Science Foundation, issued a report entitled, ‘Environmental Science: Challenge for the Seventies’ (National Science

71 Although the committee finds great benefit in program diversity, they do note several conditions that allow for successful cross-disciplinary coordination. First, faculty must have an autonomous reward structure, and they must be free to introduce curricular and administrative innovation. Further, in terms of funding, the first goal is to achieve “continuing core funding for the program as a whole,” as obtained from either government or private sources. Institutions should, secondarily, secure seed money for faculty salaries. They count this amongst the “new methods and techniques,” to be developed by institutions to fund “educational materials,” and research. Such methods include strategies of securing “release time for faculty, and other expenses” such that innovative efforts can be realized by problem area. In this respect, they note the need for work-study for students and faculty, as well as programmatic training support for students, who require guaranteed opportunities for funding either through grants, scholarships or loans. This is especially important for the “reeducation of professionals from other disciplines” or the “self-renewal” of practicing professionals which they identify as a persistent need.
Board, 1971). In this report, the Board suggests their intention to take up the issue of environmental concern, as an issue “whose status is popularly considered to be that of science generally” (National Science Board, 1971,iii). While acknowledging environmental quality, the report draws special attention to “a much larger class of environmental phenomena with enormous impact today, and in the future, on man’s personal and economic well being,” (iv) noting that study of such systemic phenomena has become possible only recently, and as environmental science properly deals with such systems, its immediate development as a fully effective partner with society must be cultivated to “ensure a viable world for the future” (National Science Board, 1971).

Two new features are thus introduced to the diagnosis of the problem scenario. First, they conceive of ‘Environmental Science’ as a unified endeavor, premised upon the existence of “the systems of air, land, water, every and life that surround man.” In this sense, the issue is not simply an issue of environmental quality. Rather the Board expansively notes:

These environmental systems contain the complex processes that must be mastered in the solution of such human problems as the maintenance of renewable resources (water, timber, fish) the conservation of non-renewable resources (fuel, metals, species) reducing the effects of natural disasters (earthquakes, tornadoes, floods) alleviation chronic damage (erosion, drought, subsidence), abating pollution by men (smoke, pesticides and sewage) and coping with natural pollutions. (National Science Board, 1971)

In this respect, the Board concedes, the goals of environmental science require a slightly different outlook. Man’s environmental involvement cannot simply be seen as good or bad. Rather, “problems can be mitigated, but absolute solutions are probably unattainable.” The best hope is to seek to establish baselines by which “the wisest-cost benefit” decisions for society can be assessed and optimized. The report adds that this
situation, which the Board characterizes as a “crisis for the Nation,” is unlike “any other challenge to science and technology that was enacted during this century” (National Science Board, 1971; vi). The crisis in fact results from two specific conditions. First, the natural environment does not consist “of a collection of isolated events and phenomena,” but is in fact comprised of mutually interacting systems. Previously, science had not been able to observe the complexities of this system, but “the recent advent of new technology and technique (satellites, advanced computers, instrumentation of many types, and the methods of systems analysis) has made the match between scientific organization and environmental systems possible.” Second, the Board observes that there is a shortage of trained manpower, a problem that stems from the fact that “the institutions of environmental science,” by which training occurs, research is conducted, and scientists educated, “remain in an early stage of development” (National Science Board, 1971; viii).

Whereas universities and Environmental Quality saw the challenge of environmental science largely as the coordination of disciplinary knowledge at the level of the university, ‘Challenge for the Seventies’ suggests the crisis of environmental science is a crisis of organization conceived more broadly, and as such, it offered organizational solutions by means of a four-part proposal to establish and enlarge the institutions for environmental research. First, they suggest a national program for “advancing the systems of environmental science.” This program should provide the means by which environmental agencies, such as the Council on Environmental Quality and the Environmental Protection Agency, can effectively predict “secondary effects and compare qualitatively the multiple consequences of alternative course of action.”
To achieve this end, the National program should have three components. First, priority should be given to projects “managed by coordinate teams” on the ‘meso-scale’ and hence at the level of “lakes, estuaries, urban areas, regional water systems, and oceanic fisheries.” The Board notes, “advances on this scale will provide immediate benefits to man.” Second, the Board suggests priorities must be established to manage manpower effectively. They note:

If these resources remain distributed as they are, scattered and fragmented, and if problems to be solved are selected largely on the basis of the perception of individuals or small isolated groups, progress in environmental science cannot meet the needs of expressed national goals and purposes.” (National Science Board, 1971)

In light of these standards, the role of the Federal Government should be to evaluate the environmental sciences in terms of their adequacy for achieving the coordinated planning and management needed to institute environmental science properly. Because environmental research is spread out amidst a variety of agencies, society is incapable of responding to environmental problems that are “broader, more difficult, more dependent upon the coordinated use of scientific resources than those found in the earlier development of nuclear energy, radar, and space exploration.” They suggest that environmental science is best viewed as a “distinctive type of activity laying between the …..of traditional, basic science, on the one hand, and the organizations established by society for the application and use of science and technology.” As such, it “shares the scientific motivations of the former, and the multidisciplinary and organizational complexity of the latter.” Rather than rely on the institutional architecture that has supported basic science, “various types of organizational structures should thus be
attempted, as experiments in the management of environmental science” (National Science Board, 1971, xii).

In effect the authors redefine environmental sciences as a type of knowledge management. This proposition holds notable entailments for academic science and industry. First, organizational experiments in academic settings should be conducted to encourage the use of systems management to coordinate work on complex problem by multidisciplinary teams. Second, as industry possesses capability in systems analysis and management, and Government has experience in the application of environmental science, the Board concludes these resources can be used by combining the talents of industry, government, and universities in new types of research organizations “by seeking new approaches to the management of environmental science.” Finally, they note the fundamental problems of funding and the development of additional manpower. They suggest that available funding ought to be developed and made available to retrain existing scientists to work in environmental fields and that colleges and universities should be supported to develop new curricula “in which to present the perspective of environmental science,” in order to cultivate an environmentally informed citizenry. Finally, they note that education efforts should not be restricted to the training of scientists nor entirely focused on citizens. Special attention must be placed upon an explained need for “natural resource administrators” to serve in local, state, and federal governments. They note this is not simply an issue of training natural resource managers, but that, as environmental science progresses, administrative education must be developed around two distinct interdisciplinary goals. First, “scientists and engineers must gain a better understanding of the social, economic, legal and political environment
within which practical action must be sought.” (xv) Additionally, public administrative students must be trained to have “a better perception of the scientific process and a better understanding of how scientists can contribute effectively to the practical solution of environmental problems.” (National Science Board, 1971; xv)

Unlike the ‘Problem of Environmental Quality’, the concerns of ‘Environmental Science: An Issue for the Seventies’ cannot simply be construed as an issue of achieving greater cooperation between action-oriented researchers. The environmental issue stems, rather, from a new class of problems and that they require a new type of expertise and a new type of expert organization that is organized around systems and, hence, not oriented towards problem solving per-se but rather towards monitoring and effective amelioration of ongoing problems. This is a qualitative shift that radicalized appeals to synthesis to include the issue of knowledge management as organized around systems of environmental information. It is the systematic synthesis of knowledge and decision-making processes that now defines the purview of environmental expertise and not the new production of knowledge per se.

The Managerial Model

In February of 2000, the National Science Board issued a report entitled ‘Environmental Science and Engineering for the 21st Century: The Role of the National Science Foundation’. Here the production of knowledge and the management of expertise are systematically coordinated with its dissemination to decision-making bodies at multiple scales. The context for the study was a total reevaluation of the National Science Foundation’s portfolio of environmental research and its status at the dawn of the 21st
The rationale for the reassessment is the view that the environment, defined as “intact, functioning ecological systems,” is essential to “opportunities for individual development, the health and well being of citizens and communities and the generation of new wealth” (National Science Board, 1999, vi). As the NSF has been a major and principle supporter of environmental research for the federal grant and academic community, the Foundation is “primed to provide dynamic leadership in advancing new insights and fundamental knowledge essential to addressing a range of emerging environmental issues” (National Science Board, 1999, vi). This is framed in urgent terms, as the report argues, “the connections between humans and the goods and services provided by the ecosystems of the earth have become better understood,” we have become cognizant of an increase in the “scale and rate of modifications to those ecosystems” (National Science Board, 1999). To address this urgency the overall conclusion of the report concentrates on ways the NSF might broaden its “environmental portfolio” of research. And, to do this, they advise “enhancing both the disciplinary and interdisciplinary understanding of environmental systems and problems,” including the improvement of the “systematic acquisition, analysis, and synthesis of data” (National Science Board, 1999, 2) and the interpretation and dissemination of that data as information.

To accomplish this goal, they lay out twelve recommendations, consisting of two “overarching keystone recommendations,” (5) five recommendations on “research, education, and scientific assessment,” (10) and four “recommendations focusing on the requisite physical, technological and information infrastructure.” (5) Finally, they suggest one over-arching recommendation emphasizing the importance of partnerships and
“coordination and collaboration with NSF’s programs and activities in research” (National Science Board, 1999, 6). I focus below on the author’s ‘keystone’ recommendations and the final recommendation addressing the need to cultivate partnerships.

The first of the keystone recommendations is to raise the current NSF expenditure on environmental research from 600 million per year by an additional 1 billion to sum to 1.6 billion fazed in over five years. This development is to be accomplished in a manner consistent with other management strategies at NSF and by targeting specific priorities in programmable areas as identified by the scientific community. The second keystone directly addresses organization. They argue the organizational aim of NSF management should be to develop criteria supporting, “a well-integrated, high priority, high visibility, cohesive, and sustained portfolio” (National Science Board, 1999, 3). This is to be achieved through the establishment of highly visible organizational “focal points,” by which responsibility will be allocated for budgetary authority, thus enabling scientific assessment, research, and education throughout the NSF and, thus, help to realize the promotion of NSF’s environmental portfolio. They note these focal points will be necessary for “identifying gaps, opportunities, and priorities, and for assuring “continuity of funding opportunities.” (National Science Board, 1999, 3) For both points they suggest special emphasis be placed on interdisciplinary areas for research.

Additionally, they note one criterion should support the “integration, cooperation, [and] collaboration with and across established programs.” (26) They note this should apply to programs “within NSF” as well as between NSF and Federal Agencies. The Board acknowledges that while these are ambitious goals, constituting an “unprecedented
emphasis on integrative, sustained, interdisciplinary activities,” the goals of the report can be achieved only through the requisite establishment of a “policy driven strategy” and a “mechanistic approach” to effective implementation. Finally, the Board notes “collaboration and partnerships are essential to important and high priority environmental research, education and scientific assessment efforts.” (National Science Board, 1999, 25) On this point, they suggest the support of partnerships between NSF and Federal Agencies and “non-governmental bodies” which they enumerate to include “private sector entities” and NGOs, including international organizations. They note the latter to be crucial as they “provide the intellectual and financial leveraging to address environmental questions” at specific scales of development. In this sense, the Board endorses opportunities to partner with organizations through bilateral and multilateral agreements and through the auspices of the National Science and Technology Council. Towards this end they recommend that NSTC “re-evaluate the national environmental R&D portfolio,” to identify priorities, set goals, and lay out roles for Federal Agencies in fundamental areas environmental to further “research, education, and scientific assessment.” (National Science Board, 1999,25)

Comparing, Environmental Science and Engineering for the 21st century to the two other reports from 1969 and 1970, we can see that these organizational imperatives derive, in part, from a ‘refinement’ in the conceptual organization of environmental issues. The Task force notes that as our understanding of “the complex connectedness and vulnerability of Earth’s ecosystems and human dependence on them” is changed, so it changes the available criteria for evaluating and organizing environmental research. In this respect, they suggest, “new discoveries have highlighted unappreciated linkages
between the environment and human health, prosperity, and well being” (National Science Board, 1999, 7). They characterize these linkages in the language of economics to suggest, “the ecological systems of the planet provide us with goods and services.” By treating environmental quality as a systemic problem for ecosystem services, the report argues for a fundamental transformation in how we think about the human relationship to environmental systems and how we treat the environment as an area of study, particularly the creation of new frameworks that yield “credible information about rates, scales, and kinds of changes” to complex interrelated ecosystems as well as improved means to research the “underlying dynamics of the relevant biogeophysical and social systems and their interactions” (National Science Board, 1999, 7). These new approaches imply new ways of analyzing alternative technologies as well as “institutional mechanisms and conceptual frameworks for making decisions” (National Science Board, 1999).

In the context of the discussion, the Task Force provides numerous studies illustrating the direction they feel research should move towards. I present one case in this context, as I feel it illuminates the types of changes to knowledge coordination that is at issue in the report but also because it brings to life the recommendations they make regarding ongoing and future NSF activities. In a discussion of “integrated natural-socioeconomic sciences,” they note that the challenge for researchers derives from the fact that natural-socioeconomic systems are “neither purely ecological nor purely economic” (National Science Board, 1999, 79). Although each discipline possesses “essential knowledge” of this type of interrelated system, neither alone is sufficient to “understand and predict” complex systems of this type. Rather, what is required is a coordinated effort to build from “the foundations of the individual disciplines” towards
interdisciplinary collaboration to build integrated bodies of knowledge. They take this example to be a sign that targeted research priorities could strengthen the possibility of such collaborations and make several recommendations as to how to bolster such activity. These include identifying and quantifying “ecosystem services and natural capital” as well as the contributions these make to “human welfare and their economic evolution” (National Science Board, 1999, 66).

**Conclusion**

In conclusion, I return to the field question with which I began the chapter “Why is there so much diversity in environmental programming, and why, at first glance is so much of it seemingly unrelated?” I offer a tentative or partial answer: the apparent diversity of environmental programming stems from the manner in which expert projects are institutionally linked with differing scientific regimes and, hence, imagined through appeals to genres of relevance. This is something that I could not see clearly while in the field but an aspect of institutional life made apparent by reconstructing the history of my university sites as shifting historical geographies.

The question of how scientific regimes are organized as durable regularities and embedded in our collective imaginations is central to understanding how cognitive authority is institutionalized. In this chapter, I have approached this question by looking at how the cognitive authority of environmental expertise was instituted through an effort to re-imagine the university. While it is common to view institutional order as an unchanging source of stability, I argue that the institutional order of the university is under constant revision as university actors re-imagine both the social significance of
knowledge production as well as the university as an economy of significance.

Institution building thus occurs in dynamic environments through the efforts to durably coordinate co-activity and also through efforts to link institutional work with broader cultural resources. Patterns of co-activity are linked with rhetorics of relevance, at two levels, in both the day-to-day institutional work of university life and through the imagination of university based institutional projects in the design of expert projects.

In this we can see that the basic research ideal valorized particular models of coordination or co-activity in the form of team-based research and research networks, as well as institutional mechanism for funding in the form of grants in aid and research contracts, re-constructing the organization of university science as a form of programmatic investment. As this ideal was adopted as a feature of institution building on university campuses, programmatic investment in basic research took on new significance as components of regional efforts to both re-imagine and valorize the role of the university in local economies and within the local projects of academic work. With the emergence of ‘social relevance’ in the 1970’s social policy, we see that the models of co-activity largely persisted but came to include two additional factors. --First, the question of how to include environmental decision making in the organization of scientific work, and, second, how to link universities to other types of institutions. I explore both of these factors in the next two chapters, looking at how environmental decision-making was institutionalized and, subsequently, organized in relationship to other institutions.
Chapter 2: Rethinking Opportunism: Institutional Work as Opportunity Structure

Recent critical scholarship has focused on the emergence of the neoliberal university, or academic capitalism (Rhoades and Slaughter, 1997, 2004; Hoffman, 2011a), where markets and profit seeking are assigned critical social value in the administration of higher education (Canaan and Shumar, 2011; Kandiko, 2010; Roberts and Peters, 2008; Saunders, 2010; Shahjahan, 2012; Shore, 2010; 2011) and in the organization of science and knowledge (Brown, 2011; Campbell, 2011; Lave and Ranalls, 2010). Scholars have examined the work of academic entrepreneurs (Shore and McLauchlan, 2012, Stuart and Ding, 2006; Vogel and Kaghan, 2001), the trend towards adoption of corporate standards in higher education (Kleinman, 1998, 1994), the growing centrality of industry sponsored research (Hess, 2007, Slaughter and Rhoades, 1996), the proliferation of regulatory regimes (Abraham, 2012, Clark, 2012), and what many scholars refer to as ‘third mission activities (Shore and McLauchlan, 2008). In this last literature, scholars point towards the emergent policies and priorities geared towards ‘knowledge transfer’ and the institutionalized links between industry and the commercial sector. At issue is the perception that ‘expert application’ ought to remain distinct from the mission of universities, generally defined in terms of teaching and research. While this portrait is contested, particularly amongst scholars who draw attention to the long history of industrial engagement and patenting (Berman, 2002, 2007), in this chapter I focus on a different dimension of this knowledge transfer problematic by looking at the
changing relationship between universities and the institutional organization of ‘governance.’

A distinctive feature of the emergence of the environmental sciences has been an emphasis on the production of environmental expertise, as linked with decision-making, and, hence, with environmental knowledge produced as a resource for policy making. In this chapter, I trace some very early projects framed in these terms, mostly at the regional level, concerned with ‘knowledge transfer’ to government, industry, and the general public. In looking at this early context, I pay particular attention to the manner in which environmental research is organized, and I argue that the notion of ‘the environment’ functioned as a type of institutional ‘opportunity structure’ for institution building.

By emphasizing the environment as opportunity structure, I challenge the narrative of the neoliberal university on two fronts. First, I argue that the recent turn to

72 Here I note that while the most broadly studied feature of third mission activities has been the trend to so-called ‘academic capitalism,’ the most widely accepted definition of third mission activities defines them as being concerned with “the generation, use, application and exploitation of knowledge and other university capabilities outside of academic environment.” (Molas-Gallart et al. 2002) While the third mission activities are often coded as entrepreneurial, they are, in principle, any aspect of the University activities that fall outside of the research and teaching functions of the University. Part of what is argued in this study is that this assumption misconstrues the picture of the modern University as an organization, and, hence, embedded in political-economic conditions. More specifically, what I analyze in this chapter is the means by which the University, as a cultural project, has been made subject to claims about its value, worth, or composition.

73 In this study I forego use of terms like ‘academic capitalism’ or ‘academic capitalization’ as critical terms designating change or transition. These notions obscure the fact that universities in the U.S. have never been independent of capitalist imperatives or free from the processes attendant to the organization of U.S. Capitalism, as a political-economic system. For that matter, disciplinary science, in general, has never been free of relations to Capital or free from market pressure or labor market dynamics. Similar factors have equally shaped the fortunes of applied science in the U.S. That the University has undergone changes in the postwar period is not in doubt. Nor do I doubt the proposition that a new emphasis on entrepreneurial activity has not had a degree of
the language of entrepreneurialism itself qualifies as a genre of relevance and, as such, a very recent institutional project (Berman, 2002, 2007) concerned with the valorization of academic opportunism. However, I argue that the conditions for opportunistic behavior have a much older pedigree and can be traced, for the purposes of this study, to the reconstruction of basic research after WWII, as a programmatic investment in science. Thus following Hoffman (2001), I argue that the organization of entrepreneurial or third mission activities does not necessarily “displace traditional academic values” (Hoffman, 2001; 1). Rather, I suggest that academic conduct has been reconstructed in opportunistic ways through various scientific regimes, and that contemporary appeals to the entrepreneurial are a selective articulation of features of the post-war compact for science. During the postwar period, academic and scientific professionals encountered and enacted a new type of competitiveness, framed in terms of opportunistic advantage, and concerned with entrepreneur-like behavior. However, I note an important critical distinction—much of this was framed in terms of institution building behavior at the level of the research enterprise, as academic and scientific professionals found themselves navigating the new institutional conditions for expert activity. In this sense, they quite literally found themselves in the position of learning to be institutional entrepreneurs.

ascendence in the field of Higher education. My main concern, rather, is with the characterization of entrepreneurial activity given the institutional dynamics of U.S. universities under the 20th century and 21st century conditions of Capitalism, and the changing conditions for the conduct of scientific inquiry. There are two interrelated issues here: a. changes to the institutions of science, notably the university and academic based science; b. and changes to the conduct of scientists, as a general category of behavior, irrespective of their institutional affiliation (i.e. industry or University research). I argue that entrepreneurial activity has been a central component of these changes, although of an institutional nature.
The chapter explores three historical vignettes, culled from the early history of the environmental sciences, with each case framed in terms of the efforts to organize institutional projects at the level of the research enterprise.

First, I examine early adaptations to the basic research economy on the part of applied forestry researchers at OSU. Here, I note the administrative means by which new sources of funding were productively cobbled together to take advantage of both applied research as well as new sources of basic research funding. The second case concerns the effort to create institutional arrangements linking environmental researchers with decision making bodies, in this case researchers at OSU and the Oregon State Office of the Governor. In this case, the arrangements were leveraged into the conditions to create an environmental information network that in effect linked environmental problems, at the level of policy, with university-based researchers and emerging stakeholder groups interested in understanding environmental issues as framed by the latest environmental research. Here, I am concerned with analyzing the exclusive claims to environmental research framed in terms of the shifting identity of the environmental scientist. Finally, I examine the main case: the construction in 1970 of the Environmental Science and Government Planning Committee (ESGPC) at OSU. At the time, the committee and its programs were seen to be an innovative planning body of science advisors at the level of the state. A short-lived committee, many of its institutional projects laid the foundation for alter environmental programming at OSU. One influential program, the Environmental Education Extension Program (EEEP) is notable, for our purposes, in the way that it was organized on the basis of existent extension programming. I analyze how, in this early environmental information network, the project was built from an existing
institutional order largely structured by conservation research. I frame this summation and analysis around the notion of ‘property scripts’ and their use in creating and identifying institutional opportunity structures. Thus, while ‘the environment’ served as a rallying cry for political contestation, it also functioned as a type of institutional opportunity structure for expert projects and as a resource for university based institution building. This resulted in new opportunities as well as new contestations over who has the right to claim cognitive authority in environmental projects.

The Institutional Project:

This chapter is structured around the interplay of three concepts: ‘conceptual vocabularies,’ ‘institutional projects’ and ‘expert projects.’ Although I examined conceptual vocabularies in Chapter 1, as institutional features of genres of relevance, here I discuss their interrelated conceptual background. I contrast these concepts with the notions of ‘discipline’ and the ‘research program’ and, hence, with the institutional instantiation of these concepts in the department and the research network. Following Lenoir (1997), I build off of these distinctions and his general insight that “beyond the resource requirements for conducting science is the obvious point that since the beginning of its professionalization in the nineteenth century, as an institution situated in universities and state bureaucracies, science has not functioned without its administrators” (Lenoir, 1997; 54). On the basis of this observation, he draws a subsequent distinction,

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74 He notes that while authority in the scientific field is traditionally associated with “successful struggles in producing technoscience” further prestige could be acquired through “institution-oriented activities, such as administrative work or institution building” (Lenoir, 1997; 54-55).
when analyzing scientific institutions, between research programs and disciplinary programs, noting that the two are oriented differently to the field of scientific production, and stipulating that while disciplinary programs are “fundamentally institutional in orientation,” concerned with establishing “service roles, facilitating links to other disciplines,” and enabling transmission of the discipline’s techniques and tools, research programs are “characterized less by their concern with organizing society than their problem-oriented focus, through their effort to dominate the cycles of credit and available resources for extending and legitimating products of their research” (Lenoir, 1997; 55). In this chapter, I suggest that this distinction is usefully resolved through appeal to the ‘institutional project’—or the coordinated use of institutional resources.

By contrast, the notion of a ‘conceptual vocabulary’ derives from a useful contrast with Galison’s work on the ‘trading zone,’ specifically the related concept of the interlanguage (Galison, 1997). The concept of the trading zone was developed by Galison in a study of the interactions between physicists and engineers to develop particle detectors and radar. Trading zones are defined as ‘an intermediate domain in which procedures could be coordinated locally even where broader meanings clashed’ (Galison, 1997; 46). This definition derives from a question as to how physicists, coming from different paradigms, create the means to cooperate with engineers and one another. Galison derives the metaphor of the trading zone from anthropological studies of how differing societies exchange goods despite differences in language and culture. The anthropological research Galison draws upon concerns the function of trade jargons, or pidgins, and their evolution to Creole languages. Defined as scientific exchange jargons, Galison refers to these as ‘interlanguages’ and when applied to science, Galison argues:
Two groups can agree on rules of exchange even if they ascribe utterly different significance to the objects being exchanged; they may even disagree on the meaning of the exchange process itself. Nonetheless, the trading partners can hammer out a local coordination, despite vast global differences. In an even more sophisticated way, cultures in interaction frequently establish contact languages, systems of discourse that can vary from the most function-specific jargons, through semi specific pidgins, to full-fledged creoles rich enough to support activities as complex as poetry and metalinguistic reflection. (Galison 1997, p. 783)  

It is important to note that ‘trading zones’ do not entail consensus, but rather cooperation. And as noted in Chapter 1, he notes as well the institutional fluidity of the university:

It is easy to think of our universities as highly stable, unchanging fixtures of the world, so old as to be part of the distant unremembered past. But the academic forms we know from the present are much more recent than the antique founding status and plaques that adorn the university gates. The world of internationally connected science, liberally funded by national agencies and open to an increasingly diverse population of students and faculty, is a creation of the years just after World War II…. Over the course of the Cold War, the essential integrity of the basic departmental division of knowledge stayed in place, even if new departments would sometimes appear, such as computer science and biochemistry. Since the fall of the Soviet Union, some of this fixity has been eroded…new

75 Since its original publication the concept has been subsequently developed and defined through its use in studies of cross-disciplinary work in the formation of interaction expertise, or the ability to interact fluently, or expertly, in more than one discipline (Collins and Evans, 2002) and through the creation of ‘expert creoles’ or interlanguages between expert organizations and various stakeholder groups (Epstein, 2012).

76 However, where as Galison argues for the generalizability of the concept to areas of ‘boundary work,’ specifically as an aid for thinking about historical moments of boundary work, I urge caution. For example, one may note that for Galison interlanguages are ‘object oriented’ in that they focus on processes of exchange—exchange in goods, ideas, theories, metaphors etc. In this sense Galison’s scientists use of an inter-language or their engagement with a trading zone are not necessarily discussed in terms of their institutional work, or in terms of patterns of co-activity. This is unfortunate as he does acknowledge the institutional shifts of the post WWII period as being a crucial, constituent feature of cross-disciplinary work.
flows of funding bolster different kinds of research—startups, intellectual property, venture capital—and all have blurred the lines between the pure and applied… (Galison, 49)

Here Galison draws attention to the same dynamic period of institution building, but with notable differences. Where Galison sees the fixity of disciplines, I emphasize the institutional work of disciplines as institutional projects. Similarly, where Galison points to the radical evolution of the landscape of science after WWII, in a way emphasizing discontinuity, I explore continuities between the two periods in terms of the dynamic of institution building.77

As I discussed in the previous chapter, the reconstruction of basic research, from the interwar period through the 1970’s, was an intense period of institution building. It was also an intense period of project formation and proliferation resulting from organized research activity. Indeed, the very definition of ‘project,’ in one meaning of the term, stems directly from this period. The OED, for example, notes that in contemporary business and in science a project is defined as “a collaborative enterprise, involving research or design that is carefully planned to achieve a particular aim” (OED). In the social sciences, and in project management, this definition is further refined as ‘temporary’ social systems constituted by teams within or across organizations to accomplish particular tasks under time constraints (Manning, 2010). In the case examples below, I analyze several different varieties of expert project.

77 Although Galison promotes the generalizability of the ‘trading zone concept’ I think its important to here emphasize building our analytical arsenal up from the observable patterns of expert co-activity, and hence argue for the more general concept of the ‘conceptual vocabulary,’ and the ‘institutional project’ as a corrective to ‘institutional’ deficiencies of the trading zone concept when applied to historical cases. While it may point at features of cooperation, it prevents us from understanding how these features relate to larger patterns of collective action.
With the emergence of the post-war compact for research, the expert projects of academic and scientific professionals were reframed in the conceptual vocabulary of basic research. This tied expert projects to the emerging institutional order of the research economy, as well as situated their projects—in terms of cognitive authority—in an evolving University system and the effort by university actors to cultivate cultural relevance. From this angle, if we examine the history of the twentieth century American university, we see a surge in ‘institution building’ measured simply by the explosion of institutes, centers, and other organizational units. Further, in that these elements of university organization promoted expert projects, we can see these organizational units as the context, along with departments, laboratories, and libraries, for the institutional work of basic research. Framed in another way, we see, both during WWI through the inter-war period and on through the post-war period, an intensified effort to re-design the problem focus of expert projects, defined in terms of research teams, and research networks.

The goal was to change the conditions for expert conduct. To be sure, these involved alterations to expert work, or labor, but it also entailed changes to how experts related to one another, to collectivities, such as organizations or associations, and most interesting for our purposes, to expert bodies of knowledge. We saw some of this in Chapter 1 with the reconstruction of basic research and the organizational changes this process entailed on university campuses. However, more generally, the institutional conditions for the production of knowledge emerged in this period as a major problematic, concerned with the organization of productive ‘teams’ of scientists into work units or research programs. This was equally relevant to the ‘applied sciences.’
Cooperative Dimensions of the Expert Project:

In the previous chapter I examined how the postwar wave of institution building was premised upon the instantiation of a research ideal, largely derived from the reconstruction of ‘basic research.’ It would be a mistake, however, to imagine that this focus on institutional development in the sciences was somehow ‘new.’ Indeed, as Pielke has observed, “Up until World War II, leadership in science policy had been firmly in the hands of agriculturalists, with the focus of government support for scientific research found in the U.S. Department of Agriculture.” (Pielke, 2002; 120) This is a particularly salient fact for land grant universities where a problem focused, project oriented approach to research was cultivated in relation to agriculture based science policy of the early 20th century.

As we have seen one sources for the team approach to scientific work emerged in WWI and WWII as a key in institutional component of ‘basic research,’ where civilian scientists from both academia and industry were employed in problem solving for military technology programs, logistics and engineering projects, and wartime industrial programs. After each war, we see a growth of durable relationships or partnerships between universities and industry, as well as industry and the federal government, and the federal government and industry. This triangle constitutes the organizational matrix of the Federal Compact for research, and as I outlined in Chapter 1, it proved an important durable economic source, at the state level, for the role of the university in expanding regional interest.

However, at the state level, a previous institutional body of arrangements had since the late 19th century, been built up between universities, the Federal Government
and industry, as centered on agriculture and natural resource extraction. This previous triangle derives much of its structure from the institutionalization of a ‘problem’-based approach to scientific research and the construction of institutional projects, organized around dissemination of technical and educational knowledge through regional institutional arrangements.

The ‘problem-based’ approach refers to the institutional arrangements for the conduct of scientific research that developed in the Federal Bureaus system in the late 19th century (Dupree, 1986). This approach was in large part an extension of the project-based military research (Dupree, 1986) that preceded the Civil War and that was crucial to the role of research in service to the expanding Federal State. (Dupree, 1986) It was refined and expanded through institutionalization in the organization of the Scientific Bureaus in the late 19th century, most notably in the Department of Agriculture. Here, the processes of building a scientific bureau shaped the constitution of research and the ability of the bureau staff to utilize resources (science included) to organize to solve tangible problems through technical application and public policy. The research ideal of the Bureaus is usefully contrasted with that of the emerging universities as organized around disciplinary societies, and their management of scientific programs, rather than discrete programs per se.

It was the transformation of agriculture after 1880 that set the stage. The expansion of the railroads, the opening of the Western frontier under the Homestead Act, and the subsequent migration to the Great Plains and Rocky Mountains created new contexts for agricultural opportunity. The rise of the mechanized farm (Stoll, 1995, Walker, 2001) and the emergence of an international market for agricultural
products (Dupree, 1986) introduced new problems for decision makers, often involving technical elements that required scientific advice. What’s more, the emerging farm based industries and the industrialized farming community became a vocal voice in the demand for institution and technical support. In response, the Department of Agriculture established the model for this with its reorganization between 1880 and 1897. As Dupree notes: “As its ability to furnish answers increased, the department gradually evolved an adequate social and political mechanism, the government bureau” (Dupree, 1986, 158). This institutional strategy was premised upon a four-fold institutional arrangement. First, at the center of the bureau was the problem base, around which was arrayed a variety of scientific staff, which leads to the second strategy of building a “stable corps of scientific personnel.” (Dupree, 158) These two strategies helped to create a form of expert conduct centered upon ‘problems’ as the foci of scientific interest. Thus, rather than cultivate expertise predicated on disciplinary interest, problem based expertise cultivated, for example:

a chemist who tested both fruits and fertilizers, the problems of growing particular crops or improving animals became central, and the bureau mobilized teams of experts from various disciplines to attack each one. Such an approach required on the one hand stability to concentrate on a given line of investigation over a period of years, and on the other hand the flexibility to shift resources as the problem changed. (Dupree, 1986158)

The third strategy was the institutionalized construction of working relationships with the support of outside groups. These outside groups “often blended economic and scientific interests,” and included active and retired politicians, emergent lobby groups, as well as emerging land grant universities, which would become a stable source of personnel,
problem foci and a mediating source of outside interest groups. Finally, the bureau pursued the institutional strategy of the stable mission, as established by the organic act, which allowed the Department to acquire lump sum funding that could be flexibly applied to emergent problems, which might require radical shifts in resources and personnel as problems changed.

Notably this architecture laid the foundation for an early regulatory science in the U.S. As Dupree observes, for the problem-based approach, success in research meant “control of a problem,” often resulting in regulatory or legal engagement and technological application. For example, citing the early success with animal quarantine, “the understanding of animal disease led to the drawing of lines of interaction and the definition of danger areas.” This activity led to quarantines and often the power to enforce scientific theories. In the 19th century, the emergence of “regulation based on scientific investigation” led to changes to both the institutional structure of problem-based science, as well as its cognitive authority. For the bureaus, the power to regulate brought scientists into increased orbit with both lawyers, and policy-makers, creating the context for an interchange between science and regulation. This was marked, institutionally, by the expansion of the bureaus’ administrative personnel, and by the expansion of administrative capacity to cover more problem areas. The resulting regulation thus helped to reshape the bureaus’ cognitive authority, as the public, impressed by the action orientation of scientific quarantine, came to view science, in its regulatory role, as a resource.

When the land grant universities were established in 1862, with the passage of the Morrill Act, existent regional institutional arrangements were re-structured around an
institutional model whose aim was to provide education in agriculture, home economics, mechanical and military art [engineering] and other practical professions. Based on the perceived success of the ‘problem based approach’ in agricultural research, regional movements began to coalesce around creating more formal programs in agricultural science at the regional universities for the application of scientific knowledge to regional agricultural problems. By the 1870’s, many land grant colleges began to set up experiment stations, which resulted in a more formalized rally to establish a network of regionally based experiment stations. This movement was further cemented by the passage of the Hatch Act in 1887. The Hatch Act gave federal funds, initially in the amount of $15,000, to state land grant colleges to create experiment stations in every state and to use these stations to distribute limited information derived from agricultural and mineral research.

With this establishment of the regional experiment stations, the institutional link between the Department of Agriculture and the regional land grant universities was cemented around agricultural research conducted on the ‘problem’-based approach. In organizational terms, the Department of Agriculture transformed from “a single central agency” towards a nexus or vector of “systems of semi-autonomous research institutions permanently established in every state” (Dupree, 1957; 170). In this respect, the institutional spread of the Department of Agriculture was unrivalled, not only in terms of geographical spread, but in terms of the types of projects the Bureau supported. A parallel development to this new alliance, between the Department of Agriculture, and the land grant universities, was the foundation of the Association of American
Agricultural colleges and Experiment Stations in 1887. In this way the durable institutional arrangements organized between the land grant organizations, the Federal Government and regional state governments became the institutional architecture or basis for the proliferation of regional partnerships with industry, civic associations, professional associations, and regional interest groups.

By the early twentieth century the scope of this formulae was extended, as many in the land grant system recognized that the regional populations which the colleges were intended to serve were remote, and it was difficult to encourage participation in college activities. To counter this problem, many land-grant colleges established projects to extend education programming to rural populations through the creation of projects that, in effect, constituted a type of informal outreach programming. This inchoate system was later formalized in two waves, at the state and then the federal level. For example, the Oregon Extension Service was approved by the Oregon legislature on July 24, 1911, and two years later, with the passage of the Smith Lever Act of 1914, the programs of the Extension service was established at the national level.

The Cooperative Extension Service, and the County Experiment stations became a focus of applied research, that, like the Scientific Bureaus, specialized in the problem-based approach and, hence, in the administration of problem-solving research and the dissemination of research materials. All three of the universities profiled in this study maintained extension programs, although UCSB’s was administered on a statewide basis as UC Extension. Before the development of basic research funding for universities,

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78 The Association of American Agricultural colleges and Experiment station would later become the APLU, North America’s oldest Higher Education Association.
much of the research at WSU and OSU was conducted through cooperation between university departments, applied research programs conducted through the county experiment stations, and extension research.

In institutional terms, the organization of these programs were structured around the production of expertise as organized, problem-based research programs and the use and deployment of expertise in problem solving that took the administrative form of discrete projects. This work was organized around three axis—cooperation between universities, government, and the private sector; collaborative research between a variety of expertis around a common problem orientation; and finally, community organizing, or institution building. In this sense, the work of the cooperative extension—the production and use of research to solve regional problems—was intricately tied with regional institution building efforts on the part of elites, as well as a key component of university-based institution building. As Henke notes, the “key to the extension model was the creation not only of a new system of expertise through the farm advisors but also the organization of the farmers themselves.” (Henke, 2008; 32) This involved the organization of “a local farm bureau, composed of local growers who were interested in learning about new farming techniques.” and the cultural and institutional extension of and consolidation of an extension advisor’s programmatic influence and reputation, “making it easier and faster to implement new practices” (Henke, 2008; 32). Likewise, in terms of research, the collaborative approach created new institutional arrangements to produce research, administer results, and secure funding, largely in relation to an ongoing series of problem foci and largely in an effort to design ‘autonomous subcultures’ built from interagency support of research.
A description of one such sub-cultural moment at the OSU affiliated H.J. Andrews National Forest is analytically compelling. The International Biological Program was an effort to coordinate large-scale ecological studies, organized between 1964 and 1974, largely premised upon the International Geophysical Year, which ran between 1957-1958 (Hagen, 1992). Both were efforts to apply the methods of big science to ecosystem ecology and the earth sciences, entailing large budgets, big staff overlay, big machines, and laboratories, with funding often derived from defense related activities. The hope of the IBP was centered on the comprehensive study of biomes--broad-scale ecosystem types--in the hopes of constructing a global range of predictive models of natural ecosystems projected at a global scale. The goal of the IBP, its genre of relevance, was to help predict how the actions of resource managers would result in disruptions, with the expectation being more efficient resource management.

When the Andrews forest applied, it applied largely as the underdog of the program, but, as Geier notes, “By 1964 the Andrews forest had been the focus of intensive monitoring and observation for more than 16 years, which made it an attractive, if unlikely, candidate. The effort transformed the Andrews forest, and its research group into “a collaborative community of scientists that could transcend institutional barriers to interdisciplinary cooperation among American academics.” (93) It did so, in part, through creating a culture of research, premised on collaborative expertise and shared genres of relevance as well as a flexible administrative ecology that supported multiple institutional projects. The research efforts were organized to draw on multiple sources of funding from “federal agencies, from universities, and from outside grants.” (Geier, 96) Each of these sources had its limitations. Forest service research money, for example, “disbursed
funds only to support research projects that met specific information needs of land managers,” and university-based academics. While both groups could write supplemental grants, “scientists who secured grant funding gained more control over hiring and purchasing decisions,” but they also assumed the administrative burdens of management. (Geier, 2007; 97) Participation in the IBP broadly extended the availability of resources for research, and, and in the 1960’s, “budget-line funding from the forest service broadened considerably.” (Geier, 2007; 97) Thus researchers in this period were motivated to pursue a more diverse array of funding, but, in the process, they came to design new institutional strategies to manage and respond to new funding opportunities and, in so doing, drew on older institutional precedents. In this way, the institutional projects of cooperative extension and problem-based research were tied to basic research sources of funding, and collaborative inter-or multidisciplinary research were tied to managerial frameworks.

As one researcher notes, “the Andrews group, and the enthusiasm for collaborative research at the Experimental Forest, survived the end of the IBP, as scientists adapted to ongoing programs of research to meet the constraints of constantly shifting sources of funding” (Geir, 2007; 94). This was done largely through sheer grit but also by embrace of the institutional project that sustained cooperative research, largely through collaborative administration of research on the basis of applied problems. As Geir notes, the Andrew group early on made a decision to “rely on postdoctoral assistants instead of graduate students and tenured professors,” and that decision allowed the transition from IBP to the search for alternative sources of funding in the 1970. This meant, however, that while these postdoctoral assistants and grant-funded appointments
could focus on their research, “few of them could rely on a regular salary if their grants didn’t come through.” And, thus, with a “common culture of urgency,” they focused on production, which drew them “across disciplinary lines to secure ongoing support for their broader effort at the Andrews Forest” (Geir, 2007; 95). To do so, they designed “a carefully structured core of salaried professionals” to hold together the broader “interdisciplinary group of scientists working on temporary appointments during the IBP” (95). This common, administrative-scientist core subsequently designed an “infrastructure that supported over 100 people who lived and worked at the Andrews Forest for prolonged periods during the field season” (Geir, 2007; 95). A heroic description, but one that largely describes, in its most rudimentary characteristics, the elements of the collaborative institutional project that evolved in relation to applied or mission oriented research in the U.S. The core characteristics being a common inter- or multi-disciplinary research base, administered around resource funding from multiple agencies and sources, and the ongoing maintenance of a variety of institutional projects, assembled from multiple genres of relevance, problem-focused, mission-oriented, framed in terms of basic research, and with the support of multiple constituencies for that expertise.

Because of the background of Cooperative Extension programming at the Land Grant Universities, many of the early environmental projects derived from the organization of project-based programming, as mission-based research groups and organizations adapted to the changing funding climates that accompanied the post-war research economy and the expansion of directed funding that emerged in relation to the emerging environmental jurisdiction for research. Although the concept of the
‘institutional project’ has theoretical purchase for us, its importance should not solely be construed in these terms. It covers a range of empirical cases whose historical importance is deeply embedded in the history of the emergence and evolution of the environmental sciences. Indeed, the earliest definition of the environmental sciences covers a dizzying array of activities, that, when considered separately, have rich documentary registers. For example, just looking at the activities covered in the policy reports reviewed in the last chapter, we can identify three levels of activity. First, the environmental sciences are involved in the production of environmental research through the production of basic research. They are involved in the organization of environmental monitoring systems as well as, third, in the dissemination of environmental information to decision makers and the public. In the context of the late 1960’s in the U.S., each of these various functions had established patterns of activity at both the state and federal level, often involving successive periods of dense institution building. The distinctiveness—the very appeal of the environmental sciences during this period—lay with the rather audacious claim that the purview of environmental expertise lay with the systematization of these various functional levels of research, monitoring, education and evaluation that were in some sense already existent.

In response to concerns over air quality, the Oregon Department of Environmental Quality established an air-sampling network in Oregon in 1969. As a precedent, the networks stands at the foot of a watershed between conservation oriented efforts and a transition towards the environmental platform. Similar examples of conservation-based institution can be found for water, soil and other ‘environmental constituencies’ indicating a broad pattern of cooperative institution building throughout the 1950’s and
1960’s, largely under the auspices of ‘environmental quality.’ However, in 1970, when Governor McCall organized a University based government advisory committee, their service was framed as consolidating existing state-level resources for environmental research and to establish the ground for variety of temporary and semi-permanent relationships around issues of environmental quality, environmental research, and the dissemination of environmental information.\textsuperscript{79} In the next section, I look at the short history of this institutional project and how this program was transitioned into several early areas of expert institution building.

**Cognitive Authority and the Environmental Information System:**

In July of 1970, the nucleus for the Environmental Science and Government Planning Committee (ESGPC) met at Oregon State University to explore the “problems, protocols, and operating procedures” and, in a sense, lay the ground work for the creation of a committee to advise the Governor’s Office, and potentially other bodies of government, on technical issues related to environmental problems relating to science and technology. The initial group was composed of a mix of administrators from OSU, academic scientists, and politicians. A notable administrative presence was made by Ken Spies from the department of Environmental Quality and Doctor Ed Press from the Board of Health. Governor McCall was present for a short period as well as Kessler Common, the Administrative Assistant to the Governor for Natural Resources. Although not

present that day, Dr. Jim Witt of the Extension Service was named to serve as
“Environmental Science Coordinator” and, thus, the Executive Secretary of the Committee. The problems identified that day consist of problems of “air pollution, land pollution, coastal zone management, solid waste management, and synthetic chemicals in the environment.”

Priority was assigned to the “problem of Coastal Zone Management” and the assignation of a “Task Force” to organize problems for the committee. Establishing protocols to coordinate between the committee and “various agencies, institutions, and institutes,” was deemed of the highest priority and took up much of the remaining time. At issue was the problem of utilizing “the manpower resources of a number of distinct agencies,” and, so as not to “alienate” cooperating agencies, “it will be important for the coordinator to have prior approval of the administrators to approach the staff members of the agency.” One identifiable future goal was characterized as the establishment of a “broad gauge technical Advisory Sub-committee which could be drawn from a number of agencies and institutions.” The committee suggests that “advisory sub-committees” would be convened to coordinate expertise to the appropriate problems. Such an arrangement, they argue, would provide for “the proper channel of approach to agencies

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and institutions,” this avoiding accusations that “this Environmental Science Committee as attempt to take over part of the functions of the individual agencies and institutions.”

In August, a press release, prepared by OSU’s department of information, was forwarded to Governor McCall’s office for approval, and by September, a grant had been written to support the committee, entitled: “Information Impacts to Assist State Government in Assessing and Formulating Public Policy Relating to Environmental Side Effects of New Technologies and of an Expanding Population and Economy.” A mouthful, to be sure, and the committee floated the possibility of an abbreviated body of names for their group, including, “Advisory Committee on Environmental Science and Technology,” or the “Advisory Committee on Environmental Science and Technology and Government Planning,” or, the shorter title of “Environmental Science and Technology Office of Information.”

By the time of the press announcement’s release, later that month, the committee had received funds from NSF in the amount of “$21,569” to launch the program. In announcing the venture, McCall notes, the committee “can provide a necessary role in alerting government to technological advances and changes which can have a profound effect—for either good or bad—upon the social and economic life of citizens.” The press release describes the committee as “one of the first of its kind in the country on a state

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level,” adding “President Nixon uses science advisers and various Academies and
councils to assist him in such matters at the Federal and State level.” Further, the
program is describes as providing “consultation and advice to the executive and
legislative branches of state government” and combined with “identification, with
foresight and assessment,” and analysis of the costs, “including risks,” of the impact of
science and technology on the state, “particularly quality of living.” The Committee will
also have a hand in identifying “the role to be played by the State in regulatory programs
initiated at the State level,” and in information dissemination through a “statewide
extension program.”

At a meeting that same month, the committee further decided that since an
important aspect of their work would be to provide information, they should explore the
possibilities available for information retrieval and their ability to “collect information on
current and imminent environmental and technological problems.” Some argued that
computer based formats, such, as those “offered by the Environmental Toxicity programs
at the University of California, Davis,” may be the best option. It was agreed that much
of the committee’s important work in this respect would be with “legislative groups,”
such as “the House Committee on Natural Resources, [and] the House Committee on Fish
and Game.” By October 26, 1970, the committee was expanded to include Dr. Edward
Hatch, head of the Department of Recreation at OSU, and by November 2, 1970, the

83Memo, “Notes on the meeting of the Advisory Committee for the grant entitled:
“Information inputs to assist State Government in assessing and formulating public
policy relating to environmental side effects of new technologies and of an expanding
population and economy…” November 2, 1970. Environmental Science and Technology
Oregon State University Archives, Corvallis Oregon.
committee had engaged in full-scale audit of the State’s environmental expertise resources. They also began limited coordination with two other “environmental committee type” efforts then underway, “the Willamette Valley Planning Committee,” and the “Coastal Zone Planning Committee.” Issues of land use, solid waste, and air pollution were identified, and two task force groups on “the detergent problem” and the “heavy metal problem” were proposed.

Aspects of this review were published by January of 1971, as “Environmental Quality in Oregon, 1971—A Summary of Future Problems.” The report provides a detailed summary of the state of knowledge for the state in terms of Oregon’s Air and Water Quality; Solid waste and Chemical Waste Management, the “Physical factors affecting environmental quality,” land management issues, and environmental radiation. All of the data is drawn from the period between 1968 through 1970. The Advisory Committee as a formal cooperative entity ran from 1970-1972. By November of 1971, Roy Young describes the program’s work, in a letter to William D. Lacey, Director, The Council of State Governments, Science and Technology Project. He notes: “Our Advisory Committee on Science and Technology was formed by joint agreement between the Governor and Oregon State University.” He adds, “There is no statute or Executive Order establishing a Science Adviser Office.”

Rethinking Propriety: The Environment as Opportunity Structure:

In relation to this enlarged role for environmental expertise, I argue that the effort to create a new Environmental Science was largely a response to the multiple efforts to institutionally coordinate the emerging dynamics between law, governance, and science, what Pestre (2003) calls a regime of knowledge, and Abbott (1988) an expert jurisdiction. This dissertation examines these two interrelated points: the emergence of an expert jurisdiction for environmental knowledge and the efforts to build new institutional conditions for expert conduct. I argue that the foundation for both has been the expanded relationship between science and governance that was itself an institutional by-product of the expansion of the university system after WWII. In this sense, ‘environmental science’ was a local expression for ‘science for policy,’ a notion, which, when treated as an imperative indicates an area in the history of science whose institutional geography has yet to be mapped. I treat this imperative to realize ‘science for policy’ as a generalized condition for collective action. From this vantage, the emergence of an expert jurisdiction for environmental knowledge and the articulation of ‘expert conduct’ is best seen as an effort to coordinate and stabilize expert conduct with the aim of producing a new type of knowledge as well as to build a new set of institutions to facilitate its coordination and use. Seen from this angle, the EGSPC was an early institution building effort to facilitate this new variety of expertise.

In the history of science, precedents for dealing with scientific interest abound. Whether interest is construed as social interest, or more narrowly construed as ‘disciplinary’ interest, the approach remains foundation for thinking about the dynamics of scientific work, if not, more specifically, its influence. Indeed, the very concept of the ‘scientific paradigm’—that patterning by which normal science is stabilized, and between
which lay imponderable problems of interpretation solved only by revolution—has
become so common place and naturalized that the idea has lost most of its analytical
utility (Fuller, 2001). I suggest that one place to begin is with the images of good science
posited by the scientists themselves as evaluative matters of fact. There is some
precedent for this suggestion, as the topic has been usefully studied as a concern over the
cultivation of credible knowledge claims (Gieryn, 1999), and as ‘boundary-setting’
activities between science and non-science—what in this study I refer to as cognitive
authority, or the cultural work of making expert claims ‘believable.’ In the previous
chapter, I suggested that a genre of relevance for environmental diagnosis emerged in the
science policy of the late 1960’s. Here I examine how, in this emerging institutional
terrain, this environmental genre was translated into a ‘conceptual vocabulary’ and
variously deployed towards differing practical ends in ‘institutional projects.’ I suggest
that this lexicon has been shaped by expert claims to ‘systematize’ environmental
knowledge and, as such, is a distinct lexical development whose emergence has been
marked by conflict over the terms of professional presentation and diagnosis. Further, I
argue that the figure of this new expertise was realized largely through deployment of this
emergent lexicon to evaluate the conduct of science and, hence, through the deployment
of distinct forms of expert rhetoric which were variously institutionalized amongst a
variety of academic discourse communities.  

85 I contrast this approach to disciplinary based histories of environmental expertise, and
suggest that an approach which begins from an analysis of ‘conceptual vocabularies’ is
better suited to illuminate the empirical gradations by which differing bodies of expert
knowledge have been collectively organized under the rubric of ‘environmental expertise.’
This is particularly relevant, as comparison of all three cases reveals distinct differences
in how, over time, and within similarly defined time-scales, the notion of the
‘environment’ was put to practical use, and, in this sense, how it figured as a topic of
One catalyst for the dramatic, and rapid organization of the environmental domain, was the publication, in 1962, of Rachel Carson’s *Silent Spring*, an examination of the effects of DDT on migratory bird populations. Carson effectively linked her understanding of biological knowledge, derived in part from her service as a Fish and Wildlife biologist, to a descriptive portrait of the destructive effects of nature as imbalanced by chemical intervention. Carson’s work is not only credited with channeling the growing concern over environmental problems, it articulated the importance of bringing scientific knowledge to bear on such issues. A notable feature of Carson’s approach is the way ‘Silent Spring’ framed the subtle risks of human behavior through examination of the unintended consequences that technological innovation might pose for the natural world. She became a symbol not only for political engagement but also for a particular stance towards our knowledge of nature -- subtly attuned to the moral contours of humanity’s relationship to nature, but equally cautious of our knowledge of nature, for fear of its unintended consequences.

NEPA was not only an outcome of this particular stance, as adopted by many architects of the bill, most notably, but it also enshrined in the act’s mandate that research practical conversation. I note that while this is a distinct and observable occurrence in the early history of each case, variation continues to mark contemporary efforts to create a professional vocabulary for environmental conduct, as a distinct lexical-variant defined by evaluation of the claims articulated in appeals to and usage of a more broadly distributed ‘environmental vocabulary’ at large. I also suggest that these points of ‘lexicalization’ in fact mark discrete shifts in distinct moments in the process of institutionalization. In this sense, the semiotic evolution of a conceptual vocabulary for the environmental sciences can also be seen as providing the opportunity structure for a variety of collective efforts to institutionalize environmental expertise as a distinct form of conduct. In what follows, I explore both aspects of this process, looking at the process of lexicalization, and the use ‘environmental concepts’ to articulate and organize research projects in established institutional contexts.
and decision making be interdisciplinary and integrated. Amidst the outpouring of activity preceding NEPA—the deluge of public outcry and its codification in law—we also find, couched between social movement demands for environmental protection and the new demands for ‘environmental expertise,’ a burgeoning movement to further cultivate the cache of Carson’s stance, by publicly defining a new form of expertise, responsive to both issues of governance and the evolving political demands that seemed to evolve lockstep with an increased knowledge of nature and an expansive awareness of environmental degradation. As professional experts on environmental matters, many assume the environmental sciences to be the inheritor’s of Carson’s effort, if not a professional outcome of the evolution of NEPA.

In the history of environmental expertise, the role of ecology and the impact of environmental legislation loom large. Although the figure of Carson, or the role of NEPA, seem a logical place to start, if one is looking for the cultural antecedents to the ‘environmental expert,’ a curious finding of this study, but not unprecedented or unobserved in the literature, is the great variety of answers one finds in the effort to define a field of expertise called ‘environmental science.’ Although I did find, in interviewing environmental scientists, that many noted both Carson and NEPA as logical forerunners for environmental awareness but tended to identify with disciplinary or professional precedents rather than with the cultural role attributed to ecologists like Carson. Yet, a striking fact, in this regard, is that less than 10% of my sample found it appropriate to describe themselves as environmental scientists and even fewer described themselves as ecologists. That is, to be clear, less than 10% of the people I contacted through reference to environmental science directives at each of the three universities
where I conducted fieldwork actually used the term ‘environmental scientist’ to describe their sphere of professional conduct. From yet another vantage, a more territorial perspective suggests logic of conflict:

**Environmental Economist:** “Environmental Economics came about because Natural Resource Economics was doing such a lousy job.”

Considered from another tract, that of disciplinary history, the responses were even more varied and, nonetheless, more confusing. As one of scientist-administrator recalled:

**Biological Scientist-administrator:** ”The Environmental Sciences, when I was in graduate school, we called those…they were located in Zoology.”

Or in more strict terms:

**Natural Resource Scientist:** “There is no valid distinction between environmental science and natural resource science. None. It’s politics.”

The snippets from these conversations present two salient features of an answer to our initial question. A history of the environmental sciences, as an interdisciplinary form of expertise, is both a history of interdisciplinary effort, and a history of interest. These features are perfectly stated by Roy A. Young, one of the architects of the Environmental Sciences at Oregon State University, in a talk before the ‘Western Soils and Water Research Committee’ where he draws attention, during the spring of 1971, one year after the passage of NEPA, to the morass of changes surging through the social organization of environmental research:
I suspect that all of you who are present would say that you are engaged to some degree in environmental research and education but whether you might have made such a statement five years ago is doubtful. Agricultural Experiment stations and state universities have been heavily engaged in environmental research for many years. Probably 80% to 90% of the past activities of most Agricultural Experiment Stations would now fall within the broad area of what is classified as environmental research. Years ago, scientists reserved such classification largely for those who were involved in ecology or physiological ecology and considered the environment as only one element of the total ecological picture. But there have been many changes. Sanitary engineers are now called environmental engineers. Landscape architects in many cases call themselves environmental design specialists. Everyone is an ecologist. In fact, this might be referred to as the age of instant ecologists. I was interested that in one group discussion several months ago, one individual felt that anyone was an ecologist who thought he was an ecologist, without regard to his previous academic training or experience.  

That multiple vocabularies, and multiple claims to authority, are at play in the transition between ‘agricultural expertise’ and ‘environmental expertise’ is perfectly demonstrated in Young’s consternation over the range of meanings attributed to the term ‘ecologist.’ Rather than focus on the salience of ‘ecology’ as a precedent, or bridging figure, in this transition, denoting a change between one distinct form of knowledge and the next, I suggest an alternative that is in part built upon a broader reading of the history of environmental expertise. I suggest that by 1971, the ‘environment,’ as a relatively new term, increased in popularity, as part of an academic opportunity-structure that emerged on the basis of the newly emerging genre of relevance, pioneered by popular experts like Carson, and translated into institutional mandates or imperatives by the passage of NEPA. While it is important to understand, as with the contentious articulation of cognitive authority instanced in the interview vignettes above—conflict over claims to relevance, 

conflict over cognitive authority—it is also important to see the work of repair that is at work in Young’s comment. In many ways, his comment is conciliatory. He is, in effect, introducing his audience to the fact that under the new ‘environmental conditions;’ it is indeed possible that everyone is, in fact, an ecologist.

One way of tracing the contours of the transition that Young refers to in the excerpt above is to examine the lexical shifts by which environmental expertise have carved up phenomena over time and the evaluative terms used to express, and judge, the problems and benefits of environmental endeavor. In the previous chapter, I suggested that these ‘genres of relevance’ had a dual character, aimed at both participation in ongoing cultural discourses about the purview and shape of cognitive authority as well as an institutional register, as conceptual vocabularies, regarding how cognitive authority is to be institutionalized and arranged in durable ways in existent or ongoing institutional contexts. Here I suggest that by drawing out the contours of this conceptual lexicon—the emergence of an evaluative language for environmental expertise; its subtle conceptual register; and its incorporation into divergent multiple disciplinary styles of rhetoric—we may see these early, environment based, institutional projects as akin to the ‘trading zones,’ mentioned above. The aim is not to draw attention to the production or constructive dimensions of language use purely as linguistic phenomena. 87 But, rather, a productive means to tap into the semiotic overlap available to expert actors in relation to a historical field of scientific action, defined at once by institutionalized and guarded fields of action—such as established research programs, or disciplinary specializations—

87 This is a worthy approach, to be sure, and one I hope to take up in more detail at a later point.
and also as topics in ongoing conversations regarding the ‘know-how’ of experts and their use of knowledge in everyday interactions. ‘Conceptual vocabularies’ thus reside on a continuum running between institutionalized forms of discourse on one end and hall-talk, or water cooler talk, on the other. Further, the use of conceptual lexicons for practical purposes is defined less by the contours of social organization than in their immediate relationship to the problems of interaction for practical purposes at hand.\textsuperscript{88}

That ‘scientific lexicons’ may form in response to disciplinary interaction is, of course, not a new suggestion. I have reviewed some of the precedents for this manner of conceptualizing expertise above. However, in the case of environmental expertise, a conceptual vocabulary evolved not through the interactions of scientists qua scientists but through the efforts of scientists, policy makers, and lay experts to articulate and define an authoritative claim to a distinct set of phenomena which required new conceptual innovations, as well as novel forms of sustained interaction, and practical intervention. The moment is notable for the way in which the work of experts in managing cognitive authority is made visible. As a feature of cognitive authority—and hence as a constituent feature of institutional agency in university settings—I refer to this variety of cultural work as propriety, or property scripts. With property scripts, the work of institutional

\textsuperscript{88} Here I draw on Goodwin’s definition of ‘contexture,’ or contextual figuration, defined as “particular, locally relevant array of semiotic fields that participants “demonstrably orient to” as a situated activity system. Semiotic fields consist of the heterogeneous sign phenomenon, as “instantiated in diverse media,” that serve as the “multiple semiotic resources” for enabling human interaction. On this account, semiotic fields refer to sets of sign phenomena, more generally, as distinguished from the specific sets to which participants demonstrably engage with, and as further distinguished from hypothetical sets of fields “that an analyst might impose to code context.” (Goodwin, 2000; 1491)
agency is pitched at the use of exclusive claims to expertise, as both a feature of cognitive authority as well as a component of institutional work.

In exploring the background to the emergence of the ‘environment’ as a distinct sphere of expert know-how and by looking at the gradual emergence of a conceptual vocabulary for interdisciplinary environmental research, I suggest that what we see is not a transition to a new body of knowledge but an effort to orient expert action in a new way to an existent body of knowledge and, hence, alter how that body of knowledge is used, and, in a sense, re-created to solve problems or create new bodies of expert know-how. The emergence of an ‘environmental vocabulary’ provided a means to capitalize on and articulate a range of existent relationships between differing bodies of expertise which were being re-organized as relevant problems for expert management as a result of newly articulated political demands. This process did not occur because a range of new values were introduced into the production of knowledge but as a result of efforts to describe epistemic concerns in ways that made them relevant to the social and political problems that were emerging in relation to environmental concerns, as expressed by figures like Carson, but also through the collective efforts of social movements and policy makers to define environmental agendas.

Seen from this angle, the great challenge for the Environmental Sciences has been to articulate claims to a body of knowledge which emerged, interstitially, from practical contexts realized in the interaction between a diverse body of scientific claims; the evolving demands and activities of social movements to shape the public realm; and an array of legal arrangements designed to manage the administration of nature, broadly construed. Indeed, the historical picture becomes even more complicated in that these
contexts, the precedents to which environmental scientists in the late 1960’s refer, were themselves built upon the sedimentation of previous efforts at scientific categorization, legal classification, and political action.

Here I review one such case, a program that emerged from the EGSPC as it was, itself, transitioned or translated into a host of new institutional projects concerned with environmental information and its use in environmental decision making. One of the very first environmental programs was Oregon State University’s “Environmental Education Extension Program” (EEEP). The program began in 1970, under a wave of organizational efforts to organize existent research along environmental lines and, thus, to create conduits to facilitate the distribution of environmental information to the public and a wide variety of organizations, both public and private.89

Although originally organized as part of Governor McCall’s committee, EEEP was also responding to mandates for increased environmental education that were issued by the USDA. In this context, EEEP was organized as a semi-permanent organization designed to facilitate the sharing of expertise between disparate expert projects and to disseminate environmental expertise to the public. The program was to serve as an arbiter of environmental information. In its inaugural description, the EEEP coordinating committee notes, the program notes “up until now the public has had to contend with the contending viewpoints of interested parties, often coupled with data which have been biased by selection.” Public confusion, they add, has been further aggravated by

“conflicting news accounts on environmental problems which often do not agree even on the basic facts of a situation.” And yet, the announcement suggests, “many citizens want to “do the right thing both in private and public action.”

To counter this scenario, EEEP was created to draw upon existing “University, state and private expertise and Extension community relations,” in order to present to the public “a balanced view of environmental issues which some confusion results from misunderstanding of technology.” To identify the issues of critical importance, an EEEP coordinating committee was formed, comprised of county agents and extension specialists. In addition to the identification of appropriate problems or issues, these “extension agents were to judge the opinion of experts in each field for accuracy and fairness.” They were to be additionally charged with the selection and dissemination of reference materials “representing a balanced view to county agents and the public at large,” as coordinated with the distribution of USDA information outreach programs on environmental information.

Before EEEP was fully inaugurated several experiments were conducted around Extension involvement in environmental education. Several study groups were formed to

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investigate the range of issues to be examined by the program. One of these focus areas centered on the role of nuclear development and environmental protection. ⁹²

A news article from January 22, 1968, describes the issue of nuclear power in its relevance for the Pacific Northwest. As the hydro capacity of the Northwest may soon be fully developed, the reporter notes, “the Northwest is going to have to rely on many nuclear power plants to provide million of kilowatts of electricity.” The authors suggest the scenario poses two problems: first, the issue of public fear and, second, the issue of how to manage the waste water that the plants use for cooling purposes. If the water is too warm, they observe, “It cannot be dumped into the rivers because it will damage fish.” As a solution to this scenario, the article advocates for the position of Art King, a soil conservation specialist at OSU, who suggests using the water for irrigation. In King’s opinion, “the water from one nuclear plant would be enough to irrigate 50,000 acres.” ⁹³

By January 31, of 1968, King had written to Dr. C.H. Wang, director of the OSU Radiation Center, advocating his opinion regarding the benefits of irrigation with nuclear wastewater. Wang approved of King’s conclusion, and in response, suggests that King contact Arthur Scott of Reed College, Portland Oregon, chairmen of the Nuclear Development Coordinating Committee for Governor McCall. Additionally, he suggests contacting Mr. Kessler R. Cannon, Executive Secretary of the Natural Resources


Committee, “appointed by Governor McCall only a month or so ago with representatives from the State Government, educational institutions, nuclear industry, and utility industry.” He adds that, as Vice Chairmen of the Committee, he will urge them to consider the issue, citing the appropriateness of the topic. In addition, he offers two further points of encouragement, citing two relevant precedents for the issue. First, he notes the participation of General Itschar, Vice President of the Portland General Electric Company. He suggests this to be an opportune scenario as Portland General Electric would soon be building a nuclear power station at St. Helen and also had plans to “have three such power plants by 1978, and with one new station every year after.” Second, the Eugene Utility Group is “currently working with the U.S. Corps of Engineers to investigate the feasibility in using water from the Dexter Dam Reservoir for the cooling purpose and the irrigating purpose.” On this point, Wang observes: “If the Nuclear Development Coordinating Committee endorses your proposal, I would contact the EWCB people so that a greater liaison can be established among all interested parties.”

By February 5, 1968, King had contacted both Scott and Cannon. In each communication, he celebrates the practical impact of irrigative wastewater usage from the standpoint of a conservationist. He notes he has given the matter much thought and suggests, “since waste water from nuclear plants has not been used for irrigation, I have found no positive information,” adding, however, “I have failed to find any hint of negative factors.” In this way, he argues conclusively for a logical trade off, suggesting,

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“I am firmly convinced that we are overlooking a bet in not planning and using other waste discharges for irrigation.” Additionally, to nuclear wastewater he would add: “effluent from pulp mills or other wood processing plants, food processing plant” and sewage disposal plants. His conclusion is that “there is plenty of practical evidence that these wastes can be profitably used for irrigation without harm to human beings, or animals,” and suggests, “we have been doing it for years before anyone had thought of sewage treatment.”

In addition, he outlines existing demand, prior precedents, and a rationale for delivery. On a note of practical politics, he suggests that “Federal send state plans for the development of soil and water resources of the Willamette and Columbia Basin call for the irrigation of the land areas indicated above and Water supplies have been revised.” Given the plans, there is no foreseeable conflict in water usage. Further, the implementation of the Federal plan would normally take “30 to 40 years,” but “joint development of nuclear power and irrigation might profitably beat this time schedule.”

By April of 1969 the Nuclear Power Study Committee had been formed. Four work groups were created to develop “problem analysis in their subject area and to identify research needs and qualifications of Oregon State University to conduct such research.” The proposed areas consist of, “beneficial use of coolant water in agriculture,”

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and “general biological effects of thermal pollution,” as well as the “physical aspects of nuclear development and control programs.” The aim of these groups was to analyze, first, “the experience elsewhere in use of warm waters for such beneficial use” and, second, to identify “possible problems associated with biological accumulation of radioactive materials and use of elements that may cause toxicity;” and, finally, to delineate “the capital requests and other economic considerations for such programs.” At this time, they also developed suggested guidelines for topical organization. The Committee argues that for the workgroup on general biological effects, the only relevant guidelines would be for the analysts to “relate their study to state and Federal water quality standards (including relevant rules and regulations) as they relate to thermal pollution.” Additionally, they suggest for the physical area work group, the group ought to focus on “metallurgical considerations with reactor site selection and such control practices as cooling towers and lakes” and, in this sense, the requisite expertise should consist of “geology, hydrology and seismology” and include “geography and population” as “siting and waste disposal will be of significance.”

Over the summer of 1969, Oregon State University Extension held meetings with officials of the Pacific Power Company and the Eugene Water and Electric Board around the possibility of consultation. The minutes from the Nuclear Power Study Committee also outline several possible developments related to nuclear power and the environment: first, discussion with the Rockefeller Foundation around the issue of support and, second,

announcement by the Atomic Energy commission of the possibility of sponsored conferences in the “distribution, effects and possible use of waste heat from various individual commercial power sources.” The group notes they would be very interested in hosting a conference of this type. By December of 1969, two meetings had been held on the issue of nuclear power and possible control side effects. The first, sponsored by the Atomic Industrial Forum, had been organized around the theme of “Radiation and Man’s Environment.” The other, regional in scope, was entitled, “The Northwest Conference on the Role of Nuclear Energy.”

In May of 1970, the results of these sessions were presented at a small conference for local community leaders, citizens, and faculty which was characterized as a “Learn About” Nuclear Energy Session. The advertisement from the Cooperative Extension Service billed the event as “an opportunity to tune in on the pulse of progress.” A memo advertising the event, written by King, suggests, “the machine age is evolving toward the era of the atom.” He sites “power” as the perfect example of this and notes “as a regional example” that planners “predict that 20 additional thermal power plants each roughly equal to McNally Dam in capacity, will be required to meet the pyramiding needs for electricity in the northwest by 1990.”


While the conference was a success, it is worth noting that the presentation received a very strong reaction from other environmental experts on campus, and we can see here to some degree the role of the propriety scripts, discussed above, in relation to the conference proceedings, particularly King’s proposal. In a letter from July 7, 1970, two marine science extension officers, Gwil O. Evans, specialist in marine science information, and Daniel A. Panshin, specialist in Oceanography, wrote a very strongly worded letter to Joseph R. Cox, then acting director of Cooperative Extension Service. In the letter they note that the conference suffered from objectivity, which, in cooperative terms is defined by a degree of social balance. They note that while the role of the Extension Service is to provide “local leadership on matters of public policy” this must be balanced against a primary concern with the “objective presentation” of information that takes consideration of “all sides of any question so that people “may then make rational and reasoned decisions.” They note, that given these standards, the May conference on nuclear power “did not comprehensively present all of the issues which the public, and its legislative and administrative bodies, must consider when they make decisions about nuclear power plants.” In particular, they note that everyone who participated in the informational conference were advocates for nuclear power and its rapid regional development. Panshin and Cox note, with some alarm, that while these advocates of nuclear power believe their views to be technically correct: “there are a substantial number of equally reputable scientists who believe that there is insufficient knowledge of the effects, both beneficial and detrimental, of these plants on the environment.” They worry that “their absence may have misled some members of the
audience to the conclusion that scientists have no serious areas of disagreement about nuclear plants.”

The letter closes with the note:

We view this lack of balance in the presentation with considerable alarm because of the potential harmful effects that it may have on decision making on a major public policy matter in Oregon. If our people go forth from this conference and convey the understanding that there is no longer any need for concern over the effects of nuclear plants, then both the University and the Cooperative Extension Service are doing a disservice to the people. In fact, we should be prepared and unafraid to tell people that there are unresolved questions regarding nuclear plants. We should be prepared to explain what those questions are, what is being done by OSU and others to find answers to the questions, and what factors must be considered in making decisions today about electrical power needs of the future. We believe that the conference failed to provide our people with that information. None of the remedies for this situation are as good as proper presentation in the first place. Misinformation is already being conveyed to the public by those who attended the conference (see Panshin’s letter of 22 May)  

The basic thrust of Panshin and Cox’s objections, in no uncertain terms, is to say ‘this is not good science.’ Strong words for an institutional memo, but not completely out of keeping with that genre of relevance, and I conclude by drawing attention to three key points in these authors’ objections. First, they note that the presentation on nuclear energy was particularly offensive because it was misleading, which is not in keeping with the spirit of Cooperative extensions approach to objectivity, understood as balance.

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between social interests. The crucial element, however, is how they mobilize this as leverage to open up question of how environmental expertise should be properly constructed, in effect calling in to question King’s usage, and that of the Nuclear study committee, in making claims to environmental expertise in the absence of consideration of other valid objections. While claims to the ‘environment’ acts as an opportunity structure for extending claims to cognitive authority, these claims are not made in an institutional vacuum, but rather subject to ongoing the work of institutional actors in the ongoing construction of institutional order. Institutional interpretation, criticism, and analysis are thus key aspects of propriety scripts, and their work in allocating legitimate authority on the basis of perceived standards of legitimate conduct for a given institutional order.

**Conclusion: The Opportunities for Research**

The results of the ESGPC and the EEP, as institutional projects, were short lived, but useful in perhaps unexpected ways. The outcomes of the project—the conference and the reports—were simply that, a conference and reports. The constituent elements of the ESGPC were shortly reordered, in 1972, when its formal organization was terminated. However, the organization of the project created interesting precedents for the author’s both before and after the program ended. First, it established the conditions supporting the creation of ‘environmental projects’ and to thus frame one’s expert project in environmental terms. Second, it created teams of collaboration, as well as audiences interested in the results of that collaboration.
In conclusion, I simply note how productive these efforts were, illustrating the institutional results of small efforts at opportunity seeking. Viewing the ‘environment’ as an institutional opportunity structure helps to re-specify two points in the historiography of university based expertise. First, it unsettles a common tendency, critically at issue in the literature on the ‘neoliberal university’ that basic and applied research are valid empirical distinctions for carving up the institutional geography of U.S. universities. As I demonstrate here, although the applied sciences sought support for their work, it was through their accommodation to the conduct of basic research that their endeavors were funded. Second, it asks that we re-examine the history of 20th century university based expertise in terms of institutional projects—and hence as a history of cognitive authority—rather than through the lens of disciplinary affiliation or identity. The fluidity by which ‘the environment’ was evoked, as a domain of research, and as an expert identity, asks that we re-examine the organization of institutional projects as zone of expert advantage.

These efforts, as discrete institutional projects, are illustrative of two aspects of environmental expertise during the early 1970s. First, we have a clear sense that the existent or available environmental research is conceptualized as applicable to existent or emerging environmental problems. From this angle, the expert question, framed in institutional terms of co-activity, is the question of how that research base should best be organized. We see two clear examples of this, first in the effort to conceptualize existent or ongoing projects as ‘environmental’ as with King’s interest in using nuclear wastewater for the purposes of irrigation. This had been a long-standing interest that was evolved, on the basis of interest, or an emerging genre of relevance, institutional
momentum, or opportunity structure, and available resources, to become a viable component of the environmental information disseminated to community leaders. And, second, in the basic efforts to organize an educational forum on the basis of existent expertise and which concerns the use of expertise, more broadly in terms of decision-making. Here we see this blandly in the basic intent of the ESGPC to create an advisory body but also in the role of the extension programmer’s efforts to adapt existent educational programs to meet the needs of evolving institutional expectation.

The context for the organization of the ESGPC involved three layers or strata of institutional activity. On the one hand, the program was built from recognition on the part of academic and scientific professionals and institutional actors in the State that the push for environmental regulation would require new relationships between the Governor’s office and OSU. Second, the efforts to develop institutional projects framed by the mission of ESGPC and, hence, organized around ‘decision-focused’ distribution of environmental information. And finally, the host of expert projects, currently active in the Cooperative Extension Program, and at OSU more generally, that were enrolled as relevant to the aims of the ESGPC, most notably the EEP program reviewed above.

While the outcomes are minimal, it is important to keep in mind how much institutional work went into building the conference and the final document as a precursor for the event. Here I emphasize the productivity of that institutional work, and suggest that this background is in fact the real arena for institution building. It is the formation, and reformation of institutional projects that are important for understanding the dynamics of institutional order, as well as institutional agency. Further, I argue that the productivity is valued in two ways---through the creation of new ‘trade languages,’

153
whose role in institutional order I call ‘conceptual vocabularies,’ and through the sponsorship and promotion of new institutional projects based on these maps or portraits of relevant institutional work. As an ‘umbrella project,’ the EEP program created the opportunity for conservation based programming to be reconsidered in light of their environmental relevance and potentially reconstructed.

In the next chapter, I apply these insights as I further examine this ongoing institutional process—of the creation of institutional projects and their ongoing function as institutional opportunity structures in reference to the ACESS program and its early effort to create a distributed environmental monitoring system linking county government, regional universities, and citizen organizations. Here, I examine this process from another angle where non-university based experts re-imagine the university as a systemic component of environmentally-based expert knowledge systems.
Chapter 3: How Institutions Forget: Change and the Cultivation of Institutional Publics

Throughout this dissertation I have emphasized the dynamic nature of the university as an institutional ecology. This dynamism is a double-edged sword in that it implies a complex problem for knowledge management, a problem of institutional memory, as well as a dynamic basis for innovation. In this chapter, I explore this problem of institutional dynamism by looking at two interrelated cases of ‘institutional forgetting,’ notable for how they relate to cognitive accumulation in the environmental sciences. First, a historical case of institutional amnesia linked to a phantom research center at WSU; and second, the ACCESS program, a project in Santa Barbara County, active from the mid-nineteen seventies through the mid-1980’s, designed to develop a sophisticated planning apparatus for the purpose of knowledge production, use, and dissemination. Both projects are interesting for the way they highlight the work of institutional forgetting, as a feature of institutional change, as well as how they enroll institutional publics in the consideration of institutional change.

Contemporary analysts have examined the role of ‘publics’ as a type of imaginary social collective, in history (Emirbayer and Sheller, 1999) and as a feature of politics (Cody, 2011). Additionally, Hess has examined the role of ‘counter publics’ in the contemporary construction of scientific expertise (Hess, 2010a, 2001). For Hess, counter publics are a species of ‘mobilized publics,’ a term that he defines as inclusive of social movements and the ‘alternative pathways’ that influence science and industry through advocacy organization, professional activity, entrepreneurial work, and religious reform. ‘Mobilized publics’ and ‘alternative pathways,’ (Hess, 2007) are factors of a broader
theory of epistemic modernization proposed to explain countervailing processes observed in relation to the neoliberalization of science. Epistemic modernization is defined as patterns of public scrutiny, in part, built from the responsiveness of scientists and policy experts to claims by those in subordinate positions. These subordinate positionalities are defined as the users of science, medical patients, and those in marginalized groups. Mobilized publics thus consist of the social groupings resulting from these interactions—ostensibly to public benefit. They also include counter publics where scientists and movements cooperate to identify ‘undone science’ (Frickel et al., 2010) or the systematic defunding of areas of research. I would note here that Hess’s work is, in my opinion, a refinement of the work on the sociology of ‘expert crisis’ (Nelkin, 1971, 1976) and the more recent work on ‘anti-science’ movements (Frickel and Gross, 2005).

Taking Hess as a guide, I posit the creation of institutional publics as a feature of the dynamic of institutionalization examined in this study. Although Hess examines this process from the angle of social movements and, hence, as an expression of political interest, I highlight in this chapter the everyday interactions and patterns of group formation that make up academic institutions such as labs, institutes, offices and programs. Specifically, I argue that in the institutional ecology of the university, cognitive authority is institutionalized through the construction of institutional constituencies. In this sense, as nested institutions, universities draw boundaries, partially through incorporation, where institutional publics are stabilized through ongoing processes of institutionalization. Disciplines, professional societies, state programs, athletic programs, and fans all figure as differing institutional publics, and all lay claim to the university as both an imaginary social collective and as a site of institutional agency.
That the university became—in relationship to the environment—an intensely contested site is a central claim of this study. In this process of contestation, differing institutional publics are selectively instituted as part of this process. While professional or disciplinary societies may seem a durable, obvious choice for analysis, in this chapter I explore the traces of forgotten institutional publics in order to examine the construction of ‘institutional innovation’ as an ongoing feature in the construction of expertise. If we define institutional innovation as the management or design of institutional change, institutionalization, as a process, may also be understood as a type of ‘targeted’ or managed, activity designed to bring about changes in expertise. And, in this chapter, I suggest that in the institutional ecology of the university—and perhaps other knowledge institutions—the institutionalization of cognitive authority centers on processes of constituency formation. Furthermore, I argue that institutional forgetting is a constituent feature of this institutional innovation and often factors in the design of sophisticated or self-conscious institution building projects. In what follows, I review both varieties of institutional forgetting with an eye towards understanding how institutional innovation was naturalized in the field of higher education. I examine this in three parts. First, I introduce the general issue of institutional amnesia. Second, I examine a complex case of designed institutional innovation from the 1970’s—the ACCESS case—an early example of an expert knowledge system in the environmental field designed to elicit a program of institutional innovation. And, in conclusion, I discuss the work of constructing institutional publics and institutional innovation as a feature of cognitive accumulation.
I open this chapter with a brief, illustrative anecdote, looking at the short, mysterious history of the Environmental Research Center at WSU. In doing archival research, I was struck by the volume of defunct institutions or organizations that, although important in their time and, to some degree, notable in the construction of my chronology, had been largely forgotten by the institutional actors—the academic and scientific professionals—that were my interview collaborators. At WSU, for example, the founding of the Environmental Science Program (ES) was accompanied by the co-organization of an Environmental Research Center (ERC). While both were considered a major accomplishment, the Center carried a further notable element of prestige in that it was sanctioned by and, indeed, to some degree funded by the Washington State legislature. However, by the time that I arrived on campus to begin fieldwork in 2008, I could not locate the Center physically although its existence was still noted in the university building directory. After discovering the existence of the Center in the administrative documentation, I made it a point to ask interview collaborators if they knew about the history of the Center. Of 49 subjects interviewed at WSU, only two were either familiar with or had heard of the Center. Indeed, many of those interviewed expressed some dismay to realize that the efforts of the faculty to develop environmental programming may in fact have been repetitive or redundant.

In its mundane details, the history of the Environment Research Center (ERC) is not very profound but interesting nonetheless. The Center was founded in 1970, along with the Environmental Studies Program, based on recommendations that had evolved in study committee two years prior. Although the ERC, like the ES program, was well
received, it suffered throughout the seventies for lack of definition. By design, it required a dynamic director whose purpose would be to grow the ERC, build a funding base, enroll graduate students, and design and promote research projects. Due to the exigencies of the ES Program’s status, both in terms of finances and staffing, the ERC never took off the way the organizing faculty had imagined. The ES faculty lacked the funding to recruit a dynamic director and, by promoting from within the existing faculty, the limited resources and available attention of the ES faculty hampered the further growth of the ERC. Indeed, the ES faculty member that was eventually appointed as interim director later served as both Center Director and ES program chair. A physicist by training, he would later, in the 1980’s, promote the Center as an alternative energy laboratory.

The ERC, as an expert project, languished, but, as a sort of institutional placeholder, it served as the basis for the institutionalization of another institutional project. It came to act as what I call a ‘paper institution,’ providing the administrative conditions for co-activity symbolically, if not substantively. The dynamic at work in this example is one that we see over and over again in the institutional records of the University, namely the development of an institutional project, its organization, and eventual decline. In this process, aspects of the expert project may be preserved or remembered, and, equally, aspects may be subsequently forgotten. Both are predicated on a type of ‘institutional revision’ or selective change in how various institutional components are stabilized or re-purposed in syncretic ways. Rather than treat this dynamic as an anomaly, I think its important to understand how this dynamic of constructive revision works in the context of institution building.
This emphasis on the forgetfulness of institutions is not a new observation. The anthropologist Mary Douglas has proposed that institutions remember, forget, and make decisions (Douglas, 1986; 69), noting that the construction of past time has “little to do with the past at all and everything to do with the present” (Douglas, 1986; 69). For Douglas, institutional amnesia has less to do with ideological revision or “conscious tinkering” than with the role of institutions in creating “shadowed places in which nothing can be seen and no questions asked” (Douglas, 1986; 69). In this way, partially through obscurcation, they also make other areas stand out in “finally discriminated detail” that is closely scrutinized and ordered. History as public memory appears in this sense to be the unintended effect of practices directed to “immediate partial ends” in ways that are highly selective, emphasizing some events and obscuring others.” (Douglas, 1986; 69)

Douglas is useful for this discussion for the way she takes up two contrasting literatures: first, the literature in the sociology of science centered on the way scientists forget things that are either obvious or previously understood, as a constituent feature of of the phenomenon of multiple rediscoveries (Merton, 1965) and, second, the anthropological literature on why groups remember—specifically Evans-Pritchard’s work on kinship (1940, 1951, 1956). Both literatures converge on the same problematic and on similar solutions whereby a social system is treated as a mnemonic system and the naming of what is good to remember corresponds with social claims to coherence or solidarity.

In this chapter, I am less interested in ideas than patterns of co-activity—that is how some examples of institutional order are remembered or forgotten. I offer not a general explanation for institutional forgetting but rather one specific to the university as
a nested institution, or institutional ecology. Rather than treat institutional forgetting as an anomaly, I propose to treat it as a constituent, regular component of institution building in higher education akin to the patterns of solidarity in the scientific and kinship activity discussed by Douglas. Building off of Douglas I note that things are remembered or forgotten through claims to solidarity and affinity, and in the field of higher education, institutionalization is enabled by these mnemonic patterns of co-activity but where the claims to solidarity and affinity are framed in terms of cognitive authority.

Cognitive authority refers to the work of attributing to experts credibility or believability based on their claims to know. The institutionalization of cognitive authority—what I call cognitive accumulation—occurs through the use of such claims in the production of expertise and also in the use of expertise towards particular ends. Here, cognitive authority is both claimed by experts as well as attributed to fields of expertise and bodies of expert actors, such as professions and disciplinary groups, as well as by groups who seek to make credible use of expertise. And, in this sense, cognitive authority is institutionalized in a variegated manner relative to specific bodies of expertise and valid claims to the use of expert knowledge.

I characterize the coordination of these claims by specific populations—either through contestation or cooperation—in the institutionalization of cognitive authority as ‘institutional publics.’ The notion of an institutional public is defined through the collective effort to define the relevance or legitimacy of a given body of expertise not simply as a matter of ‘discourse’ but as matter of co-activity and, hence, as a matter of social coordination, cooperation, etc. Specific claims to cognitive authority are thus institutionalized and variously remembered or forgotten in a differential manner relative
to a given group or collective. As the composition of a given constituency changes so too do the possible claims to cognitive authority and vice versa.

We see this, for example, as in the previous chapter, with the proliferation of opportunity structures, as well as in the discrete layers of ‘institutional strata’ as organized in the archival record. In this respect, expertise is institutionalized in two distinct ways---through the institutionalization of expert discourse, in the form expert claims to fact, and through what I term genres of relevance and, secondly, in the use of expertise in day-to-day interaction and co-activity. These two forms of activity are mutually supportive but often pitched at different scales of activity. We see this pattern if we return to the ES Research Center---although the center continued to be referenced in the institutional literature—and hence at the level of discourse—it was subsequently institutionalized at the level of co-activity, in relation to a different body of claims—related to alternative energy—and thus institutionalized in an emerging institutional public or collective.

While ‘the case of the phantom research center’ is a clear example of institutional amnesia, I turn to another, more complicated case, that of the ACCESS program. Both the ACCESS program and the ES Center are productive examples for understanding this process of institution creation and institutional remembering, as they highlight in different ways how these processes play out and are managed as a feature of institutional change.

**THE ACCESS PROGRAM**

The ACCESS program, which stands for Alternative Comprehensive Environmental Study System, was a large-scale research project conducted by William R.
Ewald Jr., under the auspices of the NSF’s RANN program. The project was loosely affiliated with the University of California at Santa Barbara in the 1970’s, shortly after the Santa Barbara Oil Crisis and in the 10 years following. Ewald was a regional planner, professionally active between 1947 and the late 1970’s, and ACCESS was one of his final projects. The aim of the study—a huge if not audacious undertaking, to be sure—was to design a socio-technical process for Santa Barbara County, creating a ‘regional policy dialogue’ between local governments, policy makers, and citizens that addressed environmental change in a manner that was both cognizant of the complexity of environmental processes, and their differential social impacts. The goal of the process was to create new means to facilitate people’s access to “information, expertise and to each other,” and, to do this, ACCESS focused on cultivating, as a constituent part of the policy process, the use of research as aided by “interactive graphic telecommunications” to both enhance the “appropriate use of science and technology” as well as aid in the development and communication of policy and policy alternatives at the regional level.102

Although ACCESS officially began two years after the passage of the 1970 National Environmental Protection Act, it was presaged by Ewald’s 30-year history working as a planner on community issues related to ecological problems. Indeed, the project can be found, in a nascent form, in his 1968 ‘Environment and Policy: the Next Fifty Years,’ where he notes that the critical problem for environmental monitoring is to “manage the metropolis as a vast ongoing system, monitoring the growth and quality of

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the environment as a whole and concentrating public efforts at the key points of
development,” (Ewald, 1968; 152)

The project was designed as a six phase process: concept development,
reconnaissance, design phase, pilot test, and the final phase running from 1977 to 1981,
proposed as a region wide system demonstration and verification. Analysis here covers
the reconnaissance, pilot, design, and test phase. In the pilot test phase, the
organizational chronology was distributed amongst many different organizations (see
below). Part of aim of ACCESS was to re-imagine the broader expert ecology of the
university, and the ongoing process was to variously organize institutions and populations
to act as sources for information and components in decision making processes.

In the design phase the goal was to survey and outline available regional
resources to create the environmental monitoring process, and, in the pilot test, several
topical areas (in this case, the role of fuel breaks in the Santa Ynez mountains, and the
impact of water quality and quantity on land use) were selected to be taken up by the
ACCESS process for evaluation. Ewald characterized the process as “regional in scope;”
focused on the “regional policy maker (official and unofficial);” and comprised of a
“non-profit citizen sector supported by government, foundations, business (including
utilities) and higher education,” making “full use of computer assisted graphics and two
way television and dialog.”

The more specific aims of ACCESS were characterized as serving as a ‘midwife’
between information (including technology) and potential uses.” Under the ACCESS

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Collection, Box 1:2. SBHC Mss 29. Department of Special Collections, Davidson
Library, University of California, Santa Barbara.
platform, Ewald argues, “a region can learn what it needs to learn; it can establish practical tests to refine knowledge for its own purposes.” Implied here is the timely importance of developing of the initiative as a type of institutional capacity. Indeed the need for programs like ACCESS is characterized as pressing because of the perception that certain institutional limitations in the use of knowledge have already been reached. He notes, “federal agencies such as NASA and NSF have had a significant learning experience in their attempts to transfer technology” but there seem to be “certain limitations to the contribution that can be made to that transfer by either universities or local governments.”

While Ewald affirms that technology transfer is well understood in a university setting he suggests that the transfer of technology by universities “directly into the operating circumstances of local government and other local organizations has not been so well proven that it can be accepted as an obvious means.” In contrast, local governments, which Ewald characterizes as maintaining “operating bureaucracies which have the capacity to use technology,” are not as familiar with rapidly changing technology. More to the point, local governments are limited by their “single function focus” and their fixed budgets for dealing with emergencies. He notes as well that elected officials “can seldom afford to take the risk of failure which lurks in innovation.”

By contrast, Ewald argues, “the ACCESS project offers a place for testing technology transfer through a non-profit broadly based regional organization.” ¹⁰⁵

As a non-profit, ACCESS held an advantage because of the opportunity to act without becoming entangled in the “primary operations of either government or higher education.” As ACCESS relates to both, the politician or the university administrator “is not called upon to take the responsibility of a gamble with innovation. He can explore innovative ideas through the ACCESS-community based process where they can be tested and adapted before being officially adopted.” The issue of innovations goes directly to the potential utility of a project like ACCESS, as well as its potential appeal to “federal agency interest.” This is a reward that Ewald ties to the question of relevance as he notes that federally funded research with urban information systems has in fact made limited progress and has not achieved innovative success through wide dissemination.¹⁰⁶

I find this case to be endlessly fascinating, and illustrative, for how it forefronts the centrality of ‘decision-making’ in the history of the environmental sciences. ACCESS was designed not only to monitor environmental processes but also to link the information culled from this monitoring to distributed decision making processes involving both policy makers and invested stakeholders or citizens. ACCESS was, in this sense, concerned with the organization of information and its ongoing linkage with action


and decision-making rather than the production of knowledge per se. In this respect, with its clear focus on institution building, ACCESS is a clear example of an early expert knowledge system in the field of environmental expertise.

ACCESS AS ExKS

In the introduction to this dissertation, I characterized this emphasis on decision making, when framed in institutional terms, as ‘expert knowledge systems,’ (ExKS) a concept I utilize to refer to a type of institutional project linking knowledge with action as a constitutive aspect of knowledge production, in effect linking knowledge production with its use in decision making. This concept draws on two precedents. First, in the contemporary literature ‘knowledge systems’ are defined as “systems of research, observation, innovation, assessment and decision support…that have been designed to foster goals of economic prosperity, human development, or environmental conservation”(Clark et al, 2008). The identification of such systems can be traced to recent and pioneering work on “knowledge systems for sustainable development’ (KSSD) (Cash, et al., 2003; i), and to work on ‘Ecological Knowledge Systems’ (EKS) (Roling, 1998). Roling (1998) defines a knowledge system in a general way as composed of “a mental construct” developed as a useful element of effective action (Roling, 1998; 127). On this account KS “may be described as stable actor networks which support agricultural innovation and learning, comprising, for example, researchers, extensionists and progressive farmers” (Roling, 1998; 127). Conceptually KS may be distinguished from ‘expert systems’ (Giddens, 1999), defined as systems of technology and professional expertise that organize and control areas of our social environment. In effect,
I combine both notions, and, by emphasizing the ‘expert’ in knowledge systems, I emphasize the expertise as an institutionalized feature of co-activity; in this case, linking knowledge with decision-making.

Rather than treat ExKS as durable features of ‘modernity,’ or particular to an expert domain, I argue that the organization of ExKS is a widespread feature of the postwar research economy, emerging with the wartime emphasis on understanding and organizing decision-making and decision making processes in governments and organizations. In this history, we see two streams of institutional activity relevant for our purposes involved in the emergence of ExKS. The first is concerned with the formal organization of decision making and the second with the role of ExKS as a feature of conservation science before and after WWII. A crucial feature of this postwar problematic is the understanding that ‘decision-making’ differs from ‘scientific discovery’ (Price, 1965) and that useful information for scientists who produce knowledge relevant to policy may look differently from those utilizing knowledge in the decision making process per se. A now classic in the field of science policy, Stone’s Pasteur’s Quadrant, describes the shift in science policy that occurred in the postwar era as a shift toward ‘use inspired research.’ (Stokes, 1997)

With the development of the postwar research economy, and the symbolic institutionalization of the distinction between basic and applied research, the dominant

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107 Although focused on knowledge systems in sustainable development, Cash explicitly recognizes their widespread distribution: “Individual efforts in research, innovation, monitoring, and assessment clearly can contribute to sustainability. But the full utility of such independent contributions depends on developing integrated knowledge systems, a lesson already learned in the agriculture, defense, and health sectors, but generally neglected elsewhere.” (Cash, 2003; 8090)
Frame in science policy was expressed in terms of a linear model of innovation. The linear model suggests that innovation proceeds from ‘invention’ to ‘innovation’ to ‘diffusion,’ with basic research factored in as a programmatic input into the pre-invention phase. In postwar science policy, this model did not subsist as a cultural abstraction but rather its basic components were a part of the institutional ‘game’ of science, as a presupposition in the daily life of academic and scientific professionals, through administration in higher education, industry and governance, through grant applications, budgeting and reporting categories, and through investment strategies. Indeed, it operated not only as a latent institutional model in the postwar period but took on the hue of cultural legitimacy in popular culture as well, particularly as it relates to expectations about the role of science in producing the notions of ‘scientific advancement’ that has transformed social expectations of the utility of science.\[108\]

While the transformation of the linear model of innovation was being formally codified at the level of science policy, at the institutional level, I draw attention to the effort to codify and manage information as a decision making resource, associated with the incorporation of systems engineering, cybernetics, and operations research, all of which can be traced to the logistical efforts to effectively organize science, technology and engineering during WWII.

\[108\] However, for Stokes, the postwar compact for research began to transform under a number of notable conditions; first, by grappling with the Sputnik Crisis; second with the end of the Cold War; third, with the economic prospect of the integrating global economy; and finally, the ascendency of fiscally conservative politics and its effect on science funding. With this set of conditions the legitimacy of the linear model was slowly whittled away as concerns over the efficacy of scientific research took central place in science policy.
This shift, as a sort implicit institutional problematic, is clearly illustrated with the example of Operations Research (OR), a discipline concerned with the application of analytical to aid effective decision-making. Growing out of a subfield of mathematics, OR utilizes formal modeling, statistical analysis, and mathematical optimization techniques to derive solutions to complex making processes. These disparate elements were unified during WWII as a means to aid executive departments in the military with planning during the war effort. The background of OR, and associated sciences, has been, until recently, largely absented by both historians of science and researchers in STS. However, several recent essays have begun to tease out an appreciation of the widespread influence of OR’s influence, particularly as it relates to the development of organizational accounting, science policy, and the relationship between the social and physical sciences. The diffusion of OR and systems engineering was effectively spurred on by what Mirkowski (1999), citing Pickering (1995) and Hardaway (1991), define as “Cyborg Sciences,’ or “interdisciplinary research programs inspired by the command-control-communication-information’ paradigm of military doctrine and the advent of the computer” (Mirowski, 1999; 685). These sciences were built around a “scientific re-


110 “During the Second World War, the British and American militaries contracted outside scientists to study military operations in order to recommend improvements to senior officers. These scientists worked in teams known as operational research groups with the British services, and as operations research or operations analysis groups in the United States. It was not long before these names (here referred to collectively as OR) began to signify not only scientists’ location within the military hierarchy closer to planning operations than to equipment procurement but also a particular sort of methodology. Identification as an activity allowed OR to escape its original wartime and military contexts and continue to exist until the present by becoming a profession and, according to many of its proponents, a science unto itself” (Thomas, 2007; 251)
conceptualization of both individual and mental processes and collective social organization as manifestations of physical theories of statistical thermodynamics, classical mechanics and information theory” (Mirowski, 1999; 686). One outcome of this synthesis is that problems initially posed by management in a military setting were translated in peacetime into “a mechanistic science of management” (Mirowski, 1999; 686). The aim of this new approach, in the wartime setting and after, was to create a systematic context for linking analytical methods to decision-making. In practice, this was translated into the effort to create a context for linking observation, the organization and allocation of resources, including information, and the ongoing organization of optimal decision-making. The result of which, Murkowski suggests, was a reorganization of science policy, the development of the postwar theory of the organization, and a celebration of the market dynamics as a model of organization.112

111 Thomas observes that it was the resources scientists controlled in the war time setting, included “the design, construction and use of an apparatus; the interpretation of data; and the formulation of theories” (Thomas, 2007; 255) that gave OR activities the quality of being ‘scientific.’ However, in engaging with the war time structure of the military, scientists and mathematicians “became scholars” of the “with the military heuristic practices that were beyond their immediate control,” to learn how field personnel established narratives of operations, how technical experts deployed equipment and interpreted data brought back from the field and…how military executives consolidated this information into an accepted coherent body of knowledge.” (Thomas, 2007; 255) In effect becoming specialists at critiquing military practice such as “identifying topics for scrutiny, designing operational tests, interpreting data, devising useful measures and checking cursory reasoning against statistical argument in order to improve the effectiveness of military operations.” (Thomas, 255; 255)

112 Mirowski traces the diffusion of OR from the dual scientific and military concerns around the organization of decision making, to the centrality of these issues for formal organizations and their management more generally. He notes: “In World War II, physicists and their allies participated in the reorganization of science patronage and management by coming up with a novel theory of organization inspired by physics and (latterly) the development of the computer; later this was imperfectly absorbed and
For the environmental sciences the effects of these ‘cyber-sciences’ is clearly seen in the transformation of the ecology concept after WWII, with the emergence of systems ecology and the “technocratic optimism” (Taylor, 1988; Hagen, 1992) supporting the large-scale interventions in society and the planning strategies necessitating the management of complex systems. Conceptually, this transformation occurred through the proliferation of a set of ‘systems concepts,’ and their application vis-à-vis the ecology metaphor as both a vernacular concept and a technical term of art in the field of biology (Taylor, 1988; Bocking, 1995; MacDonald, 1998). Institutionally, the transition was instantiated through the patterned interactions by which ecological science was applied, and adopted, in the interim war period prior to WWII and then taken up at the end of the war effort. As such, this transformation was sustained by the support of military imperatives and co-developed with the organizational transformation of the conservation movement during the depression (Cloud, 2001; Doel, 2003).

While the U.S. had long-standing and developed natural resource sciences, in the years preceding WWII, the work of these sciences was restructured through a widespread social effort linking the conservation movement to social policy. Although Roosevelt did

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revised by a distinct subset of economists into a variety of the man-machine cyborg celebrating market organization within the neoclassical tradition. Problems initially posed by science management in a military setting were reprocessed into a mechanistic science of management… the characteristic modalities and predispositions of OR were spread via the military throughout science policy and the social sciences and from there to the wider culture of management and government.” (Mirowski, 1999;678) However, he also claims that this diffusion subtly shaped the disciplinary development—in terms of both form and content—of economic thought in the postwar world, arguing that the distinctions between the various schools of OR can be said to align with the distinctiveness of the Chicago school and the Cowles tradition. In effect he argues that the emergence in what comes to be called neoliberal economics is linked to the diffusion, and refinement, of OR in formal organizations, and in the ascendency of neoclassical economics during the postwar period.
not develop a sustained program of federal aid to university research, his efforts during
the Depression to utilize conservation research as a means to promote social welfare
relief promoted an alliance between conservation based social action, the sciences of
natural resource development, and the nascent field of ecology. This latter
accomplishment occurred primarily through the founding of the Civilian Conservation
Corps (CCC) and large-scale regional land planning initiatives, such as the Tennessee
Valley Initiative, and other elements of what came to be called the ‘New Conservation.’
(Maher, 2008, Philips, 2007) The New Conservation was a series of programs that,
starting in the 1920’s, preceded and laid the groundwork for, Roosevelt’s New Deal.
Focused on rural living standards and the redesign of national agricultural and resource
policy, these programs assumed that “regional planning for land and water resources
would alleviate farm poverty, modernize farm areas, and restore the viability of rural
living” to effectively counter the agricultural depression that, at the time, was linked to
unsustainable urbanization processes.

As a continuation of prior conservation movements, the New Conservationists
articulated a vision for systematic regional planning, these programs concentrated on
translating Progressive political ideals into efficient methods and standards linking
production and distribution processes to efficient land use, waste standards, and labor
schemes linking farmer’s living standards to conservation. In addition to its role in the
depression era relief efforts, the CCC was instrumental in the wartime strategy through
forestry work, especially on the Pacific Slope, as related to wartime fire safety strategies,
and through the active and direct training of CCC volunteers for military service.
Additionally, after the war, the CCC volunteers were instrumental in creating the
conditions that supported the postwar environmental movement that largely initiated the distinctive concerns of the ‘environmental era.’

Former Corps members helped to create special interest citizen groups, transforming the conservation movement’s emphasis on efficiency into a concern for “enhancing the quality of life for ordinary Americans” (Maher, 2008; 218), including the conservation of ‘human resources,’ the development of parks for outdoor recreation, and the development of wilderness preservation campaigns. Their influence could also be felt in their diffusion of ecological concepts, greatly influencing the development of land planning and development schemes at the grass roots level. This, in turn, inspired the creation of ‘copy cat’ interest groups working in conservation issues through grassroots effort at the interstices of federal, state and local governance.

It is in this context that, in the early 1960’s, an emphasis on ‘environmental quality’ emerged, largely framed in conservationist terms but with redefined expectations as to the scale and scope of intervention, often pitched at the level of large-scale complex systems. The institutional uniqueness of this moment was defined by two practical developments. First, in that the pre-war conservation programs laid the groundwork for large scale conservation based interventions, the post-war period inherited a horizon of expectation as to what was possible in terms of organization and intervention at the level of investments in and coordination of agricultural policy, resource policy, and regional planning. This type of planning and coordination increased the scale and complexity of intervention into ecological processes, but it also amplified the amount of decisions that must be made and increased the quantity of decision makers. This concern over decision making, its organization and coordination, and the abundance or scarcity of information
available for decision making became a major concern in the post-war period and the transition towards defining the jurisdiction for effective environmental decision making.

Further, the war-time experience with management science, risk assessment and military planning laid the ground work for the application of decision making science and systems engineering to human organization and institutional order. For our purposes we see that the principles of OR were successfully translated into two areas, that of scientific education and the design and organization of ‘research teams’ in the context of ‘Big Science.’\textsuperscript{113} The post-war result of this work was the application of OR based principles to a diversity of organizational settings, and the gradual diversification of the OR research base through innovative work on management interventions, scientific policy, and, more generally, to expectations for institution building in research intensive areas that had previously been targeted for large scale social planning.

This application, I argue, helped to create the new conditions for institution building and, hence, new conditions for institutional agency that were the necessary preconditions for both the surge in institution building in the postwar higher education system, in the transformation of the research economy, and in the emergence of ExKS as

\textsuperscript{113} The importance of the scientific generalist hence held management implications: “The development during World War II of research teams ‘in which members of sufficiently different background and amplitude were added to cover all probable aspects of a given situation’ was an attempt to solve the problem’…But the scientific team must have a coordinator or administrator to unify the group, and this administrator must make the final decisions—decisions that involve consideration drawn from more than one scientific area…a ‘scientific generalist” with a command of advanced statistics was the ideal person to be the supervisor for such teams.’” (609)
durable forms of collective organization. Thus, in this history, we see two streams influencing the emergence of ExKS. The first concerned with the organization of decision making, as represented by the emergence of OR and systems engineering and the second as a feature of conservation science and large scale ecological planning. Both of these streams of influence converge in the 1970’s around a renewed effort to engage in large scale social planning but under the aegis of programmatic research. This convergence was in part the horizon of possibility for Ewald’s ACCESS program, as his early work had focused on large scale ecological planning. However, the opportunity to organize ACCESS was created by his early participation in RANN.

**RANN and the Reconstruction of Basic Research:**

The goal of the basic science model was to support the production of basic research as a resource for both National interests and scientific and technological innovation. As previously discussed the linear model of innovation (Godin, 2006) assumed an institutional pathway leading from basic science, through a design and engineering phase, through phases of manufacture, marketing and sales. Critical studies of innovation have focused on whether or not the linear model in fact existed as a viable historical ideal (Eddgerton, 2004). Others have criticized the model’s goals in favor of more direct application or in favor of alternative arrangements (Stokes, 1997). However, whether or not the linear innovation model was an efficient historical ideal, for our

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114 Fortun and Schweber (1993) argue that this transformation in institutional agency was indeed a wide spread phenomenon that fundamentally transformed the ecology of formal organizations more generally.
purposes, we are interested in how the basic research ideal was institutionalized, and subsequently changed, or transformed through the efforts of institutional actors and institution building.

The nascent basis for the linear model lay with Vannevar Bush’s ‘Science the Endless Frontier,’ and his effort to champion an undirected basic research model as the foundation for a National science policy (Sharpley and Roy, 1985). While Bush maintained that the province of applied research should remain with the Federal Bureaus, he argued that the Federal Government should direct funding toward researchers “free to explore natural phenomenon without regard to possible economic applications” (Bush, 1945). The activities of basic science were thus structured around the free play of free intellects” (Bush, 1945), where basic science is conceptualized as a type of ‘fund’ from which “the practical applications of knowledge must be drawn” (Bush, 1945). Applied Science and Technology—in Federal Bureau research as well as in industry—could then draw on this fund to support technological innovation and social policy. In constructing a roadmap for the support of basic research, Bush sought to wed the team based, exploratory research of the war to directed policy goals.

As aspects of institutional order, the basic science ideal began to shift in two directions in the 1970’s and 1980’s, first through a turn towards targeted social relevance and, second, the redefinition of relevance in terms of technological production and market relevance. As many analysts have observed, “the years 1967 and 1968 marked the high water mark of the post-war investment in R&D in the United States (Brooks, 1994; 23). Up until this point U.S. science policy had been dominated by Cold War spending (Brooks, 1994), and the resulting institutional strategy on the part of Universities was an
expansion of research activities under the mantle of basic research, as well as, in the immediate post-war period, a closer alignment with the post-war research bureaus that emerged as the center of basic research in the immediate aftermath of the war. But, as Brooks notes, “federal support for R&D as a whole and for (mainly) basic research in universities reached a peak in 1967, after which it declined in real terms until about 1976” (Brooks, 1994, 23).

It is in this context that we see in the early 1970’s up until about 1978 the emergence of a science policy emphasis on targeted science funding in domains of national priority. In contrast to the basic science ideal previously outlined, these targets consisted of the pursuit of basic science as directly linked to technological and policy based programs but distinguished from pure mission based science in that funding was allocated on the basis of competitive grant mechanisms. We see this in the organization and development of the RANN program, or Research Applied to National Needs, a short lived program in applied science active between 1971 and 1978, as well as in ASRA, its equally short-lived successor. RANN particularly emphasized the application of social science and was notable in this context for the role that it played in the evolution of ‘targeted’ science policy and for the types of projects it supported. Of particular interest is the effort to replace RANN after its demise. In this sense, we find a new emphasis on sponsored science in support of industrial competitiveness that, after 1978, moved into prominence. In our current climate this is notable for two reasons. First, the emphasis on competitiveness is the basis on which the new widely discussed market-oriented institutional strategies were to be legitimated. Second, it became the genre by which scientific and expert work was to be evaluated in terms of ‘innovation’ rather than in
terms of curiosity driven science. Subsequently, the question of how to capture the benefits of innovation became the central problematic of U.S. science policy in the 1990’s.

RANN emerged as a response to the tumultuous social climate of the late 1960’s, that, when coupled with the stagnant economic climate, provided the context, in the early 1970’s, for an intensified concern over science’s social relevance. Through much of the early 1970’s, this demand for increased relevance was tied to social outcomes, often associated with the lasting purchase of Johnson’s Great Society programs, notably centered on the war on poverty, health, housing, rural development, and the environment. This shift towards social relevance was predicated on two previous postwar shifts. First, in the institutional expansion of higher education, and the expansion of federal funding for research more generally, universities and academic and scientific professionals subsequently expanded their claims to cognitive authority as well as the relevance of knowledge. In this way, the shift towards social relevance became a shift towards the strategic investment in research, framed in terms of social benefit (Belanger, 1998; Brooks, 1994).

Largely as a response to the stagnating economy, this shift in the attitude of policy elites bolstered a new attitude towards the funding of science that sought stricter controls in terms of anticipated outcomes. From about 1967 forward, we see an emerging current of science policy analysts, economists, and industry representatives begin to sound an alarm that the U.S. would soon be facing a loss of competitiveness, in terms of its post-war gains that would challenge U.S. industrial, economic, and scientific supremacy on the world stage. The impetus for this shift occurred on two fronts, both of which centered
on an intensified criticism of the linear model of innovation. On the first front, we find a politically driven effort to restrict research activities in the post-war mission based Bureaus, most notably the Department of Defense (DOD), to projects that had “a direct or apparent relationship to specific military functions or operations” (Brooks, 1994; 24).

The second front, originating from within the DOD by way of a sponsored project, named ‘Project Hindsight,’ suggested, “few ideas originating from basic research had contributed to specific DOD weapons” (Brooks, 1994 21).

The result of these two fronts combined to support a climate of criticism, and critical interpretation, centered on the applied inefficiency of federal support for basic research programming and the research partnerships between Bureaus and Universities. This line of thought critically fractured the Cold War rationale that undirected, curiosity-driven basic science contributed to technological innovation in ways that supported national industrial and military policy objectives. The resulting intervention stemming from this shifting attitude brought about a re-organization of many of the long-term university based DOD programs and their subsequent re-allocation to civilian agencies or university-based centers (Belanger, 1998; Brooks; 1994) Both of these interventions attempted to re-frame federal funding for research in terms of verified outcomes for investment or expenditure.

In this sense the Federal purse strings were tightened just as the remnant of the science build up that accompanied the Sputnik Crisis and the Space program were starting to subside. Shrinking budgets placed pressures on both mission-directed science and universities, both of which placed new pressures on the scientific and engineering labor force. In the absence of clear political or policy-based solutions to perceived social
unrest or economic stagnation, the Nixon administration turned to the possibility of a ‘technological fix’ in the form of a vigorously applied science policy.

Indeed, for our purposes, the origin of interdisciplinary research, at NSF, as a category to be valorized, began with RANN, when in 1968 its charter expanded to include applied research, engineering, and social science. Initiated as ‘Interdisciplinary Research Relevant to Problems of Society,’ the scope of RANN’s early work was an attempt at combining engineering and physical and social sciences around discrete problems, reminiscent of work that occurred during WWII, later to become Operations Research and Systems Engineering. While expansion of the program was broadly resisted by both federal mission researchers as well as by administrators at NSF, the program became a centerpiece of the Nixon administration’s efforts to redesign science policy. Indeed, the program was organized, from the very beginning, almost as a cooperative pipeline between the NSF and mission agencies, as coordinated by Nixon’s science adviser, Edward E. David (Belanger, 1998)

Despite its short-lived run, RANN left a legacy of projects and programs whose influence can still be felt today. Here I emphasize its importance to U.S. science policy in two ways. First, the program helped to support a transition towards new, perhaps stricter, standards of relevance in science funding. We see this in the turn towards competitiveness in the 1980’s as the emphasis that became known, in its most recent form, as the science and social impact assessments (the so-called, ‘Broader Impacts Criterion’, or BIC) that became a constituent feature of NSF funding in the 1990’s. Second, in terms of institutional dynamics, the programs selected by RANN, although eclectic, produced interdisciplinary research that was at once relevant to expert interests,
and, due to the targeted nature of its approach, broadly situated amongst stakeholders and consumers of expert knowledge. For example, the cooperative venture amongst Universities, government, and industry was formalized through RANN support. 115

While the programs subsequently focused on the issue of technology production and transfer, their focus on targeted innovation is clearly evident in RANN programming’s emphasis on policy innovation. The common denominator of both was the focus on the production of innovation processes as targeted interventions.

**ACCESS as Innovation Process**

The design phase of the ACCESS program began between 1972 and 1973, and, during this phase of the process, Ewald and his team researched regional resources. Although he had begun to formulate the project with Santa Barbara in mind in 1972, it wasn’t until February of 1973 that he began to flesh out the details of the project via a reconnaissance trip to the area. His visit was announced by the Santa Barbara News-Press, along with a statement, formulated by Ewald and approved by the NSF, of the ACCESS project’s stated intentions. During this trip, Ewald organized several meetings

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115 Similarly, the Small Business Innovation Research Program (SBIR) innovated with RANN, as did much of the early programs that proposed to systematically link the utilization of science and technology as a resource for use by State and local government in policy and program development. Many of its programs targeted policy areas for focused review, developing systematic research programs around policy and decision-making. The institutional results of these programs were later relocated to form the basis for research programs at the Federal Bureaus. Green and Lepowski (2006) notes that RANN’s fire research programs were moved from RANN to form the basis for fire research at the National Institute of Standards; solar energy research at RANN provided the basis for renewable energy programs of the Department of Energy, and its environmental programs in trace contaminants were moved from RANN to the Environmental Protection Agency.
for the “interested public” in order to establish with the Santa Barbara community that Ewald sought an “open dialogue with the community” which, although they in fact occurred in cooperation with existing institutions, was presented as functionally separate. Ewald notes: “It was most important to establish the objectives of the proposed pilot process that sponsorship comes from outside Santa Barbara and from such a source as NSF.”

In addition to these informative meetings, several luncheons were organized, with “24 leaders of Women’s Organizations,” and Ewald arranged for a “three hour survey of the area by plane with two especially knowledgeable guides, a reporter from the Santa Barbara News-Press and a geologist from UCSB.” Additionally, over the course of the trip, several more informative meetings with local reporters were organized, and Ewald delivered a letter to County Supervisor Catering requesting that the Supervisors “consider a resolution supporting the proposed policy process.”

Another purpose of the Ewald’s first January venture was to evaluate the conditions for regional support by way of technical capacity and available expertise. During the reconnaissance, Ewald notes the usefulness and importance of two local colleges, Westmont College, and Santa Barbara City College, “with its Continuing Education Division,” as well as the Brooks Institute for Photography. But he concedes: “the basic, large educational plant in the area is the University of California at Santa


On this point, Ewald observed that Professor Roderick Nash, “co-chairman of its interdisciplinary Environmental Studies program,” was enthusiastic about the proposal. Ewald describes the program as comprised of “geologists, biologists, an energy economist and political scientists.” In addition, he suggests that Robert V. Noel, “who has attained national attention in his field for simulation and games,” was interested in taking part in ACCESS, as well as George D’Aignault, head of UCSB Extension Services. Ewald further notes that UCSB has generous computer capability, that it is, “connected to the ARPA network,” and that “the Kuller-Fried Keyboard for graphic simulation,” which is used around the country,” was designed at UCSB, a fact that he mentions with approval, to give an indication of the school’s capabilities.

In Santa Barbara proper, Ewald indicates the presence of “The Center for the Study of Democratic Institutions,” which he describes as “holding a long range view and an experience with dialogue,” a quality that he takes to be an asset to the ACCESS pilot process. To this, he add that GE Tempo, and General Research Corporations both have policy development capabilities. Additionally, the “Ecology Development Systems, Inc,” which he describes as a newcomer to Santa Barbara but with “environmental data bank capabilities stemming from the environmental program at the University of Wisconsin,”

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as well as “other consultants concerned with environment and policy” who are actively working in the Santa Barbara region impresses Ewald\textsuperscript{119}.

Finally, in terms of regional assessment, he notes that in the broader region, the NSF has sponsored facilities at UC San Diego and Davis in computer generated graphics and regional modeling. In Santa Monica, two hours from Santa Barbara, Ewald describes a visit with RAND political scientist, Paul Hammond, with whom he sees “potential for collaboration.” Additionally, he notes that in San Diego he visits the “Integrated Regional Environmental Management (IREM)” project which has “Ford and Environmental Protection (EPA) money,” and which is “working to improve county government decision making concerned with the physical environment.”\textsuperscript{120}

When Ewald returns to D.C., at the end of that January, he sets up Pearl Chase as a local liaison for the project in the office of Plants and Planning. Chase, he reasons, will provide a local face for the project without compromising Ewald’s objectivity, and it seems vital to him “that the community know that nothing is being forced upon them.”\textsuperscript{121}

By March, the County Supervisors had voted 0-5 in support of the project. A newspaper article from March 28, 1973 accounted the vote and described the project as

\textsuperscript{119} “ACCESS: The Santa Barbara Regional Pilot Process,” July 27, 1973. ACCESS Collection, Box 1:2. SBHC Mss 29. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

\textsuperscript{120} “ACCESS: The Santa Barbara Regional Pilot Process,” July 27, 1973. ACCESS Collection, Box 1:2. SBHC Mss 29. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

\textsuperscript{121} “ACCESS: The Santa Barbara Regional Pilot Process,” July 27, 1973. ACCESS Collection, Box 1:2. SBHC Mss 29. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
“a pilot program to create an ecological research institute in Santa Barbara.” Supervisor Catterlin is credited with the opinion that “ACCESS could provide information to the county, cities and regional boards involved in environmental decision.” To this it adds, citing an NSF report describing the proposal, “While leaving decisions where they are now, the project would develop a process to improve those decisions concerning the conservation and development of the region’s environment.”

In April, Ewald returned to Santa Barbara with Robert W. Lampson, Ewald describes this trip as “an opportunity for Santa Barbarans to learn about the National Science Foundation and its interest in the proposal.” He note: “Robert Lamson met with upwards to 100 people, many of them not the same as those the principal investigator had discussions with in February.”

An article from the Santa Barbra News-Press describes the meeting, characterizing ACCESS as a program involving community important, “computerized environmental data collection system, design for broad dissemination of information, and accessibility to that system or decision makers in area planning and development.”


During this period Pearl Chase arranged for public meetings at the News press conference room, the Louise Lowry Davis Center, and Café Gourmet, where Lamson and Ewald took community questions. Lamson stressed the need for community participation, stressing, “I would expect that groups represented around the table would participate in creating prototype projects.”\(^{125}\)

From these meetings, several salient issues arose, the price tag of the project and its proposed benefit for the region. “What can we expect from a process of this kind?” To which Lamson replied: “at minimum, a report.” A News-Press article substitutes further possible outcomes which were floated at the meetings: “the beginnings of a data bank in computer or file cabinet; some statement of further problems and alternatives; input with high credibility to diverse or opposing functions and that interaction that is the tyranny of consensus.”\(^{126}\)

Likewise, another salient issue was announced during this information session: although the project called for a $30,000 grant from NSF, Ewald also required $10,000 from the greater Santa Barbara Community. He stated that this was a requirement to demonstrate community participation.\(^{127}\)


Other concerns arose around the project’s reliance on technology. Another, more cogent concern, expressed by Douglas Wilse, City Director of Parks and Recreation, provides a striking snapshot of the state of environmental expertise at that time. Wilse observes there is a tendency “at the regional government level” to ignore studies “which has no enforcement powers.” He questions whether the ACCESS process would even produce actionable data. Lamson is quoted as saying in response, “the project does not usurp “operational implementation.” Nash qualifies the matter further, and the article attributes to him the opinion that “the project would result in data so intensive, decision makers “would ignore it at their own peril.”

Ewald returned to Santa Barbara from May 20-June 27 of 1973, setting up office at the historic Lugo Adobe, on East De la Guerra St., in Santa Barbara, choosing the site as a means to “underline the independence of the NSF investigator.” Additionally, he enrolled the American Society of Landscape Architects as a ‘go-to’ agency to manage NSF fund and the matching donations the project hoped to collect from the community. This was meant to be a short trip, to further rally support for the project, but Ewald notes: “more time was needed to explain the proposal and to actively seek full endowment and specific financial commitments of support.”

In meetings throughout the month of May, Ewald further detailed the benefits of participation in ACCESS. In response to community request for more, specific,

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129 Design Phase - Report to the South Coast Region,” Nov. 1974. ACCESS Collection, Box 1:8. SBHC Mss 29. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
information, Ewald provided a preliminary report to the region, including a nineteen-page draft distributed through the Citizens Planning Association, where he outlined four basic components of ACCESS. In the report, he characterized ACCESS as a process which is first, “regional in scope;” and focused on the “regional policy maker (official and unofficial);” third, comprised of a “non-profit citizen sector supported by government, foundations, business (including utilities) and higher education,” and, which makes “full use of computer assisted graphics and two way television and dialog” Further, Ewald suggest that Santa Barbara has a long “tradition” of environmental engagement, noting, “exceptionally competent effects have been supported by Santa Barbarans to plan and defend their environment, especially in comparison to other places.” However, Ewald notes the decision making processes in the region are not yet “scientifically oriented, truly accessible, co-coordinated or prepared to deal with long range consequences of our fast changing technological age.”

Although the newspaper articles from that period note a degree of local objection, the project received an outpouring of support in June, and Ewald continued on with his stay for the purpose of fund raising. An “ad-hoc liaison committee” was established to more aggressively coordinate the solicitation of funds. Headed by Pearl Chase, who Ewald describes in her conduct as a “character witness for the project,” the committee managed to garner the first financial contribution from Goleta Water District, and

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**130** Design Phase - Report to the South Coast Region,” Nov. 1974. ACCESS Collection, Box 1:8. SBHC Mss 29. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

additional endorsements and promises of financial support soon followed. By June 17, 1973, Paul E. Barker, U.S. Forest Service Official commended the project, and in his approval, notes: “It ties in closely with the direction Los Padres Forest is moving in long-range land use planning.” Similarly, John W. Snyder, Vice Chancellor of UCSB wrote a letter of support, and many faculty and students from the campus pledged continuing support.132

By January 14 of 1974, Ewald had received all of the matching funds from local contributions, the financial support from the NSF, and approval to begin the design phase of the process. The funding consisted of $30,000 from the NSF, and $10,000 from Santa Barbara donors but enabled an organization that coordinated the activities of 37 regional sponsors, 100 regional members of professional, academic, and civic note, organized into six study groups, a 29 person advisory board and a 9 person executive committee, 6 professional paid consultants, and many volunteer consultants culled from throughout Southern California. The study was announced in Santa Barbara, where staff hiring began in February of that year, and, by May 2nd, ACCESS held its first “citizen organization meeting.” In May 15, outside consultants were commissioned to participate in the ACCESS process. In addition and six study groups were organized to engage intensively with 6 areas:

1. Data and information resources;
2. Research resources;
3. Relationships to general planning;
4. Organization;
5. Broadcast and Cable TV; and

The goal of these groups, in cooperation with contracted consultants, was to look in depth at the issue of coordination. To give an example from the Data and Resources study group, it was decided that the purview of the group should not be to collect regional information, but rather, to “gain familiarity with regional information sources,” a process which entails learning “where information exists and how that information can be obtained on economic, physical, social, cultural, and other aspects of the South Coast Region.” This approach was designed to compensate for the fact that although there is a plethora of existing information, it poses inherent limitations as “data typically are collected at a particular time, or for a single purpose, or are known only to those who assembled the data at that time or for that purpose, or are in a form that discourages use for other purposes, or on a continuing basis.” To correct this, the ACCESS groups were organized to develop ways of making information “malleable, available to a variety of users, especially policy makers, suitable for different purposes, and relatable to other information.” Special attention was placed on how information “should be collected, compiled, made accessible, as well as what the costs for these operations would be.” For

133 Design Phase - Report to the South Coast Region,” Nov. 1974. ACCESS Collection, Box 1:8. SBHC Mss 29. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

134 Design Phase - Report to the South Coast Region,” Nov. 1974. ACCESS Collection, Box 1:8. SBHC Mss 29. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

135 Design Phase - Report to the South Coast Region,” Nov. 1974. ACCESS Collection, Box 1:8. SBHC Mss 29. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
example, Dean Robert M. Hayes, from UCLA’s School of library science was contacted to provide an analysis of “basic information needs for regional planning and policy making” and a test demonstration was made to “survey one source for a sample class of information,” namely “data relevant to Los Padres National Forest planning.”

This process was similar for all the study groups. For example, the organization group assessed public and private organizations as sources of information, and the “Research Resources,” group examined available resources for research, broadly construed, and how they might be productively organized. In this sense, the approach was couched within a larger goal of identifying and ‘converting’ regional variation from a “regional characteristic to a regional resource,” and to thus increase the “value of ACCESS as a prototype for other regions.”

One intensive area of overlap amongst these groups consisted of the judicious exploration of the available contemporary technologies which included: “maps and physical models; aerial photography and satellite imagery; gaming and simulation; computer modeling—involving the use of interactive computer graphics; citizen polling and feedback systems and broadcast cable television.” (65) Indeed a central component of the project was the construction of the ‘regional situation room,’ (established at historic Lugo Adobe, built in 1840) a technological command center, modeled after NASA, that served as a hub for a region-wide system for graphic telecommunications using coaxial television and regional polling. The goal of the situation room was to serve as an arena of synthesis whereby policy makers and citizens could interact and explore

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136 Design Phase - Report to the South Coast Region,” Nov. 1974. ACCESS Collection, Box 1:8. SBHC Mss 29. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
the complex interdependencies of environmental changes and environmental policy-making. Indeed, Ewald notes that the use of technology to develop ‘graphic literacy’ is “at the core of the ACCESS exploration,” noting that the design process is best concerned with creating “a new competence to deal with the complexities of regional policy making (including related self education, technological assessment, technology transfer, futures research, and research utilization)” (Ewald, 9). Although the role of new technology was emphasized throughout the ACCESS project, Ewald was, in effect, creating a giant database by which modeling and decision making could occur in real time, including procedures for citizen feedback and education. In keeping with this logistical task, emphasis was placed on organizing resources, as a constituent part of the process, rather than on the collection of information per se.

In June, NSF began a series of site visits, and, by July, the NSF project evaluation had begun in earnest. That July, Ewald notes the Santa Barbara city council withdrew its support but not its financial support. In August, the project had selected a range of issues and methods for “one year pilot tests.” In August, the Advisory Board for the ACCESS project was formed, and that October, at its first meeting, the executive committee was announced. In December, Ewald submits a report of the design phase to the South Coast Region and to the National Science Foundation.137

The results of this project were mixed. At minimum, ACCESS resulted in two identifiable outcomes: a. first, a series of reports to the NSF, one of which became a major policy proposal entitled ‘Information, Perception, and Regional Policy.’ The

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137 Design Phase - Report to the South Coast Region,” Nov. 1974. ACCESS Collection, Box 1:8. SBHC Mss 29. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
second result was a series of reports entitled “Geo-coding Data for Display and Policy Analysis,” which had some degree of dissemination in policy and planning communities in the 1980’s. In this respect ACCESS was something of a productive failure, specifically organized as a replicable process, the results of which may or may not be adopted as a model by subsequent researchers.

Project emphasis was not on producing durable outcomes. Rather priority was assigned to the design of an evaluation system and to create organizational benchmarks for evaluation. The bulk of Ewald’s effort was to organize people into a coherent network of supporters, in a flexible if not temporary fashion, to evaluate the resources of the region and to test how those resources might be re-organized during the pilot phase and in an ongoing manner to meet the goals of subsequent planning processes as coordinated by ACCESS. The resultant organizational structure, on which so much emphasis was placed, was largely absorbed by the University of California at Santa Barbara, in partnership with “Community Arts Association” one of Santa Barbara’s oldest non-profit citizen’s organizations (incorporated in 1923). And yet, when I was conducting fieldwork in 2007, there was no sign of ACCESS, and very few that I spoke with even knew about its existence. However the ACCESS campaign features prominently in the archival record of UCSB and Santa Barbara environmental planning. So what happened to ACCESS?

**Institutional Publics**

I find the ACCESS case, and cases like it, to be endlessly instructive because it so neatly demonstrates some of the dilemmas of examining the institutional geography of expertise—particularly the role of institutional actors in shaping institutional ecologies.
and the dynamics of institution building. It not only demonstrates how expert projects are arrayed among a variety of institutional actors and organizations but highlights how the institutional interests and collective memory of environmental expertise is not only discontinuous but potentially distributed at institutional scale across multiple institutions.

For example, if we look at the coalition that was formed in support of the ACCESS program—what I have refer to as its ‘institutional public’---we see that Ewald was able to solicit sponsorship from 27 regional funders, in addition to NSF support and 11 ‘endorsers.’ These sponsors consisted of:

The National Science Foundation,  
The Carpentaria City Council,  
Goleta County Water District,  
Santa Barbara City Council (financial support only)  
Santa Barbara County Board of Supervisors,  
Santa Barbara County School District,  
American Society of Landscape Architects, Southern California Chapter,  
Bank of America,  
Building Industry Association,  
George B. Canaletto,  
Pearl Chase,  
Citizens Planning Association,  
Mr. and Mr. James Forsythe,  
Friends of Santa Barbara County,  
Edwin J. Heimlich,  
Isla Vista Community Council,  
Anna Laura Myer,  
Leinie Nagel,  
Real Estate Board of Santa Barbara,  
Santa Barbara Beautiful,  
Charles K. Schmandt, Architect,  
Alice Sedgwick,  
Southern California Edison Company,  
Katherine W. Tremaine,  
And Warner and Gray, Inc. Architects.  

138 “ACCESS: Alternative Comprehensive Community Environmental Study System.” May, 1976. ACCESS Collection, Box 1:15. SBHC Mss 29. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
By contrast, endorsers included: The American Institute of Architects, The Annul
Company, Anthropological Research Company, General Electric, Goleta Valley Citizens
Planning Association, League of Women Voters, Los Padres National Forest, Sierra Club,
Universal Heritage Investment Corporation, University of California, Santa Barbara.\textsuperscript{139}

This coalition constitutes an important subsection of what was, for the time, the
Santa Barbara elite and their prominent organizations, as held together by a number of
themes—or genres of relevance--that tied ACCESS to various regional interests.
Throughout the project, Ewald was highly concerned with creating regional ‘buy-in’ so
that the process would generate credibility, ongoing, through local organization and
engagement. In doing so, he solicited support, in effect creating a regionally defined
public that found his vision of expertise and regional relevance, a compelling, innovative
vision of institution building.

For example, his reconnaissance visit in 1973 was announced by the Santa
Barbara News-Press, along with a statement, approved by the NSF, of the ACCESS
project’s stated intentions, framed in terms of regional benefit.\textsuperscript{140} In meeting with
community leaders Ewald carefully defined the ACCESS program, as an institutional
project, in terms of the regional relevance and concerns, but tied this to the potential
benefit the process would hold for organizations. And in meetings throughout the

\textsuperscript{139} "ACCESS: Alternative Comprehensive Community Environmental Study System.”
May, 1976. ACCESS Collection, Box 1:15. SBHC Mss 29. Department of Special
Collections, Davidson Library, University of California, Santa Barbara.

\textsuperscript{140} "Consultant to Begin working on South Coast Planning Unit.” Santa Barbara News
Press, June 29, 1973. ACCESS Collection, Box 1:29. SBHC Mss 29. Department of Special
Collections, Davidson Library, University of California, Santa Barbara.
reconnaissance and design phase, Ewald detailed the benefits of participation in ACCESS to suggest that, while Santa Barbara has a long “tradition” of environmental engagement, it has yet to develop institutions built around scientific management. He notes, for example, the “exceptionally competent effects have been supported by Santa Barbarans to plan and defend their environment, especially in comparison to other places.” However he also notes that the decision making processes in the region are not yet “scientifically oriented, truly accessible, co-coordinated or prepared to deal with long range consequences of our fast changing technological age.”

This narrative intertwines community decision-making processes with the issue of the distribution of expertise as an issue for institution building. And to some extent the presentation of this narrative was successful. One article from the Santa Barbara News Press describes the benefit of the project as amounting to a storehouse of “computer stored data that could be of immeasurable value to the men and women who make planning judgments” We see enthusiasm as well for this approach in many of the reports from the committees, where committee members enthusiastically enumerate the available resources as comprised of “human resources, including high-level professional expertise, and secondly expertise associated with personal skills, talents, interests, and action.” Also of interest to the committee were “meeting places with community and neighborhood identification,” especially those that could serve as public forums. They

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142 Consultant to Begin working on South Coast Planning Unit.” Santa Barbara News Press, June 29, 1973. ACCESS Collection, Box 1:29. SBHC Mss 29. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
make special mention of the desirability of “advanced communication technology facilities,” and also survey “research organizations, public and private, engaged in both fundamental and applied research.” Both narratives are indicative of the widespread support for scientific planning and the power of this genre of relevance for framing environmental matters.

Additionally, an editorial from Julius Holder, member of the American Institute of Planners, and a San Diego-based environmental consultant described ACCESS as “a vehicle for a community educational process,” and, hence, the benefit of ACCESS is the project’s aim of serving as a “community wide civic education and enlightenment” process, and one benefit deriving from this would be to improve the quality of life for the region’s inhabitants. To this notion, he adds: “A true concern for environmental quality necessitates a concern [for] improving the quality of human behavior in relation to the environment.” A concern of this type, he suggests, “Now, more than ever,” must be “focused on the quality of human behavior for such is reflected in the human environment.” As a process, then, the potential for projects like ACCESS, lay in our ability to analyze and change human behavior. The editorial ends by way of a very specific moral injunction for change: “When we live in close proximity to each other in light of mounting increases in world population, native intelligence informs us that correction of our failure becomes mandatory, and that we redirect our efforts and energies

143 Consultant to Begin working on South Coast Planning Unit.” Santa Barbara News Press, June 29, 1973. ACCESS Collection, Box 1:29. SBHC Mss 29. Department of Special Collections, Davidson Library, University of California, Santa Barbara.  
so that neighbor helps neighbor.” Here, behavior is parsed in decidedly institutional terms, with enthusiasm.

However despite this support, the ACCESS program was short lived, and in many respects a failure. As I mentioned above, by the time that I had arrived at UCSB in 2007 very few of my interview participants had heard of the project, or if its organization or scope. This begs the question: What happened to ACCESS? And really, there are several questions here. First, did ACCESS fail, and if so why? Second, why was it not remembered? In concluding I take up both questions relative to larger issues of institutional forgetting, and institutional innovation that I have explored throughout this chapter.

If we are to judge the programs success and failure, I propose that there are two criteria for evaluation: first, the question of political cohesiveness, and, second, the issue of technological relevance. In terms of community support, part of the problem that ACCESS faced, stemmed from the experimental nature of the project. For the Santa Barbara community members who took interest in the project, aspects of the proposal, in terms of actual organization and expected benefit, seemed exceedingly vague.

Furthermore, much of the favorable discussion of the project stemmed from its experimental nature and its effort at large-scale data compilation. But, as we have seen from the records of public commentary, particularly the contrasting comments from Nash and Wilse, the value of these features were judged relative to the projects ability to link this data with action. In this sense, Wilse’s suggestion that the data would be too large to

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help with decision making, and Nash’s suggestion that the breadth of the ACCESS data would be too large to ignore indicate, I feel, an important fault line in the reception Ewald’s vision. That is, although many found compelling the argument that decision-making should be institutionally linked to expertise, how these institutions should be situated to act—the variety of institutional action—was being debated through the idiom of expertise. This was a clash of credibility or cognitive authority rather than a substantive clash of values or priorities.

In a sense ACCESS could not speak to the problems of who acts as decision maker—policy elites, or a more distributed public voice—but only addressed the issue of how decision making and expertise might be linked in the widest possible way. So, in a sense, ACCESS failed not for lack of interest, but it is rather a victim of a secondary debate about the democratic role of expertise and the use of data. That is it adopted a technocratic stance in relation to what is a political question -- who has the authority to act on the basis of expertise. In effect, this is the larger question to be inferred from the cognitive authority of environmental expertise, framed in terms decision making.

This brings me to the second issue, that of technological relevance. In considering the efficacy of the ACCESS program it is important to situate the program within the context of the information revolution that began to take shape in the late 1970’s through the 1990’s, with the expansion of personal computing, and the explosion of the Internet. Although the ACCESS program proposed to utilize the most advanced technology of the time, many of the technologies it championed would soon be bypassed vis a vis the explosion of computer-based graphics and the diffusion of information processing.
In this respect, it would be easy to view the project simply as an early, or perhaps defunct, effort to develop an Environmental Information System, whose failure results from a question of timing, as the designers simply didn’t possess the advances enabled by solid-state electronics, or the computer platforms that established the types of monitoring developed in the 1990s. Or perhaps, the project was ahead of its time and was simply out of sync with its socio-technical *zeitgeist*. I feel, however, that these are mistaken assumptions. Consider that in a later review of the project, Ewald notes that work during the design and organizational phase resulted in resource reports that were “necessarily incomplete.” “Necessarily,” he suggests “both because of the limited time and staff available and, more important, because planning is a continuously evolving activity.”

To this I would add, so is organizational coordination, and ‘institution building,” two themes which were at issue in this process. And, in conclusion, I argue that Ewald’s process is best understood as one designed to be absorbed within other institutional projects, and to a large part it effectively was, and in that process it has been subsequently forgotten. The implication being that we reframe our approach to ACCESS and reconsider the issue of failure from the perspective of institutional innovation.

Here I situate ACCESS in reference to the case with which I began this chapter, the ES Research Center at WSU. Although ACCESS, as an interesting moment in the history of UCSB, fascinated me while I was in residence in Santa Barbara, as a case study, my understanding of this program was largely hampered by a sense that it was somehow incomplete or unstable. However, while in residence conducting archival research at

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146 ACCESS Collection. SBHC Mss 29. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
WSU, and with the discovery of the ES Research Center, I realized that the uniqueness of
the ACCESS program lay precisely with its instability or incompleteness—and, for the
purposes of this dissertation, how this instability was directly recognized by the designers
as a valued feature of institution building.

The dynamic at work in these examples—the phantom research center and
ACCESS—is one that we see over and over again in the institutional records of the
University, namely, the development of an institutional project, its organization, and
eventual decline. Often times we find that the institutional project is simply renamed, or
experiences a change in mission, or scope of activity, and that it is simply bundled into
other programs or institutes. At other times it simply lingers, symbolically, as a
placeholder for other forms of co-activity to emerge. However, rather than treat this
dynamic as an anomaly, or simply as an artifact of the archive, I think it is important to
understand how this dynamic works in the context of institution building and how we
narrate its history.

Ewald’s project provides important clues for understanding this dynamic. More
often than not, in terms of institutional order, the decline of one institutional project is
productively translated into the institution building dynamics of another institutional
project. Indeed, we see conscious acknowledgment in Ewald’s dry, almost lackadaisical
observation:

New Organizations form, sometimes quite suddenly; old ones disappear or change
their institutional status, perhaps becoming part of other operations. For example,
at this writing, the future of the Ad Hoc Committee on Water Supply appears to
be uncertain. The committee has delivered its major report, evidently it now
may—or may not—become a standing subcommittee of the Cachuma Conservation Release Board.”

When we consider the fate of these organizational forms as embodied in institutional publics, we find a telling insight into the manner in which the process of institutionalization is both a feature of durability, as well as a dynamic component of institutional change.

We see in this case two important elements that, as we will see in the next section, will become further refined as the environmental sciences are institutionalized. First, the importance institutional actors in the production of environmental expertise, not simply as producers of knowledge, but as institutional agents concerned with institution building per se. Second, the importance attributed to institution building as a constituent feature of knowledge production, where the goal is the systematic linking of knowledge to decision making.

In terms of the larger aims of this study, this contrast is important because it brings into relief two dimensions of the ACCESS project and its moment in the history of expert institution building. First, like other RANN programs, ACCESS was premised on the notion of assembling the elements of decision-making into tangible institutionalized systems. Although, as we have seen, this is a common strategy of the cooperative research model and with extension based programming, ACCESS was unique for its time in the systematic way it sought to link a great variety of expertise together as a type of knowledge or information management system rather than simply as a knowledge

\[^{147}\text{ACCESS Formative Evaluation, Oct. 1978. ACCESS Collection, Box 1:21. SBHC Mss 29. Department of Special Collections, Davidson Library, University of California, Santa Barbara.}\]
delivery strategy. Additionally, as a precedent, we see this imperative later employed as an institutional strategy in the subsequent organization of ‘innovation partnerships’ that emerged in the 1980’s first with the development of Engineering extension, and later through the auspices of academic start-ups, and I/UCRCs, or ‘Industry/University Cooperative Research Centers. This feature is important, as its institutionalization becomes a crucial feature of environmental expertise at all three university case studies reviewed in this dissertation.

In a second sense, by highlighting this emphasis on institution building, ACCESS is important for the manner in which it helps us to re-specify many contemporary strategies of environmental expertise. Here I take up the issue of technological relevance to reframe the question of ACCESS, and the question of whether or not ACCESS should be considered as an early, although failed, environmental information system. I argue that Ewald foreshadowed two contemporary movements in the environmental sciences: the concern with ‘big data’ and the turn towards integrative ‘data relationalities.’

First, the concern with ‘big data,’ or the development of large-scale data sets on the environment. These data sets cover long-term observation of ecological, geological and atmospheric change, as well as real time access to environmental monitoring etc. They can be utilized to establish baselines for observation and policy planning but also to propose new questions or hypothesis for modeling and simulation. Second, ACCESS foreshadowed what are referred to as new ‘data relationalities,’ defined as the incorporation of aggregation, modeling, and visualization technologies to make sense of the complex and heterogeneous data sets increasingly utilized in environmental governance. Here the production of data sets and modeling has become increasingly
important to the production of policy, and the work of social movement and state actors at multiple levels of governance (Abbey, Jalbert and Lyons, 2014). New data relationalities dovetail with the issue of big data particularly around the large-scale coordinated production of citizen science, ‘crowd sourced’ or user-contributed data.

In both cases, we find an increasing turn, since the late 1980’s, towards the important role of information in the organization of environmental expertise. As Fortun (1980) notes, information technology has increasingly played a significant role in shaping environmental governance, the perception of environmental problems, and ultimately addressed, where this so called ‘informating’ of the environmental field (Fortun, 1980) has resulted in changes in the way knowledge is both produced and consumed. She notes that “during the 1980’s, information processing and sharing capabilities grew dramatically, as did information culture, understood here to revolve around the belief that more information circulated among more actors will stimulate solutions to complex social problems.” (Fortun, 1980; 286) This insight is further qualified:

Information strategies were not new in the 1980s, even within the environmental domain. The 1970 National Environmental Policy Act, for example, led to the publication of annual reports on the environment for the president and Congress and mandated that all federal agencies publish Environmental Impact Statements before starting new projects. Belief in such strategies accelerated in the 1980s as the information era became a public phenomenon. (Fortun, 1980; 286).

I note two additional observations to this point. First, the broad framework for this emphasis on information was premised, as I have thus far demonstrated, on the importance of connecting environmental expertise to decision-making processes. And second, it is in the 1980’s and 1990’s that we increasingly see that this emphasis on information and decision-making is progressively framed in terms of technology. Indeed,
as we will see in later chapters, this was central to changes in environmental programming at many of the cases examined in this study. For example, at UCSB, the founding of the Bren School for the Environment was framed explicitly in terms of the horizon of possibility enabled by information technology:

In 1991, the Regents of the University of California gave their approval to establish the School of Environmental Science & Management at UC Santa Barbara. Plans for a new building to house the school were begun a year later. The time was right. Growing world population and rising standards of living were placing ever-increasing demands on Earth’s limited resources and unprecedented strains on its natural systems. Meanwhile, extraordinary technological advances — from increasingly powerful computers to advanced communication networks and remote satellite sensing capabilities — had led to breakthroughs in mapping and monitoring the planet’s snow cover, forests, oceans, and atmosphere… Information resulting from these transformational technologies led to a deeper understanding of the environment as a series of interdependent systems and underscored the intricate links between the status of human systems and the state of the natural world. 148

On this account, the technological infrastructure enabled by this integrated perspective on the ‘environment’ is what subsequently created the demand for “a new kind of ‘solution-oriented environmental professional.” 149

In that ACCESS was an environmental information system, it concerned itself with the availability of environmental data and its organization. In this sense it is a clear example of an early ExKS in the environmental field. And in so far as ACCESS aimed to link various policy constituencies to the knowledge production process it aimed to organize distributed actors as sources of information, as well as participants in decision-


making processes. But, beneath its emphasis on technology and data, we find a concern with institutional coordination, perhaps continued in the contemporary preoccupation with new ‘data-relationalities.’ (Jalbert and Bigras, 2013) In this sense, ACCESS, I believe was something of a harbinger of things to come in three ways: First, ACCESS emphasized the use of technology to produce large data sets for the purposes of planning and decision-making. Second, ACCESS prioritized understanding the location of information, highlighting the distributed nature of both environmental monitoring, and environmental decision-making. With both of these features we find contemporary parallels, particularly in the contemporary literature on distributed assessment systems (Cash, 2000) and adaptive management (Folke, 2005).

However it is the role of ACCESS as institutional process that is crucial for our discussion of cognitive accumulation. Although Ewald hoped to create a system to support environmental monitoring, his real genius lie with the organization of his ‘institutional publics’—that is the combination of investors, supporters, employee agents, consultant agents, contractors, and civil advocates—unified around the support of these institutional arrangements for the practical purposes of monitoring. His aim was to construct a durable institutional arrangement that both elicited information and conveyed or transmitted knowledge in real time as part of what we would now call ‘adaptive environmental management,’ or ‘integrated environmental management,’ scaled at the county level. Today we see this as a goal in the cutting edge of environmental management research—a feature of cutting edge ExKS-- that seeks to develop responsive
modeling in the context of real world problem solving. But in contrast to contemporary preoccupations, Ewald’s concerns were not focused on the creation of a ‘stakeholder’ population or the establishment of a stable boundary organization. And, whereas contemporary experts utilize computer models and email or text messages to create this type of integrated, adaptive network, Ewald utilized two-way television, study groups, and physical models in the hopes of producing similar results.

But, I would argue that the similarities don’t in fact end there. The novelty—and the importance for our purposes—was how Ewald utilized these technologies to speak to an institutional problematic. Rather, I would suggest, we take Ewald at his word when he characterizes ACCESS as a process. ACCESS was in many ways a failure but one whose experimental nature as an institutional process holds important precedents for understanding how the institutionalization of cognitive authority occurs through shifting efforts to articulate and organize valid institutional collectivities. In this case, the novelty of Ewald’s approach was not to found an institution per se but rather to institute a form of institutional agency specifically predicated on the malleable collection of environmental information. In this sense, the goal of the ACCESS program was to create responsive institutional agents to do the work of linking expertise with its use in situated action. The nonprofit organization, and all of the stages of the process, were designed to create the conditions for producing an institutional public as a means of managing that institutional innovation. The explicit goal of ACCESS was a form of managed cognitive accumulation---or the effort to institutionalize a particular claim to cognitive authority for

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150 Consider the INNATE program in chapter 2, or See for example Chapter 4, and the example of the BioEarth program at WSU.
the purposes of instituting innovation processes rather than the institutionalization of an organization per se.
Section Two: The Dynamics of Cognitive Accumulation in the Environmental Sciences
Chapter 4: Washington State: Creating a Science of the Environment, 1967-2010

In the 1990’s currents in science policy re-specified the relationship between science policy and basic research by emphasizing a new definition of the utility of expertise and accentuating the increasing turn towards the relevance of basic science throughout the late 1970’s and 1980’s. As Berman notes, in this transition we see a transition away from the role of basic science as a resource and the university as a type of productive reservoir, or ‘resource hub,’ to the notion that universities act as a type of engine for scientific innovation. We see this dynamic clearly in the emergence of the academic startup (Rabinow, 1997) and the turn towards academic patenting (Berman, 2012). However, while we may identify these features as salient aspects of institutional change, it is important to disaggregate their influence and scope. For our purposes, this must be balanced against a co-extensive concern with the utility of knowledge in general and not simply the generation of new knowledge per se. A subtle shift, but an important one, as it undergirds much of the institution-building, from the late eighties on, particularly for those areas of university research where the imperative towards patenting or remuneration is less salient.

Whereas ‘Science the Endless Frontier’ focused on the creation of institutional arrangements linking undirected basic research to national or social benefit, ‘Science in the National Interest’ explored the notion of science as an ‘endless resource,’ reframing this relationship in terms of expertise more generally. Rather than the production of knowledge, basic or applied, this shift frames expertise as a resource in a broad ecology of knowledge and not simply as a component in a technological innovation process. The authors of Science in the National Interest note:
…. We must emphasize that science advances national interest and improves our quality of life only as a part of a larger enterprise. Today’s science and technology enterprise is more like an ecosystem than a production line. Fundamental science and technological advances are independent, and the steps from fundamental science to the marketplace or clinic require healthy institutions and entrepreneurial spirit across society. Many of these institutions need attention. Nevertheless, we cannot afford to lose sight of the importance of scientific research and education for sustained progress in the modern world (1993)

As Brooks notes, the standard here is not simply the new production of knowledge but rather “that the ability to integrate new knowledge with old knowledge and enlist it in the betterment of the human condition be continuously enhanced” (Brooks, 1994; 34). Other analysts note “the emphasis in science and technology policy has been placed on fostering the generation of knowledge rather than the distribution of knowledge and the possibilities of improving the performance of the system by improving access to the existing knowledge stock” (David, Mowery and Steinmueller 1994, quoted in Brooks, 1994; 34). This shift thus entails an explicit turn towards ‘knowledge management’ as a constituent feature of science policy; a turn which would hold entailments for how the production of knowledge would be organized. As David, Mowery and Steinmueller note, as an extension of their view above:

the educational programs of those individuals that pursue a professional course of study in management need to incorporate an understanding of the nature of technology and the relation between technology and business. Similarly, those individuals pursuing courses of study in the scientific and technical disciplines need an understanding of the legal and economic structure, which will impinge directly on their careers. Lastly…American universities might be asked to…enhance the capacity of domestic business to monitor and benefit from timely information with regard to market developments, as well as technological changes, taking place in other countries.” (1994)
In this way the institutional work of university-based experts became increasingly framed in terms of ‘institutional enterprise’—that is, explicitly framed in terms of the creation and maintenance of explicit institutional projects aimed at creating durable institutional answers to specific problems—in this case institutional projects designed to bring expertise to bare on environmental problems. They thus combine many of the disparate features examined in the second section of this study. In this sense, team based research programs are wed to an array of directed funding sources, and these two components are subsequently built into cooperative institutional projects which organize both the production of knowledge as well as its dissemination relative to strategic policy targets. Crucially, this type of institutional project is embedded in the ongoing efforts to cultivate ‘institutional publics’ that serve variously as audience, supporter, and benefactor of the ongoing maintenance of the institutional project and the expert work of knowledge production, dissemination, and use.

In the environmental sector, these evolving standards for linking knowledge with action have variously allowed for the proliferation of institutional projects and experimentation in given institutional arrangements. Thus, in the context of each university case study, we see the organization of institutional order in which multiple institutional projects vie for institutional prominence and resources. Although the background to those projects may correlate with the broad shifts in policy, their institutional expression, within a given institutional order, instances a great deal of institutional diversity. While in the previous chapters I have sought to present some of the institutional genealogy of this variety of institutional project, in this third section of
the dissertation, I examine the role of these projects at each of my three case studies in terms of the role they have played in program development.

In doing so, I note two preliminary observations for the trajectory of program evolution at each field site. As previously noted, it is important to understand that the institutional history of the environmental sciences must be seen as distinct from, but irreducibly tied to, existent and ongoing patterns of environmental research. Thus, it is crucial to note, and to disaggregate, claims to propriety in the field of environmental expertise, as was noted in Chapter 2. These types of claims articulate cognitive authority vis a vis other varieties of expertise and relative to an established or given body of expert claim as to the cultural or social relevance of their work. Thus, in reconstructing the history of the environmental sciences, it is important to situate explicit programs in the environmental sciences within the broader dynamics of a given institutional order and to analytically compare and contrast these claims to other claims made on behalf of researchers with environmental research interests. By pursuing this analytical strategy I note in this section that the chronology of environmental science programs must be written in reference to both changing genres of relevance and their instantiation as conceptual vocabularies and the competing propriety claims to cognitive authority and institutional relevance. This brings me to my second observation: the competition and convergence of institutional projects in a given institutional order.

Here I observe two trajectories. First, in all three cases, the environmental science programs were first articulated as institutional projects aimed at either consolidating environmental expertise or designing a program for training and research. These projects were successfully institutionalized and maintained on an ongoing basis through the
institutional work of a variety of institutional actors. However, this brings us to the second trajectory, that these projects were institutionalized as programs does not mean that other efforts to innovate similar programs were somehow precluded. Indeed, for a variety of reasons, similar programs did occur, in which case they were either merged or were accommodated in some fashion. A major entailment of both of these points is that successful institutional projects act as a resource for further institution building projects, which, in turn, may result in competition, cooperation, and potentially co-optation.

With these two trajectories in mind, I analyze the pattern of programmatic institution building from three angles. First, in terms of the image of knowledge, or how environmental expertise is organized in patterns of co-activity, as interdisciplinary relationships, in the organization of research and investigative patterns of co-activity. Second, the figure of the environmental expert—that is, who works with environmental expertise, how such experts conduct themselves in relation to diverse bodies of expertise, their training and career projects. Finally, how the expertise cultivated in these institutional projects stand to the consolidation of institutional publics.

Debating the Relevance of Research:

The founding document of the Environmental Science Program at Washington State University was a report, composed by an ad hoc committee in Environmental biology, entitled “Health Science Advancement Award” (HSAA). This proposal made a case for an interdisciplinary program in Environmental Research focused mostly around biological issues of ‘environmental health.’ The report based its appeal on several precedents. At its most general, they site Man’s Role in a Changing the Face of the
Earth, a collection of papers from a 1956 Wenner-Gren Foundation Symposium which “reviews man’s efforts on seas and water, of the land, climate elements, biotic communities, of wastes and urban-industrial demands upon the land.” Some, like Carson’s Silent Spring, we may expect. Others, like Interior Secretary Udall’s Quit Crisis, or J. Telethon’s Concern for Wild Life, both polemical histories of the conservation movement, we may find out of place in an academic petition to establish a new program.

In addition to these intellectual precedents, the report is notable for its appeal to an emerging concern over the environment, but, more notably, they site efforts at the state and federal levels to develop “programs in environmental policy.” In an Appendix, entitle, “Awareness of Environmental Science Problems, “ the committee presents evidence of the growing overlap between policy, research, and public awareness. They review the federal and state laws which speak to a growth in the capacity of policy programs, more generally but also in specific relationship to conservation trends, water resources and air pollution control, parks, monuments and recreation as areas, as well as “set backs and near misses” in areas where public demand for conservation and environmental quality were successfully pushed back. In addition, they review growth in the levels of specialized periodicals, such as Environment, Science and Technology, published by the American Chemical Society, and a “new quarterly published by the Bureau of Outdoor Recreation,” and the International Journal of Air Pollution and the International Journal of Water Pollution. They note, “the biologist does not stand alone

in his concern on these matters” and review the growth of activity in professional and non-professional societies, as well as in specific areas of professional expertise, such as in engineering or the medical profession.¹⁵²

Despite this observed trend towards awareness and intensification of environmentally oriented work, the committee observed a “tendency for individuals in various areas of interest to work as isolated entities and to disparage efforts of others outside their fields of specialty.” In opposition, they assert: “We firmly believe that this must not continue and that mutual understand and cooperation is essential if mankind is to survive and maintain a quality of living.” To this end, they note a distinct “shortage of persons who can assist in closing the gaps among disciplines.”¹⁵³

To address this shortage they propose as broad, interdisciplinary program at WSU be created in Environmental Science. The program will have a special organization based on a common definition. They observe, “the expression Environmental Sciences” has come into rather common usage during the past few years,” but they maintain “the attitudes of these “sciences” are sufficiently alike to warrant definition of a common Environmental Science.” Although they recommend the program aspire to “initially concerned with the biotic aspects of the environment components, including man,” one


goal of the proposed program should be to serve as a catalyst and provide for “a positive mechanism for the mutual exchange of ideas and knowledge among environmental scientists."

If the Environmental Science program is in fact rooted in a broad set of disciplinary programs, its intention ought to aspire to synthesis. A synthetic outcome is to be achieved, broadly, through the objective of the program in relation to the program management. The committee stipulates that this is to be achieved through education and training of students, as well as faculty research, but also through the integrative efforts of the program chairmen. In this sense, the program, in addition to supporting ES research, will train students to be multidisciplinary as well as “teach environmental science to individuals whose basic training is in other related disciplines.” The program will thus build upon the “ecological” aspects of other disciplines. Rather than train students in all of the applied disciplines, the students will cultivate those ecological aspects already at work in “entomology, forestry, range management, plant pathology, sociology, anthropology, sanitary science and environmental control, public health, agronomy, chemistry, and physics.”

These disciplinary efforts would amount to a two pronged degree structure, at the bachelor and graduate level. The first is concerned with the training of personnel to “cope with a sufficiently wide range of environmental science problems” that the nation imminently faces and for which there is a growing need. In the opinion of the committee,

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“such an individual would have many employment opportunities, both in private industry and with government.” At the graduate level, the master is proposed to focus on three types of training. Field studies will prepare students for problem definition. Laboratory work will prepare students to “fully understand” the mechanics involved in a problem. Training in the modeling, and simulation of systems, will be necessary as some of the problems environmental professionals face is “of such long term nature or complexity that it is necessary to compare alternate hypothesis and solutions.”

The original proposal was written in 1966, but, by 1967, the HSAA proposal had been submitted for informal review to the National Institute of Health, and the decision was made to pursue a different, more inclusive, approach based on comments received from the NIH informal evaluation. This broadened the conversation to include contributions from agriculture and engineering, and, by the spring of 1967, a faculty petition had gained approval for a revised proposal submitted as a petition through the combined efforts of the Dean of the College of Agriculture; the Dean of the College of Engineering, and the Dean of the Science Division. By spring of 1968, the Residential Instructional Staff approved the Academic program in Environmental Science, and, by January of 1969, a formal request was sent to President Terrell for approval.¹⁵⁵

Since his inauguration in 1967, Terrell himself had advocated for the expansion of research, and research-based degrees at WSU, noting in his inaugural address: “The State of Washington has reached that level in its economic developments where it can and must have a second university which places stress on doctoral degree programs in the broadest

academic spectrum, Washington State University should be this institution.” In this respect, Terrell emphasized program building in veterinary medicine, biological sciences, nursing, the humanities, and social science. He also heavily concentrated on the attraction of outside funding for university research and facilities, drawing some $11 million in research grants and contracts during the 1965-67 period and an additional $68.5 in 1983-85. In an article published in 1969 in the university newspaper, the Evergreen, Terrell argued publicly that research should be extended, both in terms of growth and its regional utility. The response to this article demonstrates the contentious nature of the program in Environmental Science and the still existent fault lines between basic research and mission-oriented research. A letter to Terrell during this period notes that while his demand to ‘extend research’ is certainly correct, the examples that mentioned in his Evergreen article were in fact mission-oriented and under the control of the Agricultural Research Center. The author notes the changing mood in science policy, observing, “In keeping with the mood of Congress that is increasingly insistent on knowing what is being bought with research dollars, mission-oriented or problem-solving is gaining respectability. The pursuit of knowledge for its own sake, sanctimoniously labeled “basic research” is no longer given a carte blanche as though no evidence of its immediate usefulness made it “good”. And, further, that this change in mood, the changing conditions for the relevance or research, can be felt on campus, as well, particularly in relation to the Environmental Science Program proposal. Here, he notes: “The demand for relevancy and the shift in financial support has stimulated feverish interest in this campus in problem solving of currently pressing problems, to wit the Environmental Science Program.” But adding that, to achieve this, the program should
be mission-directed, rather than structured as a basic research program, noting that this organization should be reflected in the administration of the program and in the administration of research at WSU more generally: “If WSU were to employ a Vice President for Research, would it not be wise to seek candidates thoroughly grounded in effective administration of mission oriented research such as Directors of Agricultural Experiment stations and administrators of the USDA’s research programs which have been so effective in terms of results? ”

This is a debate that would not be cleanly resolved, and, in effect, it lingered throughout much of the early program formation. We see this in debates over the image of knowledge—its structure, but also in the entailments that the organization of knowledge would have for the conduct of faculty as well as the conduct of environmental experts. The result, however, was a sort of acquiescence to both models, and the program was to be administered cooperatively through a sort of melding of expert priorities. But these debates over the scope of interdisciplinary research, and what form it would take, would subsequently linger to shape the program’s scope, content, and patterns of participation.

In March of 1969 the first generation of catalogue materials were finalized, and, by May of that year, it was described to the Academic community at large with the following qualities:

Environmental science is a multidisciplinary field concerned with the analysis of natural and modified environments and their interactions with biological

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communities, including the human community. The Program in Environmental Science involved cooperating members from 10 departments in the Colleges of Agriculture, Engineering, and Sciences and arts. The course of study leads to the degrees of Bachelor of Science in Environmental Science and Master of Environmental Science.

Through the Program students acquire an extensive background and a broad perspective that prepares them for a variety of roles in the study and management of the environment and its specific resources. Training in depth is obtained within any one of six optional areas of specialization, including Agricultural Ecology, Biological Science, Cultural Ecology, Environmental Health, Natural Resources, and Physical Science. Because many departments contribute to the curriculum it is not feasible to present here a description of all courses available in the program. Complete information can be obtained by applying to the Chairman, Program in Environmental Science.\textsuperscript{157}

That same solicitation, however, also included an outpouring of responses by faculty in programs and administration units across the campus in a sort of soft protest over the criteria for administrative inclusion. In some ways, this was a repeat of the administrative concerns, which marked the original proposal, but writ large and expressed in the evolving language of environmental problems, of management and pollution. The introductory course offerings were comprised of a package of three courses: “101, a three credit lecture course; 102, the one credit discussion period; and 103, a one credit field trip.” The remaining course offerings were pulled from courses offered in other departments.\textsuperscript{158}


Project Institutionalization, 1970-1980

The two salient themes at issue during this early period were the disciplinary composition of the Environmental Science Program and the scope of its administrative capability. The two are interrelated, in a sense, as the issue of capabilities was, at this time, really a question about who should be invited to serve in the program and who should be on the coordinating committee. This was not simply a debate about control of resources but a wide-ranging debate over the organization of science and its public character. What is the difference between a program and a center? Is the department still an adequate structure for administration? 159

We see varying combinations of these basic questions repeated throughout the early history, but, as the program becomes more established, they hold varying degrees of institutional consequence. Indeed, these consequences were often magnified by the administrative foundation of the program itself. Although the rotating administrative foundation held the appeal of diversifying the claim to Environmental Science, and, thus solidifying its disciplinary base, it also meant that the status of Environmental Science was largely built on its cache as an experimental unit rather than disciplinary commitment to a particular school or program. 160


In February of 1970, Dean Kimball notes that in attending an environmental seminar sponsored by the Western Electric Company that “throughout the seminar the need for increased engineering activity was stressed [and] it became abundantly clear that engineering departments must take a more active role in environmental control.” This observation remains consistent with a broad theme throughout the duration of the program, namely, the effort to determine, cultivate and capitalize on the question of ‘existent need.’ What was environmental science good for? In this sense, Kimball’s observation can be seen as a continuation of a theme, the precedent for which can be found almost four years earlier in a review of the program proposal:

One doesn’t sell new employers on the so called name of their specialization. Employers look at the transcript and see what kind of training the man has, irrespective of the kind of name that he, or someone else, wants to apply to this specialization. The whole of agriculture is literally “environmental science” the same applies too much of engineering and certainly the biological sciences are involved. I fail to see where passing a student through this great program is going to fit him well for doing specific jobs as he would be fitted to do under the present curricula handled by existing organizations which contain those who might administer the new program.\(^\text{161}\)

In March 12 of 1970 plans for a possible budget for the program were outlined, including the positions of secretarial staff, chairman, visiting personnel, as well as provisions for travel, operations, equipment, and the possibility of fellowships and traineeships. These were seen as “realistic requests” for a competitive program. By July 1 of 1971, the issue of a minimum budget for the Environmental Science Program was raised again, this time by the administrative Dean in charge of the ES program at that

time, Dean Ray. Both appeals speak to the issue of administrative control. The budget of
the ES program was largely controlled by the Deans in charge of administration, and was,
in that sense, largely dependent upon the Dean’s opinion of the utility of Environmental
Science at that time.\textsuperscript{162} By March 29, a committee had been formed to conduct an
intensive study of the “need for new curricular offerings.” At this time, several new
options were outlined, including a three-hour lecture courses, an accompanying one-hour
discussion option, and a one-hour field trip. It was noted that the “lecture course
deserves a high priority.”\textsuperscript{163}

Additionally, during this discussion, an Environmental Science 101 course was
proposed to carry a credit in both science and social science, at the students’ option, but it
was noted that “The course is not science with the usual format; it has been called
appropriately an ‘awareness course’” Similarly, the committee met with the chairman of
social science who stated in no uncertain words that as the course is being taught by

\textsuperscript{162} This was a repeated issue raised at before the program was approved, and then again
throughout the early history of the program. Two instances in the archival record
stand out. Memo: November 18, 1968 “Proposal for Environmental Science Council
and Executive Committee.” Archive 218: Agricultural College Dean Records, 1945-
“Curricular Request for approval of Environmental Science 101,102, 103” Archive 218:
Agricultural College Dean Records, 1945-1979; Box 8 Folder 248: Environmental
also: Memo: May 31, 1971, “Budget for Environmental Science Teaching Program,
1971-73” Archive 218: Agricultural College Dean Records, 1945-1979; Box:8
Pullman, Washington.

\textsuperscript{163} Memo: March 29, 1970. “Curricular Request for approval of Environmental Science
101,102, 103” Archive 218: Agricultural College Dean Records, 1945-1979; Box 8
Folder 248: Environmental Science1970-1971. Washington State University Archives,
Pullman, Washington.
scientists, it would not qualify for social science credit. Efforts to define a place for the program remained couched between disciplinary affiliations, and there was an exerted effort, over the years, to define what sort of expertise an Environmental Scientist conveyed.\textsuperscript{164}

That April, further discussion by the administrative committee drew out the administrative relationship between the Environmental Studies Center and the Environmental Research Center. The Environmental Program was to operate as a special program, and the Environmental Research Center was to operate as a separate center. The question of whether it was a better idea to establish a ‘College of Environmental Science’ was raised but tabled for further study as such an organization would constitute a ‘major organizational change.” Finally, at that same meeting, the possibility of establishing a Ph.D. program in Environmental Science was raised, but, at the conclusion of the meeting, it was agreed that no Ph.D. in Environmental Science should be offered. Rather, the consensus reached suggested that “various departments—Engineering Science, Chemistry, Physics, Math, some of the Social Sciences, and whatever department felt willing and qualified to undertake such a program should be asked to prepare an option in Environmental Science under their existing Ph.D. process.”\textsuperscript{165}


\textsuperscript{165} Memo: January 14, 1970. From: CD Moodie to Administrative Committee, Program in Environmental Science. “A proposal (for study and modification) concerned with the Organization and Structure for the Program in Environmental Science and Center for Environmental Research at Washington State University.” Archive 199: Dean of College
By 1971, the size of the program had grown dramatically, and Parker asked for a replacement for his role as Chairman. In July of that year, Carl J. Goebel of the Department of Forestry and Range Management assumed the position at the recommendation of the Deans and approval by central administration. Goebel would serve from July of 1971 through 1973. In that same month, a new administrative committee for the Program was established, and with disciplinary representatives for four categories: Cultural Ecology, represented by anthropology and geography; Environmental Health, represented by two members from Sanitary Engineering; Natural Resources, as represented by Forestry and Range Management, and Agricultural Economics; and Physical Science, as represented by Nuclear Radiation and Physics, and the research Division of Engineering.

By May 21 of 1971, a committee had been formed to leverage the institutional momentum gained by the Environmental Science Program and to begin to “explore the possibilities of using the existing environmental science program as a mechanism for establishing a regional and municipal planning program.” During this meeting it was agreed that this was a viable notion, and Dr. Parker was appointed Chairman of the committee in addition to his duties as Chairman of the program.\(^\text{166}\) One particularly salient issue in this respect was the conflict between the Environmental Health Option, as promoted by the ES Program, and that of Environmental Health as established in the

\(^{166}\) Minutes of meeting with C.J. Nyman, Dean of Graduate School. Washington State University Archives, Pullman, Washington.
biology program. H.M. Nakaa, Chairmen of Biology, notes that the option is already being advertised as an undergraduate offering in the department of biology and that, since 1971, “this option was fully accredited by the National Environmental Health Association” which “after reviewing our application, and conducting a site visit to the department” had approved of the program, and noting, in addition, that the program is one of “the first nationally to gain full accreditation” and that “graduates in this option (the curriculum of which is quite different from the one in Environmental Science) are immediately eligible for certification as Environmental Health specialists and are placed with local, county, state, and federal agencies as well.” Nakata goes on to suggest that he has no objection to the content of the course, only the name, and that his department was not consulted in the matter.  

Additionally, by June 6, of this year, Regent Howard Morgan raises the issue of the Environmental Science program and reiterates an objection that the curriculum too heavily stresses breadth “at the expense of the depth required to work effectively in any practical professional situation.” In line with these observations, in October of 1972, the graduate studies committee met to review the M.S. degree offered by the E.S. Program, a centerpiece of the program’s claim to occupational relevance, as well as its claim to research relevance. From this review a subcommittee recommended that the


program be disbanded. This set off a series of protests from the faculty and support from the administration. In the face of unified support, and a slate of evidence that the E.S. Program had in fact met its academic responsibilities, the original recommendation was unanimously overruled by March 30, 1973.

The review, which made three basic points about the program and its decisions, as well as the grounds for rebuttal, reveal the dynamics on campus at that juncture. First, the administrative subcommittee argued that the number of degrees produced was low. This contention was countered with the argument that the program was quite new and that the number of graduates was appropriate when that fact was factored in. In his letter of support, President Terrell persuasively acknowledged this fact, arguing that the estimates of graduates seemed low and the subcommittee had used inappropriate projections of enrollment and student interest. Second, the committee found that although “enrollees in the program are very good students who are strongly

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motivated…their talents could be guided more constructively into specific disciplines,” suggesting that “Environmental Science training could be taken in the form of supporting course work” rather than treated as a substantive specialization per se. At issue was the committee’s suggestions that the student would be inadequately trained to fully utilizes or comprehend the “available literature” which is “oriented towards specific disciplines.” This particularly applied to their observation about the M.S. degree. Here the committee argued that, although the “graduate program was intended to produce scientists and technologists trained to cope with environmental problems,” the E.S. Program lacks the “necessary depth” to meet this goal.” They note, further, “Because the program is essentially a second priority curriculum for most faculty participants, faculty research and publications are generally credited to the individual faculty members parent Department.”

Third, they note, “students graduating from the M.S. program in environmental science are experiencing difficulty in obtaining suitable employment. This may be related, in part, to the great emphasis placed in the W.S.U program on engineering aspects of the curriculum to the virtual exclusion of the biological sciences.” In this sense, they argued that students graduating with “emphasis restricted to engineering science” cannot compete on the labor market with students “majoring in environmental engineering, per se.” Rather, students in the program “tend to become generalists with

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insufficient background in any one discipline to be effective,” and they “tend to undertake research for which they are not adequately prepared.”

The faculty and administration met these last two objections with two basic criticisms. First, that all of the graduates who had graduated and who sought out environmental employment were employed in areas of environmental concern. Second, and in a way, supplementary to the first, the faculty objected: “Even though our graduates have been successful in obtaining suitable employment, I do not feel the Environmental Science Program was established to fill a particular, established vocational niche.” Rather, the interdisciplinary quality of the program, along with the “request to specialize in a particular option,” had in fact made students “desirable on the labor market.” However, Goebel also argued, “the environmentally literate and responsible citizens we are producing are also a very real benefits of the program.”

President Terrell was particularly pointed in this aspect of his objection: “In the course of our review, the faculty members determined that the current interest in environmental improvements had created a demand for environmental generalists.” This need has truly been shown during the past years, as our Environmental Science Program has become nationally known. The employment record of our M.S. degree holders is

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excellent,” adding that the issue of disciplinary depth was a non-issue as “the faculty members believe that the truly interdisciplinary nature of the program is its strongest asset.” Noting that “every academic area on campus has been involved in the support of this program,” and that faculty members were participating in the program were “active in research and successful in publishing the results of their findings.”

One particularly salient objection on this point, from George Hindan, dealt with the issue of depth of knowledge, expressed in the evolving lexicon of the moment: “the preparation does have, or can have, plenty of depth” and a “special breadth” which he characterizes an “integrating approach” with “an emphasis on the system as whole rather than one of its component parts.” The issue of curriculum development gained pace during this time, and efforts were made, through the lecture courses and seminars, to provide more overall cohesion to the many, varied course offerings. Gerald Young, in

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176 We may note here that this comment speaks to an objection raised by the review subcommittee: “The faculty of the environmental science program are active in research and publication. However, credit for the scholarly activity accrues to the parent discipline. Although the faculty are enthusiastic in environmental matters, their disciplinary interests pre-date the environmental program; their enthusiasm might be better directed toward contributing more environmental flavor to their discipline…University support of the program is token only. The program has little chance for success with a part time faculty whose interests are centered elsewhere. In the best interests of both the student and the University, this committee strongly recommends discontinuance of the M.S. program in Environmental Science. Discontinuance will create little or no hardship on either faculty or students because they can inject an environmental perspective into courses or curricula in their respective home departments.” Memo: October 20, 1972. This has been a persistent structural feature of all the programs reviewed in this study. See conclusion for discussion.

177 An important aspect for subsequent comparative treatment between programs is Hindan’s view that in “the M.S. program a thesis should be required rather than being optional” and that this might insure “the depth some people feel is lacking.” This became a salient issue at Santa Barbara as well.
1974, prepared a chronological course abstract for “Pioneers of Ecology and Conservation” and “Select references on the history of ecology.”

Finally, the issue of employment was raised again in 1975 when a committee was formed to “explore the job opportunities available after graduation.” The committee was announced in the ES Program Newsletter as established “to attempt to deal with a range of problems related to employment opportunities and job acquisition.” The newsletter suggests that the major problem facing graduates is the employment problems that ESP members faced due to “the lack of awareness of the existence of the ES Program by potential employers and/or a lack of knowledge or understanding regarding the significance of the Environmental Science Degree.” The solution, as proposed by the committee, was a review of the employers on file at the University placement center to determine which “employers may need graduates with Environmental Science degrees.” From there, they suggest contacting potential employers about possible job opportunities to ascertain “whether or not they are familiar with the Environmental Science Program and whether or not they would have any possible job opportunities for Environmental Science graduates” Additional information, such as qualifications of graduates and the potential for candidate interviews would be made available to prospective employers at that time.

The employment committee also made note of efforts to “contact various State and Federal government agencies, various industries and any known consulting firms to similarly inform them of our existence or qualifications.” Several efforts to cultivate

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such contacts were noted, and the results of this effort were reported as largely successful: “The Environmental Science Department has been placed on a couple of mailing lists [and] perhaps the most important mailings we have received so far have come from the City of Seattle where there were six openings for individuals interested in planning type work.” For added emphasis they note: “The salary range was high and many ESP members would probably have qualified.”

Additionally, the committee adds that they are receiving employment notifications for teaching positions in higher education, and that, although “these positions are generally open to graduates with Master’s degrees or higher, there are occasionally openings for technical and laboratory assistants with only a bachelors degree requirement.”

From this point forward the issue of administration organization becomes a more salient problem in terms of budgeting and coordination of the program resources and administrative support. In September, a committee is formed to once again explore the possibility of an environmental science PhD. Program, partially in response to a rumor, conveyed by Dean Nyman, that the University of Washington had plans to institute such a degree.” But by February, the council of Deans pointed out some weaknesses of the administrative structure and had suggested that although the disciplinary make up of the program is a strength, the “two year rotation might be a weakness in regards to the fact that just as the chairmen and the college is getting adjusted to the administration of the program, it is about time to change.” They recommend an alternative structure whereby

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the chairmanship and the administration of the program would be kept in a College for
four years before rotating. The administrative committee in favor of the two-year
rotation immediately voted this down.  

It would be a mistake to imagine all of the environmental research at WSU was
carried out under the auspices of the ES Program or the Environmental Research Center.
Although the Program was founded to create a new holistic approach to the conduct of
environmental research, the effort was largely seen as a creative or experimental
endeavor. One that solved a pressing need, yes, but not as a replacement for
environmental research broadly construed. One document, from 1974, speaks to this
issue in precise detail. Entitled “Environmental Personnel at WSU,” the review provides
an overview of the environmental research activities at the time.  

In 1975, Professor Frank Scott becomes the chairman, serving from September 16,
1975 through 1978. At this time, the program had developed an incipient orientation to
planning, beginning with some early proposal work in 1970 and culminating in the
approval of a Masters in Regional Planning in 1976. One measure of the strength of this
orientation, as well as the program’s cache on campus, is indicated by the ability of
program faculty to continue to leverage for institutional expansion, particularly in the
push forward on the Masters of Regional Planning. Given the interdisciplinary structure
of the program, one means of doing this was to link the ES program to other programs in

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180 Minutes of the Council of Deans and Environmental Science Administrative
Committee Meeting, February 19, 1975. Archive 218: Agricultural College Dean
Washington State University Archives, Pullman, Washington.

181 Environmental Personnel at WSU. Archive 218: Agricultural College Dean Records,
University Archives, Pullman, Washington
an effort to bolster both by means of association. In June of that year, William Lassey, then a rural sociologist, argued, in a letter to the Vice-President-Academic office, for the establishment of the degree by linking the proposal to the cache of rural sociology.  

Lassey notes that few graduate or research programs in regional planning are available for rural areas. Formal planning programs have, until recently, been focused on urban areas. But Lassey notes there is an existent need for rural planning, as “rural areas are under increasing pressure to plan for more adequate use of human and physical resources—as population density increases and as natural resource shortages become apparent,” Adding, “The need for improved planning systems in rural regions is widely evident.” Of particular importance is the need to expand and enhance both the knowledge base and the professional skills of planning professionals and that a “new kind of professional and new scientists [are] needed who can help to collate, integrate and add to the knowledge base of rural people and resources—in a concerted effort to design and impart an improved physiological-biological-social environment.”

The health of the program can also be measured by its ability to expand, spatially, as well as intellectually. A similar argument to Lassey can be seen in May of that same year, as focused on the expanding space needs of the program. As projected by approval of the planning program, two new faculty positions were slated for 1981, as well as TA and RA positions, and the impending involvement in a proposed Kellogg Foundation

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Grant, (“Partnership in Rural Improvement”). As such, the program petitioned for a student lounge in addition to an increased space for research for the Environmental Research Center and room for seminars. The case was presented again, but, this time, Scott expressed the issue in the language of collegiality: “The diverse and interdisciplinary nature of the Environmental Science student body and faculty is such that they need a central facility where they can meet and interact.” He adds:

This is almost essential. I frequently have newsletters, news items, job openings, periodicals, and other materials that I would like to leave for all to read. Other than an infrequently consulted bulletin board, we have no such space. Most important to me is the need for a place where I can meet and get to know students and faculty in an informal setting. A center of this type is our most pressing need and I am particularly anxious to see it realized during the academic tenure of these students who have put so much time, effort and enthusiasm into the project.184

And yet, the increased acceptance of the programs expanding strength, and vitality did not go unnoticed by the university’s constituency. While many saw the program as making a vital contribution to the region, there were others who saw the program as a potential problem and were vocal in their suspicion.

In a letter written in response to such concerns—in this case, expressed by a general contractor in Seattle who served as member of President Terrell’s Citizen Advisory Council, Scott assuaged the Council of such concerns by reinforcing the scientific nature of the Program’s work. “I can also assure you from the philosophy of our faculty” he argues, “we are interested in Environmental science and not

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environmental emotionalism.” He suggests that the desired goal of the program is to train experts who can are “fact finders and resource persons who can provide information to decision makers on the many alternatives and consequences involved in providing our society with the myriad things of wants and needs.”

In defending the program, Scott emphasized, “We hope to provide expertise which will help our nation to grow with the minimum possible adverse environmental impact.” This he defines as a matter of professionalism and in their professional role “as environmentalists” the program stress to their students that they are “experts and not advocates,” adding, for emphasis, that because of this students have been successfully employed in their field.

An administrative memo, circulated amongst WSU faculty in 1976, provides a clue to one of the major themes of the years to come—expanding faculty involvement. In an effort to solicit broader participation, this circular described the program as broadly inclusive: “By its nature, Environmental Science is “macroscopic” with little than be validly excluded from environmental consideration. “ To this characterization, it added, that “In response to growing needs to address environmental concerns which pay little heed to tradition boundaries that divided institutions of higher learning into academic disciplines or departments,” WSU has created a strong program that has strengths including the “introduction of innovative teaching methodologies,” as evidenced by

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student and peer evaluation; wide ranging research that is “furthering new knowledge,” including the application of “existing knowledge to existent problems,” as well as the presentation and circulation of this knowledge at “professional meetings, invited seminars at universities, industries, research organizations, city council meetings, and other governmental meetings and symposia,” and public service through “formal university extension work; involvements in community problem analysis and resolution, and other work toward resolution of specific environmental problems, not necessarily through formal institutional settings.”\textsuperscript{187}

This salutary note may be usefully compared to a private letter, written just a year before, in 1975, where program chairman Scott noted, at the start of his tenure:

\begin{quote}
The greatest strength of the Program is also its greatest weakness. The diversity of the faculty, their widespread interests and scattered campus geography makes the program awkward to manage and causes it to lack unity. This together with the very small number of funded faculty (1 ¼ permanently funded faculty FTE’s and ¾ temporary causes many problems: lack of critical mass, limited internal dialogue between faculty and among faculty and students, an inordinate burden on the few funded faculty.\textsuperscript{188}

This weakness was called out dramatically in February of 1977, when the issue of administrative amalgamation was raised again, expressed this time in financial language,
\end{quote}


and largely attributed to the problems of university health, as resulting from state budget cuts. In a letter to the administrative committee, Ex-chairman Goebel argued passionately against the possibility of amalgamation, maintaining that “the three college base on which the department was built is an excellent one” and that the “continuous attempts to dilute the program by affiliating ESP with only one or two academic areas on campus” should be resisted as an effort to promote “ESP in the direction of a separate identity or department,” or to “capitalize on the term environment” in contrast to the interdisciplinary effort of the program’s faculty and students. This, for Goebel, would result in a betrayal of the “cooperation and interaction and sometime sacrifice of many academic areas on campus.” Stating that it has only been through these efforts that the program has been “successful in terms of attracting students who have genuine interest in determining the real facts behind many environmental problems.” The ongoing arrangements are subsequently characterized as a “marriage” between various portions of the academic world, whose “divorce or cleavage from any of the cooperating departments on campus would result in a dilution within our university as well as a loss of respect for our program admired by institutions throughout the State and Nation.”

As outgrowth of these administrative issues, the problem of faculty support began to cohere into a salient concern. Because the program was built out of shared time and faculty interests, Environmental Science had begun to face “faculty overload,” and also the refusal of many faculty to participate. This was characterized as a problem with faculty“ who are unwilling to accept the extra burden to direct” student work ”without

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some time return from their departments.” Compounded by the threat concern over amalgamation and the financial instability of the program, the problem was pitched in terms of dire consequences and often used to try and leverage additional administrative support. In a letter relaying staff needs, Scott notes “The Environmental Science Program was begun on a shoe string budget some nine years ago as something of an experimental program to see if it was actually viable,” but continuation of the program “is now at a cross-road.” Faced with the impossibility of finding faculty support, as well as the problems of obtaining financial support for dedicated full time or half time faculty for the required courses, or research support for the Center, or equivalencies for TA support, the success of the program was in jeopardy. At issue was the status of the program, which Scott characterizes as the “10th largest graduate program on the campus,” and the fact the program has achieved “a nationwide reputation for excellence in this field.”

Despite the problems of faculty interest, and administrative game of ‘musical chairs, ‘ the program actually did attract a great deal of interest and commitment on the part of students and involved faculty, and, in January of 1979, it received approval for all of its Regional Planning program courses, including an “Advanced Regional Planning Studio,” which brought together students, faculty, and planning professional around

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actual planning problems in the region. And by March of 1979, the Program was officially offering a Masters of Regional Planning as a separate degree from the MSC.¹⁹²

That May, Dr. William Funk announced his chairmanship of the Program in Environmental Science and Regional Planning, replacing Dr. H.H. Cheng. By June, the Department had begun to advertise for a temporary position in regional planning, “with an emphasis on rural community or resource planning.” At that time, the program was described as “connecting two closely related field of studies: Environmental Science and Regional Planning.” In this advertisement, Environmental Science is described as “concerned with the study of natural and modified environments and their interaction [and] with biological (including human) communities,” including “an emphasis on the comprehensive understanding of environmental/ecological context, assessment of beneficial and disruptive impacts, and methodically analyze, interrelate, and resolve these complex systems.” By contrast, regional planning is said to “provide an understanding of basic issues, methods and processes in rural, land use and regional planning with comprehensive studies of natural and human systems.” Together, the programs provide a “holistic and interdisciplinary perspective and ecological understanding to prepare students for roles in the study of planning and the management of the environment.”¹⁹³


By August, the administrative committee began looking for a permanent faculty of rural planning, imagined as someone who has the desired background in planning, at the Ph.D. level, as well as a source of “expertise in public administration or in laws and regulation in local government.” Cheng suggests the possible joint appointment with political science, as the political science chair has advised a high “student demand in this area” which is increasing. Additionally, by November of that year, the administrative committee began to prepare an Environmental Education Option, as approved by the College of Education Curriculum Committee (EEC). In March of 1980, Dr. George Hinman was appointed as director to the office of Applied Energy Studies, leaving the position of Director of the Environmental Research Center open. With his evacuation, there was some discussion about which administrative options were open for the ongoing organization of the Center. These included combining the Center directorship with the chairmanship of the ES/RP or counting the position as a separate line to be operated through the coordinated activities between the program and departments. By 1981, Hinman had returned to the Environmental Research Center, as the search had collapsed194

Cooperative Research at Scale

In April of 2006, the Faculty Senate approved the Center for Environmental Research, Education and Outreach (CEREO) as part of a faculty led initiative to create a system-wide network of interdisciplinary work in environmental education, research, and outreach. The Center was striking, in comparison to the ES Program, for its scope but

194 Oral History interview with George Hinman, collected August, 2008.
also for its emphasis on ‘integrative coordination’. Rather than emphasize an integrated expertise, environmental science, in the singular, the CEREO was composed of a faculty driven, coordinated or cooperative research.

By the time that I had arrived in Pullman to conduct fieldwork, during the late summer of 2008, the university, and the Environmental Science Program, had begun to undergo changes, which would dramatically alter the terrain for Environmental Research, yet again. On campus, the breadth of environmental activity seemed to be focused on the CEREO. The Environmental Science Program had merged with Geology as part of a new school of Earth and Environmental Science. Of the Earth scientists that I spoke with, none of them seemed very happy about the move, and there was a sense of discomfort regarding the topic in general. What’s more, much of the Environmental Science Faculty had left the Pullman campus, and the center of activity seems to have moved to its Vancouver branch-campus, including the office of chairmen. As discussed in chapter 5, despite repeated efforts, I failed to find the Environmental Research Center, and, although the Center still held a link on the university’s web page, nobody really seemed to know what had happened to it, if they in fact even knew what it was.

Although Environmental Science, as a distinct form of expertise, had, in a sense, been diminished, environmental research as a broad field of interdisciplinary endeavor was still very strong, and CEREO had managed to carve out a distinct identity as an active research network and a strong vision of what organized Environmental research should look like. Despite the obvious differences between CEREO and the Environmental Science program, in abstract, CEREO seems very close to what the original vision of the combined Environmental Science-Environmental Research Center
were imagined to be in the early days of the program. Faculty not only conduct research on a broad swath of environmental concerns, they may potentially organize into cooperative research units that may be directly related to outreach programs or education work. The major difference between the two programs stemmed from their differing philosophical orientations to interdisciplinarity. Where as the ES program had emphasized a new type of integrative expertise, largely premised upon a synthetic organization of interdisciplinary work, CEREO promoted cooperative research integrated through the institutional mechanisms of coordination between distinct disciplinary orientations. This orientation to cooperative organization held some degree of advantage for the CEREO program and its relevance to two subsequent institutional developments, the large-scale reorientation of research capacity in the wake of financial crisis and the subsequent consolidation of environmental offerings.

Echoing similar changes across the country, by 2008, Washington State was wracked with rumors of financial insecurity, and, across the state, all of the institutions of higher educations were preparing for the inevitable arrival of cuts to state support. By spring of 2008, the WSU community was dismayed to discover that the university’s ‘Rural Sociology Program’ was to be cut, with the phase out to begin summer of 2009, and with a completed termination date of June 16, 2010. Rural sociology had been an ongoing unit at WSU since the 1940’s with heavy attention given to applied social science extension work in the region at large. It had also been an integral aspect of the Rural Planning program and the regional Planning Masters degree. Additional cuts also included termination of the Forestry program.
The decision to cut the undergraduate program in Forestry and eliminate the Rural Sociology program was the product of a provost-initiated faculty review called the “Academic Affairs Program Prioritization Phase II Task Force (A2P2). Organized in ‘audit’ format, the A2P2 recommendations were concentrated on six outcomes: First, to reduce the number of undergraduate and graduate courses offered across the university by 20%; Second, to conduct a review of the degrees offered by the university with the goal of “reducing the numbers of majors, minors and other degree options; Third, place a moratorium on new courses and degree offerings; Fourth, impart “governance and budget” strategies for integration and differentiating the delivery of degree programs; Fifth, implement a hiring strategy to “build critical mass in priority areas of research/scholarship and teaching;” and, finally, “develop and implement strategies for redirecting faculty into and re-training them for priority areas.”

The last priority is key and lay at the center of the University’s plan to reorganize. Although the Rural Sociology program was discontinued as an academic unit, its staff, and resources, where possible, were to be reallocated to other emerging programs and academic units. Three features of this plan are important for our chronology, as they all impact the shape, and direction of environmental research at the school. First, the plan calls for the cultivation of an applied social science capacity by building a Division of Social and Behavioral Sciences in the College of Arts and Sciences. This would be additionally supplemented by infusing “Social Sciences into Health Science, Environment and Sustainability, Water and other interdisciplinary initiatives.”

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195 Academic Affairs Program Prioritization Phase II Task Force Recommendations, April 15, 2008. [http://academic-prioritization.wsu.edu/p2-tf-recommendations.html](http://academic-prioritization.wsu.edu/p2-tf-recommendations.html)
the university proposes to “conduct an internal review to determine how to build a
focused area of environment and sustainability using resources currently invested in the
School of Earth and Environmental Sciences and the Department of Community and
Rural Sociology.” The Task Force notes that SEES (School of Earth and Environmental
Sciences), NRS (Natural Resource Extension) and CRS (Community and Rural
Sociology) could be brought together to create a new unit, and resources from these units
might be deployed to strengthen existing environment and sustainability programs
university wide.” Finally, the task force recommends investing in ‘Water’ research as a
long-term investment. The proposal is innovative for the effort it makes to translate bad
circumstances (i.e., the financial crisis) into an actionable context that redefines the
circumstances for environmental research on campus. Its novelty, however, lay with the
efforts it makes to preserve continuity between programs while shifting emphasis towards
strategic growth.

This shift can be further illustrated by a subsequent report from 2009 that seeks to
carve out the programmatic, institutional basis for a School of Earth, Environment and
Society (SEES), written through the combined efforts of faculty members from the Earth
and Environmental Sciences, the Natural Resource Sciences, and Community and Rural
Sociology, forming the reorganization committee. The report begins with an analysis of
the problem of the environment, a somewhat standard formulae for this genre.
“Humanity,” it notes, “is now engaged in an unprecedented and uncontrolled experiment
of global proportions.”196 To this they add that pressures of population growth,

196 Reorganization Committee. “Conceptual Proposal for Creating a New
Interdisciplinary School of Earth, Environment and Society at Washington State
University.” Unpublished report. March 17, 2009
increased consumption, and fossil fuel reliance is rapidly altering “planetary biogeochemical processes and earth systems” in unexpected ways. As a result, “humanity faces an uncertain future of food, water and energy shortages” in addition to “changing climate and weather patterns, rising oceans, depleted soil and forest resources, and endangerment of a third or more of all the natural and biological diversity of life on earth.” They acknowledge that in response to this crisis, there is an unprecedented need for universities to meet the challenge of addressing “complex multi-dimensional environmental and social problems.” This is particularly the case given the interest expressed by funding agencies as they “shift priorities to address these issues” and student demand for “degrees that provide interdisciplinary training to tackle these emerging problems.”

The Reorganization Committee report suggests that given this scenario, “WSU has the opportunity to emerge better positioned to take advantage of new trends in federal environmental funding and the explosion of student interest in global change and environmental problems.” They propose meeting this demand with a new School of Earth, Environment and Society (SEES). The school, they suggest, should be built around the integration of the natural and social sciences, and propose a model of integration akin to the CEREO model. In this sense, a range of global environmental issues is to be studied as interlocked natural systems, coordinated with topically focused study of “system dynamics” and “policy and management” issues arrayed across a spectrum of systematic disciplinary inquiry. For the problem of ‘climate and global

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change’ they present an array of disciplinary expertise running from “Earth systems” to “Bio/Geophysical systems” including “Biodiversity and Ecosystems” and Earth, Land and Agricultural Systems” and finally to policy and social systems” By building the school around such a model, they hope the effort will effectively “refocus a core of our future land grant mission on the Earth and Environmental sciences,” providing a platform to address issues of “global change, climate change and environmental sustainability.”

To this end, the proposal suggests, merging the academic units of geoscience, ecosystem and natural resource ecology and social sustainability science, by bringing them under the same roof to create a new disciplinary unit. This new unit would “function as an open area for faculty within and outside SEES to join interdisciplinary teams pursuing external grants.” Additionally, they propose the Unit should significantly cultivate an expertise around water resources research; create a nationally recognized PhD program and undergraduate major, and establish a new “statewide extension and science communication program for expanding outreach.”

The new college would largely build upon existing resources, including major infrastructural facilities, such as WSU’s GeoAnalytical Lab; the Social and Economic Sciences Research Center; the E.H. Steften Center and the WSU Arboretum and Wildlife Research center. Additionally, the committee suggests utilizing CEREO as a vehicle to coordinate existent research centers to create “a highly visible system-wide


environmental infrastructure.” The Committee contends that this new disciplinary framework, coupled with the new infrastructure, and the focused research program on water resources, would provide the bedrock to extend and build upon WSU’s land grant mission and extension activities. In this sense, the committee foresees the ability for the University to “implement focused, high outreach programs,” that correct “current research on environmental problems with innovative technological and educational approaches to help society achieve environmental sustainability.” The motto of this approach is envisioned as “Go Cougs! Go Green!” and plays off of the regional support the school has cultivated in terms of football fandom, alumni support, and the good will created by the successful extension programs. 200

Further, the report suggest that core of this new effort will be to develop effective partnerships, and several of their proposals in this regard stand out for discussion. First, they recommend pursuing “new strategic alliances” with green public and private sector organizations, including tribal, state and federal government as well as with foundations and industry and environmental community organizations. The goal behind these partnerships is to “leverage faculty expertise to better meet regional and global environmental challenges.” Second, the committee envisions “outreach and demonstration projects in the hopes of building “national recognition for WSU’s efforts in environmental sustainability,” and develop “outreach strategies that consider rapidly changing demographics in Washington State.” In this respect, they note the growth of the Latino/Hispanic population. To this end, the propose targeting “Large national

granting agencies that are now seeking integration between the natural and social sciences as well as the integration of outreach and research.” Finally, they suggest faculty in SEES should work to meet existent research and training needs for “government agencies, distance education students, and the broader public.” They suggest offering credit and non-credit training in earth science, water resources, land management, energy and “sustainable agriculture and human resources.” They also recommend this be achieved by developing a progressive stance on education and communication technologies, which they describe as virtual broadcasting technology and the latest in web or social networking technology. The goal, in this respect, would be to “increase the visibility of our statewide faculty base and improve connections with all campuses and across the nation.”

In addition to the administrative organization of the proposed school, the Committee further isolates two areas for discussion. First, they lay out a rationale for curriculum development and, second, a rationale for fundraising and grant seeking. Both areas would require coordinated adjustments to enable the SEES mission. They argue that the proposed academic unit would combine existent strengths of the university. These constitute key areas of earth and environmental science research but also “define highly flexible thematic areas for growth and rapid response to newly emerging research issues.” These areas consist of “Aquatic Ecosystems and Landscape Ecology, “ Earth Systems science,” “Environmental sustainability and resource management,”” and social dimension of global change.” In delineating these general areas, the Committee suggests

a total reorganization of degree offerings to effectively “condense diverse and fragmented curricula in the geological, environmental, natural resources, and social sciences.” The goal is to combine several divergent offerings into a single degree offering program that would offering a B.S in four topical configurations, which they list as “earth environment and society,” “geoscience and earth systems,” “environmental science and sustainability,” “landscape and aquatic ecology,” and “wildlife ecology and conservation.” Additionally, two graduate degrees, a masters of science, and a PhD in earth, environment and society are proposed as well. 202

The authors note that a revised curriculum would be a considerable undertaking but that there is a “great interest in collaboration with other units on innovative curricular concepts” that they suggest might provide opportunity to bring in faculty from a variety of academic units. To begin, they suggest development of a required common curriculum offering unified courses applicable to all the majors of the Earth and Environmental Sciences. Additionally, they suggest several offerings floated by the committee in an outline of stages following the preliminary curriculum implementation. They suggest collaboration between crop and soil science and the college of engineering and architecture around designing a “major in hydrological science as part of an integrated SEES emphasis on water resources.” Additional collaborations are imagined to develop programs in “aquatic and restoration ecology,” and conservation biology, including “endangered species conservation.” They also suggest creating a program in environmental studies in collaboration with the College of Liberal Arts, and argue, “Such

options have been highly successful elsewhere in North American result in high student enrollments.\textsuperscript{203}

The rationale behind this degree structure consists of two basic inferences: One built on enrollment and the other built on the possibility of curricular innovation. First, they note, “230 undergraduates and 135 graduate students are enrolled” in the multiple environment-related degrees programs offered across the campus. The committee takes these to be a sign of strong interest in environmental study and suggest innovative curricular offerings are needed to capture emergent interest in environmental study and to continue to attract students to WSU in the future. In particular, they note, recruitment and diversity strategies should consider the “rapidly changing demographics in Washington, especially the growth of the Latino/Hispanic population.” They also suggest that SEES will train a new generation of research scientists but that it should also focus on empowering “other students to compete for increasingly popular “green jobs” focused on such areas as renewable energy, natural resource conservation, water resources, and sustainability.”\textsuperscript{204}

In addition to student demand, the committee notes an important reason to create SEES is to facilitate “in close coordination with CEREO” interdisciplinary research projects for which large scale funding is expanding under new federal environmental research programs.” They note that federal and international agencies, in including NSF,


NOAA, NASA, EPA, USDA, USGS, UNESCO, and the World Banks’ Global Environmental fund, all emphasize the integration of natural and social sciences. They suggest SEES will be in a prime position to pursue research on “biological diversity and endangered species conservation,” the intersection of “earth sciences and society,” the “geospatial analysis of environmental impacts” and “managed ecosystems and sustainable development,” including “water resources and global change.”

To facilitate these developments, the report makes the case for an administrative reorganization that would combine resources of all of the programs, schools and disciplinary units under one roof. This would include recruitment of a Director, coordinating academic responsibilities between Deans, and examination of the issue of faculty hiring and possible academic reappointment for interested WSU faculty. To facilitate these changes, they argue for the development of a central administration and to utilize this structure to create a “high profile funding initiative” by developing a named WSU School of the Environment and require the solicitation of “significant future donations” (they recommend 6-10 million) to “endow a nationally recognized PhD program to attract national attention to the dedication and creation of the school.” They observe this would be consistent with other highly successful ventures such as the “Nicholas School of the Environment at Duke University, the Bren School of Environmental Science and Management at UC Santa Barbara, or our own WSU School for Global Animal Health.” This is envisioned as a compliment to the simultaneous

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development of proposals to create “new green public-private partnerships” aimed at creating endowed chair positions as well.\textsuperscript{206}

By 2014, SEES had become a reality, and CEREO moved into a new sort of prominence at WSU as a sort of engine for project development. There are two aspects to this transition important to the chronology reviewed above.\textsuperscript{207} First, in the new SEES architecture, the environmental science program became a degree concentration rather than a stand-alone program. At the undergraduate level, the program was bundled into the Environmental and Ecosystem science BA, while the Master’s of environmental science and the Doctoral Degree in Environmental Science and Natural Resources were preserved. Also notable, of the Environmental Science Program faculty surveyed in this study, only one of my interview participants was retained and subsequently promoted from adjunct to Clinical Associate professor. This phase out is part of a broader degree reorganization that included as well the phase out of three other degree options, including the BS in Geology, the BS in Natural Resource Sciences, and the BS in Wildlife Ecology. All four of the previous degree offerings were replaced by BAs in Earth Sciences, in Environmental and Ecosystem Sciences, and in Wildlife Ecology and Conservation Science.\textsuperscript{208}


\textsuperscript{207} By March of 2015 SEES had merged with the Department of Natural Resources to become the School for the Environment. “School of the Environment.” Washington State University Online Catalog. Accessed, January 1, 2015. \url{http://www.catalog.wsu.edu/Pullman/Academics/Info/123}

\textsuperscript{208} “School of the Environment.” Washington State University Online Catalog. Accessed, January 1, 2015. \url{http://www.catalog.wsu.edu/Pullman/Academics/Info/123}
Additionally the structure of the CEREO network changed in two important ways. First, the development of an external advisory Board became more prominent and was promoted as a means to help CEREO’s “response to our mission.” This Board is to be “comprised of high-level members of industry, non governmental organizations, academia, and think tanks,” to provide “High-level strategic direction for the initiative and review CEREO progress.” The evolution of this strategy will be importantly compared to institutional strategy at UCSB in chapter 8. Composed of eleven members, the Board includes two non-profit members, several consultants, one member of the Governor’s office, and six members of regional industry.  

Finally, the CEREO program is advertised as structured around strategic initiatives, representative of its three broader themes, now consolidated as ‘Global Environmental Change,’ “Sustainability and the Environment,” and “Innovative Energy and Clean Technology Systems Design and Implementation.” Within these three themes, the program showcases three representative projects. The first project profiled is the BioEarth project, a research initiative founded by a $3million grant, aimed to develop a regional ‘Earth Systems Model’ “to provide regional scale information on resource cycling” to help individuals “make informed resource management decisions within the context of global change.” The second, the NSPIRE program, an NSF ‘starter program’

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designed to launch a Doctoral training program designed to “create a new generation of scientists” that will be “able to seamlessly integrate nitrogen cycle science for effective communication with key stakeholders.” Finally, they showcase the WISDM program concerned with the creation of dynamic, integrated modeling, organized around “a multi-institution team, supported by the USDA,” that aims to understand how climate and land use changes impact water quality and quantity “to consider “how changes in economic and climate affect water use.” Notably the multi-disciplinary teams is concerned as well with the prophet of exploring “how primary water users can be involved in the research process.”

These projects are interesting for three reasons. First, we find that the institutional patterns of co-activity associated with basic research have been institutionalized, where team-based research around a given analytical problem is variously supported through directed funding. But, secondly, the basic analytical problem is tied, through project design, to policy problems in regards to the environment. Finally, this project structure—as an institutional arrangement—builds on embedded or distributed expertise through incorporation, or dissemination of information, or through a combination of strategies. In this way, we find in the current CEREO model, the three institutional strategies reviewed in section three, combined in CEREO, as a sort of

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‘clearinghouse’ for institutional projects, itself guided by a Board familiar with the organizational nature of regional and global environmental problems.

**Conclusion:**

We see in this chronology a clear tension between two models of expertise, the integrative, or the synthetic, and the cooperative. Although the ES program was originally modeled along a synthetic format, its claim to cognitive authority was gradually eroded, over time, for lack of clear programmatic support, and later with the emergence of the CEREO program. Although a popular program, the lack of support, in part, was a result of an ambiguous change in terms of program development. While its earliest supporters argued for the necessity of environmental expertise, this claim was largely framed in disciplinary terms, and, when the necessity of environmental expertise was framed in terms of professional authority, the program lacked both enrollments and professional demand to justify its claims.

From the beginning, the Environmental Science program was characterized by a crisis of identity. This crisis, in turn, helped to fuel conflict over the terms by which the composition of environmental expertise could legitimately be expressed. Although the program initially enjoyed a broad range of support, as indicated by the breadth of faculty interested in its development, the overwhelming dilemma that shaped its organization was how to establish the program’s autonomy relative to the interests, both epistemic and practical, of disciplinary actors who felt they had already staked a clear claim to expert jurisdiction vis a vis their research or management efforts. To be clear, these conditions do not sum to a conflict over resources, or social prestige, although I’m sure, as in many
social settings, that issue was at play to some extent. But in this case, the issue does not seem a decisive one in shaping the institutional growth of the program. Rather, the problem was one of relevance. Although there was a clear sense of demand for relevance, there was less clarity about what this actually entailed in terms of professional outcomes. The Environmental Science program was operating in an environment that had already, in terms of organizational structure, been parceled into professional jurisdictions with clearly protected boundaries, in terms of research and application. The emergence of a demand for environmental expertise was seen by many of these professionals as a potential for expanding their claim to professional jurisdiction and not simply as a new problem or a problem that required new solutions. The effort to create a master’s degree in regional planning created a strong professional claim to authority; this claim did not match cleanly with the earlier claims to disciplinary innovation but rather was premised upon a continued claim to environmental management. With the gradual diminishment of the Environmental Research Center as a functional institution, the dynamic claims of the early ES proposal were subsequently whittled to an expert claim to authority centered upon environmental management.

However the real challenge to the ES program lay with the emergence of CEREO, an institutional arrangement that clearly surpassed, in terms of scope, the research capacity of the ES program. As an institutional project CEREO captured two elements of the existent institutional order at WSU that eluded the ES program, despite its popularity as an innovative disciplinary endeavor. First, CEREO enrolled environmental researchers into its organization, but without the requirement of a synthetic or integrative framework. This capitalized on the existent research capacity, and the campus strengths,
in terms of environmental research, that did not take on the institutional identity of environmental science. Second, without the Environmental Research Center, the Environmental Science Program’s claim to relevance remained largely confined to training in ‘integrative policy analysis’ and environmental review, both of which were largely management priorities. However, as discussed in the introduction of this chapter, the science policy that emerged during the 1990’s placed a premium on integrative and cooperative institutional projects, that incorporated a variety of expertise, and in terms of environmental policy, was to some degree hampered by its integrative vision, as centered upon the synthesis of discrete disciplinary knowledge. In this respect, because of the expansive nature of CEREO’s research capacity, largely due to its early open nature, it was clearly positioned to capitalize upon the new currency of science policy that, if not directly, tacitly privileged environmental research structured along the lines of ‘expert knowledge systems.’

Finally, as CEREO, is wed to the new school for Environmental Science it has assumed an innovative posture in relation to research, training and the dissemination of knowledge. Although its early emphasis on faculty led cooperative research coordination remained, the Center was subsequently situated to create integrated, targeted projects, in effect becoming a type of ‘trading zone’ for institutional projects, as well as an institutional framework to leverage funding, and organize claims to relevance for specific institutional projects. Thus in its contemporary form two dimensions of CEREO should be noted for cooperative discussion. First, the organization and function of an ‘external advisory board’ consisting of representatives from a variety of regional, and national organizations in industry, the non-profit sector, and government. Second, while the
CEREO program is organized by the three “integrated environmental themes” of “Global Environmental Change,” “Sustainability and the Environment,” and “Innovative Energy and Clean Technology Systems Design and Implementation,” within these themes work is organized by ‘initiatives,’ that themselves take the shape of what, in this dissertation, I have referred to as ExKS. Each initiative is, thus, organized by a discrete problem, including rationale for relevance, project mission, and frameworks for study. Research programs within the initiatives are thus coordinated across interdisciplinary teams, linking discrete problems to funding sources, as well as integrating the results of research into stakeholder communities. Beyond the basic of fundamental formal elements that I have sketched in the introduction of this chapter-- team directed research wed to directed funding, integrated projects coordinating research programs, and targeted, strategic problem areas, and institutional publics—the scope of these initiatives are important for how they combine three other areas of importance. First, each initiative includes a training component, either in the form of a postdoctoral position, or a curriculum, for graduate students. Second, in addition to stakeholders, these initiatives also include partner universities involved in coordinating research the dissemination of research results and subsequent program design. Finally, they are organized around clear institutional projects—that is programs, or models, or curriculum that involve evaluation, as well as potential for expansion, or replication.
In this dissertation I argue that, with the growth of the environmental sciences, we see the emergence of new forms of institution building centered on the use of knowledge, and a proliferation of institutional experiments linking knowledge with action. In the first section of this study, I reviewed the concept of the Expert Knowledge System (ExKS), as a strategy of institutional agency, concerned with the link between the collaborative production of expertise and its use in decision-making and applied problem solving.

In the second section of the dissertation, I reviewed three models or strategies of institution building. In the first, the basic-research strategy, curiosity driven research is supported through contracts and grants in aid, supporting best science, loosely organized around national priorities. This is the research that has generally been disciplinary based and, hence, associated with disciplinary problems. Through WWI and WWII basic research, in terms of co-activity, gradually took on a collaborative dimension, with researchers organized in research teams or networks. After WWII, the elements of this model were gradually institutionalized on university campuses and tied to genres of relevance associated with each university’s own institutional ambitions. In this institutional dynamic, basic research was insinuated within an expansive body of claims regarding the utility of science in support of governance, industry, and technology.

The second, somewhat older, problem-based model was organized on the basis of discrete problem-solving activities in federal bureaus or agencies. Here institutional arrangements facilitated the conduct of science in support of mission activities rather than disciplinary based problems. The resulting organization linked scientists, often working
in collaboration, with regulatory expertise around the linked production and application of knowledge to solve social or technical problems. When this model was incorporated at the land-grant universities, the collaborative, applied ethos was welded to a cooperative framework in which scientific conduct was organized into integrated projects around the application of science to regional problems, and the organized dissemination of expert, technical, and scientific information. In the context of the expanded postwar research economy, research conducted under this vein developed administrative patterns of co-activity linking basic research with problem solving integrated projects, supporting both basic research and the application of expertise through cooperative agreements. Finally, in the 1970s, a new emphasis on the application of knowledge emerged in which basic research was briefly tied to targeted funding goals and where knowledge was explicitly tied to targeted policy issues. Here the challenge was to take a policy issue and develop an integrated solution drawn from a variety of interdisciplinary sources. The ACESS program, reviewed in chapter 5, is a perfect example of this model, where the organization of knowledge production and the organization of its application were integrated into one project. The permutations of these formulae were later developed in terms of engineering, and production, around the integrated production of technology and science-based start-ups.

As a number of disciplines developed environmental specialties, environmental research was differentially institutionalized and variously integrated into these basic models, as basic research, as problem oriented research, and through targeted policy-based research. In this way, the emergence of ‘environmental science’ as a discrete body of expertise was predicated on the systematization of this research. The cognitive
authority of the scientist was predicated on this claim to expert organization. So, for example, as we saw in Chapter 5, we see that the early ES program at WSU was predicated on the notion of a new, synthetic disciplinary science—an integrated interdisciplinary knowledge base. We also saw, for example, in reference to this claim, its rejection in favor of a mission or problem-based model of organization, and the subsequent contention about what manner of institutional strategy the ES program would adopt. By contrast, OSU is notable, for its rejection of a distinct cognitive authority for the environmental sciences in favor of a claim based on disciplinary collaboration. The background to this strategy lay with a long history of university-based institution building that largely focused on the creation of a strong infrastructure of research administration. I argue, in this chapter, that this is a crucial component of the institutionalization of environmental expertise at OSU, shaping the image of knowledge, the view of environmental expert conduct, and the organization of institutional publics.

Research administration is defined as “the support required for success in research programs” (Kulowski and Chromister, 2008; 9). In this sense, as a type of institutional expertise, it is practiced in all organizations that conduct research. In the research economy that emerged after WWII, this would include: “institutions of higher education, industrial research laboratories, independent profit and not-for profit research companies, medical research institutions, and government laboratories and centers.” In the years before WWII, research administration “was vested with and was the responsibility of scientists and their research staff members,” (9). But after WWII, and the emergence of the federal compact for research, a nascent division of labor began to form around research administration and project management. The expansion of the role of higher
education in this research economy provided new opportunities for academic and scientific professionals to act as institution builders through the organization and design of research units, such as institutes and research centers. However, in addition, academic and scientific professionals, in building careers and interacting with the administrative requirements of an evolving research infrastructure organized and developed expert projects—such as research programs, campaigns, or agendas—that took on durable institutional factors. Research administration is distinct from, and defined in contrast with, the management of individual research projects, which falls to the individual scientist or principle investigator. Management of an individual project is referred to project management. Since the late 1950’s these two areas of labor have been increasingly professionalized as the jurisdiction of project managers and research administrators, respectively.

At the university level the development of research administration was a constituent feature of the post-war growth of higher education, as well as the incorporation of basic research examined in Chapter 1. The incorporation of basic research and the infusion of federal research money created opportunities to transform two factors of the pre-war university—the academic division of university administration and the business administration. Where the academic division was concerned with the production of research, the research goals of the university, and the relationship of research to instruction, the business affairs division was concerned with the management of awards, contracts, “negotiating award obligations, expenditures, cost control, accounting and financial reports and audits.” (Kulakowski and Chumister, 2000; 17). The institutional distribution of research administration varied, but as universities early
recognized that external funds could be used to sponsor “training, pilot or development grants, and support for work in the arts and humanities,” and, to this end, they pursued various strategies including bundling research administration as the administration of ‘sponsored programs’ universities thus pursued a variety of administrative strategies, including centralized and de-centralized organization of research administration activities.

In this chapter I examine the trajectory of research administration at OSU specifically as it relates to the environmental sciences. I draw attention to this area for two reasons. First, the development of research administration at OSU was preceded by a wave of institutional training for scientists, focused on project management and centered on the Science Research Institute active from roughly 1942-1974. The mission of this institute centered on the cultivation of basic research conduct and on an effort to "preserve and encourage the individual initiative of productive research in the science faculty, to intensify research activities, to encourage research grants, and to promote teamwork in research among the staff members in the different fields of science."214

Second, in the 1960’s, OSU developed an institutional strategy to capture research capacity through the explicit organization of a Research Office in 1965. The head of this Office, and its guiding architect, was also an early advocate for the environmental sciences, and his philosophy of research administration helped to shape both the general infrastructure for research at OSU as well as the shape of the Environmental Sciences Program. Specifically, Young emphasized environmental science as environmental research, and, rather than create an institutional identity for the environmental sciences,

he sought to cultivate cooperation between disciplinary and applied environmental research as the defining characteristic of the environmental sciences, plural. This emphasis on cooperative, multi-disciplinary, problem focused research combined basic research and problem focused research, to both capitalize on the strengths of OSU, as a land grant university, as well as to cultivate interdisciplinary research as predicated upon the integrative administration of research that coordinates collaborative exchange between researchers as well as research based outreach or institution building.

**Research Capacity and the Institutional Entrepreneur**

While the trajectory of development at WSU centered on a transition from a synthetic Environmental Studies model, the pattern of institution building at OSU favored a cooperative approach to environmental expertise, largely premised on the coordination of research programs. Like the other universities examined in this dissertation, OSU embraced the turn towards basic research by expanding its participation in federally funded research after WWII, and later, in 1965, creating an Office of Research to help expand its research capacity, and leverage funding through coordinated institution building, and training in support of basic research.

In explicit contrast with WSU, Oregon State University’s approach to the Environmental Sciences has taken a radically different approach, focused on building a cooperative architecture for environmental research, and less upon building a stable identity for the environmental specialist. Indeed, although OSU has maintained an Environmental Health Research Center since 1967, its Environmental Science program only dates to the late 1990’s. What has been emphasized since the late 1960’s, is an
ideal of disciplinary cooperation tied to an institutional architecture for environmental
research coordinated between ongoing research programs at Federal agencies, in the
extension service and a variety of centers and institutes. In this sense, of our three cases
OSU made a unique choice, when, in the 1970s it sought not to build a distinct program
in environmental science but rather to push for the development of more distributed
research capacity and to strengthen programs with existing environmental strengths. In
this way, administrators and academic institution builders at OSU used the emergence of
the environmental jurisdiction, and the evolving genres of environmental relevance, as a
type of institutional opportunity structure to ‘re-brand’ existent agricultural and forestry
based research as ‘environmental science’ and to thus capitalize upon the fluctuating
popularity of environmental relevance over time. This architecture has resulted from very
specific body of collective-decisions not to pursue Environmental Science in the
disciplinary fashion, resulting in a dense network of cooperative research and funding
programs for environmental research, and the late emergence of an Environmental
Science program relative to our other cases.

While this chapter focuses on the efforts to build and sustain this program, over
time, it suggests that the architecture for environmental research that ultimately emerged
has been sustained less by institutional inertia than by a concerted effort at institution
building, centered primarily on the long standing vision of institutional entrepreneurship
of Dean Roy A. Young. Young was OSU’s first dean of research and a long-standing
champion of environmental research as conducted in the cooperative spirit of the Land
Grant Institution. Chief among Young’s accomplishments was the effort to stabilize this
institutional architecture through broad, programmatic efforts to establish relationships
with agencies and other organizations that span organizational scales. By building relationships with Federal agencies and cultivating institutional publics receptive to environmental research at the regional level, courting Rotary Club Members and regional research members alike, Young, was, in a sense, fully aware of and an articulate advocate for the changing dimension of institutional conduct which were transforming the soul of the Land Grant University and a poetic spokesperson for the value of ‘research and an articulate interpreter of the benefits of science for policy.

Roy A. Young came to Oregon State University as a faculty member in the Department of Biology and Plant Pathology where he served from 1948 through 1966, first as Assistant Professor, and later as Department Head. He served as Dean of Research from 1966 until July of 1969 when he became Acting President of the University. He held this position until July of 1970, when he became Vice President for Research from 1970 until 1976. In 1976, he moved to the University of Nebraska to become Chancellor of the University, and, in 1980, he moved to Cornell to become Managing Director and President of the Bryce Thompson Institute for Plant Research. He served at Cornell until 1986 when he retired and returned to OSU as part-time Director of the Office for Natural Resources.215

The Office of Research itself was created in 1966 in response to the increasing Federal funding which became available after World War II. Prior to 1965, research administration was coordinated by the Associate Dean of OSU’s Graduate School. As the first head of the Office of Research, Young oversaw all research programs, centers and

institutes, and the approval and coordination of research proposals and funds for the entire University as chair of the Research Council.\footnote{Biographical Note, Roy A. Young Papers, 1913-1990. Oregon State University Archives, Corvallis, Oregon.}

In his organizational work for the University, Young was the principal architect for the conduct of research on campus, designing a pathway for building research capacity, promoting the research activities of the University to the community at large, and cultivating funds from State, Federal and private sources in support of ongoing University research programs. Young was uniquely qualified for this position, as he was actively engaged in the governance of a variety of professional societies, while simultaneously serving on the boards of National Councils, advisory boards at the State level, and as a board member of numerous organizations serving both private and public interest.\footnote{See Professional Organizations and Activities Files, 1943-1989. Roy A. Young Papers (Series IV. Committees) Oregon State University Archives, Corvallis}

In all of this institutional work, Young remained a passionate advocate for the Environmental Sciences and championed the role of environmental research based on a model of cooperation between disciplinary experts, expert professionals, and the evolving institutions of environmental governance. Young’s work is exemplary in its ability to manage the benefit of the multiple constituencies of the University and to present ‘research’ as a means of problem solving as well as the foundation for productive institutional partnerships creating a cooperative environment for research largely through bolstering the research infrastructure and through the early creation of multidisciplinary
research programs as centered on problems of agricultural research, forestry, and energy research.

The background to what would become environmental research was built from a diverse body of expert projects that had dealt with agriculture, forestry, and natural resource extraction, many of which were organized on a conservation basis. However, the proximate origin of many ‘environmentally themed’ projects took up the theme of ‘environmental quality’ as a genre of relevance, in the 1950’s and 1960s.

The Environmental Health Sciences Center was organized in 1967, founded mostly through the provision of a grant from the National Institute of Environmental Health Science. At that time, it was one of six Centers established by the NIH for environmental health research; the Center was built around an existent research program on the biological effects of pesticides. Before the development of the Center as an environmental health organization, research activities on pesticides were organized at the level of the Agricultural Chemistry department, and support for this work came from the “Agricultural Experiment Station, including support from the Chemical Industry.” 218 The environmental Health components of this cooperative activity were initiated in 1964 as the multidisciplinary project, “Toxicity of Pesticides in the Environment.” This project was subsequently folded into the Center along with the ongoing work of Agricultural Chemistry. Under this new configuration, the newly emerged Center’s activities

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218218: “Present and Projected Activities Relating to Environmental Quality at Oregon State University of Possible Interest to the Rockefeller Foundation, Summary.” Roy A. Young Papers (Series IV. Resignation) Oregon State University Archives, Corvallis, Oregon.
expanded to include work on toxicity more generally, as well as a full research program on the effects of synthetic chemicals as an environmental problem.  

In 1968, the Air Resources Center was established to “foster and coordinate work in air pollution and related fields.” This work was conceived as “university-wide” and included research, training and service, including the maintenance of close relationships with the “air pollution control agencies of the state.” By 1969, a department of Atmospheric Sciences had been organized in close cooperation with the Air Resources Center, and the two coordinated activities to develop “funding sources for research, training and service activities in both basic and applied research areas” relating to air quality. By 1970, the areas of concern were noted as work in “agricultural field burning, dispersal of forest residues, vegetative damage from air pollutants, and engineering technology for industrial sources peculiar to Oregon.”

Two other research units—the Marine Science Center and Sea Grant Program; and the Water Resources Units—had been codified from research activities ongoing since the 1930s. Established through close cooperation between “the Agricultural and Engineering Experiment Stations,” and the research program continued to include “close collaboration” between “the sanitary engineering group and fishery biologists.” These programs were re-organized as the constituent elements of the Pacific Northwest Water

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220 “Present and Projected Activities Relating to Environmental Quality at Oregon State University of Possible Interest to the Rockefeller Foundation, Summary.”. Roy A. Young Papers (Series IV. Resignation) Oregon State University Archives, Corvallis, Oregon. Oregon State University Archives, Corvallis, Oregon.
Laboratory (PNWL), active between 1962-1969, and later the Water Resources Center. The PNWL was created in 1961 when amendments to the Federal Water Pollution Control Act authorized the creation of seven regional laboratories, originally to be administered through the U.S. Public Health Service. The lab was later transferred to the Federal Water Pollution Control Administration within the Department of Interior, 1967, accompanied by a mission change to research and management in water pollution control. In 1970 with the establishment of the EPA, the laboratory was moved into EPA, and named one of nine field stations. In 1975, the lab was renamed the Environmental Research laboratory. The Water Resources Center, by contrast, was created with Federal money that OSU received from the passage of the Federal Water Resources Act in 1964, which created a network of water research centers at land grant institutions around the country. The Center was successively reorganized as the Oregon Water Resources Research Institute (OWRRI), the Center for Water and Environmental Sustainability (CWEST), and most recently the Institute for Water and Watersheds.

The Marine Science Center and Sea Grant program also grew from work originally established in the 1930’s around issues of marine water pollution. By 1965, a facility in Newport, Oregon had been expanded, and a “Unit of federal Water Pollution Control Administration Regional laboratory,” developed a research program at the Center, established “in close collaboration with the University Program.” In 1971, OSU became a major recipient of a new Sea Grant legislation to support work on “physical and

221 “Present and Projected Activities Relating to Environmental Quality at Oregon State University of Possible Interest to the Rockefeller Foundation, Summary.”. Roy A. Young Papers (Series IV. Resignation) Oregon State University Archives, Corvallis, Oregon. Oregon State University Archives, Corvallis, Oregon.
biological relationships in estuaries and near shore areas of the sea as a base for better understanding pollution effects, as well as to research relating directly to potential pollution problems in these areas. In 1970, the center was advertised as allocating an “estimated 10 percent of federal and state match Sea Grant funds “ to research as related to “environmental quality.”222 In 1995, many of the Newport labs were merged with the EPA Environmental Research laboratory to form the Western Ecology Division.223

From Environmental Quality to Environmental Science:

This research on environmental quality, and the basic institutional architecture of these programs, were successfully translated into coordinated program building in the late 1960’s through the auspices of two phases of institution building. In the first phase, issues of environmental quality, as well as older issues of conservation were translated, through a sort of ‘paper architecture’ of proposal writing that linked the older environmental themes—such as issues of environmental quality, and conservation—to the new themes concerning the availability of environmental information needed to solve environmental problems. In the second phase, this was translated into committee work that subsequently became the basis for an implicit ‘philosophy of coordination,’ that animated much of the institution building around environmental science from the late


1960’s forward. At issue was the work of interdisciplinary research framed from within a broader institutional ethos of coordinated, collaborative inquiry.

In 1969, OSU, through the auspices of E.N. Castle (PI), Hugh F. Jeffreys, business, and Roy A. Young, Vice President for Research and Graduate Studies, presented a proposal to the Rockefeller Foundation, to the tune of $935,323, and entitled “Man and his Activities as they Relate to Environmental Quality,” to establish a “three year interdisciplinary study of the biological, physical, economic and social factors that influence environmental Quality.”

The proposal identified four main activities: first, to “conduct original investigations to isolate relevant relationships in the biological and physical sciences;” second, to investigate to “better understand man and his activities as they relate to environmental quality;” third, to work towards “the construction of a simulation model that will integrate relevant knowledge from biological, physical, and social science for the purposes of designing and testing social institution and management strategies;” and, finally, the proposal suggests courses of action that initiate and intensify “those activities of University that emphasize the application and integration of knowledge.” They specify these to include: “a.) Advising commissions, councils and boards; b. graduate training with emphasis on the integration of knowledge; c. professional worker training.”

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The nature of the problem is proposed to be “an acute awareness of the relationship between man and his activity and the quality of his natural environment.” Adding further, “the manifestation of this awareness…has become known as the problem of environmental quality.”

That the public at large now appreciates this problem is characterized as a potential boon for universities to begin to deal with some very real problems. A review of their diagnosis is crucial for understanding the development of research capacity at OSU. First, it is argued that “the environmental problem now recognized in this country stems from the convergence of a number of forces,” chief of which is the antiquated economic and political systems that were designed to “cope with the problem of government and exchange in pre-industrial nations,” and, because of an emphasis on “individualism,” have not been designed to “provide for the complex interdependencies that have been created by the interaction of technology with the natural resources of the earth.” This scenario, in turn, augments the fact that “man’s power to manipulate nature” has grown in tandem with man’s knowledge of nature. In this respect, they add, “fundamental discoveries in biological and physical science increased the power to manipulate even more, suggesting this has increased human population, and allowed man to distribute himself very unevenly over the face of the earth.”

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All three observations sum to the fact that “We are now becoming acutely aware of the complexities, finiteness, and the interference of the ecological system,” and, as a result, “Many contemporary writers are describing this system and making common the knowledge which ecologists have known. We are also becoming aware that the widespread and persistent application of the techniques of nature manipulation, known as technology, often have undesirable and unanticipated effects.”

While these problems seem typical as common narratives of the time, I draw on them here as they provide an extended glimpse at the solutions, which were at issue with a transition towards environmental science. Young et al., describe these as “collective” in nature and tied to the possibility of rational conduct. “Man, in a collective sense,” they note, “has the opportunity to be rational only if he can know or estimate the probable consequences of his actions, and if his incentive or control system reflects those probably consequences at the time of decision.” This potential state of ignorance is on this analysis tied to his social relationships, as “the legal, economic, and political systems” that we have inherited “largely as the result of trial and error” developed “for a less industrialized and urbanized society.”


To this, they further add, by way of a solution, “these institutions are slow to change,” and although “it is not difficult to document their inadequacies,” change alone is insufficient to the problems. They note: “Better systems need to be substituted,” and, for this to occur, techniques must be adopted for the “systematic development and testing of institutional devices prior to their adoption by society.” With a dramatic flourish, they propose to advance “a method for such prior testing,” comprised of a three-part solution: first, “the adjustment of man in life-style, values and ethics to the realities of group living;” Second, “the need for the design and application of systems of prediction, consumption, exchange and governance that will reflect the interdependency of the ecological system, and the consequences resulting or which are likely to result from the application of partial technologies;” and, finally, a need to “better understand the interdependent and finite ecological system in the context of modern technology.” The imperative drawn from these observations entails that “It must be assured the issue is not whether man will continue to manipulate nature or not; the issue is the kind of manipulation chosen, or the impact of the application of particular technologies.” I suggest here that this is a remarkable summation of a particular strand of problem central to the entire dissertation, regarding the use of knowledge. I would add, further, only that what Young and his colleagues managed to produce at OSU, was in fact very close to this description in execution and intent.230

230 Consider the work of EEES, in Chapter 4, and the Environmental Sciences Committee described below. In comparison to WSU and UCSB the path carved out by the environmental sciences at OSU is to understand ecological systems in the context of technological systems, or development. Or, the environment as balanced against development interests.
Indeed, this course, in fact approved for funding by the Rockefeller Foundation, and implemented in 1971, became the centerpiece for much of the further organizing that around the structure laid out, implicitly, by the architects of the proposal in 1970. By 1970, plans were being made to organize and Environmental Sciences Committee in order to re-evaluate the Universities stance on Environmental Research. Up to this point, the feeling on campus had been that OSU should develop “as necessary” environmental courses to “meet disciplinary and interdisciplinary needs.” However, the prevalent belief was that “environmental science should not be developed as a major disciplinary area.”

However, looking around, some faculty began to re-evaluate this position in the light of a perceived need for “increased instruction and research in the broad area of environmental science.” In the report of the Committee, they observe, “several institutions have established schools of environmental science or schools of human ecology, or organized environmental science Centers with an associated undergraduate instructional function.” In light of these developments, the Committee was charged with the task of re-evaluating the Universities programs around a four-point assessment. First, should the University develop a department or school with an appropriate curriculum? Second, should they build an instructional function in the Environmental Sciences in

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231 Environmental Sciences Committee Letter, 11/24/70. Roy A. Young Papers (Series IV. Committees). Oregon State University Archives, Corvallis Oregon.

232 Letter from J.R. Shay to Roy A. Young, June 22, 1971. Roy A. Young Papers (Series IV. Committees) Oregon State University Archives, Corvallis
association with the established Environmental Health Sciences Center? Third, do they regard the present organization as adequate, or, fourth, make other arrangements.\(^{233}\)

Appointed in January of 1971, the Study Committee began meeting at weekly intervals throughout the month of April, and by June 22, the committee had convened, and a report had been submitted to Roy Young, then head of the Office of Research. The rough conclusion of the committee was that “the environment is pervasive, and its study should involve all disciplines as we continue the unending search for knowledge of man’s proper role.” A seemingly positive conclusion, they note as a caveat: “To find a possible organizational structure that might stimulate and nurture such multidisciplinary approaches without destruction of important disciplinary activities is a most difficult task for the committee.” \(^{234}\)

At issue was a total review of environmental research capacity. Most of the “environment-related organizations” were analyzed in relationship to other units, such as “academic departments, [and] schools and research organizations such as the agricultural experiment station, Forestry research laboratories and Engineering experiment station.” In addition, the prior founding precedents for environmental research were reviewed including the “University Goals Commission to the President of OSU (1969-1970);” “The Task Force of the Environmental Health Sciences Center;” “An undergraduate multi-disciplinary course in Man and his Environment;” “the environmental topics of the Honors Colloquia; “the Advisory Committee to the Governor on Environmental Status of


Oregon, 1970; “the International Biological program on Campus; “ and the “Committee on Development of Curricula for Secondary and Elementary Schools.”

The conclusion of the Committee was largely based on the continuation of standing policy although recommendations were couched heavily in the language of administrative re-organization. The major suggestion of the committee was to decline to create an interdisciplinary center or program for Environmental Science. Rather, “It was obvious to the committee that achievement of emphasis on environmental problems should not be attained by abandonment of the disciplinary structure, activities and services.” They reason that “complex interdependent environmental problems,” in fact require an effort to “vigorously maintain and build, where possible, our basic disciplinary research programs.” While they acknowledge these problems “require new knowledge and understanding of natural and human phenomena and processes even more abundantly and acutely than in the past,” they maintain the proper entailments drawn from the fact of environmental problems “will demand even higher levels of understanding and skill in professionals, technologists, teachers and citizens.” Adding, that as a problem of training and education, it is the responsibility of the University to “continuously upgrade disciplinary research and challenge our undergraduates and graduates in traditional disciplinary courses.” The same reasoning applies to the “extension activities of the University,” which “face continued demands from traditional areas previously served.”


The committee, in effect, rules out the possibility of ‘Environmental Science,’” in the singular, as a new science or discipline, noting “A distinct ‘center’ or ‘institute’ separate from these units, for all environmental work does not seem to us to be appropriate.” In contrast, they categorically state: “All disciplines of the sciences, social sciences, and humanities and of the Professional Schools can contribute significantly to the solution of complex multi-disciplinary environmental problems.” In countering the creation of a new way of synthetic environmental science, they argue that environmental problems demand a “very sophisticated level of interdisciplinary interaction.”

To cultivate this type of interaction, they argue, the real questions for OSU are administrative and financial. Indeed, they observe that the University already maintains an unusually “high degree of cross campus cooperation.” The ‘Environment,’ however requires a more “advanced and systematic interfacing of all the disciplines.” Administrative and financial impediments must be dealt with before the University can build a “favorable climate and organization” for such a “pervasive area as the ‘environment’”.

At the administrative level, it is argued, the problem of the environment stems from the fact that staff members “must work in teams in research, teaching, and extension.” This is problematic because, “evaluations of their performance and contributions in these team efforts must be made and rewarded outside usual

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departmental and even professional competence.” This is a problem for collective coordination, as well as an issue of support, and assignation of reward for competent performance. Any proposed administrative organization in support of environmental research must “make sure appropriate information is fed continuously into the departmental and school administration.” Further, executive action must maintain a responsible and supportive environment in this regard. They note: “University administration from the President through the department chairmen must strengthen the University commitment to environmental emphasis through statements, efforts and actions to reassure staff that proper credit will accrue from competent performance in these multidisciplinary activities.”

Problems of financial scope are treated as an interrelated issue of availability and organization. They note, “Environmental emphasis must be achieved in many cases through internal school and department changes within existing personnel and budgets.” In their view, the University is to face “lean times” at the level of legislative appropriations, and, hence, University support for existing programs will be “very selective for an indeterminate period.” They do anticipate, however, an increase in grant and contract money in environmental research and in educational extension.” Regardless, they emphasize, “It is essential that a financial base be established on state funds which will provide continuing and matching funds to attract investments from outside sources.” As an objective, they suggest: “The success of our environmental research programs is irrevocably tied to the amount of support we can attract to the

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University. We must continue to improve the quality of research and must make the results and programs visible at both the state and national level.

To solve both the financial and administrative dilemma, they offer an organizational model, and a pathway for implementation, organized functionally by activity areas now decreed inadequate. First, they argue it is urgent to increase the profile of environmental research and to “increase its visibility to citizens at the state and nation, to state and federal agencies” by making a case for the ongoing environmental programs of education and research for the purpose of “warranting their continued support.” In general, this objective, it was argued, should be facilitated by the cultivation, at the level of instruction, through the utilization of a “systems” or holistic approach, which conveys an “appreciation not only for complexities of the problem but also fosters integrated comprehension.” This implies some degree of complexity, in and of itself, as these programs ought to be taught as multidisciplinary courses through instructional teams. However, the committee notes the university lacks an “administrative system for planning, initiating, managing, monitoring, supporting and evaluating multidisciplinary courses where teaching staff are drawn from two or more schools.” Here the committee pulls for “Man and his Environment,” to be initiated that spring of 1971, as a model for a

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multidisciplinary course; a model for an undergraduate minor; and the basis for curricular outreach between the University and the regional school system.\textsuperscript{241}

While the committee maintains that OSU should not develop an undergraduate major at that time, they concede “such a major may be desirable in the near future,” and the prompt development of an undergraduate minor is warranted.” Father, this presents an opportunity as the passage of the Environmental Education Act of 1970, magnifies the strength of OSU’s position to “contribute effectively” to curricular development, “by working cooperatively with the Oregon Board of Education and with other universities,” to optimize the ability of OSU’s Schools of Education and Science in assuring “the early development of authoritative scientific content in the environmental materials for Oregon Schools.” Second, the committee argues, that research must take center pride of place in the coordination, and cultivation of University wide programs in the environmental sciences. To this end, they mandate the cultivation of a coordinated interdisciplinary research program “at both the basic and applied level” comprised of short term, and long-term research. This program would be oriented towards solution to existent environmental problems. Here they stress, “Emphasis should be directed towards providing solutions to specific problems and public acceptance of these solutions through application of existing knowledge or the generation of new knowledge.”\textsuperscript{242}


This research program is imagined as consisting of “air and water pollution programs and their abatement,” “resource inventory and regional planning,” “the understanding of ecosystems as aids the management systems of agricultural, forest, ocean and all other biological resources,” resources of geology, land and sea, environmental toxic city, and “technology assessment (in conjunction with extension).” Echoing the proposal to Rockefeller several years prior, they note, “research capability” should be expanded in areas relevant to OSU’s environmental mission, “In particular, a significantly improved capability in social science research.” They suggest this effort at social science improvement be supplemented by encouraging the trend of “Extension becoming a university wide function,” drawing on a wide range of disciplinary research to produce coordinated “interdisciplinary teams of specialists serving as resource people” working at the state and national level.”

Third, the committee notes that a major effort must undertake the improvement of communication amongst University groups conducting environmental research and the cultivation of relationships between the university and “agencies outside of the University.” This constitutes the major conclusion of the committee, and their suggestion, ideally, would sum to the functional creation of “Council of Environmental Programs.” They note, “Since the university at large is conserved in environmental activities, the focus of leadership must reside in the Office of the President.” They add, “This requirement has been recognized at Wisconsin and Washington State where environmental activity leadership is provided from the Chancellor’s or Vice President’s

offices.” While they observe that OSU’s Office of the Vice President for Research and Graduate Studies has been unusually successful in developing and supporting environmental research “in communication with State and Federal Agencies,” further coordinated activity would include extended relationships between the Dean of Faculty, “the convergence point of all special and interdisciplinary institutional programs,” and the Director of Cooperative Extension Service. To this mix they recommend adding specialized advisory committees to coordinate activity “outside and within” the university and to appropriately utilize faculty at OSU. Additional effort should go into the creation of an executive officer in charge of overseeing coordination of “all three major areas of activity—instruction, research and extension,” envisioned as analogous to the manner a department head “currently coordinates these activities in his particular discipline.”

Like all organizations, the administrative structure of OSU has been subject to ‘institutional drift’ often related to the basic fact of administrative inertia. Much of what is recommended by this committee, in abstract, can be seen in the prior reports written in prospective outline in grant proposals and plans for curriculum design. The Council of Environmental Programs, in fact, never materialized with any degree of duration as imagined by the committee. But the salient features of its recommendations can be seen to structure curriculum development, department programming, and extension work over the next four decades.

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As an exemplary program, “Man and his Environment” was greatly enlarged, and replicated throughout the general curriculum. And cooperative activities dealing with ‘environmental problems’ can be found as a cornerstone OSU’s institutional mandate into the present. These activities created a distributed basis for the conduct of environmental research, and OSU created a reputation and a prestigious institutional identity for conducting research in the Environmental Sciences. I trace out this accomplishment, first, by looking at fluctuations in curricular development from 1972 to 2010, notably with the emergence of interdisciplinary science programming, and, second, from 1994 forward, the development of an environmental science expertise predicated on an explicit institutional identity.

**Accommodating Interdisciplinarity:**

The Environmental Science Program at OSU was built from the program in General Science, which ran from 1934 to 1992. During its tenure, General Science would be housed in the School of Science from its inception until 1974 when the School became the College for Science. For the 1972-1973 school year, the General Science offering was built around an undergraduate major with options in the biological, physical and earth sciences. The graduate program mirrored these options but included as well radiation biology, radiological physics, radiological health, and the history of science. For both the graduate and undergraduate programs, the degree was built from a sequence of basic science courses, which included general chemistry, physical education, general
biology, general physics, personal health and English composition and approved courses from the humanities and social sciences.  

By 1974, the General Science offering had been expanded to include an undergraduate curriculum and a graduate curriculum. The undergraduate curriculum is described as composed of a basic “core of introductory sequences” to be taken during the first two years, and then followed by “a selection of major options in biological science during the last two years of study.” The General Catalogue at this time describes the course offerings as “scheduled from the offerings of other departments.” It also stresses that this course of study is appropriate only for students who aim to pursue graduate work in “interdisciplinary fields which do not offer undergraduate majors,” like Oceanography, for example, or for students interested in “two or more of the traditional physical and/or biological sciences, such as radiation biology, or radiological science.” By the 1975-1976 school year, environmental science is listed in the catalogue as an example of a relevant science area amenable to the general scientific curriculum. The Catalogue notes, “These programs provide preparation for teaching at the college level” or for “professional research in interdisciplinary areas.”

By 1979-1980, in addition to the interdisciplinary offerings of General Science, OSU had begun to offer interdisciplinary programs in Health Care Administration and

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Hotel and Restaurant Management. Additionally, at this time, the General Science program begins to offer a specific course, ‘science internship’ offered for 1-6 credit hours, and a pass-non-pass grade. It is described as “supervised scientific work experience at selected cooperating institutions, agencies, laboratories or companies.” The General Catalogue notes that upper division standing in one’s major is a prerequisite for the internship. 249

By the 1986-87 school year General Science was moved to the newly formed College of Liberal Arts and Sciences. The lower division courses at this time include general biology, which is described as including ecology and population biology; genetics, evolution and behavior; and cellular structure, function, physiology and development. The Physical science offerings are said to include “concepts and principles integrated from physics, chemistry, and earth science.” Additionally, a special component of the curriculum is an emphasis on understanding “the nature of science as a human endeavor,” to be achieved through classes structured around “inquiry type“ laboratory activities. These courses are designed for non-science majors and are not appropriate for students with one or more than one term of previous college course work in chemistry, physics, or geology. These courses complement the addition of a ‘General Science Orientation’ track that provides an orientation to “OSU’s science curricula for freshmen and transfer students.” Topics covered in this course of study include, “Nature and scope of science,” “science as a profession,” and a “general introduction to the University.” These courses are differentiated from Upper Division


290
course topics, which present a more sophisticated menu of offerings, including courses in bioecology, biogeography, and including “principles of environmental pollution” but also an emphasis on more specialized topics, such as “biophotography” radioecology, and “radioecology laboratory,” as well as “radiation biology and Radiation biology Laboratory.”

For the 1987-1988 year, General Science is described as a ‘special program’ of the interdepartmental studies section of the College of science, along with the pre-professional education, and science training for science teachers. The pre-professional programs consist of dentistry, dental hygiene, medicine, medical technology, nursing optometry, physical therapy, and veterinary science. Committees representing each pre-professional specialty organize these programs. At this time, General Science offered an undergraduate curriculum with majors in environmental biology, history of science, earth science, and radiation health. Additionally, graduate work consists of two offerings, first, an interdisciplinary program in biological or physical science, and a sequence of pre-professional preparation supervised by faculty in the department of General Science. The courses in interdisciplinary graduate study are made available through the “offerings of other departments,” with supervision by the faculty of General Science.

For 1988-1990, General Science began to offer the M.A.I.S, or masters of interdisciplinary science.

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General Science option was eliminated at the end of the 1991-1992 academic year. The previous year, a proposal was made to eliminate the offering, which was approved, and the 1992 The General Catalogue notes, “the areas of instruction currently offered by general science will continue to be available in the college of science, including the undergraduate degree programs for pre-health majors. As a result, during the 1992-1993 school year, the Environmental Science interdisciplinary offering was transformed into a degree in environmental science, and the Earth Science interdisciplinary offering moved to the Department of Geosciences. The individualized component was restructured to address the needs of those working towards “a degree appropriate to the Masters of Arts in Technology for admission to the Masters of Arts in Technology (M.A.T) degree program in elementary education.”

The Earth Science option is described as, “a blend of geology, geography, oceanography, and atmospheric science courses.” The General Catalogue for that year gives special attention to the environmental science degree that consists of an “interdisciplinary degree aimed at studying and protecting our environment.” It describes the degree as leading to specific careers in Environmental Research,” noting that “Federal Agencies like the U.S. Environmental Protection Agency, the Department of Energy, and the U.S. Forest Service hire qualified graduates, as do private companies, consulting firms, and Universities.” The Environmental option is presented as teeming with flexibility, and the General Catalogue suggests “students can continue their studies in graduate school, or they can combine their scientific background with law, and go into

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environmental law; or earn an M.B.A degree and assume leadership positions in the environmental science divisions of large corporations.” They add the degree is also appropriate for those who have plans to teach at the elementary or secondary degree level.

By 1994, the College of Interdisciplinary studies had emerged as a home for science dealing with issues of “emerging societal importance.” The programs are described as programs that “depend upon the existence of strong disciplinary programs, “ and that “place significant responsibility upon students to integrate and synthesize information.” Four new BA degree programs were introduced, consisting of “bioresearch research,” “Earth information science and technology,” “Environmental science,” “Natural resources,” and a degree in International Studies.

In this context, environmental science is described as “interdisciplinary preparation in the physical, biological and social sciences,” as contrasted with the degree in natural resources, consisting of study in “a broad curriculum based on the colleges of agricultural sciences, forestry, liberal arts and science.” While disciplinary specialization is described as “specialization in one science relevant to the environment,” the natural resources degree is said to provide an “understanding of the social and scientific dimension of a broad range of natural resource management challenges.” Environmental Science courses are grouped thematically around “Natural Environmental Systems,” and “Humans and the Environment.” By contrast, the natural resources degree is organized around problem areas consisting of “natural resource administration and forestry,” “agro forestry,” “arid land ecology,” “resource policy,” “recreation ecosystem planning,”
“geosciences and natural resources,” “Natural resource education,” and water
conservation, utilization and water ecology.\textsuperscript{253}

By 2014, this program has developed in three significant ways. First, in 1998, the
Environmental Sciences program was consolidated with a new graduate degree in
environmental science, including the master of arts, the master of science, and a Ph.D.
component affiliated with a Joint Campus Graduate Degree Program in Environmental
Science, involving the University of Oregon, and Portland State University. Second, in
2003, OSU launched a professional Science Master’s Degree, with a major specialization
in Environmental Science, leading to an MS degree. In 2008, the program brochure notes
that the professional offering is available for Environmental Science, Botany and Plant
Pathology, Molecular and Cellular Biology, or Applied Physics. In lieu of research,
degree candidates pursue “specific training in a scientific discipline” and obtain “skills in
business management and communication…enabling students to effectively work
between scientific and business communities.”\textsuperscript{254} By 2012, this degree offering had been expanded to that of a Professional Science Masters (PSM). However, by 2012 this
description had been significantly expanded to suggest directly that: “The worlds of
science and business are increasingly interconnected, creating strong demand for
environmental professionals who can create partnerships for research, policy and public
outreach initiatives.” This description notes further that the PSM, the first of its kind in
the Pacific Northwest, was designed in consultation with the “help of professional

\textsuperscript{253} Oregon State University. Oregon State University General Catalog 1972-1973(1972). Oregon State University Archives, Corvallis, Oregon

\textsuperscript{254} Environmental Science Program Brochure.
affiliates employed in leadership roles in industry and agencies concerned with the environment,” additionally noting that several federal agency laboratories are located in Corvallis, “including the U.S. Environmental Protection agency, the U.S. Department of Agriculture, the U.S. Forest Service, and the Bureau of Land Management.” By 2014 the degree offerings consist of four areas of concentration, Applied Biotechnology, Applied Physics, Applied Systematics in Botany, and the Environmental Sciences. Finally, the administration of the undergraduate program was moved to the College of Earth, Ocean and Atmospheric Science (CEOAS), a newly integrated College, resulting from the merger, in 2011, of the Department of Geosciences, and the College of Oceanic and Atmospheric Sciences. This merger leverages the various environmental specialties of OSU in one organizational unit, integrating research and academic degree programs.

The emergence of the Environmental Sciences Program was supported by embrace of a vision of interdisciplinary science largely stemming from a basic or general science philosophy. This perspective evolved from a focus on the study of basic science to understand complex problems, to its use in problem solving, to one that gradually focused on the use of science to study complex systems, and their social or political context. However, this shift did not occur simply on the basis of the embrace of ‘interdisciplinarity,’ as an epistemic value. It was to some degree supported by a practical acknowledgement that training environmental experts was the training of expert professionals to work in areas of complex decision making. This attitude towards the conduct of environmental professionals is in many ways augmented by the recent

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255 Environmental Science Program Brochure.

256 “Reorganizing COAS” website entry
developments, as the new professional degrees augment this aspect of expert conduct, where expertise is treated as an institutional or organizational resource, through an emphasis on the work of creating expert projects in a diversity of organizational settings. Both shifts in attitude are perhaps best illustrated in the sentiments of one EPA based scientist interviewed while conducting fieldwork at OSU. He observes:

**EPA Scientist:**

“OSU had an established history of environmental research….what was called environmental research…it really didn’t [pause]…it really didn’t need an environmental science program, or an environmental studies program…this work was already being done in other areas of the university….I really see…[pause]…in my opinion, now…that these degree programs came about…because we need a way of making problem oriented thinkers…that…[pause]…but with broad scientific experience…that’s what was missing. It’s a good program…but also so is this new program developing now….I really think you should look at this [The Professional Master’s Degree Program]…have you spoken with {it’s director}?”

From another point in the interview, he adds:

**EPA Scientist:**

“I had a broad science background…but it didn’t help me directly with the kind of work we do…I had to learn how to solve problems……to just figure things out….and to work in a group….you see…in this kind of organization.”

Our discussion is memorable for the way in which he combines two elements of environmental expertise—it's use in problem solving and its role as a resource. Following up on his suggestion, I note several qualities of the Professional Science programs that have been developed at OSU, independently, as part of the Professional Masters degree program, and as a degree option in the environmental sciences. While participants in

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257 Fieldwork interviews.
these degree programs are trained in the interdisciplinary basic science, and, hence, trained in disciplinary based research, they are educated as well in professional areas, defined as “business management, ethics, [and] communication,” among other professional skills. This gives us some indication of what the EPA scientist above is referring to—essential skills of project management—that, in these programs, are obtained through “non-thesis, interdisciplinary studies that require an internship experience” that integrates “training in communication, business management, ethics and other professional skills.” Several quotes from the PSM website provides further illumination. The brochure features four ‘scientific professionals’ in a variety of settings, two in ‘nature’ and two in the contexts of the lab. The contrast between these four profiles is illustrative of the program’s interests, and basic market. One profile notes: “When you work in any science-based organization, you’re not just a scientist. You have to be able to write a business plan and submit a budget for your projects. The PSM program gives you a very valuable combination of skills,” illustrating the need for project management skills. Another suggests that, “This program really enables students to be productive members of the biotech field — understanding how to turn scientific discoveries into commercial products that can be sold profitably to fund future research,” to provide an indication of how productivity is defined in the research economy, and the skills necessary to thrive as a scientists. Furthermore, another profile explains that as a scientific worker “You need to know – and be able to communicate – how one aspect of an environmental study relates to another in order to implement cost-effective management strategies.” Finally, we see that the experiential component integrates this

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258 Program Brochure
skill acquisition, as the final profile suggests, “I wanted to use physics in an industrial setting, and I did through my internship at Biotronik — improving the incoming inspection process for components used in implantable pacemakers and cardio defibrillators. Plus, it led to a full-time job.” These profiles are indicative of the institutional strategy this program, itself an institutional project, seeks to cultivate in terms of expert conduct. For our purposes, however, it is important to note that the ‘integrative’ element are those skills which allow experts to engage fluidly, and productively in a diversity of organizational settings, as institution builders—and, hence, to leverage institutional agency to productive effect in the form of influential and effective institutional projects were science or expertise is both the product and the resource. The professional training of environmental scientists is explicitly framed in terms of the institutional work of expertise, and hence in terms of institution building.

Conclusion:

In contrast with WSU, the institutional study pursued by experts at OSU focused on the long-term development of an infrastructure for environmental science programs, rather than the organization and development of a discrete interdisciplinary program per se. When programming of this variety did in fact emerge it was in relation to General Science programming, notably related to the integration and synthesis of information as related to complex problems in basic research and in relation to discrete policy problems. As my interviews suggest, these interdisciplinary degrees were largely seen as a means to address a perceived demand for general science training for ‘science professionals,’ as
well as pre-professional training for disciplinary-based experts working on complex environmental problems.

Like WSU, as the turn towards the environmental sciences in the 1990’s was consolidated around ‘policy-based’ expertise—that is, producing science for policy, and the increasing importance of science based policy. In this sense, the focus of the Environmental Sciences Program was framed as preparation for careers in analyzing environmental systems and decision-making factors associated with the management of those systems. In this way environmental the environmental sciences concerns the navigation of disciplinary based research and its integration relative to integrated management and policy-based expertise. That OSU developed its program at a later date, largely from the interdisciplinary instructional offerings, had to do with its early rejection of a synthetic model for environmental science, and its embrace of collaboration as preference, largely derived from an philosophy of research administration. As seen from this angle, the environmental sciences are largely predicated upon the collaborative navigation of a knowledge base for expert use in applied contexts rather than the structured conduct of basic research on environmental systems. This is notably similar to the role the ES program at WSU would take on as its early program ambitions began to subside.

However, two comparative differences between the universities should be noted. First, while OSU programming has persistently emphasized the importance of environmental science in relation to environmental policy or decision-making, it has largely pursued this through two strategies. First, the augmentation of environmental certificates and degrees in political science and, second, the organization of the
environmental sciences as a component of the General science, and later Interdisciplinary studies Program. These were largely contingent institutional developments, but their growth speaks to the conditions at OSU supporting cooperative disciplinary based expertise, rather than synthetic strategies. While this prevented the creation of an ES program at an earlier date, as compared to WSU and UCSB, it also allowed for a variety of environmental based research programs to develop along both disciplinary and applied lines, rather than through singular program development. This in effect diversified the school’s research portfolio as well as created opportunities for individual researchers to cultivate environmental expertise. Second, like the other two schools examined in this dissertation, environmental work at OSU has recently been consolidated in the College of Earth, Ocean, and Atmospheric Science (CEAOS). Like WSU, this new school is in its preliminary growth stages. However, we see elements of a tiered degree structure emerging as CEOAS absorbs the administration of the undergraduate science degree. However, unlike the other two university case studies, OSU has not sought to develop this College as an integrated Environmental Center, as with CEREO, or, as we will see with Bren, as an integrated clearinghouse for environmental research or expertise.

In this sense OSU has pursued a strategy of ‘scale’ rather than concentration. It has been able to pursue this strategy largely because of the manner in which environmental programming has been distributed on campus, and through its long-term efforts to build a general research infrastructure to support collaborative, disciplinary-based research. This model is supported by a strong emphasis on academic institution building, as balanced against collaboration with cooperative extension based programming. As compared with the other two schools, OSU’s designation as a land-
grant, sea-grant, space-grant and sun-grant institution, coupled with its federal agency research centers has created a dense network of institutional projects coordinated by integrative administrative strategies promoting collaboration, rather than program building per se.

The general portrait that emerges from the efforts to institutionalize environmental expertise at OSU is one shaped by an older idea of ‘cooperative’ knowledge, as reviewed in Chapter 1. This feature is important in two ways. First, this cooperative features, as an institutional strategy, at the level of university research administration, is in effect a sort of merger of the basic and the problem-oriented models of science policy. Disciplinary research, and problem-oriented research were, in principle, brought into collaborative working relationship, but wed to dual genres of relevance, supporting appeals to both basic research, as well as claims to applied or problem-focused knowledge. In another sense, however, in this institutional culture, the conduct of environmental experts were broadly defined in two ways: first, as that expertise which results from research on environmental systems; and second, the expertise that results from the integrated use of environmental research in problem solving, and hence as a constituent feature of environmental management or environmental policy. While not a generalist, the environmental expert’s claim to cognitive authority was predicated upon their use of environmental research rather than its production per se. It is in this sense that he Professional Science Master’s constitutes an important, and interesting strategy given this broader institutional trajectory. The skills associated with this specialization are defined precisely from their role in the use of knowledge in multiple organizational contexts, and hence as a feature of expert based
institutional work, or institution building. As we well see in the next chapter, this skill set is a valued component of the UCSB curriculum as well. I argue that it is a generalized feature—an expectation—shaping the development of environmental expertise more generally.
In the conclusion of Chapter 1, I reviewed three policy models—or genres of relevance—concerned with the organization of science in relation to the regulation of the environment. In the first model, the concern was with the creation of a ‘new’ environmental expertise, largely interdisciplinary, but focused on integration. Environmental expertise was defined as a new type of professional expertise, based on the synthesis of collaborative research and aimed at problem solving. In the second phase, environmental science is understood as the science of environmental systems and the use of that science in the ongoing management of environmental systems. Here, the issue of problem solving is mitigated as the use of environmental research in decision-making and the ongoing management of environmental systems. Environmental expertise in effect becomes a type of organizational knowledge management. In the third model, environmental expertise as a decision-making science is integrated at two levels. First, environmental expertise is integrated at the level of research where collaborative knowledge is organized around new models of environmental systems. Second, this work of model building—the knowledge of environmental systems—is then utilized in the decision-making sciences, regarding environmental policy and the ongoing management of both environment and human systems. Finally, through institution building, this work is, at both levels, brought together in institutional arrangements involved in the management of environmental systems and in mitigating environmental systems. As genres of relevance, these models, or policy prescriptions, speak to the relationship between science and society as framed by environmental concerns. What I outline here is something of an evolution of this vision—that is how these genres have
been variously construed relative to the changing dynamics of human collective organization.

At another level, in terms of institutional conduct, I have examined how these genres of relevance have been made to speak to institutional dynamics in U.S. universities. Here, I have examined how these genres of relevance—of the environment, and its management as a pressing concern—have been variously translated into institution building projects and how the organization of environmental expertise has served as an opportunity structure for the institutional development of a number of expert projects.

And so, in this second section of the dissertation, I have examined the institutionalization of two models, or two institutional strategies, related to these genres of relevance, and the policy based projections of environmental expertise. In the first case, at WSU, we see an effort to create a disciplinary based synthetic expertise built from a synthesis of various disciplinary based sciences. In this sense, its claim to cognitive authority was built from this claim to integration and its relevance to environmental problem solving. In this way, environmental science took on a distinct caste in contrast to the ongoing conduct of environmental research as pursued in the more disciplinary or problem focused modalities. With the organization of CEREO, this claim to cognitive authority began to erode as a competing strategy built around collaborative research was institutionalized, first, as the CEREO initiative, and then, later, with the emergence of SEES. By contrast at OSU, we find almost the exact opposite approach, where collaborative environmental research became the basis for environmental expertise. This strategy was largely premised upon an integrative philosophy of research.
administration, coordinating disciplinary and problem-based research through large research programs. These programs additionally provided support for both institution and research. When the Environmental Sciences Program did emerge, it was largely based on an interdisciplinary model concerned with the use of expertise in policy and environmental management. In this chapter, I examine the transition from an integrative model of interdisciplinary research to a collaborative model of basic research at UCSB. As with WSU, UCSB created one of the earliest Environmental Studies programs premised upon a new type of expertise linking environmental research to environmental decision-making and problem solving. However, unlike the program at WSU, Environmental Studies was far more inclusive, incorporating a large number of humanists into the multidisciplinary program. Additionally, unlike the programs at WSU or OSU, the ES program at UCSB had a decidedly political character, where decision-making was in large part framed in terms of political activism. As the institutional context for environmental research changed, the program subsequently went through two transformations—first, an interior challenge to the ‘integrative’ philosophy of expertise and, second, an external challenge in the form of the Bren School of Environmental Science and Management. While the first challenge introduced new standards for environmental expertise, the development of the Bren School introduced a new type of debate over the role of the environmental professional.

An Ecologist of the Academic Community:

As the Oil Crisis developed, faculty members from the University of California at Santa Barbara organized under the name “Friends of Human Habitat.” Their intention
was to create an academic and professional response to the crisis. Gerald Nash, the environmental historian, and the program’s first chairmen, explains that the issue for FHH was the formulation of an answer to the question, “What is it about my profession that I can do to make things better here—to prevent catastrophes like this and to solve environmental problems?” Their answer took the form of the Environmental Studies Program. By February 18 of 1969, the group of 21 faculty members that comprised FHH had drawn up a petition for program development. By January of 1970, the “Chancellor’s committee on Environmental Studies,” was under way and a proposal was produced outlining the scope of the program. In the fall of 1970, the Environmental Studies program accepted its first students.

Nash describes Environmental Studies as “a multidisciplinary, problem-oriented major designed to give student a knowledge of the characteristics of the environment and the working approaches to the solution of environmental problems.” As such, ES constitutes “a multidisciplinary process” rather than a discipline and, hence, “does not compete with or purport to substitute for a single discipline like biology.” This

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characterization holds implications for the environmental educator as well as the student.\textsuperscript{261}

As a process, the goal is to utilize disciplinary knowledge as appropriate inputs in a solution-finding process. Nash describes this through a contrast between inter- and multi-disciplinary approaches. He notes: “We have deliberately downplayed the interdisciplinary dream prevalent in our early thinking, substituting instead a pattern of multidisciplinary input.” The goal is to know how to access particular forms of knowledge, to solve particular problems, and, hence, to draw on the great variety of disciplinary based knowledge in order to bring knowledge to bear on a complex problem. As Nash describes it, the skill here is “navigating interrelationships,” as the goal of the environmental expert is synthesis. The environmental educator “functions, so to speak, as an ecologist of the academic community.”\textsuperscript{262}

For students, the goal is one of “General Education” as construed by the problem orientation of environmental science. The philosophy of the program stems from a belief “that it is not only possible but more effective to teach basic facts and principles in the context of real life environmental problems.” To achieve this, Nash suggests, what is required “is a framework for integrating a broad range of letters and science.” (5)

Although problem-focused, the goal of ES should not be construed as mission-oriented

\textsuperscript{261} “Environmental Studies: The Santa Barbara Experience," 1973. University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

\textsuperscript{262} “Environmental Studies: The Santa Barbara Experience," 1973. University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
research or in professional terms. He notes: “We take pride in the fact that a substantial part of the effort in Environmental Studies is directed not to producing professionals in environmental fields but rather to helping upgrade the general citizenry’s understanding of the environment and its problems as well as commitment to work for their solution.”

The architecture of the program, as described by Nash, is organized around the interaction between the co-chairmen of Environmental Studies, an executive committee, an advisory committee, and an Executive Officer, or Senior Lecturer. These offices are coordinated with the Dean of Letters and Science, the Vice Chancellor of Academic Affairs, and the Chancellor for UCSB. At the student level, an Environmental Studies Undergraduate association advises the two administrative committees.

Nash notes the advantages and limitations of the system, noting the “special problems inherent in a multidisciplinary program.” The system provides, however, the program with the ability to conduct long-range planning and coordinate the academic programs involved as well as coordination with the College of Engineering. However, he concedes, “A Deanship of Environmental Studies (or of all multidisciplinary instructional programs) would help substantially in this regard, but charges that UCSB is over-administered make this prospect unlikely in the near future.” (7) Logistically, Nash describes the Co-Chairman as providing a coordinative function between the individual chairmen’s disciplinary background and interest. By contrast, the formally appointed Executive Committee handles “week to week matters of policy and procedure,” such as

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curriculum design, budgets, and recruitment. The advisory committee, on the other hand, is “invited by the co-chairmen to help in the formulation of language policy and relations with the administration and departments.”

He notes the committee arrangements pose problems and benefits for the Program. While the Executive Committee has actionable responsibilities, the members are generally caught in a conflict of interests between their additional committee work and duties and benefits of their home departments. In this sense, they are generally not in positions to offer time to the program in addition to their committee work and tend to pursue the duties and benefits stemming from their home departments. In this sense, they are generally not in positions to offer time to the program in addition to their committee service. This presents problems for the ES program in that faculty do not maintain offices in the ES program space, and the ES students do not have feelings that “these people are “their” faculty,” and the “burden of student counseling and advising falls,” to the co-chairmen and executive officer.

While this scenario holds true for the advisory committee as well, the benefit of this committee is that it is composed of “most of the foremost environmentalists on faculty” and thus “broadens the periphery of influence of Environmental Studies on

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campus.” While the administrative benefits are perhaps minor, Nash notes, “We regard it an important accomplishment that environmentally-oriented faculty on campus have been identified and organized.” (9)

Nash isolates the position of the Executive Officer for special discussion by noting the position is unique for UCSB and was developed to coordinate duties amidst faculty and to take up teaching and administrative duties specific to the program. The position of lecturer, he observes, is not regarded as a “regular ‘ladder position,’” and it does not have “the same qualifications of professional appointment.” Rather, as the lecturer is “freed from the requirements of research and publication,” the position is expected to do more teaching and to take up many of the administrative duties for the program.” Nash suggests: “Assuming the right man can be found for the position, the Executive Officer is one way to compensate for the absence of administrative help by professors in a multidisciplinary program.” He adds, “the Chancellor regards this position as a creative response to the needs of a program such as Environmental studies” and would be willing to consider “security of employment” for Mr. Schuyler,” who at that time occupied the position.


The Environmental Studies faculty designed a curriculum around three major goals, designed to solve some of the logistical problems of multidisciplinary organization. First, they isolate the issue of coordination and designed a position of a full time coordinator who attends all of the lectures of the participating faculty and provides additional lectures and coordinating seminars in order to mediate the problem of faculty participation that arise from team teaching. Second, in terms of ‘disciplinary rigor,’ Nash notes that that an ES student cannot hope to “probe any subject area in depth as great as a departmental major.” In this respect, the program is open to disciplinary criticism. But he notes, in contrast, “The Environmental Studies student likely specializes in generalization. The rigor in his curriculum stems from its breadth rather than depth.” The issue is one of balance between breadth and disciplinary rigor. Nash argues, “Students must be advised that environmental studies is not some form of science for the non-scientist or watered down social science for the biologist.” (15) Rather, he contends, “because of its comprehensiveness environmental studies is actually more demanding than a departmental curriculum.” Adding, almost in resignation, “ES educators should be prepared for “an inevitable chorus of criticism from skeptical faculty paranoid about courses in basket weaving.”

Finally, Nash suggests the curriculum must manage the issue of environmental activism directly and up front. He notes: “If it is to gain respect in an academic community environmental studies must draw and adhere to a clear boundary between

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education and activism.” He suggests, however, that the context is difficult to avoid. He observes, students, who he characterizes as “desperate for relevance,” continually “call for moving beyond the study of contemporary issues to participating in them.” This is particularly the case for environmental studies, where many faculty and students “engage in conservation controversies,” but he adds, they do so “as private individuals.” To this end, the ES Program had endeavored to maintain that, “the purpose of an environmental studies curriculum should be largely defined as equipping people with the knowledge and tools necessary for effective activism.” However, this goal should be facilitated by a pedagogical effort to “present all sides of an issue.” In this respect, Nash argues, “students should know…the arguments for as well as against nuclear power plants, offshore oil production, or dams in the Grand Canyon.” (16) With these basic principles in place, the ES curriculum was designed around a basic progression from generalized courses at the lower division, towards upper division courses concentrated within a disciplinary department, but coordinated with a problem oriented seminar.269

The Schuyler Report:

In June of 1974, a committee headed by Schuyler began an evaluation of the program’s lower division courses. The study was completed in April of that year and published in 1975.

269 Schuyler Report,” or “Final Report. An evaluation of the lower division courses, Environmental Studies 1-6, with recommendations for revisions of those courses and changes in the Environmental Studies Program.” University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
The Schuyler report characterizes the program as offering “instruction in the principles and problems of the biological, physical and social environments.” It notes that by considering “solutions for these problems,” the curriculum “motivates its students to work for these solutions.” Expanding on this notion, the curriculum is described, “first and foremost,” as offering an “education that gives its students appreciation of the environment from the standpoint of many different disciplines,” noting that as the program is “truly multidisciplinary” its other purpose is to provide “training that will equip its graduates to work in environmental fields or to go on to graduate work.”

“After five years,” the report argues “the program is firmly established at UCSB and accepted by many who had reservations about it in 1970 and 1971,” noting “an increasing number of students are transferring to the program from other colleges or junior college.” Of the students who had graduated: “About fifty of them are in graduate school; law leads the list with 14, 10 are in planning, and many fields such as education, forestry, economics” are represented, although “few are in hard science or engineering, unless they had another major in that field.” Additionally, “Another fifty or so work for private companies doing planning or environmental analysis [and] some do this work for public agencies at all levels.” Some students, “the last third” consist of some who are “living alternate lifestyles or travelling;” as well as some who are waiting it out in “less

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270 “Schuyler Report,” or “Final Report. An evaluation of the lower division courses, Environmental Studies 1-6, with recommendations for revisions of those courses and changes in the Environmental Studies Program.” University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
desirable temporary jobs.” But the report notes: “our employment record is no worse than that of the whole college population at this time; we think it may be a bit better.”²⁷¹

On this point, the report suggests that at that time, the ‘value and purpose’ of an environmental education is something to be reconsidered. In the opinion of the reviewers, although they believe the study of the environment is “intellectually stimulating, and valuable” they recognize that “most students have to make a living,” and despite the possibility of being “jack of all trades, masters of none,” they had enough “positive remarks from graduates and those who employ them or work with them in graduate studies” to assert that “the holistic approach has value, and that a good environmental studies majors are appreciated and needed.”²⁷²

Although the ES program at UCSB has “the mystique of backpacking and river running and sailing—a concern for the wilderness and disdain for the works of man,” the committee felt ES education ought to include more attention to cities, and that an ES education must include “all problems, ask all questions, consider all solutions.” A narrow, technical specialization should be avoided, and in reference to training for environmental impact reports, they note training in this area needs to be “in step with the times,” as it seems that “state certification for environmental analysts will come and will

²⁷¹ “Schuyler Report,” or “Final Report. An evaluation of the lower division courses, Environmental Studies 1-6, with recommendations for revisions of those courses and changes in the Environmental Studies Program.” University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

²⁷² “Schuyler Response,” or “Final Report. An evaluation of the lower division courses, Environmental Studies 1-6, with recommendations for revisions of those courses and changes in the Environmental Studies Program.” University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
probably necessitate graduate work in the field.” In this respect, they argue, there is still much work to be done and the program ought to consider two points in considering the future of the programs health—the programs organization, and the role of the faculty.

Noting that Environmental Studies majors are “consistently having to explain and defend his or her education, probably to those in the humanities and social sciences who don’t believe one can develop critical thinking in anything other than a conventional discipline.” They suggest that although this may motivate believers in a holistic and general approach to speak heresy against a “rigidly departmentalized university,” they argue that “students find this tiring after a while” and that they may wish “they had more faculty to speak up in support of the program” when they are told they “need more science, more engineering, more math…more economics, more English, and more everything except more time to take it all in.”

This problem is reiterated as a preface to the serious issue of faculty involvement and support because as the program was started through faculty initiative, as the program has grown in acceptance, they observe “the program has strong support from the administration but paradoxically less concern and participation from the faculty who started it.” This is a notable, and in some ways understandable development, as “the founders of ES feel that the program is going well, and they have moved on to other interests and problems.” This is a potential problem, they suggest, because faculty do not come to meetings, and lectures “can only teach and do routine administrative work, they

273 “Schuyler Response,” or “Final Report. An evaluation of the lower division courses, Environmental Studies 1-6, with recommendations for revisions of those courses and changes in the Environmental Studies Program.” University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
cannot set policy and effectively fight for support and funds.” Further, “faculty who must work in their own home discipline or participate in outside research simply do not have the time to direct the progress of ES.” But even this may not be enough, as they observe the program must have “a full time hand who is distinguished in his or her own field, a star, and a person who will direct his entire ability and influence to raising ES from a promising beginning to a strong future.”

In 1975, these partnerships became a topic for discussion. A course in Environmental Modeling was proposed, as offered through the department of biology, for both biology and ES students. At issue were the industry ties of the faculty who had designed the class. By consensus, the committee decided that the more important question was his profession and research competence. Similarly, that same year, another issue was raised around the issue of student competence—what type of academic background should students be required to have to take ES courses? Should ES be a “functional training environment for tools and skills, or should ES just be training for knowledgeable citizenry?”

A.H. Schuyler was approved in May of 1974 to take over for Nash, contingent upon Schuyler’s plan to begin an Environmental Science and engineering degree at

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274 “Schuyler Response,” or “Final Report. An evaluation of the lower division courses, Environmental Studies 1-6, with recommendations for revisions of those courses and changes in the Environmental Studies Program.” University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

275 “Schuyler Response,” or “Final Report. An evaluation of the lower division courses, Environmental Studies 1-6, with recommendations for revisions of those courses and changes in the Environmental Studies Program.” University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
UCLA, fall of 1976, exactly one month after the Schuyler study began. That same month, on May 7, Roderick Nash resigned as Chairman and member of the Environmental Studies committee. The decision was premised on his professional concerns as well as his regard for the program’s health. He had just received a grant to study National Parks, comparatively, worldwide, and he admits to finding it “extremely difficult to accomplish fresh scholarship and publication, or even improve my lectures,” while maintaining his leadership of ES. Noting that during the five years he ran the program, he found the administrative duties to be taxing’ that even chairs of actual departments have shorter tenures. On a personal note, he adds a sense of frustration: “there is the objective of bringing the number of things I do in line somewhat with my ability to do them well. It has been helter-skelter for too long, and the results were disappointing both to myself and to many around me.”

In the letter, he characterizes his resignation in a positive light, noting that if the ES program is “to retain its values, Environmental Studies must not stand on its laurels,” and in moving forward it must embrace the observations made by the ‘Schuyler report’ which made clear there is a need “for a fresh look at the philosophy and context of the entire lower division offerings” as well as a need to “stabilize the leadership” of the program in order to stay innovative. On a small note of resignation, he adds, “But I also know that the shortcomings of Environmental Studies, as described in the report, must also rest in large part on my shoulders,” explaining “some problems quite naturally stem

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276 Letter from Roderick Nash, May 15, 1975. ‘The Future of Environmental Studies.’ University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
from my interests as a teacher and scholar.” He implies that a new leader “would at least bring a new set of biases to the job—perhaps an urban emphasis to balance my interest in wilderness. “ This would also provide the fresh vigor to launch Environmental Studies on its second “five year plan.”277

Mel Manilas became the chairperson of the program in 1976-78, and was appointed as an Assistant Adjunct professor, “since the title of executive officer doesn’t exist.” Although the executive committee considered the issue of qualifications and, hence, the possibility of opening the position up for competition, it was agreed that the organizational duties that Mr. Schuyler experienced were unique and that help should be imminent.278

That same year, the ES Executive committee began to work on establishing the program as a department. The program had seemed to amass a dedicated set of faculty who were interested in shaping the environmental curriculum. They also entertained the possibility of a creating a Masters degree in Environmental Science. The question was raised as to whether or not ES programs were healthy at the national level, and efforts were made to consult the prior chairmen on the matter. Additionally, it was agreed that knowledge of this sort would be critical for convincing the administration that ES should become a department rather than continue as a program. Some argued that department

277 Letter from Roderick Nash, May 15, 1975. ‘The Future of Environmental Studies.’ University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

278 Minutes of the meeting of the Environmental Studies Executive Committee, Tuesday, June 1, 1976. 2-3pm. University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
status “might help to convince some there is such a thing as ES as a discipline,” and others argued that there might be some advantage to maintaining ES as a program, implying that continued cooperation from departments was healthy for the health of environmental science. It was agreed that either outcome would benefit from greater “documentation” as many departments may not even be familiar with the work of ES on campus. The issue was not simply one of topical scope but of organization, both institutionally and epistemologically. In an editorial by Schuyler, in 1978, he alludes to this fact in a discussion of the program’s efforts to produces scientific generalists.

Adopting a familiar definition, he defines environmental studies as an “education for generalists,” providing a holistic view of the environment and appreciative of “all of the contributions that all disciplines and professions can make to the identification and solution of environmental problems.” This is the original view of the Environmental Studies Program, and he enrolls Nash for support: “We are a process that brings all disciplines to bear on environmental problems.”

He notes however, as a practical concession, but fully in line with Nash’s earlier treatment, “we term ourselves interdisciplinary, but in actuality we are multidisciplinary.” By defining interdisciplinary work as “the interaction of two or more disciplines,” he juxtaposes a definition of the multidisciplinary “the juxtaposition of various disciplines with no apparent connection between them.” Observing further, “After eight years we are tired of belaboring this point and now, with some discussion in their senior seminar,

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279 University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
leave it to the student to pull it all together and to discern how disciplines can and should communicate.”

In characterizing the ES approach as “multidisciplinary education for the generalist,” he suggests it is a “synthetic” and not “reductionist.” The product of this approach is a person who holds “exceptional breadth of appreciation in the sciences,” adding “we extend their appreciation to the humanities and social sciences as well.” For Schuyler, the accomplishments of this approach are dual. Graduates of the program are expected to “affect the environment positively as citizens, educators, politicians, businessmen and officials.” More generally, the ES program has helped to return to education a synthetic approach that promotes a generalist viewpoint.

To understand this as a subtle shift of intent, let’s return to one early, articulate statement regarding the purpose of the generalist approach to environmental studies. Jo-Ann Shelton, an early chair of the program notes that her goal was to provide a balance between the scientific and humanistic disciplines, so students might understand that environmental issues are “very complicated and require examination from various points of view.” She adds, “We can use scientific data, but we have to understand that people make decisions based on their values.”

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280 University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

281 University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
Schulyer’s 1978 editorial is a clear transition from this emphasis on the use of science to solve environmental problems, as problems of value, to an emphasis on science itself as a form of problem solving. One article from UCSB’s Daily Nexus, in 2000, makes clear retrospective mention of the transition in a description of his tenure. It observes: “Schuyler also reversed the tack of the program, focusing more on science and less on humanities. The trend was continued into the 1980’s with biologist Daniel Botkin as chair.”

This transition continued into the 1990’s and beyond. In recollection of the program’s history, we see this partially attributed to the changing needs of the labor market, of the practical process of disciplinary transition, and as a general characteristic of the transformations of environmentalism. As one administrator describes it, “We are constantly adapting to meet the needs of the environmental movement,” to which he adds, “we have to adjust the curriculum to meet standards.”

Throughout the program’s early history, we see aspects of these concerns in the worry over student career options, or the efficient preparation of students to meet potential technical standards. But from a disciplinary standpoint, the shift has been more dramatic, as it consists of a reorientation by topic as well as by method. In characterizing the program in relation to its 35th anniversary, Program Chair Josh Schimel notes: “The problems have changed and the scholarship that contributes to the solutions has changed.”

282 University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

283 University of California, Santa Barbara, Environmental Studies Program collection. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
He suggests that over the programs duration, the study of the environment has shifted from the “multidisciplinary study of environmental affairs to an integrated interdisciplinary study of the linkage between human and natural systems.”

**Enter the Professional:**

By December 5th of 1989 the Committee on Educational Policy and Academic Planning (CEPAP) reviewed a revised proposal from May 4, the second in a progression of three revisions, in reference to a plan to create a Professional School of Environmental Science and Management at UCSB. The committee notes that this revised proposal “is a comprehensive, exciting plan for a school that would bring distinction to the campus.” They were especially impressed with the “rigor and breadth of the proposed course of study, noting the proposal demonstrates a “directed justification of the need for the school” with an “elaboration of advantages that UCSB has in establishing the school.” Of particular interest was “the strategy of providing individual students with training in both environmental science and management with emphasis in one of these areas, and of establishing a mid career associates program for preparing professionals which would draw on their expertise for teaching purposes in group projects, while exposing these individuals to new environmental science and management techniques and developments.” It characterized this approach as “innovative.”

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284 Dept. to Host Anniversary Events. The Daily Nexus. University of California at Santa Barbara Archives, Santa Barbara, California. UArch 76. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

285 CEPAP Review of the Proposal for the Professional School of Environmental Science and Management, December 5, 1989. University of California, Santa Barbara, Academic
However, by way of criticism, the proposal raised four general issues and ten specific issues for which CEPAP would seek clarification. These issues would become a salient feature of subsequent institution building efforts. Here I concentrate on three, as the answers provide some insight into subsequent institution building efforts. All have to do with the relationship between existing environmental programs, and the differences between these programs, at UCSB and in the UC system, more generally, and the province of Bren’s specialization. For example, “what distinguishes a professional school from a multidisciplinary academic program,” and whether this distinction implies differences in terms of resource allocation”? In revision, the authors of the proposal note, “two of the three emphases contain important applied components,” which as an approach more appropriate to a professional school.” This has implications for the administration of the School, as compared to an academic program, in that the stipends of the Dean and Associate Dean, including replacement costs, is in considerable “excess of a stipend for an academic department chair,” figuring in at around $131,700. However CEPAP notes that the “additional support for the school structure (as opposed to a department) perhaps can be justified by the midcareer associates program which would involve unique outreach efforts.” The second line of inquiry has to do with the relationship between the school and the existent environmental studies program. Here we find uncertainties: what role will the faculty of the ES program play in the school and will the two programs be in competition? CEPAP notes that there is a noted “absence of an undergraduate component in the school,” and notes that in revision this point was

Senate records. UArch 13. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
somewhat addressed, the two programs differ in terms of specialization, as the School, “will be more oriented towards physical and mathematical sciences than is the current program.” This has two entailments. First, the authors note that while “School faculty and TAs could assist in the undergraduate program,” many of the ES program’s graduates “might not qualify for admission to the school.” Similarly, because most campuses consider “enrollment of their bachelor degree programs to be unhealthy “inbreeding” the relationship between the school and the program is complementary, and not competitive, and that “the continuity from the individual student perspective is not relevant.” No mention is made in this discussion as to the fitness of the ES program’s prior intentions to expand to graduate level education, particularly in reference to the Ph.D. The final issue, of whether or not it would not be more prudent to “evolve an existing multidisciplinary program into a professional school, rather than start a new one de novo,” was resolved in two ways. First, through the suggestion that the existent ES program was significantly different, in terms of expertise, not to evoke a competitive challenge, and second, through reference to the need for the professional master’s degree. This issue was further nuanced, and largely resolved after approval of the proposal for the creation of the new school of Environmental Science and management, largely around its core innovation, the Master’s degree in Environmental Science and Management (MESM).

In 1991 the Regents of the University of California approved a proposal for the establishment of a new school of Environment Science and Management for the Santa

286 CEPAP Review of the Proposal for the Professional School of Environmental Science and Management, December 5, 1989. University of California, Santa Barbara, Academic Senate records. UArch 13. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
Barbara Campus. In July of 1994, the school appointed its first Dean, Jeff Dozier, an Earth Scientist, and by July of 1995 the school appointed its first Faculty.\footnote{Minutes from the Academic Senate, April 27, 1995. University of California, Santa Barbara, Academic Senate records. UArch 13. Department of Special Collections, Davidson Library, University of California, Santa Barbara.} By April of 1995, Dean Dozier added to the momentum by presenting before the academic senate a proposal for a new “professional Masters degree in Environmental Science and Management (M.E.S.M), noting that “two more advanced degrees are still in the planning stage and will be proposed later.” Dozier’s testimony emphasized the professional nature of the degree, and, after the proposal was approved, met several objections during the discussion.\footnote{Minutes from the Academic Senate, April 27, 1995. University of California, Santa Barbara, Academic Senate records. UArch 13. Department of Special Collections, Davidson Library, University of California, Santa Barbara.}

One faculty senate member observed, that “the proposed degree seems weak in the human behavioral dimension,” to which Dozier replied, “this objection had been entertained,” but that “courses in management policy would partially address “the issue. Although the program planners “realize that economics is not the only relevant social science” they were less clear about what else to do, but they “expect the curriculum to evolve” and that “any suggestions” would be welcome.\footnote{Minutes from the Academic Senate, April 27, 1995. University of California, Santa Barbara, Academic Senate records. UArch 13. Department of Special Collections, Davidson Library, University of California, Santa Barbara.} Additionally, another member questioned if other schools offer a similar degree, to which Dozier replied, “Two, Duke and Yale, both in existence for a while, both arising out of schools of forestry, and both
oriented to manage ecosystems.” But he notes, “They are similar to the UCSB proposed degree in being a professional master’s degree based on a two year curriculum.” From another member, the question of scope was raised: “Why not just call the degree a Master’s of Science in Environmental Science?” To which Dozier explained: “acronyms for professional degrees are different, for example, the MBA”  

Some were concerned about the system wide implications, pointing out “UCB has a degree program that sounds familiar, but it included policy.” Dozier distinguished between the two programs by noting, “Berkeley combined its departments of Agriculture and Natural Resources into a Super Department of Environmental Policy and Management. Their [UCSB’s] preparations are about four months ahead of UCB. Unlike our program, they are not going to give a professional degree, but rather an academic Master’s and PhD.” To this he adds the professional implications of this choice by reference to disciplinary distinction: “Their program has grown out of forestry studies. Their expertise is managed ecosystems, but they have nothing in oceans, hydrology, or aquatic ecology. We think that there are sufficient students to support both programs. The two are not similar enough to compete with one another.”

The proposal to create a Master’s of Environmental Science and Management, the lynchpin to the new School of Environmental sciences was subsequently approved by

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290 Minutes from the Academic Senate, April 27, 1995. University of California, Santa Barbara, Academic Senate records. UArch 13. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
unanimous vote of the faculty legislature on April 27, 1995. The description accompanying the vote reads:

In 1991 the Regents of the University of California approved the establishment of a new school of Environmental Science and Management on the Santa Barbara Campus. The dean has been appointed and 3.0 faculty FTE will begin their appointments starting July 1, 1995. The proposal for the school, as approved, contained the provision that the School would offer a professional degree—The Master of Environmental Science and Management (M.E.S.M)—a Ph.D. in Environmental Science and Management, and the Certificate for the Mid-Career Associate in Environmental Science and Management. The school now presents the MESM proposal for final approval. Separate proposals for the PH.D. and Mid Career Associate programs will follow.

In the context of the vote, the description accompanying the announcement, largely drawn from the original proposal, reads as if a manifesto for a new approach to environmental expertise:

In the past, the diverse disciplines that address the environment in various ways developed independently, and scientists and engineers tended to pursue discrete research objectives and strategies. Advances in observational methods, theories and models in such fields as meteorology, oceanography, ecology, geochemistry, hydrology, economics, sociology, political science, and history remained unique. Now, however, four forces have combined to alter the modes and focus of teaching and research on the environment:

a. Teaching and research on the environmental science and management now require integration of traditional disciplines in order to progress.

b. The view of Earth from space has underscored the fact that the planet is a single, complex, integrated system.

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291 Minutes from the Academic Senate, April 27, 1995. University of California, Santa Barbara, Academic Senate records. UArch 13. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

292 Minutes from the Academic Senate, April 27, 1995. University of California, Santa Barbara, Academic Senate records. UArch 13. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
c. Advances in theory, data management, and computation power now enable more realistic models of complex, large-scale phenomena.

d. Growing awareness and apprehension about the effects of human induced changes and the effect on humanity make concerted research and teaching essential.²⁹³

While the disciplinary status of the ES program had, throughout the early history of environmental program building, been a heated topic of debate, the development of the professional degree subsequently altered the debates over disciplinary distinctions in environmental science by dint of its professional ambitions. Students who complete the MESM will “enter or reenter the workforce directly,” and the program is “designed to serve the needs of California and the nation for working professionals with training beyond a Bachelor’s degree.” It notes, however, “the program is not designed to be an “intermediate for the PhD,”²⁹⁴ as the MESM is a plan II masters degree…of two year duration,” and culminating in a comprehensive examination.

On this model, the students were to prepare for this course of study through a course of 72 units of instruction comprised of “a multidisciplinary colloquium,” and “six core courses, a three part group project course that student begin in the spring quarter of the first year, four courses in specialized emphasis, three cross disciplinary courses, and three courses in supporting teaching and applications.” These courses are to be organized

²⁹³ Minutes from the Academic Senate, April 27, 1995. University of California, Santa Barbara, Academic Senate records. UArch 13. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

²⁹⁴ “Although the MESM graduates will be well prepared for, and may …apply to a Ph.D. program in the school or elsewhere.” Minutes from the Academic Senate, April 27, 1995. University of California, Santa Barbara, Academic Senate records. UArch 13. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
around four core areas—“Applied Ecology, Environmental Biogeochemistry, Earth Systems Science, and Environmental Policy and Management.” 295 As each core program will attract students from “varied undergraduate majors” participants are imagined to have basic preparation in subjects such as “mathematics, computer programming, chemistry, physics, biological sciences, earth science, physical and human geography, economics, political science and history in various combinations.” 296

Further, it is argued that these students will be in high demand as instanced by survey data “from the graduates of the Yale School of Forestry and Environmental Studies,” as well as “jobs advertised by public agencies, the California Resources Agency, and Federal Agencies such as the Environmental Protection Agency, the Office of Technology Assessment, and Agency for International Development;” in addition to “advertisements in professional journals, and employment projections from the National Science Foundation, U.S. Department of labor, and various trade and professional journals.” 297

The Bren School and Professional Command:

295 Minutes from the Academic Senate, April 27, 1995. Appendix I. University of California, Santa Barbara, Academic Senate records. UArch 13. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

296 Minutes from the Academic Senate, April 27, 1995. Appendix I. University of California, Santa Barbara, Academic Senate records. UArch 13. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

297 Minutes from the Academic Senate, April 27, 1995. Appendix I. University of California, Santa Barbara, Academic Senate records. UArch 13. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
The initial study for the Environmental Science Building, and the Marine Science Institute was conducted in 1993. The proposal notes the proposed construction of a five story building consisting of approximately “40,000 assignable square feet” for which office, laboratory, teaching, and research facilities will be housed for the new Professional School. The School itself is described as consisting of programs in “Applied Qualitative Ecology, Earth Systems Science, Environmental Engineering, Environmental Microbiology, and Toxicity, and Environmental Policy and Resource Management.” In addition, the proposal also describes the Marine Sciences Institute as housing an “Antarctic Research Program, the Coastal Resource center, Ocean Policy Center, and the Oceanography Department.”

In 1993, this proposal set the administrative style for the realization of the Bren School as a statement of environmental responsibility, articulating the school’s professed philosophy of a “comprehensive, balanced, and cutting edge” approach to environmental science and management. Bren Hall was officially opened in April 19, 2002, and the transition to the Donald Bren School for Environmental Science and Management was complete. The opening of the hall, the list of presenters included Chancellor Hang T. Young, an engineer, noted for his membership in the National Academy of Engineering, and the American Institute of Aeronautics and Astronautics, as well as participation in the


advisory boards of the “U.S. Air Force, Navy, NASA, National Science Foundation, and National Academy of Engineering.” Also in attendance was Dennis Aigner, Dean of the Bren School at that time, and Professor of Management and Economics, noted for his “agency work on the Orange County Regional Economy;” As well as Christine Ervine from the U.S. Green Building Council; Aileen Adams, Secretary of State; Congressman Lois Capps; Bob Fresco, Chair of the National AI Committee on design; and Amanda Eichel, a second year Master’s student focusing on Green Building. Finally, two notable attendees were present, Donald Bren, and Kermit the Frog. Bren is largely credited with enabling the transition of Santa Barbara’s School of Environmental Science and Management to a more professional platform, when in 1991 “he made a gift to the Regent to establish a multi-campus interdisciplinary graduate program.” He is described as the owner and Chairman of the Irvine Company and the Bren Foundation.300 Finally, in addition to the many show business honors, the brochure for the event describes Kermit as “more than just a show business success story,” noting that “he has worked with such groups as Save the Children, UNICEF, and the National Wildlife Federation,” while maintaining the philosophy that “one frog can make a difference.” That day, the message he wanted to deliver was that although he has often said “its not easy being green,” at the opening of the Bren School, “one of the nation’s greenest building,” he wants to change his tone to “tell the world that being green is easier than you think.” 301

300 Donald Bren Hall Grand Opening Brochure. University of California, Santa Barbara, Bren School of Environmental Science and Management collection. UArch 24. Department of Special Collections, Davidson Library, University of California, Santa Barbara.

301 Donald Bren Hall Grand Opening Brochure. University of California, Santa Barbara, Bren School of Environmental Science and Management collection. UArch 24.
In a way, Kermit’s participation was the most auspicious of symbols from that day, signaling the ‘environmental dream’ so often characterized with environmental science had established itself on a fresh new footing. The Bren building was designed around the concept of “borrowing something…to return it.” The extension of this belief being, “constructing a building is like taking out a loan or “borrowing” a set of resources from the “environment.” Construction, in this sense, constitutes a “large debt to repay” and thus it was necessary and important for the designers to “rethink our approach to construction and minimize the impact to our air, water and land while creating a high performance structure that uses energy in new and creative ways.” The building and the school thus provide, “The opportunity to make an environmental statement and set a benchmark for the new century,” emphasizing, “The building is the greatest statement the School can make about practicing what we teach.”

The building, in itself a remarkable symbol of transformative change in the vision of what environmental expertise can accomplish, is also a potent symbol for a new type of partnership between the environmental research field, the university, and the state-sector and private organizations. Although Donald Bren Hall is described as a “state funded building” it is also a “highly visible symbol of the foundation upon which the school is built,” described as a “partnership between leaders, visionaries, and scholars.”

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302 Donald Bren Hall Grand Opening Brochure. University of California, Santa Barbara, Bren School of Environmental Science and Management collection. UArch 24. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
Not only is the school a symbol of sustainable design,” its symbolic resonance is said to exemplify “the convergence of equity, ecology and economy.”

These symbols are also alienable, and the advertisement of the event suggests:

“Visionary corporations, foundations, and individuals who share our commitment to these ideals may proudly associate their names with this environmental landmark through a personal investment in our technology laboratories, learning spaces, or conference rooms. These endowments ensure in perpetuity that the school will be able to attract the finest scholars, and support them in leading edge teaching and research in the most sophisticated green environment in academia.”

The early effort at UCSB was designed to produce scientific generalists with an integrated familiarity with generalized environmental problems, where integration was defined as a multi-disciplinary process and the aim was fluency in the scientific and humanistic materials that defined the parameters of a given topic as an environmental problem. As the program developed, there has been an acknowledged shift in temperament, with emphasis on a more scientific focus than earlier programmatic efforts had sought to cultivate. This was accompanied by a shift in language from a framework for synthesizing information in regards to environmental problems to an emphasis on ‘environmental and human coupled’ systems. And, both perspectives were largely overshadowed by the gradual absorption of the Environmental Science Program by the Bren School and the shift away from the generalist vision of environmental expertise.

303 The brochure additionally notes, “Spaces throughout the building for which endowment is sought are identified with the building image below.” Donald Bren Hall Grand Opening Brochure. University of California, Santa Barbara, Bren School of Environmental Science and Management collection. UArch 24. Department of Special Collections, Davidson Library, University of California, Santa Barbara.
towards a science based scheme for Environmental Management. While the philosophical benefit of this approach remains unclear, as compared to the older ES model, the purchase of field level legitimacy seems clearly at stake and, in some sense, acknowledged by the architects of the transition to a more professionalized model. Regardless of the differing visions of knowledge, the differing models imply distinctions at the level of institutional conduct, both within the university, and as a matter of expert conduct. While the early ES program model focused on the process of utilizing multi-disciplinary knowledge to shape judgments, their vision of the environmental expert was largely described in terms of activism. This emphasis was somewhat diminished in the aftermath of the Schuyler report, where the emphasis was placed on science based judgments relative to the analytical reconstruction of environmental systems. By contrast the Bren expert is largely oriented to the production of institutional projects, either in support of research or as an aspect of professional problem solving but both requiring a level of institutional coordination.

Clearly, the institutional entrepreneurs behind the rise of the Bren school are concerned not simply with program building within the stable confines of UCSB but rather with a coordinative effort to make competitive claims upon, and shape, a labor market for which there is an attributed demand. In this respect, the larger organization of the Bren School, with its focus on corporate sponsorship, and partnership with the private sector more generally, must be seen as a specific effort at institutional-coalition building. There are obvious advantages to this approach. The financial benefits alone would be sufficient given the financial problems faced by Universities and the generalized posture of ‘funds seeking’ adopted by most schools. Sustaining corporate partnerships, in this
sense, would provide a steady means of support for a field that has had limited success in its ability to garner dedicated funding at all levels of activity (research, teaching, application, etc.). Another aspect of this strategy, however, and in line with the pattern of institutional partnerships as discussed in chapter 5, is that it provides a means to tie together temporary, or impermanent institutional arrangements with an outlet for disseminating scientific work.

**Conclusion:**

Of all the cases reviewed in this study the development of environmental science at UCSB has experienced the most radical change, in terms of scope and breadth. While both OSU and WSU had strong applied backgrounds, in terms of cooperative extension, and regional agricultural research, the development of environmental science at UCSB was largely built from a disciplinary-based, basic science portfolio which was successfully translated, first into a comprehensive environmental studies programs, as centered on interdisciplinary training and, later as a constituent factor of the Bren School’s programs in environmental research and professional training. In so doing, of all these three cases, they were the first to innovate the tiered degree arrangements, that we now see in all three cases, although of these developments were largely accidental by-products of the dynamics of institution building, rather than by design.

In contrast to OSU, UCSB’s institutional architecture for environmental science was developed first on the basis of a model of synthetic expertise and later transitioned to a model of cooperative research, first, from within the ES program, with the transition to an ‘environmental systems’ curricula, and, later, with the emergence of the Bren School.
Furthermore, as with OSU, we see the turn towards environmental professionalism grew from a concern over the flexibility of general scientific professionals as ‘knowledge workers.’ This element was a consistent feature of the Bren vision from its founding.

Likewise, as compared to the development of environmental science at WSU, the ES program at both schools made the transition to their current configurations, largely through the emergence of faculty driven challenges to each school’s earliest programming. These challenges championed institutional projects—the CEREO network, and the Bren School—that sought to cultivate interdisciplinary environmental research largely based on the model of cooperative disciplinary inquiry. However, unlike WSU, or OSU, UCSB’s transition to this form of conduct was packed into the Bren School’s design, as both a home for environmental research as well as a home for the professional training of environmental experts. The architect of the schools did so through an institutional strategy that we see eventually taking shape in the two other cases.

This takes me to a final point of comparison. Of all of the case studies examined in this dissertation, UCSB is perhaps the most extreme example of what I call the ‘distributed’ model of expert conduct. As I discussed in chapter 5, an element of many institutional projects in the environmental sciences has been to treat the generalized distribution of environmental knowledge or information as a resource for environmental problem solving. We see this clearly in the ACESS program, as an early precedent, but also as an explicit feature of many institutional projects in the environmental sciences, accompanying a broader emphasis on the use of knowledge, and the role of experts in policy in the 1990’s. This has become an explicit feature of many institutional projects in the environmental sciences, accompanying a broader emphasis on the use of knowledge,
the role of experts in policy making, and the role of stakeholders in the production of expertise.

A consistent feature of the Bren School has been its institutionalization of this feature in three strategies. First, the School solicits targeted support from the organizational stakeholders of environmental research, including local level industry and not-for-profits. This strategy entails support for Bren, but also, specifically support for faculty and students through direct industry funding. Second, aspects of this strategy institutionalized as a pedagogical degree requirement for professional students in the form of a mandated internship requirement. Second, as an aspect of career development, the school maintains a career development team and “internal social networking program” for graduates that, along with networking skills training and career development training, is a consistent aspect of student’s professional development. Similarly the program boasts that “Nearly 100% of the Bren students complete summer internships,” and masters students complete intensive, problem-focused ‘group projects’ often working for intensively in organizational contexts (see below).

Finally, and really building on the first two strategies, the third strategy consists of a series of groups or councils charged with integrating the expertise cultivated at the university, into various patterns of institutional conduct at the regional, national and international level, through interaction with industry, academia, government and the not-for-profit sector. This third strategy is organized into six levels of affiliation, that, since its inception the school has actively sought and cultivated through a variety of working partnerships.
At the first two levels, institutional entrepreneurs have sought relationships with funding partners that comprise businesses that share a “commitment to sustainable enterprise, cutting edge research and educational programs of the highest quality.” This level is comprised of two groups: the first, the founding partners, and the second, corporate partners. This group is comprised of materials providers and firms involved in the construction of the Bren School, including: Armstrong Industries, Johnson Controls, Milliken, Pacific Earth Resources, Parker Bailer Co., Southern California Edison, To Market, a sales and marketing firm, in addition to a number of alternative energy providers, regional sustainable landscape companies, and material providers, such as plastic polymer producers. By contrast the Corporate Partnerships refer to the “mutually beneficial alliances with local and national companies that share our commitment to sustainable enterprise, leading-edge research, and educational programs of pre-eminent quality. The program is designed to facilitate “high-level introduction to leaders across an array of industries” to provide “regular access to the schools administrative team, faculty, and students.” This program thus consists of a tiered model of giving that translate into “corporate summit and networking opportunities,” including workshops and colloquia and regional symposia and receptions. But the program actively works, as well, to build relationships with industry to support summer internships, employment opportunities for Bren graduates, faculty consulting opportunities, and to provide presentations to students about industry research needs and the state of the environmental field.

Additionally this program facilitates the submission of group projects ideas for problem solving. A staple component of the Master’s Program, the Group Project, is an
exercise in problem solving that provides masters students with the opportunity to perform “professional level work” that involves managing group dynamics and applying technical expertise to solve complex, multidisciplinary problems,” while students are still in school. Through this program, businesses, government agencies, NGO’s and individuals, have the chance to submit proposals, and if selected, the “opportunity to have a group of talented students tackle their environmental problems and make specific and meaningful recommendations.”

At the second level, partnerships have been cultivated around the formation of institutional projects, first, in terms of legal expertise, and, second, at the level of entrepreneurial investment. The council of legal advisors supports legal education for Bren students, as well advice for the conduct of group projects, and the ‘Eco-Entrepreneurship Advisory Council,’ guides and supports green tech and innovation opportunities, in essence acting as a “conduit between the school and the entrepreneurial and investor communities.” The group includes independent consultants, venture capitalists, and individual entrepreneurs from within the faculty, outside of the university, and university adjacent start-ups. Finally, the Dean’s council is organized to act as a conduit between the school and the university at large. This group consists of prominent members from regional businesses, and holds influential and “action-oriented meetings,” throughout the years, in addition to sponsoring the ‘Breakfast Club,’ a forum for sharing

http://www.bren.ucsb.edu/research/masters_gp.htm
leading edge research from “industry, academia, government and environmental consulting presented to “donors, corporate partners, and invited guests.”

The strategy of the Bren School is similar to the program development currently deployed by the CEREO network. I find, however, that both have pursued strategies remarkably similar to Ewald’s ACESS program, and the work of creating an institutional public. In this sense, both CEREO and the Bren School are stable institutional projects that have been institutionalized at different scales of institutional activity but serve as a type of integrated administrative clearinghouse for research programs as well as institutional projects that concern the use of knowledge, as a condition for research and as a product.

Conclusion: Cognitive Accumulation in the Environmental Sciences

This dissertation examines how the science of the environment emerged in U.S. universities in the late 1960’s, how it came to be institutionalized as a feature of academic institution building, and, ultimately, how the environmental sciences were consolidated as both trading zones for institutional projects and as a sort of institutional clearing-house for expert knowledge systems. Both result from the long-term transformation of the basic problematic framing environmental expertise in the postwar period—namely, how to link knowledge and action for the sake of environmental problem solving. Throughout this study I have documented two outcomes of this institutionalization process, which I refer to as ‘cognitive accumulation,’ defined as the institutionalization of cognitive authority. First, the institutional re-organization of the relationship between experts and citizens, mediated by the university; and, second, the emergence of a tiered administrative structure within the university, in effect, institutionalizing a ‘trading zone’ between experts and environmental constituencies. In conclusion, I summarize these findings and discuss these outcomes, which I suggest may be seen as administrative efforts to stabilize cognitive accumulation as an innovation process.

Cognitive Accumulation in the Environmental Sciences

In this study I have examined how the cognitive authority of the ‘environment’ was variously translated into discrete projects at the level of the University and its organizational ecology. At the institutional level, the environmental sciences were constructed from a dense syncretic background of institutional precedents, projects and programs, including long-standing academic and scientific customs, as well as the new
expectations regarding the organization of knowledge, and its social role, that emerged in
the early twentieth century and during the interwar period between the two World Wars.
The impetus for their construction was framed by the convergence of two broader
institutional innovations—the crisis of the university, largely precipitated by the growth
of the higher education industry, and its incorporation into the expanding U.S. research
economy; and, secondly, the perceived crisis of the environment, framed by a resurgent
re-interpretation of the older progressive conservation movement, and the institutional
translation of social movement demand in an explosion of environment-focused literature.
Framed by both crises the role of university-based expertise took on a new importance as
policy makers, government officials, and social movement actors variously targeted, and
made claims to environmental expertise, and strategies for how environmental expertise
might solve environmental problems. This became the ‘expert jurisdiction’ for a broad
variety of claims to cognitive authority by academic and scientific professionals whose
work dealt with ecology, nature, natural resource management and a variety of other
environmental themes.

As environmental scientists, acting as institutional agents, elaborating institutional
projects, they stressed the use of expertise, comprising a new mode of expert conduct that
emphasized institution building as a constituent feature of the production of expertise,
and its use in problem solving. By constructing the relevance of expertise in this manner
these claims to cognitive authority took on a dual character, articulated around new
‘rhetorics of legitimacy,’ as well as the institutionalization of these claims to cognitive
authority in durable institutional arrangements linking environmental research with
decision-making, governance, and the further distribution of expertise.
As the ES programs were institutionalized, we thus see environmental expertise organized along a continuum concerned with the valuation of science as a public good, with the production of science for policy, on the one hand, and the policy driven use of environmental expertise in the management of environmental problems, at the other end of the spectrum. Institutional projects constructed around both poles constitutes the ‘expert knowledge system.’ Throughout the study I demonstrate that the elements of the expert knowledge system, and the consolidation and diversification of expert-knowledge systems largely result from the use of environmental research as an institutional opportunity structure. These changes were widespread, but differentially distributed in an existent body of institutional orders that comprised the field of higher education, where multiple types of expertise have been enrolled into the field of environmental science. Knowledge as expertise is defined both as a produced object—a social good, and a commodity—as well as a resource in the construction of cognitive authority. The emergence of the environmental sciences in the 1960’s was driven by institutional ‘opportunity structures’ that established the conditions and the means for academic scientists, acting as institutional actors, to engage in institution building as both a precondition and as an outcome of their research endeavors. From this emerged an emphasis on the proper ‘use’ of knowledge to solve social problems that when, translated into institutional terms, concerned how to properly organize the University as a responsive source of ‘knowledge transfer,’ problem solving, and policy development.

I have traced three factors of this process and its configuration over a period of four decades. First, I have examined the changing organization of expert cognitive authority as universities were gradually, throughout the course of the 20th century,
incorporated into the research economy. The conduct of academic and scientific professionals was culturally and institutionally tied to new regimes of relevance as expertise and science based research became intricately tied to industry and governance. In this nexus, university science was reconstructed as a programmatic investment, and universities were subjected to new pressures, new demands, and new expectations for the utility of university-based knowledge. We see this in the academic cultivation of the basic research ideal and with the emergence of science-based policy, a turn towards the centrality of basic science in its regulatory dimensions.

Second, I have demonstrated how the expansion of the research economy after WWII, and the growth of the U.S. system of higher education, created new conditions and new imperatives for academic and scientific professionals to act as institution builders. Under these conditions knowledge and expertise took on dual roles, and was valued in a dual way—as a product of expert labor and as a resource for institutional projects. The cognitive authority of environmental experts is tied not only to the production of environmental knowledge but to the institutional work of creating interdisciplinary research teams, policy networks, educational venues, forums and initiatives, and new forms of knowledge with policy relevance. The third and final feature concerns how these first two elements were variously organized into institutional arrangements that combined the basic science ideal, discussed in Chapter 1, with the integrated cooperative projects, discussed in chapter 2 and 3, that spanned distributed institutional domains. Here we see the emergence, in the environmental sector, of ‘expert knowledge systems’ (ExKS) as a discrete institutional outcome.
These strategies—as an outcome of institution building—constitute part of a class of expert endeavor concerned explicitly with fashioning scientific knowledge and professional expertise into durable arrangements in the support of efficient decision-making. As I discussed in the first section of the dissertation, there are three, historically salient components to these decision making arrangements. The first were genres of relevance linking the patterns of co-activity of basic science—the research team, standards of best-science competition—to discrete policy questions. These genres of relevance were additionally employed in areas that had previously been organized under an applied model of scientific conduct. The result of this type of institutional building was a category of ‘regulatory genres’ that straddled basic and applied—or disciplinary versus project-based—science. For environmental scientists the outcome of these shared regulatory genres was an increased emphasis on the conduct of the environmental expert as linked to decision-making or policy processes. While previous models of science—in the basic as well as the applied ideal—were constructed relative to policy priorities, or in relation to problem areas of policy significance, the expansion of regulatory genres and their role in institutional conduct placed a premium on the creation of experts that could fluently negotiate the relationship between the work of producing scientific knowledge and its use in decision-making.

In the second section of this study I examined how all three of these basic features emerged in the efforts to institutionalize environmental expertise into durable institutional programs. Here I isolate three phases of development. In the first phase, the environmental sciences were organized along integrative or synthetic lines. WSU organized its program around environmental science, singular, and UCSB around an
environmental studies model, where the difference between the two residing with the number and degree of disciplines contributing to the program. In this sense, UCSB had a notable concentration in environmental humanities. OSU, by contrast, is notable for its explicit rejections of this model in favor of a cooperative model premised upon the coordination of applied and basic research programs. OSU explicitly distanced itself from the synthetic model. That OSU subsequently developed an ES program, in the 1990’s, stemmed not from its adoption of the synthetic model but rather from a recognized need for an integrative general science model that would also support environmental science, and other policy intensive areas, within a largely cooperative endeavor.

This is largely the direction that all three schools would adopt in the second phase of program development, although for largely different reasons. At UCSB, the institutional ambition of the Environmental Studies program was held in check by the emergence of the Bren School. As institutional projects, each program was wed to uniquely different visions of environmental science. However, as was noted in Chapter 6, the ES programs transition to a more cooperative vision of expertise had begun to emerge in the late 1980’s as the program evolved towards a model of expert conduct aligned with the model of ecological systems. Rather than an environmental generalist—an ecologist of knowledge, so to speak—environmental expertise on this model stems from the integrative study of environmental systems and their coordination or management. This is an explicit transition from within the integrated, or synthetic model, but a clear transition between an earlier model of integrative expertise, premised on the creation of a synthetic knowledge base, or a cooperative model of expertise largely defined in terms of synthetic environmental problems.
The model of expertise active in the Environmental Studies program during this phase is again usefully contrasted with the emergence of the Bren School and its model or vision of the environmental professional. In contrast with the Environmental Studies program, the Bren School did not originate with a vision or model of a synthetic science, but rather, was built from efforts to translate ongoing environmental research into a professional, policy-oriented research base, largely organized through the interdisciplinary coordination of environmental research programs. Both of the change to UCSB’s Environmental Studies program, and the organization of the Bren School are broadly congruent with the policy recommendations of ‘Environmental Science and Engineering for the 21st Century’, reviewed in Chapter 1.

These observed changes are potentially aligned with broader field level shifts in environmental policy. However, I have in this study sought to construe their relevance in terms of institutional order, and, I note, in contemporary terms, that at UCSB both programs now constitute a tiered degree structure, largely organized around cooperative lines, with the ES program as the undergraduate tier in the environmental course of study, and the Bren School the research and professional tier. We see similar patterns at WSU and OSU but from slightly different angles. The trajectory of development at WSU followed a similar route to that of UCSB, with the earliest attempts structured around the organization of a synthetic Environmental Science Program, centered on an integrative model of expertise. This was also largely contrasted with existent environmental research and its pursuit outside of the purview of the Environmental Science Program. In contrast to UCSB, this program centered on issues of environmental synthesis, stemming from questions that were largely disciplinary or policy oriented rather than from an active
concern with environmental politics, as with the founding of the ES program at UCSB. Similarly, as with the UCSB program, the Environmental Science program at WSU suffered from stymied growth—it suffered from fluctuating enrollments and budgetary problems—and prevented from developing a doctoral program in its earliest stages of development. Likewise, while its expansion into the Masters in regional planning helped to solidify its policy-orientation, the program remained somewhat isolated from the evolving environmental research community at WSU.

Like the Bren school, in the 1990’s, the ES program at WSU was challenged, in terms of cognitive authority, by a faculty centered research initiative, CEREO, and its expansion in the early part of the 21st century. CEREO effectively displaced the centrality of the ES program, and the now defunct Environmental Research Center, on the WSU campus as the focus of environmental research and championed a model of environmental research and education framed in cooperative terms. What’s more the reach of CEREO enrolled faculty from throughout the WSU academic community, including the Extension Service and the county level research stations. By 2009, resulted in several notable changes to the overall organization of environmental expertise—as was noted in chapter 4, the ES program was relocated to the Geography building, and both programs were scheduled to be subsequently bundled together in the new School for the Environment. As this merger unfolded, the disparate earth and environmental based degree programs, including programs in the Natural Resource Sciences were relocated to newly formed School of the Environment. The ES program was thus incorporated into the School the Environment as a degree offering, rather than a stand-alone program, at
the undergraduate and graduate level. At the graduate level the program is coordinated with CEREO, and many of the research centers that comprise this network.

Although OSU was a late-comer the explicit development of environmental programming, it is notable, as previously discussed, for its reticence to develop explicit programming based on ‘integrated’ or synthetic environmental expertise. Rather it sought to develop a cooperative model for environmental research, largely based on applied principles, whereby disciplinary and problem oriented research was coordinated through common research endeavors. Thus, the training of ‘environmental experts’ prior to the emergence of the ES program largely occurred at the graduate level, in research teams, situated as an aspect of disciplinary training, or in applied formats, through cooperative based work in agriculture or forestry. The formal development of an ES program in the 1990’s as well as its informal development throughout the 80’s is notable for how the program was built from the disparate elements of the General Science programming. From the very beginning, the basis for the program was interdisciplinary basic research, not conceived in terms of synthesis, but rather cooperation between disciplinary specialties organized around specific problem foci. In its formal organization the program instantiated this orientation in its choice of name—whereas WSU’s early program name had been the Environmental Science Program, singular, OSU’s Environmental Sciences Program, reflected the cooperative spirit, through emphasis on the plurality of sciences involved in environmental inquiry. Thus emphasizing interdisciplinary research, the program was structured around disciplinary cooperation from its very beginning. Likewise, although the interdisciplinary offerings concern training in the basic sciences, tracks within the program were ultimately
structured around ‘environmental systems’ as the organizing feature of its problem areas. Similarly, and like UCSB, the program has developed a training program explicitly focused on the acquisition of professional skills, promoted as a Masters degree in Professional Science. Like both WSU and OSU, the Environmental Sciences Program has also been gradually tied over time, with an undergraduate degree, presently housed in the College of Earth, Ocean and Atmospheric Sciences (CEOAS). Notably, research in the environmental humanities is possible in the environmental sciences program, as a program of training, but is the only humanities offering promoted by CEOAS.

In all three programs the trajectory of program development has been away from an integrated, synthetic science, and towards a model of expert conduct that combines a disciplinary basic science oriented expertise with a problem based approach largely structured by natural environmental systems and their correlated policy based areas of study. Gone is the integrative specialist. Rather, what we find is an expert who’s training is defined by both broad ranging expertise and depth of specialization. This is the basic research ideal stated in pedagogical terms but where the specializations are largely organized in systemic terms, as disciplinary and problem, or policy, based systems. In this sense, as noted above, the environmental sciences have been built from two distinct science policy models. In the first model, basic science is seen as a resource for policy priorities—and hence for decision makers. In the second—the cooperative or problem model—science is understood in its application, and hence as a factor in problem solving, where scientific inquiry is defined by the progressive search for technical solutions.
In the environmental sciences both of these models have been institutionally wed at two levels: first, at the disciplinary level, where basic research problems are integrated—for example, through the study of biogeochemistry, or the nitrogen cycle; and, second, in terms of discrete problem areas, framed in terms of policy, again, for example, around regional water issues, or in terms of the distribution and circulation of nitrogen cycle science. We find distinct variations on this model at various points throughout this study: as an imperative or priority in ‘Environmental Science and Engineering for the 21st Century;’ as a pedagogical principle in the curricula of the various programs reviewed in this study; and as a research framework animating the great variety of research programs that comprise the environmental sciences. Again, in terms of institutionalization, we see a great deal of variation in terms of how environmental sciences, as institutional projects, are integrated into institutional orders, and ordered by appeal to genre’s of relevance, pitched in terms of regulatory or societal importance. Much of this stems from the way the basic research ideal was institutionalized, particularly in relation to coordinated, team-based science. It was this background that, with the passage of NEPA, became mandates as a best-practice model for environmental assessment, understood as integrated interdisciplinary research, and subsequently wed to a genre of relevance broadly framed in relationship to an evolving terrain of environmental problems largely defined by environmental policy and politics. 

While noting the differences between schools, I also draw attention to three key similarities. First, at all three university programs we see the continued alignment of scientific interest and policy or decision-making work, not simply as an ideal or abstraction, but as an intellectual or expert problem with clear institutional entailments.
Second, all three of the schools have developed, from differing institutional components, an institutional architecture linking expertise around discrete research problems, as well as by policy problems.

The final similarity concerns the substantive effort to link knowledge production and management in institutional arrangements that are both integrated and distributed. These programs look remarkably like the ambitious organization of the ACESS program, reviewed in chapter 3, of some thirty years earlier, in three key ways. First, they draw on distributed expertise from throughout the university-faculty body and from the region. Second, they have all engaged in novel institutional experiments emphasizing the use of environmental knowledge through modeling, policy intervention, or management programs. Finally, both of the features above have been the subject of institution building projects, whereby distributed expertise is linked through expert projects, to the consolidation of institutional publics concerned with regional environmental problems. This final feature is, I argue, crucial for understanding the dynamics cognitive accumulation.

Throughout this study I have examined disparate trends in the environmental sciences as instances of institution building. Institution building, as institutional work, is a constituent aspect of the institutionalization process, and thus a central driver in the efforts to institutionalize cognitive authority. However, after WWII, and the reconstruction of university science as a type of programmatic investment, institution building took on new dimension in university settings. First, research increasingly involved interaction with the research economy in the form of ‘research enterprise’—the origination of research projects, their funding, and management. Second, instruction now
increasingly framed in terms of research, involved the creation of a continuously expanding body of program building, institute creation, etc. This emphasis on institution building informed the institutionalization of the environmental sciences in two ways. First, the cognitive authority of environmental experts was increasingly framed around the link between knowledge and action. This required new interdisciplinary approaches to reorganize disciplinary knowledge around particular problems. It also required institutional mechanisms for linking this new interdisciplinary approach to decision making processes. Further, I have suggested that, as a type of institutional agency, these strategies of institution building, as a type of institutional agency or work, are indicative of a variety of academic opportunism, perhaps valorized today as ‘entrepreneurialism.’ Academic and expert professionals, from this perspective, are thus increasingly organized to translate expert projects into institutional terms, as institutional projects have become increasingly central to the production of expertise. I trace this to the emergence of the postwar research economy, as a constituent feature of academic and scientific conduct, which became increasingly tied to institutional arrangements for the production expertise, technology, and policy. Finally, as we have seen this emphasis on institution building has been increasingly theorized as part of an ‘innovation process,’ whereby the resulting outcome of targeted research is the institutional process itself rather than a discrete technology or market oriented product.

**Innovation and the Reconstruction of Basic Research**

In both sections I have examined how the institutional dynamics supporting the institutionalization of the three forms, or trajectories of, institutional projects examined in
this study. I argue that it is analytically useful to view these disparate institutional forms as stages in an emergent institutional strategy. As I have demonstrated, for example, the shape of institutional projects, in both so called basic and applied research, have taken on a remarkably similar form—a core of collaborative research projects wed to a body of claims to relevance, and cognitive authority—in large part through the efforts of academic and expert professionals in grant seeking and efficient project administration. However, in this study, I have focused on the way this dynamic is built from the institutional conduct of academic and expert professionals as well as how it is also, in turn, been changed by this dynamic.

On this point a final field-example is instructive. Just before leaving WSU, after an intensive period of interviews, participant observation, and archival study, I was lucky to finally meet up with one prestigious researcher who had been at WSU, rising through the highest faculty ranks, and at the height of his disciplinary prestige, and standing within his area of specialization. Now retired, and serving as Emeritus, I found he held a wealth of insight regarding the history and institutional dynamics at play at the university, as he had participated in a great deal of institution building throughout his tenure. In the interview I was struck, however, by what I perceived at the time, to be a sentiment of regret, or, at the very least, a sense of defeat. For this researcher, whose life’s work primarily concerned the organization of specimen collections, the institutional conditions had passed him by:

**Retired Professor Emeritus:** “You know…the type of research that I do…the work…just isn’t really valued in the same way as it once was. People don’t see the need for collections in the same way……My work involves other people, and its important for a lot of researchers…access to the collections…but traveling and maintaining
collections….its not the type [of work] people do now…. That’s more team intensive….using more resources, with big grants…and I have often felt left behind….My work is crucial basic work….but its not considered to be innovative.”

In this anecdote I want to pull out two features relevant for understanding how processes of cognitive accumulation stand to university-based research. I observe here an acknowledgement that expert projects—this researcher’s academic work—may be valued in institutional terms. Although this work—his expert project—is considered highly distinguished in its field, its importance at the level of the university is, by his impression, unrewarded because it does not fit the predominant institutional model of innovative research. Here we have an example of a project that is largely institutionalized but potentially hampered in terms of prestige or potential for expansion. In this sense we see successful institutional projects that, although institutionalized, may not act as durable foundations for future institution building.

In the context of our conversation what this interview participant is objecting to is not the sense of innovation predicated on market dynamics or privatization, although those topics did emerge in the context of our discussion. Rather the broader topic of our conversation focused on institutional innovations predicated on organizing knowledge production in ways that make expertise ‘useful.’ Knowledge is to be ‘used’ as a resource in problem solving, but also produced in the context of problem solving as well. A major topic of our conversation thus centered on the implicit de-centering of ‘interdisciplinary’ research as a standard for construing research as innovative or relevant.

The background of this conversation has to do with the manner in which interdisciplinary research has been construed as relevant, and featured as a constituent

306 Fieldwork Interview
feature of the institutional organization of environmental research. We see this, for example, in the history of institutional co-activity, from the WWI to the present, in the evolving emphasis on research teams, and team based networks, as a basic feature of university-based research. Creating and managing research teams became a pivotal feature of the basic research ideal but also a crucial feature of applied research, as framed in terms of the cooperative extension model, as well as in agricultural, engineering and industrial research. In this sense, coordinated team based research became an enduring feature of the post WWII research economy. In the second section of this study, I have examined how this variety of co-activity became institutionalized in university-based research, as well as a pedagogical feature of scientific and expert training. In this institutional process, team based research, as well as the pedagogy of research, were wed to an evolving rhetoric of legitimacy whereby research was framed in terms of utility at different scales of organization. For example, whereas basic research was institutionalized, for example, as a resource for social well-being and economic growth, cooperative research was construed as directly relevant to the management of social and technological problems through the direct application of expertise. For both models, experts developed institutional strategies that combined multi-disciplinary research around expert problems. In the 1970’s this approach was formalized under the RANN program where expert problem solving was explicitly tied to problem focused frameworks designed to induce innovation. This work was explicitly framed in terms of ‘interdisciplinary research’ with a problem focus. In this sense, as Manheim notes, although RANN was unpopular with basic research advocates, it did create “successful innovations, including some 60 alternative energy systems that were subsequently spun
off to what would later become the Department of Energy” (Manheim, 20120; 27; Belager, 1998). Furthermore, although the RANN style of “explicitly applied science projects did not become integrated into NSF’s science mix,” the outcome of this experiment resulted in the addition of “engineering research support,” as well as in later years the addition of “interdisciplinary, problem focused research” (Manheim, 2010; 27).

More to the point, this anecdote serves to illustrate a broader feature of contemporary university order—strategic, collaborative problem focused research is valued not simply for the knowledge produced, but for the institutional innovations this form of conduct produces. In so far as cognitive accumulation, as a process, re-structures the organization of existent expertise, it does so through discrete claims to relevance that shape cognitive authority in enterprising ways.

Today much of science policy assumes the importance of this form of research. And indeed, as I have demonstrated, a major narrative in the history environmental sciences concerns the importance of valorizing interdisciplinary research programs in the service of solving environmental problems. However, I highlight this sequence in relation to the above anecdote for two reasons. First, as noted above, how the interdisciplinary character of environmental expertise—in terms of co-activity— is to be achieved has remained something of an open question, and a pregnant area of institution building. Second, the increasingly formalized emphasis on strategic, collaborative, interdisciplinary research has taken on new prominence in the organization of the environmental sciences, as well as across the field of higher education. Consider, for example, the Bren School’s SERI program, launched in 2013. The aim of this program is to build on its effectiveness at organizing interdisciplinary approaches to environmental
problems in order to ‘leverage and scale that strength’ through strategic, collaborative initiatives. In this sense, the program mobilizes resources to “jump start” new collaborative partnerships around strategic research questions. This format is integrated into the broader institutional architecture of the school, including curricula, colloquia, and university focused activities, but, also, its aim is to partner with a variety of other institutional actors, in non-profit, business, and government, around environmental problem solving.

A Prospective Conclusion:

In conclusion, I note that these patterns of cognitive accumulation tend towards two outcomes. First, there is a re-articulation of the relationship between experts and citizens. In the early phases of program building, all three universities worked, in some way or another, to incorporate ‘outside voices’ in the institutionalization of ES with varying degrees of emphasis. UCSB with its emphasis on the scientific generalist was probably the most radical in its focus on the use of environmental expertise in political decision-making. This is most probably due to the legacy of this program, as founded by political activists. However, even in the ES program we see a clear turn towards ‘professionalization’ with the ‘Schuler report’ and an even sharper turn with the emergence of the Bren School. While professionalization does not preclude citizen involvement, it does imply a differing articulation of constituency formation. And indeed, although the ES program maintains an active alumni association, the Bren school is actively engaged—as an explicitly expression of institutional strategy—in the cultivation
of industry, and government, and non-profit relationships as a feature of its research, outreach, and educational mission.

This is similarly the case for WSU, particularly in its advisor committees for the CEREO network. Additionally, all three universities have promoted formalized ExKS as a component of their integrated research programming, in effect creating formalized opportunities for stakeholder participation in the research process. Less a feature of strategy, I attribute this outcome to state of the art ‘best practices’ in the field of environmental research. Regardless, the boundaries of the ES programming at all three schools are permeated by a focused effort to include university constituencies in decision making, either through participation in research, as stakeholders, or professionally, in an advisor capacity.

The trend in effect formalizes what Hess (2011) refers to as ‘mobile public formation’ but does so through cultivation of stable administrative mechanisms. I suggest that this formalization, as both institutional strategy, and as a best practices feature of environmental research, constitutes an institutionalized ‘trading zone’ between environmental experts, and the institutional constituencies of environmental research. Built as a tiered administrative structure, these trading zones are positioned to act as ‘engines’ for both institution building projects as well as potential sources of institutional innovation. In this sense I suggest they aim to capture the dynamic features of the university, bringing together experts and constituents in much the same way as Ewald’s ACCESS program did, where the outcome of this enterprise is research, but also the trade in ‘institutional projects.’ In conclusion, I posit that the trend towards this institutional strategy in ES programming constitutes a new phase of institution building concerned
with the efforts to both re-imagine the university and institutionalize cognitive authority as a formalized feature of institutional innovation.
Appendix A: Research Design and Methodological Appendix

The data for this dissertation was collected through a combination of methods including archival research and analysis of historical documents; participant based fieldwork, semi-structured interviews, and a social network census and survey. The research was funded through grants from the National Science Foundation (National Science Foundation Doctoral Dissertation Improvement Grant #0741861), the American Philosophical Society (Lewis and Clark Fund for Exploration and Field Research) and the CUNY Graduate Center.

General Research Design

Over a period of 24 months, I conducted fieldwork at three university cases, the University of California at Santa Barbara (UCSB), Oregon State University (OSU), and Washington State University (WSU). At each field site I pursued a multi-method strategy, which included interviews, a short social network survey, observational research and cultural document and institutional artifact collection, and archival research. Interviews were organized as extended interviews with environmental experts regarding their personal and occupational history, the cultivation of careers and professional contacts, their opinions of the state of the field, standards for innovation, and the social role of science. These interviews were followed by a Social Network Analysis Survey (SNA) circulated amongst my interview informants, and more broadly amongst scientists and professionals in my three field sites, collecting both socio-economic and relational data regarding common contacts, educational background, and institutional support. Finally, I conducted archival research, working with three types of source material: a.
institutional record sets; b. university cultural documents, such as campus newspapers, and program bulletins; and c. regional cultural documents, such as newspaper articles, and meeting minutes.

Interview and survey samples were derived from the construction of an integrated sampling frame during the reconnaissance period of fieldwork, based on the total number of faculty at each field site. These numbers were derived from the IR (Institutional Research) Office of each University. Of a possible 28,195 cases, 10,0570 were at UCSB, 7,555 were located at WSU and 10,070 were located at OSU. Of this 28,195 cases were sampled in four phases. First, a census of the faculty associated with the environmental science programs, as derived from the faculty registers at each site. This resulted in 666 cases. 184 located in at UCSB, 222 at OSU and 240 at WSU. In the second phase, of these 666 cases, each case was profiled, and descriptive data collected and catalogued for analysis, including Curriculum Vitae, research and teaching statements, select publications, professional work, etc. Of these 666 cases 389 were then contacted for enrollment in interviews, participant observation, and the social network survey. 131 cases were subsequently enrolled, resulting in a 33% response rate. 146 cases were, for various reasons, not contacted, or were excluded from enrollment. For example, they may have joined the faculty during the 24 months of research, but after I had completed the reconnaissance, or fieldwork period at each site. Or they may have been listed for projects or in the directory, but without contact information, or their professional scope or role may have fallen outside of the scope of the study. Interview-survey data is thus representative of roughly 20% of the total population surveyed. Of the 666 cases, 186, or 28% were female, and 480, or 72% were male. Network data modeled in this study is
based on all 666 cases, modeled for disciplinary, organizational and expert affiliation. Ego level enrollment data was excluded for subsequent analysis.

**Ethnographic Cases:**

This study was specifically designed as a field based study that would result in an ethnographic monograph. Unlike many contemporary studies in the social sciences, I draw an analytical distinction between field based research designs—their methods, and methodology—and ethnography. A field-based study is an inquiry into the context of a particular place or population. A field-based study utilizes methods to answer specific questions derived from the research design. One’s methodology thus concerned with the consistent application of research methods. I treat an ethnography then as a synthetic document analyzing both the production or collection of data, as well as an analysis of that data, where the findings are situated within a greater more detailed narrative of the field work case, situating research questions, evidence, and framework of analysis into a qualitative scaffolding.

For this study my research questions had to do with the institutional growth of the environmental sciences. Specifically, the study is designed as an inquiry into the institutional organization of the environmental sciences, with particular emphasis on the relationship between culture and ‘structure.’ By examining how the environmental sciences emerged, and were organized over time, I examined to what extent perceptions of social structure functioned as drivers for institutional change, where institutional change is construed as ‘growth.’ As a hypothesis I posited that the growth of the environmental sciences at each university was tied to: a. perceived market demand; b.
patterns of disciplinary innovation; emerging areas of environmental concern. Measurements for these drivers were based on patterns of network activity in professional relationships, and coded patterning derived from interviews and archival data. What I discovered is that none of those posited drivers had overwhelming significance when compared, although they may have some significance when we consider the three case studies independently. What’s more, while all three programs developed specializations over time, there was very little overlap between programs. Rather, what emerged was a persistent pattern of efforts to legitimate science as a public good, built around various strategies to legitimate scientific relevance, often framed around the link between knowledge and action. In this sense the major finding of this study is that, for all three cases, the history of innovation in the environmental sciences is defined by an evolving emphasis on utility and application defined largely in terms of institutional organization. This institutional organization is construed as a constituent feature of the production of environmental expertise, which I refer to as the ‘expert knowledge system.’

Fieldwork Conditions:

Like many contemporary ethnographies, I argue that the process of writing ethnography is iterative—where the collection of data results in the gradual re-evaluation of research question’s in light of a progressive familiarization with the context of inquiry. This has certainly been my experience conducting this study. These results are complicated by three findings. Prior to my fieldwork, I conducted reconnaissance work at each site. In this developmental stage of the study my primary research objective was to examine the network organization of each university’s IGERT program in the
environmental sciences. IGERT stands for Integrated Graduate Education and Traineeship, and refers to the NSF’s flagship program in interdisciplinary research and education. The program is run on a competitive basis, providing funding for graduate students, while serving as the basis by which universities can organize research programs around collaborative problems in science, technology, mathematics, engineering, and the social sciences. Each program is organized around discrete, cutting edge problems that serve as the basis for collaborative research training. The research and training is structured by three components: interdisciplinary collaboration, team-based research, and develop professional skills through internships, and the conduct of research. My cases were thus selected on the basis of two criteria: did they have IGERT programs in environmental science, and did they have established environmental science programs. My hope was to understand how these IGERT programs, as institutional innovations, relate to the established environmental science programs, as well as how each had been integrated into the regional research economy, and regional networks of expert professionals. This design was challenged by several research conditions.

Due to the interdisciplinary nature of the programs, for all three cases faculty for the environmental science programs were drawn primarily from university faculty distributed throughout the university. During the reconnaissance phase I realized some of the difficulty of this approach as all three IGERT programs lacked institutional presence. That is, perhaps reflecting my naïveté, they didn’t have a central office or organized space of activity. Rather they were composed of networks of co-activity and participation, and, in this sense they were truly ‘relational’ phenomenon, in that they organized graduate students and faculty mentors. Additionally, after my reconnaissance
I realized that the majority of the faculty participants in the IGERT programs were not environmental science faculty, but rather environmental specialists from a variety of disciplinary backgrounds. To accommodate both aspects I expanded the research design to include inquiry into the available environmental programming of each site in hopes of capturing important linkages between IGERT network structure in relation to other areas of environmental research, and to thus capture a comparative dimension, however implicit, between growth in the environmental sciences and growth in the environmental research.

While in the field, this proved to be a fruitful line of inquiry, in terms of network analysis, but it proved problematic in three additional ways. First, the faculty that I interviewed tended to downplay their consultative roles, and had very weak to non-existent relationships with other regionally based expert professionals. Also, the IGERT programs served to organize students, rather than faculty per se. As my research design was concentrated on faculty, I realized early on that I would need to enroll graduate students in order to capture the ‘innovative effects’ of IGERT influence. However, this really fell outside of my studies research design, and its IRB approval. Second, in order to maintain methodological parity I examined the archival records of the additional environmental based research. However, in doing so, I realized that environmental expertise had a pattern of historical distribution not easily confined to the environmental science programs, which had relatively short institutional record. Third, and finally, I realized that the constitution of the environmental sciences was an institutional problematic that scientific and academic professionals at each field site had engaged with multiple times over a period of five decades. The emergence and growth of
the environmental sciences did not have a simple single trajectory—one that began in the 1970’s and culminated in the IGERT programs or the Environmental programs that were the subject of study, as driven by a single driver. Rather the chronology of emergence and growth had multiple points of emergence, decline and re-articulation that were crucial to my research questions. In this respect the network structure was not simply the by-product of professional activity, but rather the constitution of the environmental sciences—through enrollment, ongoing maintenance of ties, and the definition and redefinition of relationships—was in and of itself the focus of institutional action over time. In this respect, whereas I had previously attempted to treat the analytical construction of chronology as a scaffolding to examine network organization, the construction of a chronology took on a new importance, not simply as a framework, but rather as a means to examine how the ongoing use of culture and institutional resources formed the ‘raw material’ of social relationships and interaction. This realization put me at odds with my—admittedly naïve—approach to network modeling, but it put me in position to examine the dynamic link between institutions and what I came to call ‘institution building.’

**Componential Analysis:**

Although I persisted with my data collection strategy this analytical re-orientation constituted the first iterative moment in my field study. The result being a focused effort to examine in more historical detail the relationship between the conduct and training for environmental research, and the conduct and training for environmental science—and hence to specify, in institutionally specific terms, the differences and overlap between the
two. The second occurred when, on the basis of my archival work, and in relation to my ongoing interviews, I began to recognize a persistent appeal to ‘utility’ and application, defined in terms of institutional organization and policy making. Through this initial insight I developed a series of codes to delineate in both my interview data, and my network census, projects that were defined in terms of utility and policy relevance. A second set of sub-codes emerged as focused on ‘integration’ and ‘cooperative’ activity, and ‘multi-disciplinary’ organization. I developed a third set of sub-codes related to mention of ‘knowledge management’ and information. On the basis of this I realized that this patterning was clearly shared by actors in all three-field locations, and when I began to engage in coding and collocating the archival data, I recognized the relevance of these codes to the historical conditions as well. It was in the development and application of these codes that I began to recognize historical patterning around the ‘use of knowledge’ and the importance of institutional arrangements in the environmental sciences, for linking knowledge with action. A sub-chronology emerged around changing perceptions of the link between knowledge and action, particularly where this link is featured as a constituent feature of knowledge production. In this sense I recognized that the development of the IGERT programs could be situated, at each site, as part of an ongoing dynamic whereby environmental science, environmental research, and environmental relevance were periodically reorganized around the re-conceptualization of the link between knowledge and action.

Finally, in the analysis period I applied all of these codes, along with a meta-coding scheme for issues of organization, management, and coordination. This was the methodological basis for my emphasis on the institutional work of environmental
scientists and experts, and my overall analytical interest in institution building. A theory of institution building was thus built from the deployment of codes utilized in the archival work, and in the analysis of the interviews, to create the basis for comparison, and synthesis.

The codes discussed above were combined with a set of codes that later became the source of the componential approach outlined in Chapter 2. The componential heuristic—as a method of discovery—is derived from a series of codes developed to analyze patterns in the archival records reviewed during fieldwork. The codes were initially organized around the reconstruction of department and program chronologies, and later extended to the rest of the collected archival data, to the interview data, and to aspects of the survey/census. The codes were broadly organized around statements or assertions regarding the organization of knowledge and its value, who held legitimacy or derived value from this organization, and who was said to be involved in this organization, or in a particular course of action. These eventually became the analytical basis for the three concepts deployed in the dissertation: conceptual vocabularies, property or propriety scripts, and action-sets.

Furthermore, as many record sets are organized as relevant to ‘projects’ this became the basis for ‘institutional projects’ as an operative category for analysis. Where these records were complete these were examined in terms of institutional dynamics, and hence in terms of how projects were organized, how projects were integrated into the institutional order, and finally how they served as a basis for enrollment. These codes were combined with the codes above to serve as the basis for the componential heuristic, as centered upon ‘ordering activity’ and its relationship to ‘institutional dynamics.’ These
integrated codes were subsequently deployed in two ways: first, as a basis for organizing inquiry into record sets, and archival data collection, and second, as a means for analyzing interview, archival data, and the analysis of the document and cultural artifact database produced throughout the course of fieldwork.

The reduced archival and interview data thus became the basis for an integrated chronology of the growth of environmental research at each university case study, and for a chronology of program development. This chronology served as the basis for data employed in Chapters 4-8. Additionally, this chronology was comparatively contextualized into a common theoretical narrative that integrated original, case specific data, with the existent literature. This narrative served as basis for contextualization in Chapters 1-8. Finally, data reduction on select network data produced models for two sets of variables: the analysis of program distribution featured in chapter 3, and the distribution of ‘expert knowledge systems’ featured in the conclusion of the study.
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