Is There Anything New Under the Sun?: A Discussion and Survey of Studies on New Commons and the Internet

Charlotte Hess

Director of Library and Information Services
Workshop in Political Theory and Policy Analysis
Indiana university
Bloomington, Indiana

May 2000

Introduction

        This paper examines questions of the "new commons" -- an area of study that some define as technology-driven, human-made common pool resources (CPRs)[1]. The diverse subjects include urban shared space, highways, genetic data and the Internet. These might also include global commons such as the use of the atmosphere, air slots, and the radio spectrum. Many new commons operate on local, regional, and global levels. New commons can also refer to new areas of study in the "traditional" natural resource oriented CPR literature. The "new" CPRs share some characteristics with "traditional" natural resources but also have unique properties.

        I will place this new area of study within the context of the established CPR literature. I will present some of the issues and foci of the "traditional" literature, and survey some of the scholarly literature in this area. This will be followed by a discussion of the problematic nature conceptualizing and defining the *new commons*. I will pay particular attention to the literature on the Internet as a commons.

        I approach these questions as an information professional: How are bodies of knowledge organized and retrieved? Is their emphasis on region, discipline, subject, issue, or outcome? Are they classified by discipline (economics, political science etc. or interdisciplinary?) What are the questions? Are the authors looking at a commons' property rights? Equity issues? Rules and norms? History? Size? Social organization? What are the unifying threads of these works that identify them as part of the CPR literature?

I. Traditional commons and its literature

        New commons, is a recent term within the CPR literature. *Common pool resources* itself is a relatively new term, an outgrowth of interdisciplinary analysis applied to previously more narrowly-focused subjects. Before Gordon and Scott introduced their concepts of CPRs, there was a long history of intellectual inquiry into the nature of the commons. There are centuries of intellectual investigations into the nature of property rights, free riding, overpopulation, efficiency, participation, volunteerism, resource management, organizational behavior, environmental sustainability, social equity, self-governance, transboundary disputes, common fields, enclosure, communal societies, and the common good. What has remarkably changed is the merging of disciplines, the methodologies, the international comparative approach, and the intentionality of the CPR literature that has grown up in the past fifteen years.

        Fifty years ago a library search on the word "commons" would have pulled up three main subject areas: works on Parliamentary Houses of Commons; historically-shared fields in

---

[1]The IASCP eighth conference chairs described the new commons session topic as: *Technology development creates new common pool resources (Internet) and enables codification and management of existing common pool resources (genetic pool). How do issues of access, social exclusion, intellectual property rights, and commercialization shape the governance of these common pool resources (CPRs)? Population settlement creates common property that has to be managed by all residents (condominiums). Budgets of private and government corporations as well as international organizations (for example, EU farm subsidies) and the allocation of their shares among competing activities can also be analyzed as a common pool resource."*

England and Europe and their enclosure; and primarily American works on democracy, the town square, and the common good. There would also have been a few minor works on shared dining halls as campus commons. In the mid-fifties, Gordon (1954) and Scott (1955) introduced an economic analysis of a natural resource (fisheries) that had, prior to that time, been the domain of biologists. Their two articles are credited with outlining the conventional theory of the commons. (Feeny et al. 1990, p. 2).

The CPR literature that has been developed since Gordon and Scott, such as the work of Hardin, Ostrom, and IASCP members, did not grow out of those pre-1950s writings on the commons. Rather the developers of the CPR theory combined what was useful from ancient and modern classics -- Aristotle, Tocqueville, Hobbes, Kropotkin, Adam Smith, James Buchanan, Mancur Olson and others -- with their field research and knowledge from their particular disciplines. In the process, the study of common pool resources grew into a well-defined and recognized area of study with strong ties to many diverse disciplines.

A number of significant events helped shape the study of the commons from separated disciplines and one-dimensional narratives to the integrated area of study it is today: Garrett Hardin's 1968 *Science* article, "The Tragedy of the Commons" (TOC); the 1985 National Research Council's (NRC) Annapolis Conference on Common Property Resource Management, the development of the CPR library at Indiana University, the founding of IASCP in 1988, and the 1990 publication of Elinor Ostrom's book, *Governing the Commons.*

No one doubts the wide-spread influence of the "Tragedy of the Commons." It remains one of the most-cited articles in the social sciences. Feeny and colleagues lamented that the article (or the metaphor) has been "accorded by some the status of scientific law." (Feeny et al. p. 2). Because the article contains several errors and misconceptions, scholars have pondered its success and influence. Burger and Gochfeld surmise that its utility has been in "illustrating the importance of integrating social and political theory with biological data." (Burger & Gochfeld, p. 6). Ostrom wrote that TOC " has come to symbolize the degradation of the environment to be expected whenever many individuals use a scarce resource in common." (Ostrom, 1990 p. 2) Dasgupta wrote that "it would be difficult to locate another passage of comparable length and fame containing as many errors..." (Dasgupta in Aquilera-Klink 1994, p. 227). Aquilera-Klink's impression is that few people read or know much beyond the title.(p. 223) Pauline Peters postulated that the article "felt so seductively right because it harks back to deeply entrenched notions in the English-speaking world about common properties and individual interests." (Peters 1994, p. 5). In the same vein, McCay elaborated that it nurtured an "old and persistent part of Western culture--that is, "the idea that common property causes trouble." (McCay 1992, p. 2).

The "Tragedy of the Commons" does tell a short and memorable story with an action scenario: shared space plus overpopulation plus natural resources plus economic incentives plus human self-interest equals degradation of the resource and the demise of humans.

Hardin's work influenced the study of CPRs but a unified area of study did not begin to develop until the mid-1980s. This was a direct result of the 1985 NRC Annapolis Conference. This event brought together a wide variety of scholars who rejected Hardin's formulaic,

impressionistic narrative, who chose to look more closely and deeply into the problem of shared resources. Feeny best summed up the purpose of the conference:

> *The basic question that motivated the Annapolis conference was how and*
> *why certain groups have been able to manage common property resources*
> *successfully while others have not. The focus was on the institutional*
> *arrangements that governed the relationships among people who were*
> *associated with each other through the use of the resource. The theme*
> *was an inquiry into the nature and causes of success and failure.* (Feeny 1986, p. 8).

This conference set the standard for careful time and place analyses, well-crafted definitions and finely-tuned language. The contributors generally agreed on at least the two defining characteristics of a common pool resource: subtractability and difficulty in excluding others from its use. The conference also established the strong emphasis of CPR research on natural resources in developing countries. The conference organizers were members of the Panel on Common Property Resource Management in Developing Countries who had been brought together two years earlier, upon the recommendation of the NRC's Advisory Committee on the Sahel (ACS). The ACS urged the formation of a group to follow-up on their research regarding CPRs and the global dimensions of the Sahel drought of the 60s. (Hess 1999) . The books which came directly out of that conference (NRC 1986, and Bromley 1992) contain high-quality case studies organized around an analytical framework. The benefits of combining thorough case study with a theoretical framework set another important precedent.

The 1989 founding of IASCP grew out of the NRC Panel members' efforts to continue their work with a larger, more international and multi-disciplinary group. Initial members were drawn from the CPRnet -- an international network of associated researchers, practitioners and policy makers -- that the Panel had pulled together in the mid- 1980s. The association's conferences, begun in 1990, and the CPR Digest, first published in 1986, enabled an intellectual dialogue that has continued to this day. In the 1990s there were seven IASCP conferences with over 700 papers presented.

Elinor Ostrom left the 1985 conference determined to build a relational database of CPR case studies and to begin a CPR library at Indiana University. The relational database laid the groundwork for Ostrom's 1990 seminal work, *Governing the Commons*. She developed the library with a professional librarian, Fenton Martin. Together they defined the basic subject areas for the study of common pool resources. At the time of the first CPR bibliography compiled from this library (Martin, 1989) there were eleven categories: agriculture, fisheries, grazing, forests, land tenure and use, village organization, water resources and irrigation, wildlife, general and multiple CPRs, and theory and experimental literature. These are the areas of study that make up the "traditional" literature. Of the 700 IASCP papers mentioned above, less than 5% strayed from these subject areas.

Elinor Ostrom's 1990 *Governing the Commons* has had an enormous influence on CPR scholarship. In it, she lays out the economic and experimental foundations for the study of CPRs.

Her analyses of case studies of a variety of CPRs with a range of outcomes produced eight *design principles* that long-enduring CPRs have in common.[2] She considered them speculative at the time but they have been employed in hundreds of studies in the past ten years with continuing credibility. The design principles are considered a scientific response to predictions of Hardin's tragedy.

Ostrom and many of her colleagues are vigilant in arguing the importance of a clear distinction between *common pool resources* and *common property*. Common pool resources are natural or human-made resources where one person's use subtracts from the others and where it is difficult to exclude other users. Common property is only one of four broad types of property regimes, any of which may be best suited for the sustainability and efficiency of a CPR. This distinction is frequently overlooked. The narrower term, *common property* is frequently used when the more general term *common pool resource* is actually meant.[3]

Since 1985, thousands of theoretical, experimental, and case-study analyses of CPRs have been published.[4] Today, though most studies continue to focus on natural resources, there are many CPR scholars have expanded their field of vision. New analytical frameworks have been or are in the process of being developed.[5] Areas of concern in ecological economics, adaptive systems, intellectual property rights, and environmental treaties expand the boundaries of the traditional literature.

II. New commons

"New commons" is a broad category of more recent studies of different types of common pool resources. They are usually those that are human-made and technology-driven. They can exist at global , regional, and local levels.

There may actually be more urban common pool resources than natural resource commons, but the CPR literature has only occasionally dealt with the former. This is not to say that street crime, playground conflicts, neighborhood associations, community centers, park benches, green space degradation, apartment buildings, litter and so forth do not have an extensive literature devoted to them. But this literature is outside the traditional CPR literature.

---

[2]See Ostrom, 1990, pp. 90+ for a list and a discussion of these design principles.

[3]Some argue that this is the case with the names *Common Property Resource Digest* and the *International Association for the Study of Common Property.*

[4]See Hess, C., 1999. *A Comprehensive Bibliography of Common Pool Resources*. (CD-ROM) Bloomington: Indiana University, Workshop in Political Theory and Policy Analysis for a searchable database of over 25,000 published works and working papers on a broad range of CPRs.

[5] Since the Oakerson framework Ostrom and other Workshop scholars have developed the Institutional Analysis and Development (IAD) framework. More recently. Edwards & Stein have developed a "contextual framework" which challenges the limitations of previous frameworks.

Jane Jacobs' work on street life in a modern city is an example of core work on urban commons.(Jacobs 1961). It was written, however, before Hardin or IASCP or the IAD framework. In the areas of the *new commons* there are possibly more works by authors unfamiliar with the traditional CPR literature than not. These are works focused on commons and their dilemmas but without the CPR language They will not appear in most bibliographic searches on the "commons."

Initial funding for CPR research through the NRC determined that the focus of study be on natural resource management in developing countries. While this nurtured a new area of research, the area of study was artificially narrowed. Some of the most respected researchers on the commons were omitted from the early group because their work was centered in developed countries. Oakerson, who played such a key role in the formation of CPR theory, modeled the analytical framework for the NRC Panel, after the one he had developed in his dissertation on a "new commons": Kentucky coal-haul roads (Oakerson 1978). He had already argued in his case in 1978 that the "concept of common property applies to public facilities produced for joint use as well as to natural resources." (Oakerson 1978, p. 25)

Despite the proportional small percentage of "nontraditional" CPR studies, there are nevertheless a wide variety that have been legitimately studied by independent social scientists. These new CPRs include: surfer's waves (Rider 1998), sports (Bird and Wagner 1997), budgets (Shepsle 1983), public radio (Brunner 1998), traditional music (McCann 1995) air slots (Sened and Riker 1996), campus commons (Boal 1998); urban commons [apartment communities & residential community associations, streets, parking places, playgrounds, reclaimed buildings etc.] (Choe 1992; Oakerson 1999; Rosin 1998; Ingerson 1997; Groc 1997); highways and transboundary transportation systems, (Witbreuk 1995, 1998; Van Vugt 1997; Benson 1994); the Internet [domain names, infrastructure, information, acceptable use policies](Nathanson 1997; Bernbom 2000; Kollock and Smith 1996; Noonan 1998; Hess 1995; Reilly 1997); tourism landscapes (Healy 1995); cultural treasures (Sax 1999); car sharing institutions (Prettenhaler and Steininger 1999); garbage (Bose 1995); and sewage (Svderberg 1997). These resources were recognized by the authors to have characteristics similar to natural CPRs, such as free-rider problems, congestion, or difficulties with nonexcluability. The authors tend to be familiar with the traditional CPR literature, the issues, and the language. The areas with the fastest growing literature appear to be the urban commons, transportation commons, and the Internet commons.

Global commons, a more established but relatively new area of study, includes both traditional natural CPRs (Antarctica, the atmosphere, high seas, etc.) and new commons, such as the radio spectrum and the Internet. The global commons that do fall in the new commons group are those that have until recently "remained unclaimed due to a lack of technology for extracting their value and for establishing and sustaining property rights. (Ostrom in Buck, xiii). The global common literature is generally much more developed than that of the other new commons. This may be due to the contributions of major scholars from the traditional CPR literature: Ostrom, Buck, Keohane, Soroos, and Young.

The term "new commons" is an unfortunate one. Already in its short life span it has

5

several meanings:

(1)It can indicate those new areas of CPR studies as indicated above; (Nontraditional Commons)

(2) It can mean human-made, technology-driven resources as in the 2000 IASCP Conference session topics description (See footnote 1). This limits the area of study to information technologies -- the Internet, botanical and biological genetic data, and perhaps some global resources that can only be captured through technology, such as radio spectrum and space. (Technology-driven Commons)

(3) It can mean new institutional arrangements for natural CPRs. The authors of these works use the term "new commons" to describe their resources. This literature includes the work of Lars Carlsson, who writes on common forests in industrialized regions (Carlsson 1998). Phil Coop and David Brunckhorst write about the establishment of new, contemporary agricultural commons based on traditional systems by the Ecologically Restorative Industries Pty Ltd (ERI) on the New England Tablelands in Australia. (Coop and Brunkhorst 1999). Antonio Diegues describes new forest commons institutions in Brazil.(Diegues 1998). Several studies examine new CPR natural resource institutions in Africa (Bosc and Weber 1998; Berglund 1999; Bertrand and Weber 1995; Mahamane 1995; Takforyan 1995). (New Traditional Commons)

The term "new commons" is also troublesome in that it implies that traditional, natural CPRs are not "new;" but rather that they are "old." This connotation obscures the reality that all enduring CPRs are the result of dynamic institutions, subject to constant endogenous and exogenous change, as well as continual technological development. For the remainder of the paper, "new commons" will refer to all of these various types of nontraditional areas of study unless specified.

A seminal event in the development of the study of new CPRs was the 1995 fifth IASCP conference in Norway, with its theme "Reinventing the Commons." Erling Berge, co-chair of the conference, understood this "reinvention" of the commons to be "the academic exploration and search for deeper understanding of how and why institutions of common ownership can manage resources in an equitable and sustainable way in a changing environment and benefit the local communities depending on them for their survival." (Berge 1995). If we can equate "reinventing" with "new," this definition is similarly inclusive of the various meanings listed above.

The 1996 Berkeley IASCP conference hosted a number of scholars interested in the new commons. Alice Ingerson discusses issues raised at one of the sessions in a short article in *Land Lines*.(Ingerson 1997) The session brought together a dozen researchers and practitioners from the U.S. to discuss these *new forms of commons*. The group considered land trusts, group housing, urban open spaces, and converted military bases among the new commons. Ingerson, seeing the advantage in studying new types of CPRs, describes the slant of the session:

> *most recognized common property is in natural resources, and most recognized*
> *commoners are rural people in developing countries. But the concept of commons*
> *might also apply to some aspects of urban land in the United States. At the least,*

*common property theory may help U.S. policymakers understand more clearly
what is at stake in debates about land rights.* (Ingreson, 1997)

There were several papers on new commons given at the 1998 Vancouver conference. Betty Morgan looked at the issue of alternative property rights for public housing, with a case study of a Greensboro (North Carolina) Housing Authority initiative. Her focus was on how the *control* of a public housing commons can be determined through the use/appropriator community rather than through actual property rights. Tom Rosin discussed his study on the social customs and norms of street use in India. Anthony McCann presented a singular paper on the commodification of traditional Irish music and the threat of sound technologies and new social norms on this heretofore long-enduring social commons.

At this 2000 conference, we can expect to see a substantial increase in the number of new commons papers. The decision to include streams by topic (such as "Adaptation and Resilience to Change;" "Failures and What We Can Learn from Failing Institutions;"and "External Influences on Local Commons) instead of just type of resource invites opens the door to a broader range of CPR studies.

The IASCP conference new commons papers can serve as helpful tools in modeling future work. They are usually set within the context of the traditional literature. Many are written by scholars who have previously investigated natural CPRs

Marc Witbreuk has presented papers on his research and analysis of Dutch transportation systems as common pool resources at three IASCP conferences. (Witbreuk 1995, 1996, 1998). His work has focused on issues of transport policy, compliance and collectve action. He seeks to understand conditions of cooperation between organizations as well as individuals. While Witbreuk's work is from a civil engineering and technology management perspective, Mark Van Vugt's work on transportation systems is from the field of social psychology. His dissertation "Social Dilemmas and Transport Decisions" (Van Vugt 1996) applies game theory analysis to study decisions to use public transportation or to commute by car.

The *CPR Digest* has in recent years published two "CPR Forums" devoted to issues of new commons. The CPR Forum in issue no. 46 is devoted to "Enclosing the Academy," (Jul./Oct. 1998). It contains five points of view on various new commons in universities, such as intellectual property rights, commodification of academic knowledge, and electronic information. The Jan. 2000 issue's Forum "Beyond Natural Resources" contains perspectives on a variety of new commons, from car sharing, housing, policing and highways to sports, music and art.

The second edition of the book *Managing the Commons (*Baden and Noonen, 1998) reveals a recognition of "new commons." The editors have included chapters on neighborhood associations, the Internet, and the federal treasury -- common resources they describe as " unconventional or problematic common-pool resources."

***

Thus far I have discussed new commons as being "nontraditional." There are other types of recent commons literature that more difficult to place in the context of the traditional CPR literature. The first type includes studies and discourse on the *concept* of the commons: the "common good." In the U.S. there is a long tradition of this literature, particularly in the disciplines of political science and philosophy, education, religion, and sociology. The interest in the "common good" has had a resurgence, judging by the number of recent publications. To many average American citizens, the "commons" means the "common good" and is connected with "community spirit" and democratic principles. These studies have seldom been incorporated into the traditional CPR literature.

Roger Lohmann's book *The Commons* (1992) develops a "theory of the commons" based on his study of nonprofit and volunteer associations. The views outlined in his book are "fundamentally Tocquevillian." He draws heavily on the writings of Tocqueville, as do Ostrom and others. He also refers to Kropotkin, Hardin, and Olson. But he does not draw upon any of the CPR literature.[6]

Daly's *The Common Good*, or Etzioni's *The Limits of Privacy*, is directly in the range of works on social capital and deliberate democracy but they have so far had little incorporation into the current CPR literature. These authors appear to be working on parallel tracks.

The second type of nontraditional use includes the growing popular uses of the term "commons" They deserve discussion because of their persistence on the Internet. The Internet, as a mechanism for global self-publishing, is also a growing database of new commons--both new institutions and new uses of the word. Following are some types of "new commons" that appear on the web.

A. Digital Technology Commons

The phenomenon of the massive amounts of shared information made possible by the Internet has inspired the sudden rise of several kinds of new virtual or virtual-related commons. Most of these "commons" are physical facilities for technology and digital information. In the past ten years there have appeared many "digital commons." The "Digital Commons" at Southern Methodist University was founded in 1994 "to promote campus-wide teaching excellence through the appropriate use of technology..." Equally numerous are "information technology commons." The University of Toronto created an Information Commons[7] that " maintains an inventory of audiovisual equipment to assist the University community in its teaching endeavours." The University of Arizona is building an Information Commons also as a facility in

---

[6]The work is unusually well-referenced with a 48 page bibliography. But the only work of Ostrom's referred to is her 1978 paper on citizen participation in policing (Ostrom 1978).

[7] See: http://www.utoronto.ca/welcome.html/

which to share information technology.[8] The resources are the facilities and retrieval of digital information. These uses of the term may trace their roots to one of the older definitions of the "commons' -- a shared campus dining facility.

B. Information Exchange Commons

There are several websites dedicated to the provision and exchange of certain types of information. The "Copyright's Commons"[9] is "a coalition devoted to promoting a vibrant public domain. It is a group of students, teachers, authors, filmmakers, archivists, publishers, and other members of the public who believe in widespread access to creative works." The "Seamless Website: Law and Legal Resources" is billed as a "commons" because it is "a place for people to exchange ideas on law or computer related topics."[10] The Great Plains Free Net is a "virtual commons where people gather 'on line' to read, search for information and communicate with family and friends. It is also a place where non-profit groups share information with others..."[11] "A 'commons' is a gathering place," they add. Another site, "The Commons,"[12] combines the role of information and collective action about technology issues into its definition.

> *...The Commons is being organized as a citizen-led 'knowledge and consensus building' activity that is setting out to harness the latest available technologies in an attempt to permit those of us around the world, who care about these matters, somehow to 'put our heads together' to see what we might eventually be able to do, collectively, about these great and growing challenges.*

The Noise Pollution Clearinghouse is another virtual group devoted to information provision and exchange as well as (or as a form of) collective action. This group tries to educate

---

[8]This prototype is described as *the first step in implementing the Information Commons that will be a part of the Integrated Instructional Facility. The purpose of the Information Commons is to facilitate the integration of new technologies into teaching and learning by providing access to the Internet, electronic resources, and software packages that encourage sophisticated presentations of assignments, research papers, and projects. The Information Commons will serve as the primary space for students to do individual/group work and to receive additional informal instruction.* See: http://dizzy.library.arizona.edu/library/teams/ust/iiffaq.htm

[9] See: http://cyber.law.harvard.edu/cc/

[10]See: http://www.seamless.com/commons.html

[11]See: http://www.gpfn.sk.ca/gpfn/commons/index.html

[12]See: http://www.the-commons.org/commons/comintro.htm

the public about the nature of a "commons" at the same time.[13]

These uses of the term, as well as the uses described in the following section, are rooted in one of the older "classical" meanings of the "commons" -- a town hall, a town square, or other public meeting place.

C. Community Commons

There are hundreds of sites describing a local "commons." Some of these are groups while others are places. One such "community commons" describes itself as representing "a new concept of the totality of Frederick County's environment in a global community. It is a non-political, non-profit, volunteer amalgam" well defined by its name.[14] The Greyrock Commons is a co-housing initiative outside of Fort Collins, Colorado.[15] "Eno Commons" is a housing community built around the idea of the need for both privacy and community. Members have their own home and yard and "the option of gathering with neighbors in the Commons House, and in the community gardens or orchard."[16]

A recent book titled, *Reclaiming the Commons: Community Farms and Forests in a New England Town* has been reviewed extensively in the media (Donahue 1999). As described on the Internet, the book "is a lively account of a community working to combat suburban sprawl, to

---

[13]   The Noise Pollution Clearinghouse mission statement is called "Protecting the Commons:"
Our effort to control second-hand noise is part of a greater effort to protect that which is held in common by the public from exploitation, abuse, and degradation. Other efforts to protect the commons are concerned with protecting our public lands and parks; air, airways, water, and waterways; habitat, species, and bio-diversity. What these efforts share is the recognition that our well-being is enhanced when the commons is used to maximize opportunities for everyone, and degraded when the commons is used to maximize profits or opportunities for a few, or to maximize only a few opportunities.
  Some individuals and businesses feel that they have a right or the freedom to use a common resource in any way they see fit. Perhaps these people are mistakenly extending their own private property rights to that which is publicly owned or cared for and not exclusively their own.
See: http://www.nonoise.org/commons.htm

[14]http://www.communitycommons.org/

[15]The Greyrock group articulates well their institutional purpose and design:
 We are a group of people seeking to build a cohesive, cooperative community based on respect, responsibility, and shared human and material resources. We encourage and accept a diverse membership, representing a variety of ages, professions, family structures, and, ethnic, cultural, and spiritual backgrounds...
  We are dedicated to consensus decision-making. We value living lightly on the Earth, and pledge the wise use of our natural resources. We also value a sense of family with each other and relationship with the larger community, a safe environment for growing and learning, and privacy balanced with cooperative living.   See: http://www.greyrock.org/

[16]See: http://www.employees.org/~enoweb/

protect a large part of the landscape as common land, and to enjoy the land productively in an ecologically sustainable way."

A community commons website in Australia takes the broadness of the resource to the extreme:

> *Garrett Hardin's essay, "The Tragedy of the Commons" (1968), is a modern classic in environmental literature. The "commons" refers to the common resources that are owned by everyone. The "tragedy" occurs as the result of everyone being free to maximize one's own profit by exploiting the commons. ... Although Hardin's essay describes a problem inherent in an unregulated public pasture, it serves as a metaphor for our entire society. Our communities are the commons. Our schools are the commons. Our roads, our air, our water;* **we all are the commons***![17]* (Emphasis is mine).

D. New Tragedies of the Commons

Just as the concept "commons" is having a resurgence, so too is Hardin's 1968 pessimistic scenario. New applications of TOC are visible throughout the Web. Some examples are the following:

"The Republicans and the Tragedy of the Commons"[18]

> *Every once in a while, someone invents an operative metaphor, and is gratefully remembered ever after. Garrett Hardin did it in 1968 when he wrote his article Tragedy of the Commons...*

"Beef Information Ownership"[19]

> *Just as everything else that's held in common, there are no incentives to improve one's situation because no one is fully able to capture the improvement. For examples we need only look to the overgrazed common range of Montana in the 1800s, or the overfished east coast common fishery of the late 1900s.*

"Tragedy of the Commons Re-stated"[20]

> *In his 1968 classic, "Tragedy of the Commons", Garrett Hardin illustrates why the*

---

[17]http://www.upstarts.net.au/site/ideas/democracy/capital_v_demos_ch06.html

[18]http://www.spectacle.org/196/common.html

[19]http://www.cattle.ca/root/wsga-9w6/opinion/ward9703.htm

[20]The author is J. Hanson, 6/14/97   See: http://aloha.net/~jhanson/page109.htm

reindeer crashed and why communities everywhere are headed for tragedy

brings ruin to all: Will the coming global currents will pull us to the bottom and tear us

apart? Our only chance to avoid it is to invent a political system that money can't buy

commons. If we can't, we're dead.

These popular usages of TOC exemplify the facile understanding of the metaphor and lack of awareness of the nature of common pool resources.

It is difficult to tell whether the "conceptual" commons or the "popular" commons deserve a place in the scholarly CPR literature. The competing uses of the term "commons" add confusion and muddle the messages CPR scholars are trying to get across. If CPR scholars are to take on Marshall Murphree's 1996 challenge to make their scholarship accessible and understandable,[21] the question is an important one. It is clear that serious CPR scholars are battling a fresh wave of ideological concepts, simplistic metaphors, and blurry definitions. At the same time, there are new voices expressing interest in the concepts, incidences, and dilemmas of the commons.

<div align="center">***</div>

There are a few studies that may serve as guidelines for deeper analyses of new commons. Jaesong Choe observed in his 1992 dissertation that the study of urban commons was still in its infancy (Choe 1992, p. 3).Today, the study of urban and other new commons seems still quite undeveloped. Few studies have taken on the complex layers of these resources. Time and place analyses would lessen the generalizations by carefully defining the physical resource at hand, identifying the user community, the rules and norms, the actions and the patterns of behavior which lead to certain outcomes. There are still few studies that consider size, scale, heterogeneity, or gender issues.

A model study of a "new commons" is Ronald Oakerson's 1978 dissertation "The Erosion of Public Highways: A Policy Analysis of the Eastern Kentucky Coal-Haul Road Problem."[22] This work is a meticulous study that applies public choice policy analysis and draws upon economic theory to understand the complexity of road degradation and conflicting interests in Eastern Kentucky. Oakerson develops a framework for analyzing a common pool resource which he then applies to the problem of road erosion.[23] Four of the chapters correspond to the

---

[21]Murphree challenged the conference participants to share their insights with "those who can make a real difference." By only sharing our wisdom with each other -- the scholarly community -- we lessen the impact we could otherwise make and silence the voices of those who have taught us. (Murphree 1996).

[22]See Oakerson 1981 for a published summary of the dissertation.

[23]Oakerson based his model on "four elements of policy analysis" developed by Vincent Ostrom. (Oakerson 1978 p. 53 and footnote 5, p. 62).

four elements of his framework: the structure of events, decision-making arrangements, individual choice of strategy, and outcome and evaluation (Oakerson 1978, p.53-57).

Jaesong Choe's 1992 dissertation "The Organization of Urban Common-Property Institutions: The Case of Apartment Communities in Seoul" presents a theoretical framework around a case study of six apartment communities in Seoul, Korea. One of his main areas of concern are the collective action problems inherent in these common property institutions, which he describes as "access control, use regulation, and maintenance." (Choe 1992, p. 3) The author relies on Oakerson's earlier distinction between defining a CPR as a "resource" or as a "facility." This differentiation is useful in understanding many human-made CPRs. [24] Also helpful is Choe's clarity in distinguishing types of commons:

> *The commons can be categorized with respect to whether it yields*
> *income (fisheries, forest products, etc.)or consumption goods and*
> *services to users (streets, highways, internet, irrigation systems).*
> *The commons also varies according to the degree that its degradation*
> *can be monitored and the ease with which it can be renewed (Choe 1992, p. 8).*

<div align="center">***</div>

---

[24] A resource may be subject to "appropriation" -- the withdrawal of resource units from the resource. A facility is subject to "use". "Use" for Choe is the more general term and refers to both the appropriation of resources and use of facilities. (Choe, 1992, p 6).

III. The Internet as a complex, multi-layered commons

The Internet is possibly the most complex of the new commons.. The product of interoperable information technology, the Internet enables rapid transfer of information and communication at the local, regional, and global levels.   It is an extremely dynamic resource: its users are growing at an exponential rate, as are its uses and applications. Its complexity lies in its interlinked system of technologies as well as in its nested layers of local, regional, and global regimes The Internet contains several different common pool resources. It's very size and scope, its complex, multilayered, and local-regional-global nature requires that the particular resource and user community at hand be carefully identified and defined.

Most of the studies about Internet CPRs fail to adequately identify the resource. Commonly authors move back and forth between three different Internet CPRs: an information commons, a social commons, and an Internet technology infrastructure commons.[25]

Peter Kollock and Marc Smith were among the first to publish on the Internet as a commons (1996). They focus on Internet communication with its own sets of cooperation and coordination problems. They examine Usenet newsgroups as an example of an Internet commons situation.   This paper provides a good summary of the conditions and types of free-riding and other types of inappropriate behavior of problems of this resource: overuse, unacceptable language, information "pollution" and so forth, which need not be duplicated here. When Kollock and Smith, however, state that the "key common resource is not an open pasture, but bandwidth," (p.8) they illustrate the problem of analyzing the Internet as one homogenous resource. The bandwidth is not the CPR at hand, but rather the social or community commons (Hess 1995).

Lawrence Lessig is a Harvard scholar who is often called upon by the media to comment on the social dilemmas of the Internet. His writings and speeches about the Internet as a commons are ubiquitous. Unfortunately Lessig does not seem to draw on any of the CPR literature. In a 1999 keynote address, he stated:

---

[25]In Hess (1995) a fourth type of commons is identified: an "Internet Budget Commons."I no longer consider this to be an Internet commons. While an Internet budget may qualify as a commons, the *budget* is the resource, not the Internet.

> *The Internet is an aberration in a property obsessed era... [It is a] space that*
> *anyone can enter and take what she finds without permission of a librarian or*
> *a promise to pay. The net is built on a commons -- the code of the World Wide Web,*
> *HTML, is a computer language... Access to the common property is not*
> *conditioned upon the will of anyone else.* (Lessig 1999).

Lessig is mainly drawing upon his ideological concepts of a commons and not the actual resource.

Robert Reilly's 1997 dissertation gives an overview of acceptable use policies (AUPs) and university management of their "electronic commons." The work argues the necessity of well-defined resources and rules in regard to information technology. He advocates well-crafted AUPs in order to educate the user group about the physical nature of the electronic resource and the social responsibilities required the networked environment.

Douglas Noonan's chapter in *Managing the Commons* (Baden and Noonen 1998) is a worthy overview of the Internet at a commons. He, unlike most authors listed here, is familiar with the traditional CPR literature and argues that there are many parallels between the Internet and traditional CPRs. While he acknowledges that the Internet contains several different commons, he frequently blurs the distinctions.

Nathanson's study of the competition for domain names investigates what type of resource domain names are and whether they are property or trademarks (Nathenson 1997). The work is a well-documented illustration of the problem of technology rushing ahead without waiting for legal institutions to catch up and adapt. He gives a helpful background on the history and development of the problem. In describing the complexity of the issue he presents numerous court cases of relevance.

Huberman and Lukose report in *Science (*Huberman and Lukose 1997) on their work on Internet congestion. They examine social dilemmas caused by Internet users not being charged in proportion to their use. This work is the best in this issue, combining empirical data with theory about individual decision making and influence of feedback information regarding the condition of a resource on decisions made.

Yochai Benkler researches beyond the Internet to wireless communications. His extensive articlel in the Journal of Law and Technology painstakingly details the outdated and inappropriate regulatory institutions for recent communication and spectrum technologies (Beckler 1998).

In 1999 there was a Conference with the title "Governing the Commons: The Future of Global Internet Administration."[26] The conference was called to carry on a "civil discussion of conflicts with the newly formed Corporation for Assigned Names and Numbers" (ICANN) described as a "global institution for Internet administration." Conference themes concerned

---

[26]Computer Professionals for Social Responsibility (CPSR). 1999 "Governing the Commons: The Future of Global Internet Administration, September 24-25, 1999, Alexandria, Virginia http://www.cpsr.org/conferences/dns99/dnsconf99.htm

ICANN's institutional order, domain name competition, and the emergence of new technologies. Despite the title, there is no reference to Ostrom. The speakers and topics have virtually no overlap with CPR studies and make no reference to the traditional CPR literature.

A May 1999 conference at Harvard University titled "Building a Digital Commons"[27] also had no reference to CPR literature.

***

As a resource containing different types of common pool resources, the Internet is an important area for future CPR analysis. It has characteristics that are noteworthy. It has both local and global communities. It continues to experience unprecedented rapid change. It's non-geographical space calls for a redefinition of "place."[28] It softens the boundaries between what is "local" and what is "global." The size of this network of networks is beyond human dimensions or experience. Depending on the Internet resource at hand, it can any one of the four main property regimes.

As with other new commons, the study of the Internet as a CPR is very young. Much of the research thus far suffers from generalization and lack of clear definitions. A CPR analytical framework has rarely been applied.[29] When the resource at hand is not defined, the ensuing analysis becomes muddled. Frequently studies refer to the "international access," the global reach of the Web, when the points being made are only meaningful when applied to the developed world. The panel on the Internet at this conference may stimulate new high-quality research and analysis in this area.

Conclusion

Diverse studies of CPRs are growing and developing rapidly. The lines between different types of commons, though not always clear cut in the *traditional* CPR literature, are becoming increasingly blurred. More and more scholars are investigating *nontraditional* commons. At the same time there is a rise in the uses of the *classical* meanings of the word "commons." And the preponderance of impressionistic, uninformed usages of the commons metaphor makes it harder to sift out any of the quality literature.

Without agreement on the meaning of *new commons*, it is difficult to categorize it as a new area of study within the CPR tradition. It is clear that there are many different meanings and

---

[27]Building a Digital Commons," Presented by the Berkman Center for Internet and Society, May 20, 1999, Harvard Law School, Cambridge, MA
See: http://cyber.law.harvard.edu/opencode/archive/agenda.html

[28]This aspect is causing great confusion for governments wishing to tax commercial transactions on the web.

[29]Hess (1995) and Kollock and Smith (1996) are two works that have attempted the application of an analytical framework.

uses of the term "commons." Some new commons literature has nothing to do with traditional CPR studies but is rooted in earlier, pre-Hardin meanings of the *commons--*town square, village green, campus dining hall, or "the common good." Some new commons literature is based on a broad metaphorical application of Hardin's TOC.

This survey of some of the new commons literature raises some interesting questions. Is a "commons" the same as the concept of a "commons"? Are popular uses of the word "commons" polluting scholarly CPR literature? Is "new commons" a valid or helpful category?

The next step will be to develop a viable taxonomy for these new and nontraditional types of commons.

References

Agrawal, Arun. 1996. "Common Property Discourse and Forest Management in the Indian Himalayas: A Critical Assessment." (Working Paper).

Aguilera-Klink, Frederico (1994) "Some Notes on the Misuse of Classic Writings in Economics on the Subject of Common Property." *Ecological Economics* 9:221-228.

Aristotles. *Politics,* Book II. Trans. B. Jowett. New York: Modern Library.

Baden, J. and D. Noonen, eds. 1998. *Managing the Commons*. 2nd. Ed. Bloomington: Indiana University Press.

Benkler, Yochai. 1998. "Overcoming Agoraphobia: building the commons of the Digitally Networked Environment." Journal of Law and Technology 11(2):287-400.

Berge, Erling. 1995. "A Prolegomena to 'Reinventing the Commons.' " Presented at "Reinventing the Commons," the fifth annual conference of the International Association for the Study of Common Property. May 24-28, 1995, Bodoe, Norway.

Bergland, Christer. 1999. "Evaluating New Institutional Settings: A Pilot Study of New Common Property Forests in Tanzania." *Scandinavian Journal of Development Alternatives* 18(1):43-60.

Berkes, Fikret, ed. (1989) *Common Property Resources; Ecology and Community-Based Sustainable Development.* London: Belhaven Press.

Berkes, Fikret. 1992. "Success and Failure in Marine Coastal Fisheries of Turkey." In *Making the Commons Work: Theory, Practice, and Policy*, ed. D. Bromley. San Francisco: ICS Press.

Berkes, Fikret and Carl Folke. 1991. "A Systems Perspective on the Interrelations between Natural, Human-made and Cultural Capital." (Working Paper).

Bertrand, Alain and Jacques Weber. 1995. "From State to Local Commons in Madagascar; A National policy for Local Management of Renewable Resources." Presented at "Reinventing the Commons," the fifth annual conference of the International Association for the Study of Common Property. May 24-28, 1995, Bodoe, Norway.

Bird, Edward J. and G. G. Wagner. 1997. "Sport as a Common Property Resource: A Solution to the Dilemmas of Doping." *The Journal of Conflict Resolution* 41(6):749-766.

Boal, Iain. 1998. "The Campus and the Commons." *Common Property Resource Digest* 46:1-4.

Bosc, Pierre-Marie, and Jacque Weber. 1998. "Farmers' Organizations and the Building of a New Common Pool Resource: the role of Social Heterogeneity in the Socio-Political Search of Compromises." Presented at "Crossing Boundaries," the seventh annual conference of the International Association for the Study of Common Property, June 10-14, 1998, Vancouver, British Columbia.

Bose, Anuradha. (1995) "Garbage as Commons? The Case of Calcutta." Presented at the fifth

annual meeting of the International Association for the Study of Common Property, Bodoe, Norway, May 24-28, 1995.

Brennan, Timothy. 1998. "The Spectrum as Commons: Tomorrow's Vision, Not Today's Prescription." *The Journal of Law and Economics* XLI(2):791-803.

Bromley, Daniel W. 1986. "The Common Property Challenge." In *Proceedings of the Conference on Common Property Resource Management, April 21-26, 1985,* National Research Council. Washington, DC: National Academy Press.

Brunner, E. J. 1998. "Free Riders or Easy Riders? An Examination of the Voluntary Provision of Public Radio." *Public Choice* 97(4):587-604.

Bryson, John M., and Barbara C. Crosby. 1992. *Leadership for the Common Good: Tackling Public Problems in a Shared-Power World.* San Francisco: Jossey-Bass.

Buck, Susan J. 1998. *The Global Commons: An Introduction.* Washington, DC: Island Press.

Burger, Joanna and M. Gochfeld. 1998. "The Tragedy of the Commons 30 years Later." *Environment* 40(10):4-27.

Carlsson, Lars. 1997. "The Swedish Common Forests: A Common Property Resource in an Urban, Industrialized Society." In *From the Field.* Rural Development Forestry Network, ed. London: Overseas Development Institute.

Choe, Jaesong. 1992. "The Organization of Urban Common-Property Institutions: The Case of Apartment Communities in Seoul." (Ph.D. Dissertation, Indiana University, 1992).

Common Property Resource Digest; Quarterly Publication of the International Association for the Study of Common Property. ed. D. Wilson. Bloomington, In.

Coop, Phil and D. Brunckhorst. 1999. "Triumph of the Commons: Age-Old Participatory Practices Provide Lessons for Institutional Reform in the Rural Sector." *Australian Journal of Environmental Management* 6:69-77.

Daly, Herman and J. B. Cobb. 1989. *For the Common Good: Redirecting the Economy toward Community, the Environment and a Sustainable Future. Boston: Beacon.*

Dasgupta, P.S. (1982) *Control of Resources* Oxford: Basil Blackwell. P. 13

Diegues, Antonio Carlos. 1995. "Rethinking and Rebuilding Common Property Systems in Brazil." Presented at "Reinventing the Commons," the fifth annual conference of the International Association for the Study of Common Property. May 24-28, 1995, Bodoe, Norway.

Donahue, Brian. 1999. *Reclaiming the Commons: Community Farms and Forests in a New England*

Town. New Haven, CT: Yale University Press.

Edwards, Victoria M. and Nathalie A. Steins. 1999. "A Framework for Analysing Contextual Factors in Common Pool Resource Research." *Journal of Environmental Policy & Planning* 1:205-221.

Edwards, Victoria M. and Nathalie A. Steins. 1999. "The Importance of Context in Common Pool Resource Research: Special Issues Introduction." *Journal of Environmental Policy & Planning* 1:195-204.

Esser, Aristide Henri. 1971. "Social Pollution." *Social Education* 35(1):10-18.

Etzioni. Amitai. 1999. *The Limits of Privacy.* New York: Basic Books.

Feeny, David. 1994. "Frameworks for Understanding Resource Management on the Commons." In *Community Management and Common Property of Coastal Fisheries in Asia and the Pacific: Concepts, Methods, and Experiences*, ed. R. S. Pomeroy. pp. 20-33. Manila, The Philippines: ICLARM.

Feeny, David (1995) "Optimality, Sub-optimality, Nirvana, and Transaction Cost: Foraging on the Commons." Presented at the fifth meeting of the International Association for the Study of Common Property, Bodoe, Norway, May 24-28, 1995. <http://www.hibo.no/IASCP/D_Feeney.html>

Feeny, David et al. 1990. "The Tragedy of the Commons: Twenty-Two Years Later." *Human Ecology* 18: 1-19.

Galston, William A. 1999. "Does the Internet Strengthen Community? *Report from the Institute for Philosophy and Public Policy* 19(4):1-8.

Getz, Wayne M. et al. 1999. "Sustaining Natural and Human Capital: Villagers and Scientists." *Science* 283(5409):1855-1856.

Gordon, H. Scott. 1954. "The Economic Theory of a Common-Property Resource: The Fishery." *Journal of Political Economy* 62:124-142.

Gorove, K. 1998. "Protection of the Space Commons: New Customary Law?" Journal of Space Law 26(28).

Groc, Isabelle. 1997. "Stopping Halfway in Commons Preservation: The Case of Traverse City, Michigan." http://www3.bc.sympatico.ca/idoumenc/CommonPropertyPaper.html

Hardin, Garrett. 1977. "Denial and Disguise." In *Managing the Commons*, ed. G. Hardin and J. Baden. San Francisco: W.H. Freeman

Hardin, Garrett. 1968. "The Tragedy of the Commons." *Science*162 (Dec. 13): 1242-1248.

Hardin, Garrett and John Baden. 1977. *Managing the Commons.* San Francisco: W.H. Freeman

Healy, Robert G. 1995. "The 'Common Pool" Problem in Tourism Landscapes." Annals of Tourism Research 21(3):596-611.

Henderson, Hazel. 1995. "New Markets and New Commons: Opportunities in the Global Casino." *Futures* 27(2):113-124.

Hess, Charlotte. 1998. "Capturing the Campus Commons." *Common Property Resource Digest 46:9-11.*

_____. 1999. *A Comprehensive Bibliography of Common Pool Resources*. (CD-Rom). Bloomington, IN: Workshop in Political Theory and Policy Analysis.

_____. 1999. Tracking the IASCP: Crafting an Organization: The Early History of IASCP and the Workshop Connection. *Polycentric Circles* 6(1): 1-2.

_____. 1995. "The Virtual CPR: The Internet as a Local and Global Common Pool Resource." Presented at "Reinventing the Commons," the fifth annual conference of the International Association for the Study of Common Property, May 24-28, 1995, Bodoe, Norway.

Hobbes, Thomas. 1962. *Leviathan; Or the Matter, Forme and Power of a Commonwealth Ecclesiasticall and Civil*. Michael Oakeshott New York: Macmillan

Holman, JoAnne. 1997. "An Information Commons: Protection for Free Expression in the New Information Environment." (Ph.D Dissertation, Indiana University, 1997).

Huberman, Bernardo A. and R. M. Lukose. 1997. 'Social Dilemmas and Internet Congestion." *Science* 277(5325):535-537.

Ingerson, Alice E. 1997. "Urban Land as Common Property." *Land Lines* 9(1)(January):1-7. http://www.lincolninst.edu/landline/1997/march/commonp.html

Jacobs, Jane. 1961. *The Death and Life of Great American Cities.* New York: Vintage Books.

Jordan, Bill. 1989. *The Common Good: Citizenship, Morality and Self-Interest*. NY: Blackwell.

Keohane, Robert O. and Elinor Ostrom, eds. (1995) *Local Commons and Global Interdependence; Heterogeneity and Cooperation in Two Domains.* Thousand Oaks, CA: Sage.

Klein, Daniel B. 1990. "The Voluntary Provision of Public Goods? the Turnpike Companies of Early America." *Economic Inquiry* 28:788-812.

Kollock, Peter and Marc Smith. 1996. "Managing the Virtual Commons: Cooperation and Conflict in

Computer Communities." In *Computer-meditated Communication; Linguistic, Social and Cross-cultural Perspectives*, ed. Susan C. Herring. Philadelphia: J. Benjamins.

Lessig, Lawrence. 1999 "Code and the Commons." Presented at a keynote address at a conference on "Media Convergence," Fordham Law School, New York, NY, February 9, 1999.

Lloyd, William F. 1977. "On the Checks to Population." In *Managing the Commons*, eds G. Hardin and J. Baden. San Francisco: W.H. Freeman.

Lohmann, Roger A. 1992. *The Commons: New Perspectives on Nonprofit Organizations and Voluntary Action.* San Francisco: Jossey-Bass.

Mahamane, El Hadj Laouali et al. 1995. "Creation of New Commons as Local Rural Development Tools: Rural Markets of Wood Energy in Niger." Presented at "Reinventing the Commons," the fifth annual conference of the International Association for the Study of Common Property, May 24-28, 1995, Bodoe, Norway.

Mansbridge, Jane. 1990. *Beyond Self-Interest.* Chicago: University of Chicago Press.

McCann, Anthony. 1998. "Traditional Music and Copyright: The Issues." Presented at "Crossing Boundaries," the seventh annual conference of the International Association for the Study of Common Property, June 10-14, 1998, Vancouver, British Columbia.

McCay, Bonnie J. 1992. "Everyone's Concern, Whose Responsibility? The Problem of the Commons." In: *Understanding Economic Process,* eds. S. Ortiz and S. Lees. New York: University Press of America.

McGinnis, Michael, and Elinor Ostrom 1996. "Design Principles for Local and Global Commons." In *The International Political Economy and International Institutions, Vol. 2*, ed. O. R. Young. Brookfield, VT: Edward Elgar.

McKean, Margaret. 1992. "Management of Traditional Common Lands (Iriaichi) in Japan." In *Making the Commons Work: Theory, Practice, and Policy*. ed. D. Bromley. San Francisco: ICS Press.

Meeker-Lowry, Susan. 1995. *Invested in the Common Good.* Philadelphia: New Society.

Morgan, Betty. 1998. The Language of 'The Commons' in Low Income Housing Communities: Common Property Theory and the Development of a Progressive U.S. Federal Housing Policy." Presented at "Crossing Boundaries," the seventh annual conference of the International Association for the Study of Common Property, June 10-14, 1998, Vancouver, British Columbia.

Mounolou, Jean Claude, and F. Fridlansky 1995. "Biodiversity: Scientific Stakes and Inferences (The Case of Plants and Plant-breeding)." Presented at "Reinventing the Commons," the fifth annual conference of the International Association for the Study of Common Property, Bodoe, Norway, May 24-

28, 1995.

Murphree, Marshall W. 1996. "Articulating Voices form the Commons: Interpretation Translation, and Facilitation." Keynote Address presented at the sixth annual conference of the International Association for the Study of Common Property, Berkeley, CA, June 5-8, 1996.

Nathanson, Ira S. 1997. "Showdown at the Domain Name Corral: Property Rights and Personal Jurisdiction over Squatters, Poachers and Other Parasites." *University of Pittsburgh Law Review* 58(4):911-990.

National Research Council. 1986. *Proceedings of the Conference on Common Property Resource Management, April 21-26, 1985,* Washington, DC: National Academy Press.

Noonan, Douglas S. 1998. "Internet Decentralization, Feedback, and Self-Organization," In *Managing the Commons,*" eds. J. A. Baden and D. S. Noonan. 2nd. ed. Bloomington: Indiana University Press.`

Oakerson, Ronald J. 1992. "Analyzing the Commons: A Framework." In *Making the Commons Work; Theory, Practice and Policy*, ed. D. Bromley. San Francisco: ICS Press.

_____. 1999. Governing Local Public Economies: Creating the Civic Metropolis. Oakland, CA: ICS Press.

_____. 1981. "Erosion of Public Goods: the Case of Coal-Haul Roads in Eastern Kentucky." In *Research in Public Policy Analysis and Management,* ed. J. Crecine. Greenwich, CT: JAI Press.

_____ . 1978. "The Erosion of Public Highways: A Policy Analysis of the Eastern Kentucky Coal-Haul Road Problem." (Ph.D. Dissertation, Political Science, Indiana University, 1978).

_____, 1993. "Reciprocity: A Bottom-Up View of Political Development." In *Rethinking Institutional Analysis and Development: Issues, Alternatives, and Choices.* San Francisco: ICS Press.

Oakerson, Ronald J. and S. Tjip Walker. 1994. "Analyzing Policy Reform and Reforming Policy Analysis: An Institutional Approach." In *Policy Analysis Concepts and Methods: An Institutional and Implementation Focus,* ed. D. W. Brinkerhoff. Greenwich, CT:JAI Press.

Ostrom, Elinor. 1978. "Citizen Participation and Policing: What do we Know?" *Journal of Voluntary Action Research* 7(1-2):102-108.

_____. 1977. "Collective Action and the Tragedy of the Commons." In *Managing the Commons,* eds. G. Hardin and J. Baden. San Francisco: W.H. Freeman.

_____. 1997. "Commons." (Working Paper) Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington, Indiana.

_____. 1999. "Coping with Tragedies of the Commons." *Annual Review of Political Science* 2:493-535.

_____. 1992. Crafting Institutions for Self-Governing Irrigation Systems. San Francisco: Institute for Contemporary Studies Press.

_____. 1990. *Governing the Commons*. New York: Cambridge University Press.

_____. 1992. "Institutions and Common-Pool Resources: Editor's Introduction." *Journal of Theoretical Politics* 4(3):243-245.

_____. 1999. "Polycentricity, Complexity, and the Commons." *The Good Society; A PEGS Journal* 9(2):37-41.

Ostrom, Elinor et al. 1999. "Revisiting the Commons: Local Lessons, Global Challenges." *Science* 284(5412):278-82.

Ostrom, Vincent. 1980. "Artisanship and Artifact." *Public Administration Review,* 40,4:309-17.

_____. 1950. "Government and Water: A Study of the Influence of Water Upon Governmental Institutions and Practices in the Development of Los Angeles." (Ph.D. Dissertation, University of California-Los Angeles, 1950).

_____. 1968. "Organization of Decision-Making Arrangements and the Development of Atmospheric Resources. (Working Paper).

_____. 1956 *Politics and Water*. Los Angeles, CA: Haynes Foundation.

Ostrom, Vincent and Elinor Ostrom (1978) "Public Goods and Public Choices." In: Savas, E.S., ed. *Alternatives for Delivering Public Services; Toward Improved Performance.* Boulder, CO: Westview.

Peters, Pauline E. 1994. *Dividing the Commons: Politics, Policy, and Culture in Botswana.* Charlottesville: University of Virginia Press.

Platt, Rutherford H. 1996. *Land Use and Society: Geography, Law, and Public Policy*. Washington, DC: Island Press.

Prettenhaler, Franz, and Karl Steininger. 1999. "From Ownership to Service Use Lifestyle: The Potential of Car Sharing." *Ecological Economics* 28: 443-453.

Proudhon, Pierre-Joseph. 1994. *What is Property?* New York: Cambridge University Press.

Putnam, Robert. 1993. "The Prosperous Community: Social Capital and Public Life." The American

Prospect 13(Spring). http://epn.org/prospect/13/13putn.html

Reilly, Robert A. 1997. Transforming the Paradigm for Crafting Acceptable Use Policy: Managing the Electronic Commons. (Ph.D. Dissertation, University of Massachusetts, Amherst, 1997).

Rider, Robert. 1998. "Hangin' Ten: The Common-Pool Resource Problem of Surfing." *Public Choice* 97(½):49-64.

Rose, Carol. 1986. "The Comedy of the Commons: Custom, Commerce, and Inherently Public Property." T*he University of Chicago Law Review* 53/3 (Summer):711-781.

Rosin, Thomas. 1998. "The Street as Public Commons: A Cross-Cultural Comparative Framework for Studying Waste and Traffic in India." Presented at "Crossing Boundaries," the seventh annual conference of the International Association for the Study of Common Property, June 10-14, 1998, Vancouver, British Columbia.

Sax, Joseph L. 1999. *Playing Darts with a Rembrandt: Public and Private Rights in Cultural Treasures.* Ann Arbor, MI: University of Michigan Press.

Schlager, Edella, and Elinor Ostrom. 1987. "Common Property, Communal Property, and Natural Resources: Some Conceptual Clarifications." Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington, IN.

Scott, Anthony D. 1955. "The Fishery: The Objectives of Sole Ownership." *Journal of Political Economy* 65:116-124.

Sened, Itai and W. H. Riker. 1996 "Common Property and Private Property: The Case of Air Slots.: *Journal of Theoretical Politics*.8(4):427-447.

Shepsle, Kenneth A. 1983. "Overgrazing the Budgetary Commons: Incentive-Compatible Solutions to the Problem of Deficits." In T*he Economic Consequences of Government Deficits,* ed. L. Meyer. Boston: Kluwer-Nihoff.

Sherover, Charles M. 1989. *Time, Freedom, and the Common Good: An Essay in Public Philosophy.* Albany: State University of New York Press.

Soroos, Marvin S. 1995. "Managing the Atmosphere as a Global Commons." Presented at the fifth annual meeting of the International Association for the Study of Common Property, Bodoe, Norway, May 24-28, 1995.

Sproule-Jones. 1997. "Common Pools and Multiple Uses." (Working Paper)

Steins, Nathalie A. and Victoria M. Edwards. 1999. "Collective Action in Common-Pool Resource Management: The Contribution of a Social Constructivist Perspective to Existing Theory." *Society and*

Natural Resources 12:539-557.

Svderberg, Henriette, 1997. "Recycling of Sewage in Swedish Municipalities: Policy Implications? In *Managing Common Resources in Local and Global Systems: Applying Theory Across Scales* ed. S. Karlsson. Linkvping, Sweden: Institute of Tema Research, Linkvping University.

Takforyan, Ani. 1995. "Wildlife Management: New Commons as an Alternative to Protected Areas: The Case of the Eastern Cameroon Forest." Presented at "Reinventing the Commons," the fifth annual conference of the International Association for the Study of Common Property. May 24-28, 1995, Bodoe, Norway.

Theobald, Paul. 1997. *Teaching the Commons: Place, Pride, and the Renewal of Community.* Boulder, Co: Westview Press.

Tocqueville, Alexis de. 1954. *Democracy in America, Vol. I,* ed. Phillips Bradley. ("The Henry Reeve Text") New York: Vintage Books.

Van Vugt, Mark. 1996. "Social Dilemmas and Transportation Decisions." (Ph.D. Dissertation, University of Limburg, Maastricht, The Netherlands, 1996).

Witbreuk, Marc. 1995. "Collective Action and Regional Transport Policy." Presented at the fifth annual meeting of the International Association for the Study of Common Property, May 24-28, 1995, Bodoe, Norway.

_____. 1996. "Regional Cooperation in the Management of Transport Systems." Presented at "Voices from the Commons, the sixth annual conference of the International Association for the Study of Common Property, June 5-9, 1996, Berkeley, CA.

Witbreuk, Marc. 1998. "The Effectiveness of Co-operation: Regional Transport Networks as Common Pool Resources." Presented at "Crossing Boundaries," the seventh annual conference of the International Association for the Study of Common Property, June 10-14, 1998, Vancouver, British Columbia.

Young, Oran R., ed. 1996. *The International Political Economy and International Institutions; Volumes 1-2*. Brookfield, VT: Edward Elgar.