

ARTICLES

Protecting Traditional Knowledge and Expanding Access to Scientific Data: Juxtaposing Intellectual Property Agendas via a “Some Rights Reserved” Model

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Abstract: The twenty-first century has ushered in new debates and social movements that aim to structure how culture is produced, owned, and distributed. At one side, open-knowledge advocates seek greater freedom for finding, distributing, using, and reusing information. On the other hand, traditional-knowledge rights advocates seek to protect certain forms of knowledge from appropriation and exploitation and seek recognition for communal and culturally situated notions of heritage and intellectual property. Understanding and bridging the tension between these movements represents a vital and significant challenge. This paper explores possible areas of where these seemingly divergent goals may converge, centered on the Creative Commons concept of *some rights reserved*. We argue that this concept can be extended into areas where scientific disciplines intersect with traditional

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knowledge. This model can help build a voluntary framework for negotiating more equitable and open communication between field researchers and diverse stakeholding communities.

INTRODUCTION

We are developing organizational and technological methods to enhance data sharing for research in both the social and environmental sciences. These challenges include information quality control, protections for sensitive data (such as the specific locations of archaeological sites and their vulnerabilities to looting), copyright issues, incentives to share data, and financial sustainability. Initially, we had expected to simply mimic preexisting, off-the-shelf solutions for such areas as terms and conditions, copyright and data-accession policies, and procedures for handling disputes. We quickly learned that the intellectual-property status of these types of content represent a challenge where there are few solutions readily at hand.

At the heart of this problem is the tension between the potential for universal access and enhanced creative possibilities of digital content and the need to ensure that the sources of digital content benefit from these new options. For example, publishing an ethnomusicology study on the World Wide Web can vastly increase the audience of the study and spark creative reapplications of the source content, in this case music. At the same time, because online data are so easily replicated, distributed, and manipulated, this content is at risk of appropriation and exploitative uses. Both the researcher who performed the study and members of the indigenous society whose music she collected stand to both benefit and suffer from the power of online dissemination. These issues are widely recognized and debated. In our attempt to explore these issues, we found two prominent movements with very different perspectives, models, and goals. The goal of the traditional-knowledge movement is to protect certain forms of knowledge from unfair exploitation.¹ This movement emphasizes the need to respect the rights and claims of disadvantaged communities; as such, it seeks recognition for communal and culturally situated notions of heritage, property, and knowledge. The open-knowledge movement aims to open access to information.² This movement seeks to counter legal and commercial forces that inhibit individual free expression, knowledge sharing, and creativity.

The convergence emerged around the idea of a framework that enables flexibility in determining rights and conditions for the use and distribution of content. The traditional model for content control has been all-or-nothing. Copyrights and patents claim exclusive rights over creative or technological works, whereas the public domain does not allow for the retention of any rights whatsoever. This binary scheme forces some communities to choose between imperfect fits for their

own needs. Moreover, many communities lack the resources (legal, political, or economic) to even exercise the right to choose between these two imperfect options. Having identified the need for a low-cost, easy-to-implement solution, our conversations turned to the “some rights reserved” model of voluntary licensing tools pioneered by Creative Commons (<http://creativecommons.org>). These licensing tools allow users to structure permissions and conditions that create incentives for communication, while at the same time respecting the restrictions placed on data by the originating authors or communities. The licenses, now with several million applications, are one of the more visible developments of the open content movement, especially in the arts.

In this paper, we describe a rationale and possible process for expanding these licensing approaches to more successfully accommodate the tensions outlined earlier. We focus our discussion on the realm of field research, where current intellectual-property frameworks are unsatisfactory for both researchers and the communities they work with. We discuss how new approaches have the potential to simultaneously encourage protection of traditional knowledge, enhance collaboration and interdisciplinary research, and facilitate communication among field scientists and indigenous communities. To frame the discussion, we first introduce some background on various intellectual-property issues surrounding different types of content important to the field sciences as well as indigenous-rights groups. We then describe how intellectual-property frameworks help shape incentives for disclosing and communicating versus hoarding and restricting these different types of content. Finally, we outline how the some-rights-reserved framework of voluntary licensing can be developed to encourage more open and more equitable communication of these various types of content.

BACKGROUND

As narrated earlier, new communication technologies expose us to complex and uncharted new territories of legal risks and ethical pitfalls.³ Within the heart of this territory lies a key area of focus, intellectual property (IP). IP affects the incentives researchers have to contribute data, the potential value of our information to enable further innovation and creativity, and much of how research works within and between interested communities. At its core, IP is a system of permission-based restrictions. Those who “own” the property set the default limits for those who wish to use it, subject to certain public policy constraints such as fair use. Ideally, such a system protects the incentive to author and disseminate research, analysis, and data, while simultaneously serving the public interest in accessing knowledge.

Current IP practices, institutional structures, and professional pressures can negatively impact field-based research (especially archaeology, anthropology, and environmental sciences) in a number of ways. One of the most commonly articulated

complaints, especially within the university community, centers on the escalating costs of scholarly material. Subscription and purchase costs of scientific journals have jumped by some 210% (or more) over the past 15 years.⁴ Students also see inflating textbook prices, which have become 60% more expensive between 2000 and 2005.⁵ These escalating costs restrict access to content, because many individuals and institutions (especially small or community colleges) work with tightly constrained budgets. Costs are important factors in exasperating knowledge gaps between nations.

While these costs go up, larger trends in copyright law and publication practices make these materials increasingly difficult to use. Academic publishers typically require authors to sign away copyright on their contributions.⁶ This grants to power to give access to scholarship entirely to commercial institutions that tend to be profit-maximizing rather than knowledge-maximizing. Researchers now expose themselves to legal risk when they distribute *even their own* published research (in cases where copyright is signed away) to colleagues or on the Internet. This risk has added significance because of the increasingly severe nature of copyright enforcements coupled with the ambiguities and uneven protections of “fair use.”⁷ One might assume that these developments are only a concern for scholarship in the relatively wealthy West, because the easy accessibility of bootleg music, movies, and software in other areas of the world demonstrates that intellectual-property laws are not universally enforceable, especially in nations with weak institutions. Nevertheless, restrictive copyright practices do have important effects, even if legal enforcement is locally weak. For example, copyright laws brand any unauthorized user a pirate or thief of property, thereby reducing the likelihood that any substantial insight or creation would be contributed back to the global cultural and intellectual discourse. In particular, this creates disincentives for indigenous scholars to publicize their own comments and analysis if they did not receive full permissions to access the original works on which their analysis is based. Also, even if laws are not enforceable in certain jurisdictions, communication technologies themselves often act to enforce restrictive controls over content, and such restrictions often work globally. These mechanisms are even used to block, threaten, or censor traditional fair uses of content, such as quoting a short passage of a source.⁸

Cost, access, and intellectual-property debates now see growing attention in the sciences and beyond. As demonstrated by recent editorial debates in the prestigious journal *Nature*, knowledge accessibility is emerging as a significant issue for the sciences.⁹ Major granting foundations, in particular the National Institutes of Health (NIH), have signaled their interest in ensuring that the results of publicly funded research remains accessible to the public.¹⁰ Many critics believe that keeping information inaccessible and proprietary, either locked away in file cabinets or the basements of museums, or held behind restrictive publishing practices, inhibits both the process of scientific innovation and the equitable distribution of the benefits of science.¹¹ Reformers believe that encouraging people to freely share

and repurpose images, databases, videos, drawings, maps, and other types of data makes all this information more valuable and meaningful. They see that the freedom to build on, recombine, and reevaluate research will promote scholarship in a fundamental way.¹² A knowledge commons that is openly disseminated has the potential to create “communities of stewardship” that preserve information through active use.¹³

At the same time, the social context of field-based research is also changing. Scholars have a growing appreciation for the potential impact their investigations have on local and/or indigenous communities. Prior and continuing abuses, inequities, and appropriations of biological knowledge and culturally significant icons highlight human-rights failings and negatively impact research and cross-cultural education. The expanding reach of information technologies makes questions of attribution and ownership all the more urgent. Traditional knowledge, whether stored in the minds of indigenous peoples, or represented in ethnographer notes, museum records, or arcane research publications, was often relatively inaccessible and therefore less vulnerable to exploitation. However, easy global travel and the explosive growth of the World Wide Web, coupled with increasingly powerful search engines (such as Google and Google Scholar), now expose this formerly inaccessible knowledge to the glare of the global media. Therefore, the “security through obscurity” that formerly offered sensitive information some safety is quickly crumbling.

Because of this rapid pace of development, addressing IP concerns surrounding traditional knowledge becomes ever more pressing and will likely increasingly shape the research process. In the field sciences, research depends on access to, and often active cooperation of, local communities. Many such communities are closing access because of historical abuses and rising fears of the misappropriation of religiously and culturally significant traditional knowledge.¹⁴ Disputes over commercial appropriations of traditional knowledge also fuel increasing restrictions,¹⁵ and some field research (especially relating to ethnopharmacology) has commercial applications.¹⁶ Inequitable sharing of these benefits creates disincentives for indigenous communities to grant researcher access and collaboration. Finally, field research may affect government policy decisions and bring welcomed or unwelcomed media attention. In both developed and undeveloped countries, landowners and other stakeholders have real concerns about how research can lead to undesirable legal or economic ramifications.¹⁷ As a result, there are many gaps in our knowledge of species distributions, ecosystem health, and other conservation issues.

Much field research has its foundation in the diversity of human experience. Access to local and indigenous communities is often critical to understanding key biodiversity, health, and environmental questions.¹⁸ Some of these questions have global significance. However, local concerns mean that field research must aim for more than abstract understanding. Working with local communities and learning from native cultures should be a two-way process of communicating and reciprocal sharing. Traditional knowledge rights advocates believe that as active par-

ticipants in research, local people should benefit from research. They too should have access to the knowledge, solutions, creations, and commercial opportunities that come from studies in their backyards. Moreover, awareness of the history and struggles of a culture or society, as expressed through their stories and creations, can lead to respect and political support in international or national conflicts. In short, the insights and observations made in field research can, and should, more directly benefit those outside the scholarly community.

When considering the open-knowledge and traditional-knowledge movements together, it would appear that they are heading in opposite directions on questions of opening or restricting access and use of certain kinds of knowledge. For example, much traditional knowledge and cultural heritage has been relegated to the public domain, as defined by international intellectual-property frameworks.¹⁹ Many members of indigenous communities rightly see the arbitrary inclusion of their cultural knowledge as part of the public domain as either inappropriate or as a highly damaging strategy of cultural appropriation.²⁰ In contrast, open-knowledge advocates work to unleash information bound by strong IP laws from what they see as inappropriate constraints and overprotection. As will be discussed, both movements must navigate a course between polarized states of all-or-nothing protections found in current international intellectual-property frameworks.²¹ We believe that there is an opportunity to reconcile the aims of both traditional-knowledge protection and open-knowledge advocates (see Figure 1). Mutual benefit for both movements (and many other stakeholders besides) may be found using the some-rights-reserved model as discussed later.

Creative Commons Licenses

The growing dissatisfaction with rigid and inhibitory intellectual property legal frameworks motivated some to seek more flexible alternatives. Creative Commons licenses strive to address the middle ground between the “all rights reserved” stance of traditional copyright protection and the “no rights reserved” of the public domain. They do not abandon any copyright protections or dedicate any part of a work to the public domain. Rather, they merely adjust the default permissions that copyright owners grant to the world regarding the use of their work. By default, copyright law reserves all rights in a work to the copyright owner, except those uses that would qualify as fair or otherwise privileged under applicable law. However, because these qualified uses are often ill-defined, there is legal uncertainty as to what one can actually do with a work without gaining explicit permission from the copyright owner. Moreover, the high transactions costs of gaining permission, especially when a copyright owner is difficult to identify or locate, can limit the opportunity to lawfully gain appropriate permissions.

Creative Commons licenses resolve these problems by changing these defaults. Rather than reserving all rights in a copyright, these licenses only reserve some of them. For example, some movie makers, musicians, and authors do not mind

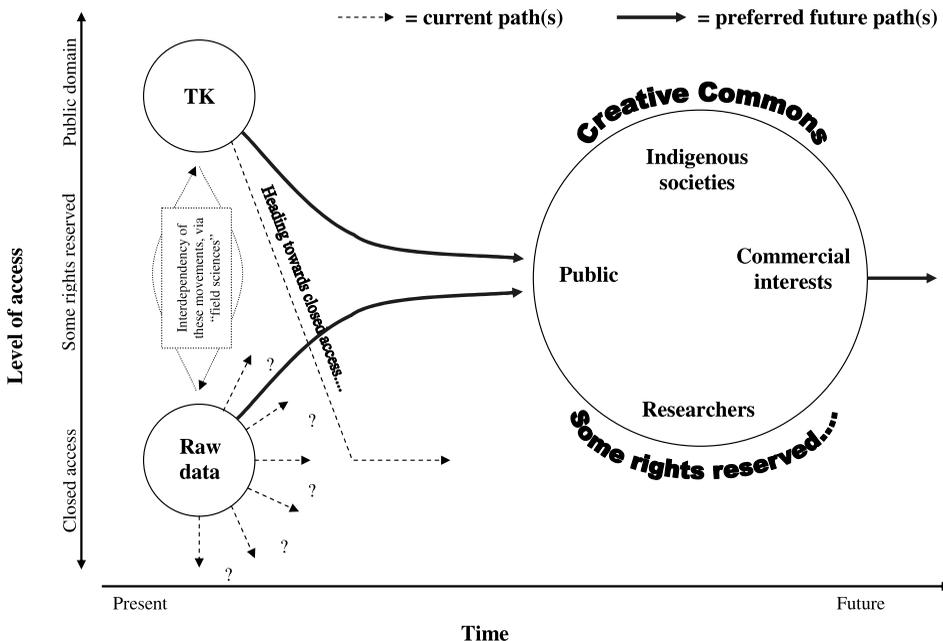


FIGURE 1. Possible pathways of rights reconciliation for traditional knowledge and research content.

if their fans make noncommercial copies of their works to post on the Internet or send to friends as long as they properly attribute the works to their respective creators and do not profit from their activities. For these copyright owners, Creative Commons offers a *non-commercial-attribution* license that automatically grants permission to distribute the work in any medium to as many people as one wants, as long as one does not make money off such distribution and properly attributes authorship. Because the license is attached to the work as it is distributed, subsequent users have no need to get further permission. This scheme dramatically lowers the transaction costs of distributing a work for both the creator and the user, especially over electronic networks such as the Internet. Instead of having to negotiate dozens, hundreds, and potentially thousands of requests for permission, the author simply chooses the right CC license and her fans to do the rest. Numerous musicians, movie makers, and authors have used these licenses, leading to an unprecedented explosion of electronic dissemination and creativity.²²

RAW DATA, BIOLOGICAL AND CULTURAL HERITAGE, AND INTELLECTUAL PROPERTY: A CONVERGENCE OF INTERESTS

While Creative Commons has enjoyed enormous success, these licenses were not designed or customized to meet many needs in the research and traditional-

knowledge communities. Nevertheless, the flexible approach of the some-rights-reserved model can be extended to meet these needs if it is properly applied. There are many aspects of both the traditional-knowledge and open-knowledge movements that favor collaborative *some-rights-reserved* solutions.

As Creative Commons has demonstrated, enhancing communication requires recognition of the motivations and interests of content creators.²³ By extension, recognition of the motivations and interests of researchers and members of indigenous communities must be a priority. In the case of traditional knowledge and field sciences, we must similarly explore how to facilitate negotiations that reconcile the needs and interests of all the diverse stakeholders. It is only by considering these diverse perspectives and interests that we can hope to build communication frameworks that encourage both greater respect for multiple claims of ownership and enhanced openness, sharing, and creative use of information.

For convenience, we can divide the content of interest (especially for the many field sciences) into four broad categories:

1. Biological heritage (ecological relationships, genetic and behavioral information, evolutionary history, and geospatial information)
2. Cultural heritage (traditional knowledge, lifeways, sacred sites, medicine, art, religion, etc.)
3. Raw data (primary sources, field notes, databases, image archives, analytic data, etc)
4. Syntheses (narrative interpretations and theoretical syntheses of the above)

Syntheses, the desired end-product of individual research agendas, are typically communicated in scholarly books, journal publications, conference proceedings, and so forth. This discussion does not focus on syntheses, because many other important initiatives examine IP issues and researcher incentives related to this type of scholarship (see below). Instead, we devote our attention to incentives and IP issues relating to biological and cultural heritage and raw data. Obviously, these categories are not absolute. Nevertheless, they do have heuristic value to help frame this discussion.

IP Issues Related to Raw Data

The distinction between fact and expression in copyright law has important, though as of yet not fully explored, implications for scientific data. In the United States, much raw data can be legally considered as factual and therefore is not protected by copyright (though some other international jurisdictions, including the European Union, extend protection over some factual data sets).²⁴ Alphabetical telephone white pages represent a quintessential example of unprotected facts.²⁵ They contain only lists of numbers (facts) and no original or creative information in their organization or expression. Similarly, many standardized lists and databases

of measurements collected during field research will probably not be protected by current copyright law. Such data represent an important component of much field research.

In many cases, this legal distinction does not easily translate into the realm of scientific documentation. For example, the specific manner in which data (facts) are presented, their expressions, do see protection by copyright law. Thus, a data table or graph may be protected by copyright, because there may be some originality in the actual expression of the facts presented in that data table or graph. Also, researcher field notes and interviews may take the form of written or recorded narratives. Copyright law would inhibit some attempts to reproduce and distribute such documentation in a form where the facts are embedded within their expression; on the other hand, copyright law would still permit other authors to extract the facts from the narrative and republish them separately. Similarly, photographs, drawings, and other types of recording all mix fact and expression. Thus, the copyright status of much field documentation is likely to be mixed (depending on the specifics of the records involved) and likely open to interpretation. In any case, the threshold for copyrightable originality is very low and the risks of infringement are extremely high, so a typical user must almost always assume that copyright protections pertain, even if data compilations seem very factual.

Digital technologies are rapidly transforming the significance and breadth of data dissemination. Thus, there is a clear need for the participants in online communication to better understand the role of copyright protection in the sciences. Because field documentation will likely contain both protected expressions and unprotected facts, copyright-licensing issues become important in the dissemination of this material. The growing recognition that much of this information will have multiple claims of ownership further highlights the need for clear intellectual-property frameworks appropriate for the field sciences.

Researcher Incentives

Encouraging the growth of an open-knowledge commons requires understanding the incentives and needs of researchers, because they are an important source of content. Researchers have clear incentives to *use* a knowledge commons, but their incentives to *contribute* to such a commons need more exploration. Publication brings professional advancement to researchers, and some publication can take place openly. Creative Commons licenses may see application in a growing number of scholarly e-journals, such as the Public Library of Science (PLoS) (<http://www.pubmed.ncbi.nlm.nih.gov/pmc/journals/419/>), which currently publishes two journals in molecular biology and medicine. As yet, there are only a few other examples of peer-reviewed syntheses that are immediately available for public review using the Creative Commons model. On the other hand, most scholarly journals allow unrestricted (or at least less restricted), online access to their publications after some

period of time has elapsed (generally a year or less). Other efforts focus on the development and open dissemination of instructional content. For example, through its Open Courseware system, MIT now posts a large fraction of its faculty's course material online under Creative Commons licenses. There are several examples of MIT course material being translated and adapted for use across the globe, including in educational institutions in the developing world.²⁶ Rice University has a similarly successful initiative, Connexions, that also boasts a rapidly growing body of Creative Commons–licensed instructional content.²⁷ These initiatives are demonstrating that scholarly communication can be adapted to build an open-knowledge commons.²⁸

The growing success of open-knowledge approaches in e-journals and instructional material is inspiring for those of us interested in sharing raw or primary research data. Such raw data often have rich and underrealized interpretive potential and are often collected at great expense, time, and effort.²⁹ An example from the biological sciences helps to illustrate this point. In 1898, Hermon Bumpus published a landmark study on the evolutionary process of stabilizing selection by investigating mortality among house sparrows. Unlike most of his contemporaries, he comprehensively published his primary observations along with his theoretical interpretations.³⁰ This set of raw data has proven to be tremendously valuable to later researchers and has helped inspire the publication of many (sometimes highly influential) peer-reviewed papers.³¹ If one measures the value of raw data by the number of publications they spawn, then sharing this set of raw data made it at least 10 times more valuable than it would have been without dissemination. Such exponential reuse is likely to increase dramatically if the raw data are made available over general public networks such as the Internet. This dataset has even more value if we consider how useful it has proven for student instruction and exploration of real world data.³² In contrast, hoarded data sets are very vulnerable to loss through overly restrictive intellectual-property policies or simple neglect.³³

The traditional (paper) publication process rarely promotes the sharing of raw data, because such data sets are often far too large and complex to print. Many technological frameworks are in use and in development to meet this need. However, complaints about data hoarding remain very common, even in disciplines that favor information openness and have established systems for raw-data dissemination.³⁴ The question remains as to whether Creative Commons licenses can be easily extended for data-dissemination applications. One problem is that researchers seem more eager to access digital repositories than to contribute to them.³⁵ Incentives play an important role in this tepid enthusiasm. Published articles, the currency of the academic market place, are more valuable if they are influential, cited, and spark secondary research. Therefore, mechanisms to enhance the distribution of articles (and their creator's attribution and reputation) will likely be favored by scholars. The success of Creative Commons licensing with e-journals and instructional repositories results from such incentives among contributing authors to build reputations within their communities. Unfortunately, simple attri-

bution is not a sufficient incentive for many researchers to share their raw data or primary observations. Published articles are typically narrative syntheses of primary data. Sharing unsynthesized primary data is typically not highly valued, because such data are mainly considered meaningful only as part of a compelling synthesis. Researchers often fear opening access to raw data, because this would provide resources for competing academic rivals to publish their own syntheses.³⁶ Viewed in another way, control over content provides opportunities for professional advancement and financial gain. A tenure-track position at American universities may be worth a few million dollars over the course of a career.

We believe that new voluntary academic publishing licenses may protect researchers from unethical rivalries and still create incentives to share large datasets. These new licenses may be modeled after (or extend) the Creative Commons some-rights-reserved copyright licenses. A *noncompete/do not republish* term, for example, might allow the public free access and use of primary research, so long as these uses do not include use of the data in an unauthorized publication in a peer-reviewed journal or similar outlet. Under this licensing term, anyone can read and reanalyze the underlying data set, but no one can *use* the dataset to compete with the research or publications of the original researcher/author. Thus, access to knowledge is increased without decreasing the value of the data to its publisher. This approach parallels Creative Commons' *non-commercial* term, a tool that encourages sharing without weakening one's position in the commercial marketplace. A *do not republish* term similarly counters disincentives to sharing in the academic market by recognizing the prestige of publication.

Moreover, a *noncompete/do not republish* term may actually encourage greater collaboration between researchers than exists currently. For example, an interested researcher may develop significant interpretations while exploring large open datasets available under a license from another researcher. With a *do not republish* term in effect,³⁷ however, the interested researcher would then have to negotiate terms, including coauthor arrangements, with the original creator of the raw data to publish his findings professionally. Such negotiations would encourage greater collegiality within academic professions, lead to proper recognition and attribution in the publication process, and also promote the types of interactions where synergies and early peer-review could emerge. Researchers who openly disseminate raw data can thereby attract more coauthoring partners, enhancing their own publication record as well as enhancing the quality of overall research and analysis based on their work.

Developing Country³⁸ /Indigenous Society Incentives

Just as researchers both desire and fear various levels of access to their works, traditional-knowledge advocates and communities both fear and desire various levels of access to their culture. Indigenous groups often lose control over infor-

mation they regard as sacred or important to their community identity (as is the case when certain artistic motifs become appropriated).³⁹ Environmental research can lead to commercialization pressures or governmental policy changes, with profound effects on local economies and community life. Such communities are therefore very direct stakeholders in the research process.⁴⁰

The working assumption of many field sciences is that their research materials and subjects constitute public-domain resources. In contrast, many Traditional Knowledge rights advocates emphasize the proprietary nature of some domains of culture, and view the “public-domain” as a concept that some have uncritically romanticized.⁴¹ Thus the definition and boundaries of the public-domain is inherently politicized. Its positive value comes from its role as a context for the free exchange and development of knowledge. By definition, use of public-domain materials has little regulation with either legal rules or more informal customs. Because of this lack of governance, people are free to use public-domain materials in any way they see fit. Although this lack of regulation may fuel creative reapplication and use of public-domain materials, the benefits of the public domain are not necessarily equitably shared. The rich and powerful often have more ability to appropriate public-domain material and recast such material as their own. For public-domain content that falls under the category traditional knowledge, such appropriations are the source of resentment and conflict.

To encourage better equity and fairness in the communication of cultural heritage, methods and frameworks for negotiating across different systems of property must be developed. Experience garnered from other approaches to protecting traditional knowledge can inform this development. Among the various methods attempted to protect traditional knowledge, licensing seems to have some advantages.⁴² However, international conventions and specific national protection laws (e.g., *sui generis* statutes) offer geographically limited and highly variable protection; such laws are difficult to manage and often see little enforcement. They are also often premised on “all-or-nothing” systems of protection. As an example of another protection strategy, some databases attempt to document traditional knowledge and use existing laws to establish that this knowledge represents items of “prior art.”⁴³ Prior art claims would inhibit commercial appropriation of traditional knowledge through patenting. While such databases often serve as useful tools to document traditional-knowledge claims, their efficacy as an instrument to protect such knowledge (without other complementary mechanisms) is limited.⁴⁴ Unfortunately, this protection can often be circumvented, and such prior art claims may even undermine commercial opportunities for the indigenous communities themselves.⁴⁵

Nevertheless, traditional-knowledge databases have a variety of purposes, some of which include *cultural preservation* (attempts to document cultural knowledge through digital archiving). Many of these projects are sensitive to the requirements of different indigenous communities, some are built in collaboration with different indigenous groups, and some indigenous communities maintain their own digital archives.⁴⁶ Development of culturally specific rules for regulating ac-

cess and use of these digital collections is also being explored. The Indigenous Collections Management Project created new data-security software and metadata standards for the dissemination of culturally sensitive materials.⁴⁷ The goal of this project is to develop a metadata framework that is flexible enough to encompass most, if not all, culturally specific rules relating to content. Metadata are usually defined as information about information; most scholars are familiar with metadata from library information systems, where users can search for books or articles based on author, title, or key word, all of which are metadata that describe specific items of content. Metadata also see widespread application for intellectual-property-rights management, where use rights and permissions can be tagged to an item of content. Along with human-readable and lawyer-readable code, Creative Commons licenses are also expressed in a series of standard metadata tags that let software know how to handle use rights and conditions. A metadata standard works best if it is widely adopted, because widely adopted standards facilitate interoperability between different systems.⁴⁸

Because the Indigenous Collections Management Project aims for wide applicability across diverse cultural contexts, it has developed customization strategies to meet diverse needs. It also acknowledges potential implementation problems where the rules governing content are contested between and within communities.⁴⁹ Tapping into this body of experience can go a long way in facilitating the development of new Creative Commons–type licenses for cultural heritage. Because licensing can be used to structure conditions and protections on dissemination, it has great potential for customizing and delineating proper use of traditional knowledge. Licensing has great flexibility in how terms are negotiated and is generally recognized throughout the world as enforceable. Some indigenous communities already require license-like agreements for research conducted in their territories.⁵⁰ This flexibility offers advantages over other traditional-knowledge protection strategies, because licensing terms can be tailored to diverse circumstances. In some ways, licensing enables the participants in communication (including members of indigenous societies) to create customized “laws” to structure that communication.

DEVELOPING A JOINT SOLUTION BASED ON THE SOME-RIGHTS-RESERVED MODEL

As discussed earlier, both the open-access and traditional-knowledge movements are striving towards a future where licensing and other IP practices have increased flexibility in meeting the diverse interests of the various stakeholders. However, the currently disparate and ad hoc efforts in both movements are likely to lead to confusion for both creators and users, which may not be better in practice than the faulty system that already exists. We believe that the some-rights-reserved model of standardized, yet flexible, licensing terms derived from Creative Commons licenses offers a resolution to this problem. For both traditional-knowledge and

open-access interests, the some-rights-reserved model offers the opportunity for a convergence of interests and resolutions, which should make each of these movements (broadly speaking) stronger.

Creative Commons focuses largely on advancing individual freedoms for expression and seeks to maximize the personal freedom of people to use and create culture, while at the same time preserving the core rights that the original creators cherish. Their licenses should be understood as attempts to express and further these values. The individualism advanced by Creative Commons sees its clearest expression in the attribution term, which is a default setting for Creative Commons licenses. This term requires crediting the authorship of a work in return for granting dissemination and other privileges. These values are also embedded within the context of a globalized technocratic society where information is often imagined as endlessly replicable and *remixable* (capable of being divorced from its original context and reused in novel applications). In this world, commercial concerns are paramount in shaping the creation, flow, and application of information. These concerns are built into the license choices offered by Creative Commons. Creative Commons offers options for restricting commercial appropriation of content but nothing for addressing other types of concerns and values (moral, spiritual, or even taste).⁵¹ Uses of Creative Commons licenses similarly reflect this concern over commercial appropriation. According to statistics recently released by Creative Commons, about three fourths of all 10 million applications (in the Yahoo search directory) include the noncommercial term.⁵² Thus, while there is certainly overlapping interest in managing commercial applications among indigenous societies and boosters of Creative Commons licenses, the current scope of Creative Commons licenses is too narrow to adequately address the myriad concerns of indigenous societies in protecting their cultural heritage. We explore some of these challenges and limitations later.

There may be more fundamental value differences between the Creative Commons approach and the world views of people outside its relatively elite, technocratic context. Creative Commons-supported individualistic goals may be at odds with other systems that place culture and expression within webs of social obligations, local systems of authority, rules and traditions, and political struggles.^{53,54} Finally, Creative Commons licenses represent clever *legal hacks*, novel applications of existing intellectual property and contract law. According to commentary from "The Ethical Use of the Public Domain," Creative Commons' reliance on existing legal structures is inherently flawed, because its attempts to revitalize the public commons rely on the same oppressive (and even implicitly violent) legal structures that constrain culture and free expression.⁵⁵ This publication criticizes what is seen as the legal/bureaucratic determinism behind Creative Commons and argues that the public domain should be promoted more by action motivated by respect and kindness.

Open-knowledge advocates favor voluntary Creative Commons-type licenses, because they allow people to share information under terms that are more open

and free than the all-rights-reserved terms of standard copyright. By leaving some rights reserved, these licenses do not put information into the public domain. Creators can choose various restrictions and requirements for certain uses of their content.⁵⁶ These include requirements to attribute the creative source of the content, restrictions against commercial use, and requirements that others must openly share any derivative works under the same terms they took (*share alike*). This last *share-alike* requirement was inspired by the open-source software movement and its popular GNU-GPL license. In essence, the GPL and *share-alike* terms work to ensure that both a specific body of content and its derivatives remain part of the public commons. These licenses require distribution of all copies and derivatives of a work under the same licensing conditions, both online and offline.

Crafting licenses that are replicated when works are copied and used to create derivative works represents a potentially powerful tool for traditional-knowledge applications. This viral replication of licenses can enable members of indigenous societies to legally shape how traditional knowledge is communicated and applied beyond their communities and beyond individual Web sites or databases. Other aspects of the Creative Commons model may also have relevance. As stated, Creative Commons expresses its licenses in machine-readable metadata, legal jargon, and simplified nontechnical terms. All three aspects are important for wide application. Standard metadata tags enable Creative Commons licenses to function across the many diverse information systems that make up the Internet. The legal code was developed by some of the world's leading intellectual-property legal firms, thus ensuring that the licenses have legal credibility. Human-readable expressions ensure that the terms of the licenses are widely understood and intelligible, both for creators and consumers of content. In addition, Creative Commons has a relatively simple and straightforward process that enables users to choose different licensing options. This simplicity encourages use of licenses customized for different needs and can be extended to newly developed licensing options appropriate for cultural and community heritage.

New traditional-knowledge and data sharing licenses may help remedy current problems by providing a ready-to-use framework where attribution, commercialization, and other use rights can be negotiated and expressed in an easily intelligible manner. By explicitly structuring a flexible set of permissions and conditions among multiple stakeholders, incentives for collaboration and information sharing should emerge. Such a license should be highly customizable to suite diverse needs and contexts.

What would cultural heritage and data sharing licenses look like and how would they be developed? We have compiled some specific options and areas for future investigation, including:

- Broad-based, stakeholder-driven process: We should establish a broad-based process involving representatives of indigenous communities concerned about traditional knowledge, scholarly societies and their ethics committees, re-

searchers, anthropologists, IP lawyers, and museum and library representatives. Broad-based adoption depends on each community viewing cultural heritage and data sharing licenses as a viable strategy to meet their particular needs and interests.

- Exploration of common themes and needs: The archaeologist George Nicholas and his collaborators are building a database comprising the IP policies of several traditional communities. His project will provide an important resource for understanding commonalities in the needs and concerns of several indigenous groups and can help guide future licensing efforts.
- Develop licensing terms to recognize community authorship: In the case of cultural heritage, “authorship” is sometimes distributed across generations and individuals from different communities. This form of ownership lacks explicit recognition in contemporary IP law. Appropriate contractual licensing agreements can promote the recognition and attribution of local communities as trustees and stakeholders of traditional knowledge.
- Shared stakeholder authorship: Relating to the issue of authorship, we should explore ideas of joint and shared ownership, including rights in trade secrets, trademarks, copyright, and patents. Some stakeholders are concerned about the issue of secret knowledge (locations of sacred sites, some artistic motifs, narratives, and rituals) and time-delayed release of knowledge (e.g., until publication of a synthetic work). These issues should be explored to see if trade-secret law can provide a useful framework for needed protections. One way to approach the secret-knowledge issue from an archival perspective would be to grant people access to different parts of a data archive based on who they are and what their purpose is (later we discuss controversies and problems). For example, users can fill out a form every time they want to do a search, which asks them if the purpose is commercial or not and then give them more or less access based on the terms of the licenses from which the data came. By agreeing to these terms, the licensee then comes under a duty of confidentiality. Violations of this duty could then be enforced either locally or in the licensee’s home jurisdiction. This type of restricted access is already in use for some data archives within the field sciences.
- Protecting Commercial Rights: A common concern regarding traditional knowledge and biological heritage often centers around protections against commercial exploitation.⁵⁷ Future research should explore how existing Creative Commons licenses could be built into the research agreements between institutions and principal investigators and the communities they are researching, especially regarding the noncommercial term.
- Possible New Licensing Terms for Cultural Heritage: Several new terms may underlie any new Creative Commons–type cultural heritage license. The suggested terms (following) should be explored in light of case studies and collaborators from indigenous communities:

- *Cultural Integrity*: Licensee agrees to maintain the integrity of the information or object as much as possible in its original context; the information or object should not be changed in any way that is inconsistent with the values of the culture from which it came.
- *Reporting Back*: Licensee agrees to report back to the licensor at least once every year regarding any new public use of the information or objects covered by this license of which licensee is aware. Report will include, at a minimum, location of use, a brief description of the use, and contact information for at least one person responsible for said use.
- *Cultural Identity/Attribution Term*: Licensee agrees to always identify in any subsequent publication, whenever possible, the complete cultural origins of any information or object licensed under this agreement, either as specified in the agreement or based on good-faith efforts of the licensee.
- *Required Translation Term*: Licensee agrees to provide to licensor a native translation of every publication in which licensee or any of its sublicensees use information or objects covered under this license.
- *Share-back Term*: Licensee agrees to grant identical permissions to licensor for any knowledge, analyses, or products derived from information gained under this license.

We recognize that many of these terms, as currently understood, may appear to some as controversial or vague; in addition, this list is far from complete. As with any limitation on use, there will be some costs involved that will need to be negotiated among the licensors themselves. For example, a translation requirement, while potentially useful and satisfying for the indigenous groups involved, will often be so costly that it may deter potential users from repurposing and disseminating materials from those groups. Thus, such a restriction might reduce global exposure and economic benefits for the groups that could otherwise be enjoyed. The important point is that the creators and indigenous societies must negotiate and decide for themselves what makes the most sense for them. The cultural heritage licenses will hopefully prove sufficiently flexible so that the IP perspectives of indigenous groups can be successfully incorporated into a more widely recognized legal framework.

- *Possible New Licensing Terms for Research Datasets and Dissemination*: Several new terms may also underlie any new Creative Commons-type open-access licenses, serving the interests of academic researchers. Thus, opportunities for greater communication and understanding among researchers and indigenous communities can arise from this shared legal framework for open access and IP issues. Some possible terms include:
 - *Noncompete/Do not Republish*: Licensee agrees not to use the information or objects in this work in any professional scholarly article, book, or presentation without prior permission from licensor.

- *Time-limit*: Licensee agrees not to use the information or objects in this work in any publication or presentation within two years of receiving access to said information.
- *Reporting Back*: Licensee agrees to report back to the licensor at least once every year regarding any new public use of the information or objects covered by this license of which licensee is aware. Report will include, at a minimum, location of use, a brief description of the use, and contact information for at least one person responsible for said use.
- *Attribution*: Licensee agrees to always identify in any subsequent publication, whenever possible, the name and professional affiliation of licensor in conjunction with use of any information or object licensed under this agreement (either as specified in the agreement or based on good-faith efforts of the licensee).
- *Licensing and Prior Informed Consent*: These licensing choices can also be discussed in a prior-informed-consent process, where researchers negotiate intellectual-property terms with members of indigenous communities. Given the complications of cross-cultural communication and the widely diverse political, economic and social contexts of research, establishing prior informed consent will often be a difficult process.⁵⁸ Nevertheless, this process can be facilitated by the Creative Commons approach, which makes licensing terms relatively easy to understand and communicate. Offering choice in specific license terms may also make the prior-informed-consent process a more flexible negotiation process suitable for diverse needs and contexts.
- *License Enforcement*: One issue of concern with such licensing terms, whether for cultural heritage or open access, is that of enforcement. How will people be able to monitor and protect their works from unauthorized use? It's important to recognize that there are already many violations, both intentional and accidental, of the all-rights-reserved IP laws that exist today. The limits on enforcement have more to do with detection of the violators than with successfully defending a claim. We believe that enforcement will actually be much easier with greater dissemination of protected works, simply because there will be more people who will be able to detect violations, be familiar with different works, and be committed towards some-rights-reserved frameworks. When violations are detected, legal enforcement measures can be enacted by members of indigenous communities, advocacy groups, or other organizations.

Managing the Commercialization of Bio/Cultural Heritage: An Area of Special Concern

A recently published paper raises additional points relevant to licensing strategies.⁵⁹ As already described, traditional knowledge is often shared across multiple communities; thus, even if the ownership of traditional knowledge were recognized, someone wanting to commercially exploit that knowledge could bar-

gain with many different actors in negotiating royalties for the same set of rights. Because of this situation, there would be a race to the bottom on setting royalties, because there would be clear incentives to underbid others who could claim ownership of the specific item of traditional knowledge. As a result, local communities would likely see very little benefit from this kind of protection.

To avoid such competitive undercutting, Chander and Sunder suggest possible alternatives, such as the use of liability rules and the establishment of international bodies to set fair prices for traditional knowledge. It may be possible to incorporate these ideas in future versions of Creative Commons licenses adapted for traditional knowledge. Such licenses can include a special kind of noncommercial term that may read like:

“This information is traditional knowledge and is owned by (unnamed) indigenous inheritors of this knowledge; any commercial use of this information requires payment of royalties set by XXXXXX (a designated board of indigenous-rights representatives).”

This board would have exclusive rights to negotiate royalties over the information, thereby eliminating the risk of a race to the bottom. Multiple boards may be organized to help ensure that local communities have choice in negotiating bodies. The problem of how royalties get distributed remains to be resolved, probably most effectively by indigenous communities themselves. Note that such a board could also be involved in enforcing the law and setting penalties in a manner similar to tribunals or mediation boards, as suggested by other authors.⁶⁰ By placing the IP rights of indigenous peoples into an internationally recognized framework, these licensing terms offer a promising route for increasing the self-determination and viability of many indigenous cultures.

MOVING FORWARD

The success of Creative Commons at encouraging communication suggests that its some-rights-reserved model deserves exploration for both data sharing and traditional-knowledge applications. At issue is how the worlds of individualistic interests and governance found in the World Wide Web (and manifest in Creative Commons) intersect and conflict with the rights of collectivities, the use of public goods, and alternative systems of trust.⁶¹ To encourage better equity and fairness in the communication of cultural heritage, methods and frameworks for negotiating across different systems of property must be developed. Much research and discussion remain on how, and even if, data sharing and cultural heritage licenses can be made workable. What are the specific terms of the licenses? How should rights be negotiated among stakeholders? How are stakeholders to be identified? How should licensing be communicated when the concept is alien to many cultural contexts? At this preliminary stage, few specifics are offered. This paper merely points to a direction where we may see positive future developments.

Because this is an active area of research, we anticipate that any cultural heritage license and other licensing terms would see multiple revisions as we gain experience in building collaborative relationships between stakeholding groups. Experimentation with new licensing models will involve uncertainties and unanticipated consequences. These uncertainties require that development should take place within ethical frameworks designed to ensure equitable interactions between members of the research community and members of indigenous communities. As urged by Brendan Tobin, an attorney with great experience in this area, building an inclusive and broad-based process that includes representatives of indigenous peoples is a vital first step. Ideally, this process can be used to create a licensing framework that helps level the playing field and helps balance the inevitable power inequities between negotiating partners. License experimentation should also be guided by the ethical imperatives of the precautionary principle, where participants should avoid potentially damaging uses of traditional knowledge.⁶² Because of the uncertainties and high stakes of these endeavors, license experimentation should first proceed with less sensitive bodies of content. The process of negotiating prior informed consent may provide valuable feedback for identifying bodies of content safe for testing new licensing ideas.

An iterative process of community evaluation will provide the feedback needed to refine and enhance intellectual-property frameworks, including the effectiveness of any new licensing terms, should they be developed. This evaluation requires application to real-world research data and interaction with both the academic and indigenous communities. By applying the licenses to research data, we will lead the research community by example and provide a proof of concept. Long-term follow-up studies will help evaluate if these licenses do indeed help create incentives for greater information sharing and collaboration with local communities and other interested parties.

Once created, such licensing strategies and frameworks may be of particular use in shaping professional ethical guidelines as well as structuring access and ownership concerns for museums and digital libraries, including such organizations created by indigenous societies. Developments in information-ownership and use-rights can be further expanded to meet the needs of other communities and disciplines as well. Licensing developments may see application with the often contentious arena of bioprospecting, where the interests of biotechnology firms and indigenous cultures sometimes clash. These and other licensing developments will also likely provide an important foundation to explore other biological and cultural heritage IP issues, including patenting and trademarks.

RISKS

From the open-knowledge perspective, there is very little to be lost in experimentation with cultural heritage licenses. The default setting for all creative works is

“all rights reserved” copyright. Opting into open-knowledge frameworks now is strictly voluntary, and even if cultural heritage licenses become more restrictive than many open-knowledge advocates would like, less restrictive alternatives will still remain.

From the point of view of traditional-knowledge advocates, cultural heritage licensing is something more risky and problematic. It entails putting information into global circulation where abuses may occur, and the enforcement of licensing terms will always be less than perfect. While it is conceivable that licensing terms can be developed that have very broad application and meet many needs, there may never be a perfect fit for every conceivable circumstance. Nevertheless, we still see cultural heritage licensing strategies as valuable since they have the potential to provide people with choices. We currently face a binary decision between extremes—either leaving culture vulnerable to exploitation and appropriation or creating legal and technical barriers that hermetically seal bodies of knowledge. Cultural heritage licensing can represent a third option that enables communication to take place along the lines of a negotiated framework.

Perhaps more risk is inherent in the choice of licensing terms themselves. Creating a licensing system that functions on tests of highly politicized aspects of a person’s identity (race, ethnicity, religious affiliation, sexual orientation, gender) may be seen as reinforcing social categories often linked with violence and oppression. Permissions and restrictions based on these categories have already been encoded into the metadata protocols developed by the Indigenous Collections Management Project.⁶³ Although these aspects of identity are important for many communities and may have less controversial application in individual systems (such as a digital archive maintained by a specific community), they may be inappropriate to incorporate into systems intended for global information sharing. Thus, careful attention must be placed on exploring the ethical implications of potential licensing terms. A new licensing system will likely result from a series of compromises between the often divergent concerns of maintaining notions of cultural integrity and facilitating communication and cross-cultural dialogue. It is important to recognize that one potentially powerful aspect of using flexible licensing terms is that such terms can be crafted to incorporate the legal and cultural viewpoints of the creators and indigenous societies themselves. Thus, as already mentioned, this approach allows for an extraordinary degree of self-determination for indigenous societies.

As discussed, some possible cultural heritage licensing schemes may highlight conflicts between indigenous values and other civil rights goals and policies (see also Brown’s recent contribution to this journal).⁶⁴ For example, an indigenous group may wish to restrict access to certain images based on the gender of the viewer.⁶⁵ Under such restrictions, female students in a class would be denied to male pictures and male students to female ones. Restricting access to educational materials in this manner potentially violates numerous national civil rights laws. Such conflicts, however, are not unique to online dissemination of information or

to use of permissive licensing systems. Currently, male and female field researchers from state educational institutions must confront these types of restrictions when they go to the physical sites to do their research. Confronting them online and via dataset restrictions simply reiterates the issue and brings it new focus. The most likely solution would be for the institution subject to these laws to either negotiate nondiscriminatory access with the indigenous group or refuse to accept the licensing terms all together. Ethically, any educational institution that does accept the terms must promise to enforce them. If they cannot, they should not take the license. Lack of licenses and access to indigenous cultures will raise the visibility of these cultural conflicts and promote discussion and further research into ways of reconciling cultural diversity differences.

Another initial problem will be the startup costs of creating the first licenses. We foresee that a number of intensive rounds of discussion will be necessary within each community to establish baseline terms for a cultural heritage licensing system. The more communities vary in terms of values and needs, the more difficult it will be to develop globally applicable licensing terms. A major challenge will be choosing the “right level” of abstraction and generalization for licensing terms so that they will at least partially, meet a myriad of diverse needs. However, once these baseline terms are established, transaction costs for each subsequent access negotiation should drop dramatically and overall efficiency should increase.

Finally, the potential exists for complex problems regarding enforcement. For countries that have strong contractual or IP laws, this will be less of a problem, but for countries where there are weak legal enforcement mechanisms, cultural heritage licenses may be perceived as worthless or too expensive to use. These problems are beyond the scope of this paper to explore in depth, but some possible solutions would be to either establish jurisdiction for any dispute resolutions in a foreign country with stronger laws, through organizations like the World Intellectual Property Organization, or via the creation of stronger legal regimes in the country of origin.

SUMMARY

It is the context of field-based research where much of this discussion has focused. Field research is a process that involves developing relationships among many different stakeholders (researchers, their colleagues and students, and members of local communities). The some-rights-reserved frameworks discussed here can help make building these relationships more equitable and collaborative.

For researchers, especially in the field sciences, a noncompete/do not republish licensing term may have important ramifications for a diversity of disciplines, many of which have the same disincentives for sharing raw data. Effective ecological management and conservation strategies require environmental understanding based on effective data sharing and communication. Structuring intellectual-property

incentives along the lines of the some-rights-reserved model should encourage data sharing, which will promote better collaboration across the sciences, leading to more effective research, policy making, and instruction.

With respect to cultural heritage, past and ongoing abuses and perceived abuses of indigenous IP claims have created a regrettable and damaging climate of mistrust and antagonism between researchers and some indigenous communities. Such antagonism has led to increasing calls for restrictions on field science and disputes over the content and application of such science.⁶⁶ For field research to thrive, it must do more to acknowledge indigenous IP claims and do more to formally recognize the contributions and interests of such communities.

At the same time, attempts to respect and enforce indigenous IP rights and claims run the risk of inhibiting communication, innovation, and freedom by locking away native culture behind rigid legalistic barriers. Culture is continually created, contested, shared, mixed, and hybridized. This process unfolds within and between indigenous communities and with other communities across the globe. Sometimes people choose to hold information secret, sometimes they choose to share information according to culturally diverse rules and motivations. Rigid legal categorizations of elements of culture as belonging to a particular group can inhibit this dynamic process of culture creation, imagination, and communication. Such “reservations of the mind” (as expressed by Michael Brown⁶⁷) would further impoverish the very indigenous societies that were being “protected”.

The importance of a vital global information commons must be recognized and is a major motivation for us to discuss traditional-knowledge, intellectual-property concerns *along with* research-data, intellectual-property issues. It is our sincere hope that voluntary, negotiated some-rights-reserved frameworks may do much to guard against both unfair exploitation of knowledge and rigid and damaging regimes of overprotection. Putting up predetermined barriers that impede communication, balkanize culture, and reinforce cultural and ethnic boundaries would profoundly curtail freedom of expression and inhibit scientific understanding in many vitally significant areas. Ideally, the power to structure how (and even if) communication will take place should be held by its participants. Thus, we see great benefit in the Creative Commons model of some rights reserved, since this model enables people to voluntarily negotiate and set flexible terms and conditions for communication as they deem appropriate.

ENDNOTES

1. Coombe, “Fear, Hope, and Longing.”
2. Samuelson, “Preserving the Positive Functions.”
3. M. Brown, *Who Owns Native Culture?*
4. Case, “The Impact of Serial Costs”; Reed, “Just Say No.”
5. Beshears, *The Case for Creative Commons Textbooks*.
6. Willinsky, “Copyright Contradictions in Scholarly Publishing.”

7. Lessig, *How Big Media Uses Technology*; Samuelson, "Preserving the Positive Functions."
8. Vaidhyanathan, "The State of Copyright Activism."
9. Rous, "Electronic Publishing Models and the Public Good."
10. Park, "NIH Research to Be Open Access."
11. G. Brown, "Out of the Way"; Campbell et al., "Data Withholding in Academic Genetics"; Helly et al., "The State of Computational Ecology"; Reed, "Just Say No."
12. Samuelson, "Preserving the Positive Functions of the Public Domain in Science."
13. Promoting the continued use of information (its incorporation into new creative and technical works) also aids digital preservation, because it builds communities likely to continually migrate data into current standards. In that more flexible IP frameworks relax restrictions on copying and using information, they too can be important enablers of digital preservation.
14. Abel and Stepp, "A New Ecosystems Ecology"; Escobar, "Whose Knowledge, Whose Nature?"
15. Dutfield, *Intellectual Property, Biogenetic Resources*; Gómez-Pompa, "The Role of Biodiversity Scientists."
16. Moran, King, and Carlson, "Biodiversity Prospecting"; Posey and Dutfield, "Beyond Intellectual Property."
17. ICOMOS, "International Cultural Tourism Charter"; Isager, Theilade, and Thomsen, "People's Participation"; Miller and Hobbs, "Conservation Where People Live and Work"; Warden-Fernandez, "Indigenous Communities and Mineral Development."
18. Cox, "Will Tribal Knowledge Survive?"; Dutfield, *Intellectual Property, Biogenetic Resources and Traditional Knowledge*; Lewis and Ramani, "Ethics and Practice in Ethnobiology"; Moller et al., "Combining Science and Traditional Ecological Knowledge."
19. Chander and Sunder, "The Romance of the Public Domain."
20. I. Alexander, "White Law, Black Art."
21. While not discussing traditional knowledge specifically, negotiation between extreme states of overprotection and underprotection is a common theme articulated by Lessig. He explores this in detail in Lessig, *How Big Media Uses Technology and the Law to Lock Down Culture and Control Creativity*, 282–86.
22. See Internet examples: (<http://creativecommons.org/wired/>), (<http://creativecommons.org/getcontent/features/doctorow>), and (<http://akma.disseminary.org/archives/001253.html>)
23. G. Brown, "Academic Digital Rights"; G. Brown, "Rhetorical Virtues."
24. Lessig, *The Future of Ideas*, 105–6.
25. Feist Publications, Inc. v. Rural Tel. Service Co., 499 U.S. 340 (1991), Cited by Harlan Onsrud et al., *Public Commons of Geographic Data: Research and Development Challenges* (www.spatial.maine.edu/geodatacommons/), 2004).
26. Diamond, "MIT Everywhere."
27. Henry, Baraniuk, and Kelty, "The Connexions Project."
28. Eisen, Brown, and Varmus, "PLoS Medicine—a Medical Journal"; Gass and Doyle, "The Reality of Open-Access Journal Articles"; Kelty, "Punt to Culture."
29. For examples in genetics and the environmental sciences: Campbell et al., "Data Withholding in Academic Genetics"; Helly et al., "The State of Computational Ecology"; for examples in archaeology and museums: Gaffney and Exon, "From Order to Chaos"; Jones et al., *From the Ground Up*; Jones et al., "From the Ground Up."
30. The original dataset is published in Hermon Carey Bumpus, "The Elimination of the Unfit"
31. Some of these papers include: Calhoun, "The Role of Temperature"; Crespi and Bookstein, "A Path-Analytic Model"; Grant, "Centripetal Selection and the House Sparrow"; Harris, "A Neglected Paper"; Johnston, Niles, and Rohwer, "Hermon Bumpus and Natural Selection"; Lande Arnold, "The Measurement of Selection"; Manly, "Detecting and Measuring Stabilizing Selection"; Manly, "Some Examples"; O'Donald, "A Further Analysis of Bumpus' Data"; Schluter, "Estimating the Form of Natural Selection."
32. Frank Price, "Bumpus' House Sparrow Data (Poster)" (paper presented at the Biology in Action: New Approaches To Teaching And Learning Science, Radford, VA, 1996).

33. Hoarded digital data tends to decay very rapidly, because digital media are often fragile and data file formats (especially common proprietary formats) change rapidly. Frances Condrón et al., *Strategies for Digital Data. Findings and Recommendations from Digital Data in Archaeology: A Survey of User Needs* (Archaeology Data Service, University of York, 1999 [cited March 14 2002]); available from <http://ads.ahds.ac.uk/project/strategies/>; Richards, “Preservation and Re-Use of Digital Data.” Sharing data enables institutions and communities to migrate data to new systems and open, non-proprietary file formats, which tend to be accessible over much longer time periods. Maintaining and widely distributing multiple copies of digital information secures data through redundant backups and is also an important digital preservation strategy, see Reich and Rosenthal, “LOCKSSA.”

34. Campbell et al., “Data Withholding in Academic Genetics.”

35. Foster, “Papers Wanted.”

36. Campbell et al., “Data Withholding in Academic Genetics.”

37. We imagine that such a term should expire after a number of years (its exact duration may vary across disciplines) to encourage more open uses of raw data. Another possible variant of this term would be to quantify how much of a raw data source would have to be used to require inclusion of its creator as a coauthor. For example, one researcher conducting a synthesis project may use only small portions (5% or less) of many raw data sets developed by other researchers. In this case, the researcher doing the synthesis would only have to attribute (cite) the raw data creators, but not have to include them as coauthors in a publication.

38. The term *developing country* is used as a convenient and widely understood shorthand for nations (mostly recently decolonized) with less access to capital and less infrastructure than wealthy heavily industrialized countries. It is and not meant to assume any predetermined developmental path.

39. M. Brown, *Who Owns Native Culture?* 63; Coombe, “Fear, Hope, and Longing.”

40. Garí, “Biodiversity Conservation and Use.”

41. Chander and Sunder, “The Romance of the Public Domain.”

42. Stephen A Hansen and Justin W. VanFleet, “AAAS Project on Traditional Ecological Knowledge,” Washington, D.C.: American Association for the Advancement of Science, 2003; Lewis and Ramani, “Ethics and Practice in Ethnobiology.”

43. M. Alexander et al., “The Role of Registers.”

44. Tobin, “Towards an International Regime.”

45. Chander and Sunder, “The Romance of the Public Domain.”

46. Nathan, “Plugging in Indigenous Knowledge.”

47. Jane Hunter, “Rights Markup Extensions”; Hunter, Koopman, and Sledge, “Software Tools for Indigenous Knowledge Management.”

48. Buca, *Introduction to Metadata*.

49. Hunter, Koopman, and Sledge, “Software Tools for Indigenous Knowledge Management.”

50. Nicholas and Bannister, “Copyrighting the Past?”

51. Part of their licensing system stems from practical considerations. Creative Commons developers made several judgments about the feasibility of developing licensing terms for different areas of concern. For example, moral rights or author rights (noneconomic rights over works, including the right to maintain the integrity of a creative work from mutilation or distortion) are not directly addressed by Creative Commons licenses. Creative Commons developers felt that crafting licensing terms around this issue would have been too difficult/inappropriate given the wide variability of moral rights across different international jurisdictions. This experience will no doubt provide invaluable guidance in any cultural heritage licensing effort. See Lawrence Lessig’s weblog for a fascinating discussion: (<http://www.lessig.org/blog/archives/002449.shtml>)

52. Neeru Paharia, *License Distribution*.

53. M. Brown, “Heritage Trouble.”

54. Coombe and Herman, “Rhetorical Virtues.”

55. Nahrada, *Whynotcopyleft*.

56. G. Brown, “Out of the Way.”

57. M. Brown, *Who Owns Native Culture?*
58. Rosenthal, "Politics, Culture and Governance."
59. Chander and Sunder, "The Romance of the Public Domain."
60. I. Alexander, "White Law, Black Art."
61. Herman, "Rhetorical Virtues."
62. Bannister and Barrett, "Weighing the Proverbial 'Ounce of Prevention.'"
63. Hunter, Koopman, and Sledge, "Software Tools for Indigenous Knowledge Management."
64. Brown, "Heritage Trouble."
65. Hunter, Koopman, and Sledge, "Software Tools for Indigenous Knowledge Management."
66. IPCB, *CBD'S International Regime: Indigenous Activist Organizations Call for No Access Zones to Genetic Resources and Indigenous Knowledge* [Web Page] (Indigenous Peoples Council on Biocolonialism, February 19, 2004 [cited February 28th, 2005]).
67. M. Brown, *Who Owns Native Culture?* 228.

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