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Cyberlaw and the Norms of Science

Dan L. Burk fnA

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I. Introduction

Much of the recent legal commentary regarding the Internet has been directed to discussion of norms and the role that such decentralized behavioral order should properly play in governance of this medium. (Johnson and Post, 1997; Lemley, 1999; Radin and Wagner, 1999) This body of literature mirrors and draws upon the expanding the expanding body of legal commentary regarding the role that norms should play in legal rule-making generally. (Cooter, 1996; Posner, 1996; Bernstein, 1996) Like the users of California basin groundwater (Ostrom, 1990) and the ranchers of Shasta County (Ellickson, 1991), Internet users have become something of a metaphor for the proposition of spontaneous communal ordering.

But to date, this scholarship on Internet norms has tended to overlook certain bodies of scholarship that apply uniquely to analysis of the Internet community, as opposed to analyses of ranchers or groundwater management: the literature regarding the interaction of law and scientific norms, and the STS literature examining the social role of artifacts. In this essay, I hope begin correcting that oversight, by addressing the genesis of legal controversies arising from the values embedded in the current structure of the Internet, and from proposed adaptations of that technology. I take as my thesis the proposition that the current values embodied in the structure of the network are largely those of the scientific community, and hope to juxtapose several types of scholarship that seem to be running in parallel in different disciplines. In doing so, I also hope to indicate new lines of inquiry that are suggested by tying together the literature on law, norms, and artifacts.

I begin by briefly reviewing the history of the Internet and the early users who influenced its current design. I then discuss the role of artifacts as social agents, arguing that the Internet as an artifact reflects the value judgments of its designers, principally the values of the scientific research community. After reviewing some of these scientific values, I argue that current legal controversies regarding the Internet may be viewed as cultural clashes between the norms embedded in the network and those entailed in its current use. I conclude with some observations as to how this view of the network impacts current scholarship on governance through law and through code.

II. Artifacts and Values

This analysis starts from the assumption that technologies embody the values of their creator, and the values thus embodied may include social values otherwise unassociated with the artifact itself. By itself, this premise should not be controversial; there is a large literature on the history and sociology of artifacts undergirding the claim. In one of its aspects this assumption forms the basis for the study of all the humanities -- we assume that the characteristics of building, a statue, or painting can tell us something about the thoughts and culture of that artifact's creators. Technological artifacts yield such clues in the same manner as architecture or art.

Of course, some care must be taken when drawing inferences about the values embedded in any particular artifact, as some artifactual characteristics may not necessarily embody value choices. Many design choices will be the result of manufacturing or marketing constraints, although of course even such utilitarian design choices assume certain values, and the technological embodiment of such values through artifacts is not socially trivial. But many other technological design choices are not necessarily choices about durability, manufacturing cost, or consumer appeal, and may more clearly reflect the value choices of the technology’s builders and users.

In some cases such embodiment of cultural values in artifacts is an explicit or premeditated design choice. A dramatic if unsavory example of such a deliberate design choice is given by Winner in discussion the low-hanging overpasses on Long Island expressways. (Winner, 1980) There exists compelling evidence that the overpasses were intentionally designed by their architect, Robert Moses, to preclude the passage of buses, and so to preclude low-income public transportation riders --

primarily African-Americans -- from reaching Long Island parks.

In other instances, the technological embodiment of such biases may be unintentional or subconscious, simply incorporating the social assumptions of the designer. In such instances, the inherent bias or limitations of the technology may serve to perpetuate the assumptions with which it was imbued. As an example, Wacjman (1991) describes how19th century Linotype typesetting machines defined social roles within the typesetting and printing industry, because the design of the machine inseparably combined the skilled and unskilled work of type compositor and distributor. As a more modern example of such inherent bias, Hoffman (1995) discusses how dedicated word processors of the early 1980s, such as the Wang Writer, were designed around certain assumptions about the duties and abilities of secretaries, who were the machine's intended users. The machine interface allowed the user to engage only in particular application level tasks, such as word processing, and excluded the user from most system functions such as adding, deleting, or renaming files. As a result the secretaries who used the machine -- and who were primarily women -- were constrained in the degree of task control and skill development possible in their jobs.

We might therefore consider the Internet as an artifact and similarly ask what types of values are reflected in the in the inherent limitations and biases of the system. We need not ask the question in the abstract, as the history of the technology is relatively well documented; and as a first approximation, we might expect the structure of the network to reflect the values of its early users and designers. Numerous commentators have observed that the underlying architecture of the Internet is attributable to the cold war legacy of its predecessor, ARPAnet, which was conceived and designed to survive the damage of nuclear attack. However, the network does not reflect the rigid and hierarchical command structure that might be expected of a cold war artifact. Rather, recent commentators have argued that Internet technology embodies the distinctly non-hierarchical attitudes of the researchers employed by the military. (Giese, 1996) Indeed, historians of the net have described in some detail how the "hacker ethic" of ARPAnet designers clashed with the values and expectations of the United States Department of Defense, which supplied funding for the project.

Subsequent to its incarnation as ARPAnet, the network and its development were for a much longer and more critical period in the custody of the National Science Foundation. The users of the network during this period were not primarily soldiers or military personnel, but members of the NSF-sponsored scientific research community. Thus, the early history of the network was dominated by academic research usage and academic users, both in computer science and other areas of basic research. We might expect to find some imprint of these users and custodians on the current architecture of the Internet, and particularly so given the distinctive normative structure of the research community.

III. Scientific Norms

Sociological studies of scientists as a community suggest that scientists tend to share a set of expected behaviors that govern the conduct of that community. These norms, as identified by the pioneering work of Merton and others, include *universalism*, the expectation that scientists should judge empirical claims according to impersonal criteria, without regard to the identity of their author; *disinterestedness*, the expectation that scientists will subordinate their own biases and interests to the advancement of knowledge; *communalism*, the expectation that discoveries will be freely shared and dedicated to the community of scientists; and *organized skepticism* , the expectation that scientists will subject empirical claims to systematic scrutiny and validation. (Merton, 1973; Barber, 1953) Additionally, some sociologists have identified a norm of *individualism* or *independence* under which scientists choose their own research agendas without central coordination. (Barber, 1953; Hagstrom, 1965)

These norms are believed to function together to drive the scientific enterprise, creating community behavior that rewards contributions to the corpus of scientific information. Scientists are expected to freely contribute their discoveries to the community; such contributed knowledge is vetted through criticism and peer review of published papers or reports. Thus, publication in peer reviewed journals further both values of communalism and organized skepticism. Contributed knowledge that passes such scrutiny gains the contributor the recognition and respect of his or her peers. Under the norm of universalism, any knowledge contributor can expect to receive such recognition, regardless of social status; the norm of disinterestedness discourages fabrication of knowledge to gain undeserved recognition. Scientists who depart from these norms – by unreasonably withholding data, for example – may be subjected to disapproval and ostracism, and may feel some degree of guilt or shame.

In considering this list of scientific norms, one or two caveats are in order. First, the validity of the Merton’s work has at times been criticized on the grounds that some members of the scientific community fail to adhere to any such standards. And indeed, numerous examples might be cited of scientists behaving in apparent contradiction to norms of communality, disinterestedness, and so on. (Burk, 1995). However, instances of such behavior do not necessarily disprove the existence of such norms; indeed, no community, scientific or otherwise, achieves total compliance with its expected standards of behavior, and outliers can always be found. As I have pointed out in a different context, the issue is not whether there are outliers, but rather how such outliers are regarded (Burk, 1995).

A second caveat deals with the criticism that the norms identified by early researchers were overly idealized. Merton's conclusions were based upon empirical surveys as to what behavior scientists claimed was expected of them. It has been claimed out that these are not necessarily the true practices of the community, and that scientists are at best deluding themselves as to how their community really operates. (Stehr, 1978) Whether or not one accepts this criticism, one may still expect to find behavior in accordance with the stated norms. For example, a citizen of a particular community may believe that the guiding principles of his society are truth, justice, and the American Way. The fact that these values may be largely epiphenomenal, in many instances cloaking a different social agenda does not the believer may still tend to act in accordance with the tenets that he believes are the guiding star of the community. So too in the scientific community, even if idealized values may cloak some deeper agenda, researchers will still likely conduct themselves in accordance with the values they believe are norms. And, the technology of the community might be expected to reflect the behaviors to which its members believe they should adhere.

IV. Cyberspace Norms

Armed with this general description of the norms of science, we may begin to examine the Internet for the imprint of the scientific community. Initial support for this hypothesis comes from an examination the customs of Internet usage, or “netiquette,” that evolved to govern resource usage among the early users of the network. The plethora of “how to use the Internet” books that emerged as the network seized the popular consciousness in the early 1990s attempt to explain to new users these polite conventions of on-line interaction. (Krol and Ferguson, 1995; Dern, 1994) Many of the customs detailed in these guides were seemingly directed at managing communal resources: admonitions to limit the length and frequency of telnet sessions, appeals to keep postings on-topic, exhortations to conserve bandwidth by limiting the length of .sig lines. (McGlaughlin et al., 1995; Kollock and Smith, 1996)

But the rules of “netiquette” managed the commons in a distinctive manner. For example, the social prohibition against expansive .sig files may have been more than a rule to conserve bandwidth. In addition to promoting such communalism, it may also have served to promote values of universality. Displays of title or position were long frowned upon in listserv or Usenet discussions. The culture of the net purported indifference to whether ideas were posted by a Nobel laureate or by an undergraduate student, and proclaiming one’s title was considered an ad hominem declaration. So .sig lines were expected to remain short and plain.

Similarly, until relatively recently, the culture of cyberspace also displayed a marked hostility toward commercial usage of the network that was not really necessary simply to manage the commons. On occasion, these conventions were even been raised to the status of formal rules, as when during the years of NSF oversight, prohibitions against commercial traffic on the network backbone were a formal part of the network's Acceptable Use Policy (AUP). The obverse of this norm was a strong sense communality: success or recognition in the on-line community was to be achieved by contribution to communal resources – such as a nice bit of shareware programming or well-organized FAQ. Indeed, some of the animosity against the “hordes of newbies” that descended upon the network when America On-Line first began providing a gateway to the Internet for its subscribers stemmed from the complaint that these newcomers would utilize ‘net resources without providing any in return, since AOL-based resources would not be reciprocally open to netizens.

Thus the behavioral conventions of netiquette past map well onto scientific norms. But more important than the legacy of behavioral conventions on the Internet is the signature that its early designers left embedded in its technology. This signature was apparent from the earliest history of the network in the "hacker ethic," which emphasized sharing of resources and unrestricted informational flows, an ethic consistent with the scientific norms of communalism. These same values were built into the network architecture, which in turn lent itself to usage outside the uses envisioned by the DoD, but which were quite in keeping with the attitudes of first, of computer science researchers, and later of other scientists.

Thus, the Internet by design disseminates information according to a relatively non-hierarchical and decentralized structure, as might be expected of technology embodying norms of universality, communality, and independence. The network architecture might almost be a metaphor for the idealized scientific community. Although each system has its key points of dissemination – routers and journals, respectively—information is developed and shared among independent, autonomous participants.

The network is also structured to enable remote access and resource sharing, as might be expected of technology embodying

norms of communality. The open architecture of the network not only allows, but encourages communal use of resources. Examples of such protocols are almost too numerous to list, but they extend from the most foundational level of the network to its highest level applications. The concept of packet-switching is based upon efficient utilization of bandwidth by sharing channels rather than dedicating them to single uses. The through telnet and similar utilities, the network facilitates distant sharing of informational or infrastructural resources that might otherwise be defeated by geography.
Additionally, many of the applications that run on the network assume open access to publicly available files. For example, the hypertext protocols that make up the World-Wide-Web operate on the assumption that files on the network, which may be pointed to by hypertext links, are intended to be available for access.

Other assumptions embedded in the network may be more subtle, but nonetheless pervasive. For example, the Internet affords few clues as to the identity or status of users, as might be expected of technology embodying norms of universality and disinterestedness. The current network protocols network makes almost no provision for user identification – as the saying goes, on the Internet, no one knows if you are a dog, or a Nobel laureate or a graduate student. This type of personal indeterminacy fits well with the value of universality: ideas or contributions are valued independently of their originator, and thus the originator's identity is relatively unimportant. This feature may also promote the value of disinterestedness; in a network where cues to identity are suppressed, participants may be less likely to invest their contributions with personal

Thus, the technological characteristics of the network appear to bear out the rule that artifacts reflect the values of their users: the Internet is superbly suited to facilitate information exchange, and to resist geographic, cultural, or legal impediments to the free flow of information. Agre (1997) argues something of this sort, suggesting that because the scientific community was not thought to harbor valuable secrets, the system was built without extensive privacy safeguards, or that because the scientific community adheres to norms of self-regulation, the system was built without extensive authentication and security protocols. My point here is that the absence of such characteristics is not so much a bug, as it is a feature; not that the system lacks security safeguards, but rather that the system requires open access. This is hopefully something more than a semantic argument regarding whether the glass is half empty or half full; rather, it suggests that the structure of the network actively channels behavior into certain modes, which reflect the values of the community that built it.

V. Culture Clash

If we correctly perceive in the current function of the Internet echoes of scientific research norms, and technological structures that channel behavior toward those norms, then the question then arises as to the effects those channeling structures may have when they outlast the community that built them. It is clear that the explosive growth and proliferation of Internet usage extends beyond the scientific community. The network is no longer exclusively in the hands of that community, but is rather being employed by a much broader range of users who may not share the normative assumptions built into the network.

This issue, like the general issue of artifacts as social agents, is not entirely novel. We have some experience as to what may occur when artifacts built under one set of assumptions are introduced into a culture with a different set of assumptions. There are numerous instances of such cultural encounters, but for the present let us consider only one or two illustrations arising out of the introduction of common Western technologies into developing nations. For example, the introduction of water taps into homes in India, which might be viewed from the developing world as an improvement in the standard of living, if not a necessity, has less than enthusiastically received in rural Rajasthan. (Jayaraman, 1999) The faucets carrying the water were soon damaged either by neglect or by outright sabotage. Those who installed the faucets failed to appreciate that the provision of water in that cultural setting was the responsibility of young women, whose only opportunity to leave the house for social interaction – particularly with young men – was their daily trips to the well. The Western cultural assumption of convenience built into the indoor plumbing diverged sharply from the local assumptions regarding social freedom.

In another instance, Western assumptions regarding refuse may diverge sharply from those in developing nations – assigning items the status of "garbage" is of course based on cultural assumptions, and one culture's waste may be another's staple. This cultural disconnection foiled plans in New Delhi for provision of a power plant designed to provide electricity by burning municipal trash. (Jayaraman, 1999) Rather than ridding the city of tons of garbage each day, the plant instead sat idle, unable to produce any power. The Danish builder had failed to consider that municipal trash in New Delhi is systematically gleaned for reusable cloth, wood, and plastic by the city's 8,000 "rag pickers." Without these combustible materials, the remaining waste was insufficient to fire the plant.

As the Internet has passed from the exclusive provenance of the scientific community to that of broader society, the social result may be no less incongruous in the examples of technological transmission between the developed and underdeveloped worlds. Previous commentators have noted the conflict between customs of the "old guard" of Internet culture, and those of newer commercial users. But the question here is less conflicts of custom than conflicts of usage. The uses to which new netizens may put the technology will not necessarily be harmonious with the normative assumptions built into the network by its designers. When the network is put to uses other than those assumed by its creators, as Internet now has been, conflict may arise between the values of the new users and the values embedded in the technology itself. And indeed, since popular adoption of the network, punctuated by disputes over copyright, domain name ownership, bulk e-mail, pornographic content, and dozens of other issues. Many of the current legal controversies related to the Internet appear to be grounded in the incompatibility between the network's embodiment of scientific norms, and current commercial usage that assume entirely different values.

Thus, the transmission of bulk e-mail, or "spam, " is possible due to the network's open architecture and capacity for reproduction and distribution of message content. (Agre, 1997; 1998) Those who send bulk commercial e-mail are able to utilize the publicly accessible SMTP gateways remote hosts. Similar network capabilities enable the unauthorized reproduction and dissemination of copyrighted content. This type of open network architecture may be desirable and even necessary for shared resources in an environment where the incentive structure for innovation relies primarily on reputational reward; scientific norms assume that scientists do not need a pecuniary incentive to engage in creative work; scientists already have an creation incentive in the form of peer recognition. But where the primary reward is pecuniary, open architecture may quickly be exploited for free advertising.

Suppression of user identity may also be ideal to promote idea sharing in a community where contribution is literally its own reward. But in a pecuniary reward system, these system features serve to obscure the origin and identity of “spammers” and “pirates,” making difficult the technological impediment of either activity. On the consumer side, the network makes equally obscure the location and identity of content recipients. On the Internet, no one may be able to tell if you are a dog, or a Nobel Laureate, or an undergraduate, but more importantly, no one can tell if you are a minor, or a foreign national. Thus the widespread availability of pornographic content on the network, including availability to underage users, stems in large measure from the indeterminacy of identity, as do concerns about sovereignty and jurisdiction.

A litany of other examples might be cited, from the transformation of domain names from mnemonic file addresses to commercial identifiers, to the transformation of browser “cookie” files from technical markers to marketing records. In each of these instances, unanticipated use of the network’s features has led to controversy. They generally, although not exclusively, relate to commercial use of the network. They generally related to broad popular uses of the network, and not to the “hacking” and “cracking” abuses of deviant users with specialized expertise. Most important, they each disclose some unarticulated assumption of the research community around which the network was designed.

VI. Norms in the Machine

I have thus far argued that the openness, decentralization, and relative anonymity afforded by Internet protocols are the results of implicit or explicit design decisions that incorporate the values of the scientific research community, and that the current controversies surrounding the Internet tend to arise out of conflict between technologically embedded values and the more diverse values of the networks’ current users. Such controversies are emerging with increasing frequency, and each generates calls for new law, or bromides regarding the ineffectiveness of current legal controls. In essence, these demands assume that law can and should be used to bridge the gap between user values and designer values.

This type of legal retrofitting is of course not unique to difficulties with the Internet; it might be applied to almost any technology. In the artifactual examples offered above, we might imagine attempts to make the New Delhi power plant function by criminalizing “rag picking” from municipal waste, or forcing indoor plumbing on the homes of Rajasthan by criminalizing trips to the well, or criminalizing sabotage of water faucets. But the law is a relatively blunt instrument for changing social norms, and unless we are willing to devote substantial resources to policing and enforcing such laws, we might anticipate that reusable refuse would continue to disappear, or that young women would continue to slip away to the well. Additionally, legal rules can sometimes be trumped by artifactual affordances; one may enact laws to ensure racially equal access to beaches and parks, but it will have little effect if the buses cannot fit underneath the overpass. Similarly, ongoing legal controversies reflect the inability of legal restrictions to effectively control content in a medium that not only rapidly reproduces and disseminate content, but also lacks any central control point or organizational hierarchy from which to restrict such dissemination.

In the case of the overpasses, changing the social outcome dictated by the artifact may require physically changing the height of the buses or of the overpass. This type of technological retrofitting has been common in the case of the Internet.

Where the current openness, decentralization, or anonymity of the network prove problematic – that is, where these network characteristics are perceived as bugs rather than as features – technological fixes are proposed. In the case of spam or of pornography, content filters may be used to screen out, respectively, bulk e-mail or information deemed unsuitable for minors. Where age, citizenship, or other relevant legal status is uncertain, cryptographic systems may be used authenticate identity, via digital certificate or other means. In the case of intellectual property, copyright management "lock out" systems are planned to restrict unauthorized access to proprietary information, as well as to monitor and charge for authorized access.

Thus, legal controversies involving the Internet have increasingly been linked to proposals for technological controls. In considering these technological fixes, Lessig has argued that legal constraints and technological constraints may often be interchangeable; desired behavior can be enforced by law or by the affordances of artifacts, including computer software. Reidenberg (1998) has dubbed the rules embedded in such technology "lex informatica," a body of prescriptions that may serve as an adjunct to or substitute for formal legal rules. Law may directly require technology embodying a certain rule set, or law may be used to encourage the voluntary use of a certain technology, or law may create an incentive such that the market develops technology as a response. Each of these approaches can be seen in recent legislation or proposed legislation addressing the Internet.

But alternatively, technological fixes such as censorware or copyright management may be viewed as an attempt to build back into the network constraints or limitations that its designers purposefully avoided. As such, they may be considered attempts to build into the network a different value system than that held by its initial designers. This view seems implicit in Lessig's observation that behavior may be constrained by norms, by law, or by technology, and that in cyberspace, technology can substitute for either norms or law. (Lessig, 1997) While Lessig gives relatively little attention to the current assumptions built into the network, he clearly articulates the potential for filters and other technological modifications to include hidden value choices.

This observation in turn raises the critical question as to which values should be built into such technological fixes, and the process by which the answer to that question is decided. In the past, such implicit value choices have been left to the designers and builders of the particular technology, although commentators in the participatory design literature have advocated the creation of mechanisms through which stakeholders in a given technology might have a voice in its creation. (Bjerknee et al., 1987; Schule and Namioka, 1993) But on a theory of lex informatica virtually everyone in society is a stakeholder. In a democratic society, the imposition of such values through technology raises the same issues of participation, fairness, and process as would be raised by imposition of values as formal legal rules. Thus, Reidenberg in particular has urged that the elected government is the proper mechanism for the design of rules as technology, just as it is the proper mechanism for the design of rules as law.

VII. Cyberlaw and Cybernorms

The question of state intervention into technological design brings us full circle, to the literature on law and norms with which this essay began. This literature has tended to reject state-imposed rules in preference to development and enforcement of communal norms to govern cyberspace. Such norms or other "spontaneous" ordering have been characterized by Johnson and Post (1997) as a successful example of "bottom-up" governance. Yet one implication of the argument presented here is that the "spontaneous order" of cyberspace may be far less spontaneous than its proponents have supposed. The behavior and interactions of Internet users may rather have been channeled into certain forms by the normative architecture of the network. Thus the purportedly "bottom up" ordering of the network into discussion groups and other cyber-communities may in fact have been a type of "top-down" ordering imposed, or at minimum channeled, but the structure of the network. In this sense actually another manifestation of the "lex informatica" principle, the instantiation of rules through technology.

But this observation has implications not only for the advocates of "bottom-up" ordering, but for their critics as well. Thus, Professor Radin (1996) observes that the cyberspace community might have been effectively governed by informal norms when it comprised a relatively small and homogenous group of researchers with a common interest, but that as the community has multiplied in both size and diversity, this method of governance may no longer be sufficient. Certainly empirical studies of governance through informal processes indicate that such social constraints work best when the group to be governed is relatively small and homogeneous, with shared goals and values. Radin is clearly correct that the cyberspace community of today is anything but small or homogeneous, and displays a wide, almost infinite, variety of goals and values. Professor Lemley (1999) expands upon this notion, arguing that it would be quite impossible to identify any commonly shared values among Internet users in order to formulate an enforceable set of norm-based governance rules.

These arguments seem correct so far as they go, but probably fail to fully appreciate Lessig's observation that law, norms, and code are at some level interchangeable. (Lessig, 1997) The ur-inhabitants of the network may have been a small and relatively homogeneous group, sharing the goals and values of scientific research community. But they were not merely governed by a set of disembodied norms; those norms were instantiated in the technology of network they designed. The size and composition of the network community may have changed, but the fundamental technology connecting the community has not, and neither have the norms embedded in that technology. Consequently, while the present polyglot Internet community may not share any stated set of goals or values, they necessarily share the goals and values designed into the network itself – whether they intend to or not.

Similarly, Lemley (1999) is surely correct when he argues that norm-based Internet governance is unworkable because the rapidly changing character of the Internet community precludes the development of a stable set of shared norms. However, the argument overlooks what is *not* rapidly changing: the character of the network to which new users subscribe, and the assumptions built into that network. Nor are those technological assumptions likely to begin changing with any noticeable speed. Lemley himself identifies the network effects that are likely to lock users into the current technology. (Lemley, 1999; Lemley, 1996; Lemley and McGowan, 1998) The Internet constitutes a prime example of a true network, which increases in value as additional users join the system. The value of the network is therefore maximized by maximizing interconnectivity, and interoperability is key to creating such connectivity. Structural changes in the network may threaten the value bound up in the number of people who use it, and in the interoperability of the equipment that gives access to those people. Migration to a new technological standard would entail significant costs for users, and it may be difficult to overcome the "lock-in" barrier created by those costs.

Reidenberg (1998) has similarly noted the technological inertia that may inhibit systemic change once rules are crystallized into technology. Thus, although Lessig (1997) argues that technology is relatively "plastic," this plasticity may be severely limited by social and economic factors. In theory we could change the Internet to allow ubiquitous user identification or robust security, but in practice ridding ourselves of the current technological architecture may prove to be difficult or impossible. In this regard, it is worth noting that content filters, copyright management systems, and similar attempts to retrofit the network are, by and large, local overlays upon the existing infrastructure, rather than systemic changes. As a consequence, they remain prescriptively leaky, since the underlying characteristics of the network remain unchanged, facilitating circumvention of the local rule set.

VIII. Conclusion

By drawing on bodies of scholarship examining the social role of artifacts and the normative structure of the scientific community, I have suggested that the current debate over Internet norms must take into account the normative rule-set of the Internet's current technology, especially given the likely durability of that technology. To the extent that network effects resist technological change, remaining locked into the current network architecture, or to a compatible version of that architecture, means being "locked-in" to the assumptions of those who designed that architecture. And, so long as those assumptions are incompatible with the expectations of the current network users, we may expect artifactual conflicts to continue on a regular basis. Attempts to fill the gap between design assumptions and user expectations with law or with technological retrofits at odds with the value design of the technology will only generate continued disputes, this suggests full employment for Internet lawyers, and perhaps for scholars of technology and social change, it also suggests that, absent widespread societal adoption of scientific behavioral norms, the Internet is likely to generate social controversy well into the foreseeable future.

This consideration of Internet structure also suggests several promising lines of future research. For example, feminist scholars examining the experiences of women in on-line communication have suggested that a dearth of identifying cues and lack of personal investment may make the technology of the Internet poorly suited to the types of communication most natural to female users. (Herring, 1996) Interestingly, much the same criticisms have been leveled against scientific discourse by feminist scholars in that discipline. (Keller, 1985; Shepherd 1993) Congruencies between these studies may be the source of fruitful investigation; it may be that the "masculine" discourse of the Internet reflecting values of organized skepticism and possibly disinterestedness embedded in the technology by its early users.

Additionally, this is not the first time that scientific norms have been studied in conflict with other normative systems, particularly in a context of commercialization. (Eisenberg, 1986; Heller and Eisenberg, 1996; Merges, 1996) Eisenberg (1986) has detailed how the scientific community's system of reputational incentives functions as an alternative to the pecuniary exclusive right incentive in biotechnology innovation. Although there are significant differences between the commercialization of biotechnology and that of Internet technology, the role of scientific incentives as an alternative to encourage innovation may be worth further exploration. In particular, Barlow (1994) and Dyson (1995) have argued that the exclusive rights incentive of intellectual property will not function well in digital media, and have suggested reward systems based in reputational value as an alternative. This suggestion may take on an additional dimension in light of the argument that the current network was designed to facilitate the scientific reputation-based incentive system.

Notes:

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Dan L. Burk
Associate Professor of Law
Seton Hall University
One Newark Center
Newark, NJ 07102-5210
973-642-8829 (voice); 973-642-8194 (fax); burkdanl@shu.edu (bits)

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