RECONFIGURING INTELLECTUAL PROPERTY FOR CYBERSPACE:
A Look At The Semiconductor Chip Protection Act of 1984

by

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ABSTRACT

With computer science technology and the Information Superhighway, or cyberspace, developing rapidly, information services and resources are playing an increasingly fundamental role in everyday life. The question of rights over information, who owns what and to what extent, is correspondingly becoming more complicated as well. Intellectual property law was developed to protect creator rights over so-called intangible goods in recognition of the great value these goods may have. Though many critics claim that the established regime for intellectual property is not adequate for the new requirements presented by the electronic, computer age, this regime continues to provide the only form of protection normally possible for information and information-based goods.

An investigation was made to evaluate the appropriateness of intellectual property protection in cyberspace, beginning with the theoretical principles underlying the concept of property and their applicability to a nonphysical, electronic environment. It was found that these principles apply easily, despite the arguments considered that oppose our present intellectual property regime in cyberspace. Software was chosen as the most predominant intangible, computer good for which protection is sought and a study was made of current protection practice for software and the technological and political difficulties that surround such action. From the Semiconductor Chip Protection Act of 1984 as a model, a specialized software act was then described as the recommended direction for the development of intellectual property law in cyberspace.

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Introduction

As more of our physical world activity is transferred to cyberspace, the question of rights over information is becoming more complicated. Individual autonomy and privacy, as well as state sovereignty, in the cyberspace world are already difficult, international issues.[1] Who, for example, has property rights to what would be regarded in physical form as personal information when it is created, transmitted, and stored electronically if access to this information is only possible by physical machines, computers and terminals that may not be owned by the person in question?[2]

This paper examines the applicability of our current intellectual property law in the rapidly developing computer network-based environment, popularly called cyberspace. Our rules and regulations, codes and standards are being called for reexamination as the boundaries of property, personal, national, and otherwise, are being redefined electronically; our concepts of law, and of reality—what we consider to be in the range of possibilities—are being tested by this new electronic reality. The challenges that cyberspace present to intellectual property law arise from its nonphysical, electronic nature and the resulting, previously unheard of powers to copy, transmit, and distribute information.

In cyberspace, distance and physical barriers are effectively meaningless. When a computer network user—or, simply, user, or cybernaut—logs in to the Internet, (s)he becomes part of a network that extends globally with computers in perhaps the next room and in another country. A network is any group of people connected by computers to share information.[3] The Internet is an interconnection

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[1]Burk, Dan L. "Patents in Cyberspace: Territoriality and Infringement on Global Computer Networks." Tul. L. Rev. Vol. 68, No. 1, Nov. 1993: 4-5, 21, 24.

[2]Branscomb, Anne Wells. "Chapter 5: Who Owns Your Electronic Messages?" Who Owns Information? From Privacy to Public Access... New York: Basic Books, 1994: 92-103.

[3]Unisys. "Information Superhighway Driver's Manual." URL: <http://www.unisys.com/OfInterest/Highway/highway.html>.

of thousands of separate networks worldwide. It was developed by the US
Federal government to link government agencies along with colleges and
universities and, more recently, has expanded to include thousands of companies
and millions of individuals.[4] The Internet is the working framework from which
the Information Superhighway, or I-Way, has developed and continues to
develop. Another term for the I-Way, coined in 1984 by William Gibson in his
science fiction novel, Neuromancer, is cyberspace. We use it here to refer to the
network of electronic computer networks that is fast becoming more and more a
part of all our activities and interactions in the physical world, from providing the
latest stock market figures to providing a means for family members to stay in
contact over great physical distances. Finally, the term "virtual" is used in this
paper to refer to the electronic environment configured by cyberspace in which
we, through computers, visualize, manipulate, and interact with the information
we are exchanging.[5] Though, we may be far from realizing Gibson's
Neuromancer world, we already construct virtual mailboxes for our electronic
correspondences, virtual classrooms for online education, and virtual space in
which to expand our cyberspace visions.

Cyberspace is a developing vision for the future of the Internet, to extend
its public availability to individual homes to provide electronic commerce, health
information, education—the list is unbounded. Network commercialization is to
begin with movies on demand, followed by such services as personalized news
reports, databases on network-available consumer goods and services (to make
travel arrangements, for example), and the ordering of products direct from
manufacturers.

As with physical goods, information and information-based products and
services differ in their value depending on the region or country. Regulation,
meanwhile, of information exchange is difficult, perhaps even impossible,
because the technology and management of networks, and of the Internet, is
decentralized with little or no monitoring of information exchange. Without such

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[4]Ibid.
[5]Isdale, Jerry. "What is Virtual Reality? A Homebrew Introduction and Information Resource
List." Version 2.1, Oct. 8, 1993. URL: <ftp://sunee.uwaterloo.ca/pub/vr/documents/whatisvr.txt>.

monitoring, however, safeguarding information from wrongful appropriation or use becomes problematic. As a form of intellectual property, information and information-based products may then become restricted from public access.

But this is what intellectual property law was designed to prevent. The concept of intellectual property was developed to compensate for the lack of physical barriers over ideas and other so-called intangible goods. Typical justifications for intellectual property are essentially economic.[6] As with physical goods, the creation or development of intellectual goods often requires significant investments of time, effort, and resources. Unlike physical goods, intellectual goods may be infinitely reproducible at minimum expense and requiring minimum amounts of time. As a result, compensation for production costs or reward for the creation of intellectual goods may be complicated. Without compensation or reward, however, individuals may lack the incentive or be even disinclined to make any creations public. As this unrealized potential for advancement, would be competitively, socially, and culturally disadvantageous, intellectual property protection was established to prevent the diminished production of intellectual goods from the disincentives of unrewarded or uncompensatable labor.

To illustrate this market perspective further, the monopolistic rights given to the creator by patents, for example, are designed to create economic inefficiencies: higher prices, restricted supplies, inefficient allocation of resources--deadweight loss. The costs to society for these inefficiencies are outweighed, theoretically, by the benefits provided by the creation of intellectual goods promoted by patent protection. To ensure that these societal benefits outweigh the societal costs of protection, patent grants are limited by standards of novelty, usefulness, and nonobviousness.[7] To ensure that these standards are met, patent applications are subject to an extensive review process before patents are issued.

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[6]Burk, supra note 1: 25-26.
[7]35 U.S.C. §§101-103.

According to a report by the Office of Technology Assessment, however, our present intellectual property regime may not be equipped to adapt to the new, virtual reality of cyberspace[8] Our concepts of property rights are based on our physical reality; demarcated by tangible boundaries and barriers, private property is intrinsically characterized by exclusivity of use. Intellectual property law was established for intangible goods rendered in a physically permanent form: published "hard" copies, a machine or device or even process physically incarnating the idea.[9] As with geographic boundaries, the nonphysical nature of cyberspace also renders physical form parameters nonexistent. As a result, a sizable group of cybernauts advocates the abandonment of intellectual property law with respect to cyberspace; anchoring to ideals of intellectual freedom and the untethered dissemination of ideas, they argue that the law as it has developed is inherently unsuitable for the new, virtual reality of cyberspace and that this law is destined to collapse. Some also believe that the concept of property itself is disintegrating. They propose a move towards a propertyless system where, for example, creator rights are protected not by law but by the ability to make the creation available to the public before would-be copiers can.[10]

These arguments are again typically framed in economic terms, emphasizing the monetary rewards that intellectual property protection affords. These advocates also typically suggest that the monetary reward based reality they decry lacks the ideals present in cyberspace, such as selflessness; they offer as testimony the unpaid network administrators, working for "nothing," and the free, public distribution of much software. Thus limiting their consideration to a materialistic context that they themselves propose to abandon, proponents of property rejection present overly simplistic grounds for their position.

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[8] Office of Technology Assessment, US Congress OTA-CIT-302. "Intellectual Property Rights in an Age of Electronics and Information." 159 (1986): 19;
Branscomb, Anne W. "Overview: Global Governance of Global Networks." Toward A Law of Global Communications Networks. Ed. Anne W. Branscomb (1986): 17;
Burk, supra note 1: 24.
[9] Branscomb, supra note 8: 17;
Barlow, J. P. "The Economy of Ideas." Wired 2.3, Mar. 1994: 85-86.
[10] Barlow, supra note 9: 85-89.

One can clearly counter examples of nonexistent monetary reward in cyberspace with similarly unpaid instances in the physical world, as well as with the idea that compensation can take forms other than a monetary one. Arguably, the noncommercial nature that cyberspace has maintained could almost sanction a reliance on non-monetary compensation. The question, however, remains. Is property a viable concept in cyberspace? If so, how can we best recognize and protect it?

To illustrate better the problems of intellectual property protection in cyberspace, we will often refer to a cyberspace construct, Multiple User Dungeons (MUDs), as a continuing, working example. A MUD is a computer program that defines a virtual space where the MUD's users interact together. It is a text-based space; its structure—rooms, buildings, furnishings, etc.—is founded in text descriptions. Unlike video games from which MUDs may be said to have developed, the users interact in a MUD space simultaneously via text messages and develop the space by adding their own descriptive additions on to the original MUD structure. The purpose of MUDs is for users to congregate and experience this collective or group interaction.

A cybernaut logs into and explores a MUD as a character or persona that (s)he defines. One can thus virtually walk around the space defined or created by the MUD, interact with other characters that the user may meet there, explore different MUD areas, and create objects, descriptions, rooms. An unfamiliar user can even get lost and confused in a MUD, requiring the aid of another more experienced user, or at least a guide or manual of some kind.[11]

There are many different types of MUDs: those based on adventure games like Dungeons and Dragons, social MUDs where friends get together virtually, and even MUDs like MediaMOO--which stands for Media MUD Object Oriented--which is a meeting place for media professionals who must apply with some form of basic qualifications in the study of media to be admitted. MediaMOO was created with "only the public corridors, stairwells, and a few

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[11]Smith, Jennifer "Moira." "FAQ MUDs [Frequently Asked Questions: Basic Information about MUDs and MUDing] ." rec.games.announce newsgroup, July 16, 1993.

public places within MIT's Media Lab" re-created virtually. It was and has been up to the community of MediaMOO's users to "build the rest, as they do in any good MUD."[12]

This paper begins, in Part I, with an examination of the theoretical arguments for the recognition of virtual property. Part II considers arguments for abandoning our intellectual property regime in cyberspace. From these two parts, we find that intellectual property law should be pursued in cyberspace. Part III then examines the US legal history of cyberspace-related court decisions and the complications that cyberspace poses for such intellectual property protection. Part IV explores jurisdiction issues and other practical considerations that affect cyberspace property protection. Part V then discusses the reconfiguration of intellectual property protection for cyberspace with the establishment of a protection tool specifically for software based on the Semiconductor Chip Protection Act of 1984. We also examine the historical record of the SCPA and its implications for implementing a new intellectual property scheme for cyberspace.

I.   Theoretical Bases for Property in Cyberspace

Intellectual property, and property in general, is a human construct and not a fundamental truth of our existence. According to Jeremy Bentham, the founder of utilitarianism,[13] "it is entirely the work of law" and without law, there would be no property.[14] This reasoning would imply the abandonment of intellectual property as a concept in cyberspace with the abandonment of intellectual property law in cyberspace. Why then recognize property in cyberspace?

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[12]Kelly, Kevin and Howard Rheingold. "The Dragon Ate My Homework." Wired 1.3, July/Aug. 1993: 72.

[13]Bentham, Jeremy. "The Principle of Utility." Introduction to Philosophy, Ed. John Perry and Michael Bratman. 2nd ed. (1993): 526.

[14]Bentham, Jeremy. "Security and Equality of Property." The Theory of Legislation, reprinted in Property: Mainstream and Critical Positions. Ed. C.B. MacPherson (1978): 41-58. Reprinted in W. Fisher, 'Property Law: Theoretical , Historical, and Comparative Perspectives' course notes (1994): 143-144.

Economic or market justifications not withstanding, arguments for property recognition may be framed in terms of utilitarian, labor, and personality theories. These arguments are made in defense of physical property. Our rationale for recognizing claims to nonphysical property is based on what we perceive to be shared characteristics between physical and nonphysical property. The question then is whether or not these arguments apply if we consider them in the context of cyberspace.

UTILITARIANISM

The principle of utility "approves or disapproves of every action whatsoever, according to the tendency which it appears to have to augment or diminish the happiness of the party whose interest is in question: or ... to promote or oppose that happiness."[15] "Actions are right in proportion as they tend to promote happiness, wrong as they tend to produce the reverse of happiness." Happiness is "pleasure, and the absence of pain"; unhappiness is "pain, and the [de]privation of pleasure."[16] "The rightness of actions is to be judged by their consequences."[17]

According to Bentham, "the idea of property consists in an established expectation . . . of being able to draw such or such an advantage from the thing possessed. . . ."[18] With property, owners become more secure in the rewards of their labor. Such security promotes greater individual industry to increase personal benefits. This leads to greater collective benefits and thus the promotion of the utilitarian maxim: "the greatest good for the greatest number."

The "action" of recognizing property is "right" because it promotes utility by diminishing four basic "wrongs": the "Evil of Non-Possession," or the loss of

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[15] Bentham, supra note 13: 526.

[16] Mill, John Stuart. "Utilitarianism." Introduction to Philosophy, Ed. John Perry and Michael Bratman. 2nd ed. (1993): 531.

[17] Smart, J. J. C. "Extreme and Restricted Utilitarianism." Introduction to Philosophy, Ed. John Perry and Michael Bratman. 2nd ed. (1993): 550.

[18] Bentham, supra note 14: 143-144.

benefits or wealth from loss of ownership; the "Pain of Losing" the expectations invested in property, from the loss of sentimental value or from the forfeiture of property-based plans both for the present and the future ; the anxiety from the "Fear of Losing" which may prevent the enjoyment or even acquisition of property and its resulting benefits; and the "Deadening of Industry" which may result from a loss of industry resulting from the lack of incentive to acquire property.[19]

While these arguments were framed for physical property, they can be applied to nonphysical property as well. In the physical world, the above simplified rendering is complicated where individual good may conflict with the collective good--as when one person secures a large estate of land, leaving a significantly reduced amount for others. Such conflicts are less problematic with nonphysical property--an idea may be shared with an infinite number of others without reducing the idea for any one. Intellectual property secures one's expectations in the use of one's creation; the creator is freed from the fear of inappropriate application of his or her creation. Care and control over an intellectual possession or creation provides for the development, refinement, and/or preservation of that intellectual possession-- to prevent an idea, for example, from becoming tainted or twisted or otherwise deformed.

This reasoning applies to cyberspace as well. The securing of an object in cyberspace for use does not conflict with the use of that object by others; likewise, multiple users of an object do not affect the use of any one user. In fact, some virtual objects, like MUDs, are explicitly created for an infinite number of multiple users. Likewise, in cyberspace, an object--an image or software--may be copied countlessly, allowing for an infinite number of relatively costless and effortless appropriations. A creator's concerns regarding the use of his or her creation or the preservation of its conceptual integrity may be correspondingly amplified. A utilitarian recognition and protection of property would secure those creator expectations.

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[19]Bentham, supra note 14: 146-147.

LABOR THEORY

John Locke describes property as the acquisition of an originally unowned object by mixing one's labor with it. Such labor is viewed as a prerequisite before any benefit may be enjoyed from an unworked, natural object. Likewise, the "Commons" may only be collectively enjoyed or benefited from if individuals labor and thus appropriate pieces of the "Commons" to develop and cultivate. The proviso is that one only acquire that which one can use without any of the acquisition going to waste and that there be "enough, and as good left in common for others."[20] With limited physical resources, Locke's rendering of property encounters problems resulting from scarcity and exclusivity of use; also, one person's ownership of physical property cannot leave "as good left in common for others," who are by definition unable to use freely what is no longer common but what is now one individual's property.[21] As with utilitarian theory, nonphysical goods escape much of the conflicts of use under labor theory.

Cyberspace users--cybernauts--may have decided that claims to property are unnecessary or unwise as compared with the relatively uncomplicated communal sharing of resources and objects that presently characterizes the virtual world. They may also believe that the concept of property is nonsensical or inappropriate where physical dimensions do not exist. In terms of labor theory, however, the cyberspace commons have been developed by the labor of individuals, without which there would be no commons at all.

Property rights as framed by labor theory may, however, still be problematic. A claim to ownership is based upon mixing one's labor with something previously common or not owned. In MUDs, for example, the object by design calls for others to mix their labor with it. These users would then have labor-based claims to some ownership of the object. At the same time, a MUD is

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[20]Locke, John. "Second Treatise of Government." Chap. 5. Property: Mainstream and Critical Positions. Ed. C.B. MacPherson (1978): 17-27. Reprinted in W. Fisher, 'Property Law: Theoretical , Historical, and Comparative Perspectives' course notes (1994): 2, 5.
[21]Nozick, Robert. Anarchy, State, and Utopia. (1974):174-82. Reprinted in W. Fisher, 'Property Law: Theoretical , Historical, and Comparative Perspectives' course notes (1994): 14.

the creation of another, separate individual or group of individuals who may have already made an original claim.

Though perhaps difficult to resolve, potential conflicts like the one just described do not disallow the application of labor theory to cyberspace property. Objects, like MUDs, or virtual resources in general may be considered collectively owned but, as such, they are still property, the property of any and all users. Furthermore, making a property claim to some virtual space, configured by software, does in fact leave "as good ... in common for others." One might argue that there are hardware limitations to cyberspace use but this is another physical world parameter and may thus be dismissed for the consideration of virtual property as a concept.

PERSONALITY THEORY

The personality theory, as advanced by Hegel, suggests that individual, private property is crucial for the development of personality or personhood. The basis of Hegel's theory is the embodiment process. To derive the benefits of personhood development, an individual must exercise his or her will on objects which then become a reflection of that will. An individual thus develops a sense of self from extensions of will. "To achieve proper self-development--to be a person--an individual needs some control over resources in the external environment."[22] Objects embodied by an individual in turn affect the individual's ability to realize personal choices . In recognizing other people's objects and wills, an individual further develops his or her own personhood by contrast with other people.[23] Individual property ownership is, therefore, crucial for the personal development of an individual.

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[22]Radin, Margaret Jane. "Property and Personhood." 34 Stan. L. Rev. (1982): 957-959, 991-1013. Reprinted in W. Fisher, 'Property Law: Theoretical , Historical, and Comparative Perspectives' course notes (1994): 230.
[23]Waldron, Jeremy. The Right To Private Property. (1988): 284-318, 343-89. Reprinted in W. Fisher, 'Property Law: Theoretical , Historical, and Comparative Perspectives' course notes (1994): 255-334.

The personality theory then does much to support the justification of intellectual property protection in cyberspace. Not only does this theory support individual ownership claims in cyberspace, it holds that such claims are necessary to human development, with the present communal nature of cyberspace incapable of supporting such development. In fact, if the increasing transfer of physical world activity to cyberspace results in a loss of opportunity for individual physical property, to compensate, we would increasingly need to favor individual virtual property ownership for personhood development. Correspondingly, the recognition and protection of individual property claims could not be deterred because of the difficulties of establishing and enforcing such property claims. These would seem to be secondary considerations relative to personhood development and, in the end, they simply would need to be resolved.

APPLYING THEORY TO MULTIPLE USER DUNGEONS

MediaMOO is an embodiment of the wills of its creators, Amy Bruckman and Mitchel Resnick. It is the product of their labor and intellectual property recognition would enable them to safeguard their intended utilization of MediaMOO, and thus promote their utility, as well as that of society. MediaMOO users who develop the virtual space also invest labor and embody their wills in their creations within MediaMOO. Intellectual property protection for these creations would thus promote these users' utility.

When software configures an object like a MUD, therefore, both creators' and users' wills embody the object. This, however, suggests a property-sharing or communal property arrangement that the personality theory seemingly finds incapable of promoting. When a MUD's creator or "grand wizard" wishes to leave it permanently, the MUD is dissolved and users, individually or in groups, must find a new space. Sometimes a displaced MUD community will create a new MUD to replace their lost one.[24] Such losses may be theoretically traumatic from the loss of labor and personal investment in the space.

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[24]Bruckman, Amy S. Multiple User Dungeons lecture. Digital Communities (4.207) course. Massachusetts Institute of Technology. Cambridge. Nov. 30, 1994.

Intellectual property protection would offer an alternative. If the MUD creator wished to leave the MUD, (s)he could license the MUD to others to run for finite amounts of time or to assume ownership permanently. License agreements could specify the ways in which the MUD were to be run or developed. In this way, MUD creators would have a formal or standardly recognized method to dissolve their personal ties to the MUD without fear of consequences from later misappropriation or misuse by others, and thus without consequent losses of utility to the creator.

Likewise, users would have a standard means of maintaining their own personal investments in the MUD. Each user, through their licensed rights, would have the right to expect to participate in the MUD for at least a specified amount of time. Thus freed from anxiety or fear of loss, they will be better enabled to participate in the creation process of the MUD; they will have the incentive to invest themselves to continue the development of the MUD space and, with each creative extension of their will, they themselves will continue to develop with respect to personhood.

License arrangements promote the "sense of continuity of self over time"[25] that personhood requires, both for users during their time granted and for creators in the longer term. It might also be argued that the time limits of patent and copyright protections represent a necessary amount of time for the creator's development of self through the specific expression protected.

The application of the concept of intellectual property to cyberspace MUDs would therefore maximize its cybernaut utility and maintain incentives for MUD development to the potential benefit of cyberspace and society as a whole. Similar arguments can be made for other types of software. The benefits of intellectual property protection for cyberspace seems clear.

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[25]Waldron, supra note 23: 245.

II.   To Abandon Intellectual Property in Cyberspace

Opponents of private property in cyberspace would still maintain the communal nature that is presently characteristic of MUDs and cyberspace in general. But this is not likely. Community property arrangements in the physical world are generally short-lived, and also restrict behavior, sometimes severely. When such arrangements are effective, it is only with a limited number of community members.[26] With the rapidly increasing number of cybernauts and with commercialization likely to increase those numbers further, maintaining a community property nature in cyberspace will likely result in increasing restrictions that would conflict with the freedom currently enjoyed in, and considered fundamental to, cyberspace by its users.

Many critics dismiss such reasoning claiming, as stated earlier, that physical world reality is fundamentally not applicable to cyberspace. It is argued here, however, that the relevance of the physical world to the virtual one is significant because of the power of context with respect to human beings. We are immeasurably framed by the context of our experiences. The very questions that we think to ask are framed by what we have known. The physical world will not fall to the wayside as cyberspace develops but will frame the way cyberspace develops. This is even now apparent in the virtual spaces--rooms, buildings, communities--already adopted from the physical world. Likewise, the study of our physical reality will help us to explore the emerging virtual one, even by contrast alone.

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[26]Ellickson, Robert C., "Property in Land." Section III: "Parceling Land Among Owners: Liberty, Privacy, Equality, and Community." 102 Yale L.J. 1315 (1992). Reprinted in W. Fisher, 'Property Law: Theoretical , Historical, and Comparative Perspectives' course notes (1994): 180-198.

THE AMERICAN OLD WEST

To consider the proposition of abandoning our current intellectual property regime in cyberspace, we consider the perhaps extreme case of a "lawless" cyberspace, modeled after the frontier communities of the American West pioneers. In "The Economy of Ideas," John Perry Barlow claims that ethics and principles will better serve cyberspace than the modern law constructs we have come to rely upon in our physical reality.[27] For example, along with the expansive details to a base MUD, users will develop rules of behavior for the MUD without relying on any formal law.

Similarly, according to Barlow, standards of conduct and behavior and not intellectual property law will hold virtual court in general. Intellectual property claims of ownership will fall to the wayside--perhaps despite encryption attempts--as a cyberspace emerges that is more similar to the oral tradition of storytelling that existed before the publication of (hard) books became standard. Furthermore, this reliance on standards will be possible because value in cyberspace will not be manifested by objects that may be owned but by the relationship a user has with the object--what the information signifies or means to the user, or how useful the information is to the user.[28] A MUD will thus be shared by many users but it will have a different value to each.

But these elements of Barlow's position are not unique to his vision or even to cyberspace. In the international world, standards of conduct, diplomatic protocol, already reign where national law systems lack jurisdiction. Customary international law is based on such standards that have come to be accepted widely enough to be considered universal. At the same time, these standards of behavior are not universally accepted or practiced. The modern terrorist is not unlike the Old West outlaw, nor perhaps the cyberspace pirate.

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[27]Barlow, supra note 9: 84-90, 126-28.
[28]Ibid.

Similarly, standards of value, including the value of information, are inherently based on individual taste, whether in the virtual or physical world. The personality theory, in fact, advocates this in its proviso for self-development and self-identification relative to others.

There is a difference between the physical and virtual world with respect to Barlow's vision. In the physical world, elements of Barlow's proposition do not replace other facets of the physical world reality but exist with them. For example, the value of a physical object is assessed both with respect to individual relationships with an object--the value the object has to the consumer--as well as with respect to its material costs. And, in the international law example, custom and protocol overlap with and are often the bases of codified international law.

An overlap of custom and law seems not only necessary for cyberspace but perhaps even the logical preference. Cyberspace is distinct from the American Old West in that the pioneers of the Old West were very isolated from other "civilization." The electronic pioneer, however, always maintains an interface with the physical world, necessitated by the hardware required to access cyberspace. As long as we maintain a physical world existence, we will require this overlap between the physical and virtual world. Likewise, property claims, or the lack thereof, in cyberspace will have physical world ramifications; they will affect the physical existence of cybernauts. Consequently, intellectual property law will most probably be unavoidable in cyberspace. At the same time, the fusion between cyberspace custom and intellectual property law originating in the physical world, would be the most practicable way to address both virtual and physical world concerns.

III.   US Intellectual Property Law and Cyberspace

Cyberspace customs reflect the nature of the cyberspace environment as it is configured by computer programming science. What this technology makes possible and what it makes more difficult, leads to conflicts with physical world concepts of intellectual property, making cyberspace property claims problematic. To understand this conflict better, we examine the application of the existing law for intellectual property protection to cyberspace and the technological complications which surround those applications.

At this time, the prominent intellectual good in cyberspace is software.[29] In the Federal Copyright Law, and for this paper, a computer program or software is defined as "a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result."[30] Software has been

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[29]The virtual world is not based solely on software. Other components exist which also present difficult questions for property protection. Databases, for example, comprise another, backbone element of cyberspace. As compilations or directories of information, they would fall under the domain of copyright protection but their creative or literary aspect is weak and thus open to attack. In Feist Publications, Inc. v. Rural Telephone Service Co. [111 S. Ct. 1282 (1991)], for example, the Supreme Court eliminated the "sweat of the brow" doctrine that had traditionally provided the broadest protection for factual compilations. What remains is protection based on original selection, arrangement, or input by the author, something, however, which is not always fixed in the digital, and normally comprehensive, databases of cyberspace. Protection is also limited to that material originated by the author but a database is useful because it stores large amounts of factual data not authored information. Copyright protection is thus jeopardized, some would say even nonexistent, effectively. [Hayden, John F. "Copyright Protection of Computer Databases After Feist." Harv. J. L. & Tech. Vol. 5, Fall 1991: 215-243.]

[30]17 U. S. C. §101.

protected by copyright as literary works[31] or audiovisual works[32] and by patents as processes.[33]

The three general categories of intellectual property protection are copyrights, patents, and trade secrets. Trade secrets are ill-equipped to protect software. Trade secrets are protectable through license arrangements in which the parties to the contract agree to safeguard the innovative aspects of a creation. As such, trade secrets are problematic for the mass distribution or accessibility that typically categorizes software.[34] Furthermore, a computer program's structure or design is inherently vulnerable to reverse engineering that would make known any technological innovations. As will be further discussed in this section, such access is often necessary for the software to be compatible with computer systems and other programs. As a result, the two predominant instruments for intellectual property protection most relevant to this study are copyrights and patents. We thus limit this discussion accordingly.

COPYRIGHTS

Copyright laws were originally created to protect literary and artistic work. The Copyright Act of 1976 explicitly protects literary, musical, dramatic, choreographic, pictorial/sculptural, audiovisual works and sound recordings.[35] It is the expressions of ideas that are protectable and not ideas themselves.[36]

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[31]"'Literary works' are works, other than audiovisual works, expressed in words, numbers or other verbal or numerical symbols or indicia, regardless of the nature of the material objects, such as books, periodicals, manuscripts, phonorecords, film, tapes, disks, or cards in which they are embodied." 17 U. S. C. §101.

[32]"'Audiovisual works' are works that consist of a series of related images which are intrinsically intended to be shown by the use of machines, or devices such as projectors, viewers, or electronic equipment, together with accompanying sounds, if any, regardless of the nature of the material objects, such as films or tapes, in which the works are embodied." 17 U. S. C. §101.

[33]"The term 'process' means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material." 35 U. S. C. §100(b).

[34]Kidwell, John A. "Software and Semiconductors: Why Are We Confused?" Minnesota Law Review. 70 Minn. L. Rev., Dec. 1985: 550-51.

[35]17 U. S. C. §102(a).

[36]Whelan Associates v. Jaslow Dental Laboratory, Inc. 797 F.2d 1222 (3d Cir. 1986), cert. denied, 479 U.S. 1031 (1987).

[see also, Baker v. Selden. 101 U.S. (11 Otto) 99 (1879); Mazer v. Stein. 347 U.S. 201, 217 (1954)].

Procedures, processes, systems, methods of operation, concepts, principles and discoveries are all thus excluded.[37] The courts, however, have recognized that certain elements outside of specific expression are protectable. In fact, there has been a consistent movement to protect ideas underlying expression.[38] The distinction between idea and expression remains unclear, despite the establishment of judicial tests—such as the Arnstein bifurcated test for substantial similarity[39] or the abstractions test for statutory subject matter[40]—in disputes between a copyrighted work and an allegedly infringing one. Where similarity of "expression concept" is established, courts have decided in favor of copyright protection.[41] Again, whether "expression concept" is a facet of expression or idea remains difficult to answer.

These complications do not disappear in cyberspace. The Copyright Act of 1976 suggests that such protection would extend to software as "original works of authorship fixed in tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device."[42] The Software Protection Act of 1980 specifically extends copyright protection to software. Disputes, however, continue, involving the scope of this protection.[43]

Apple Computer, Inc. v. Franklin Computer Corp., established that "a computer program, whether in object or source code, is a 'literary work' and is protected from unauthorized copying, whether from its object or source code version."[44] Whelan Associates, Inc. v. Jaslow Dental Laboratory, Inc. considered whether the structure of a program or only the literal elements of the program are

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[37]17 U. S. C. §102(b).

[38]Winteringham, Robert M. "Stolen from Stardust and Air: Idea Theft in the Entertainment Industry and a Proposal for a Concept Initiator Credit." Fed. Comm. L. J. Vol. 46, No. 2: 383-86.

[39]Arnstein v. Porter. 154 F.2D 464 (2d Cir. 1946), cert. denied, 330 U.S. 851 (1947).

[40]Nichols v. Universal Pictures Corp. 45 F.2d 119, 121 (2d Cir. 1930), cert. denied, 282 U.S. 902 (1931).

[41]Winteringham, supra note 38: 383-86.

[42]17 U.S.C. § 102(a).

[43]Soma, John T., James Shortall, Jr., Vernon A. Evans, "The Use of Quiet Title and Declaratory Judgment Proceedings in Computer Software Ownership Disputes." Denv. U.L. Rev. Vol. 73, No. 3 (1994): 551.

[44]714 F.2d 1240, 1246-47 (3d. Cir. 1983), cert. dismissed, 464 U.S. 1033 (1984).

protected by copyright, raising the issue of idea as distinct from expression. The court here defined the uncopyrightable idea of a computer program or utilitarian work as its "purpose or function." The copyrightable expression of a computer program was described as "everything that is not necessary to that purpose or function" of the program. From this, the court found that copyright protection of computer programs "may extend beyond the programs' literal code to their structure, sequence, and organization...."[45] In this case, the fact that the infringing program was written in a different programming language and thus literally different code did not prevent the finding of infringement.

Broderbund Software, Inc. v. Unison World, Inc.[46] held that copyright protection of non-literal elements extended to a software's user interface, the program's menu screens. Digital Communications Associates, Inc. v. Softklone Distributing Corporation[47], however, rejected this finding, holding instead that "consistent with those cases finding audiovisual screen displays of a video game to be separately copyrightable, that screen displays generated by a computer program are not 'direct copies' or 'reproductions' of the literary or substantive content of the computer programs. . . . [F]rom the fact that the same screen can be created by a variety of separate and independent computer programs[,] it is somewhat illogical to conclude that a screen can be a 'copy' of many different programs. Therefore, . . . a computer program's copyright does not extend to the program's screen displays and that copying of a program's screen displays, without evidence of copying of a program's source code, object code, sequence, organization or structure, does not state a claim of infringement."

The Digital [case] court's reading of copyright law narrowly limits protection to the subject matter explicitly stated in the Apple and Whelan cases. The technological capability of software allows menu screens of substantive similarity to be created by dissimilar code. This, however, by itself was not enough to disqualify the design of a software's detailed structure from protection in the Whelan case or the stylistic creativity and aesthetically pleasing layout and

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[45]797 F.2d 1222 (3d Cir. 1986), cert. denied, 479 U.S. 1031 (1987).
[46]648 F. Supp. 1127 (1986).
[47]659 F. Supp. 449, 455-56, (N.D. Ga. 1987).

sequence of menus screens in the Broderbund case. Clearly the copyright laws allow for great variation in their interpretation by courts. With protection consequently uncertain, the safeguarding of creative incentive remains jeopardized and the intentions of Congress to protect intellectual property remain unrealized for software via copyright. If the similarity between two programs is not substantive enough, a copier may in fact be found not guilty of infringing the copyright of the original work.

To illustrate further, the concept of a MUD as a "collaborative work of building a shared world . . . [to] help foster interaction between researchers in related fields"[48] (of media), is the underlying idea of MediaMOO, developed by Bruckman and Resnick, and would not be subject to copyright protection. The computer program that defines or creates the MediaMOO world is an expression of the MediaMOO concept and would thus be copyrightable. Arguably, expressions created by users of MediaMOO in the development of the MUD should likewise be copyrightable, whether such rights are individually granted to users as second generation authors or transferred perhaps by contractual agreement to the original authors. But if a user created expression, such as a specialized media laboratory, is more fundamentally linked to the idea of a professional media MUD in general, rather than the specific MediaMOO expression of that idea, the user creation may not be interpreted by a court as protectable. The idea of a MUD as a professional, collaborative forum remains accessible. What qualifies as expression subject to ownership as intellectual property remains uncertain.

Computer Associates International, Inc. v. Altai, Inc. illustrates a three-step test to determine substantive similarity between computer programs. First, in its Abstraction step, the computer program is isolated for each level of abstraction (program design model,[49] source code, object code, etc.) to reduce the program to its constituent parts. Also, each stage of the program's design process is retraced to identify the primary function of the program. The second step is deemed the

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[48]Kelly, supra note 12: 72.
[49]Normally, this is called the computer program's algorithm but for the sake of clarity, we refer to it as "program design model" as "algorithm" is used differently in patent law. This difference in meaning for the same word is discussed later on p. 20-21.

Filtration process, where all non-copyrightable material is removed. This includes incorporated ideas, expressions incidental to the ideas, and elements derived from the public domain. The final Comparison step is the search for impermissible copying; the remaining "core" of potentially copyright protectable parts of the program is compared with that of the allegedly infringed program. The court held in this case that the above test did not establish the degree of substantive similarity required to find copyright infringement.[50]

Outside of judicial opinions, the determination of substantive similarity is complicated fundamentally by software technology itself. All computer programming may be abstracted to a common design method; in fact, software is, in some respects, very uniform in the ways that it is developed and implemented. The design of all programs begins with a model of the process to be coded. Computer programs must operate within protocols defined by the machine or hardware on which the program is written to run, and often within operating system software as well. Computer programming languages further standardize the ways in which a computer program is coded. All programmers, meanwhile, use design strategies and elements that have been successful in earlier projects. Innovations are relatively rare. For example, object oriented programming was a major design breakthrough that has become a standard program design approach At the same time, what differentiates object oriented programming from non-object oriented programming is not always clear.

As a more precise example, in order for a new software to interoperate with an existing program, the existing program's interface specifications must be incorporated into the new software's code. This information is, of course, the work of previous software development. Interface design, in fact, is technically very innovative.[51] When interface information is not made public or available through licenses, it must be acquired by reverse engineering or decompiling the program to extract the necessary information. While reverse engineering another program would seem to be infringing, the requirement of computer programming

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[50]982 F.2d 693 (2d Cir. 1992).
[51]Samuelson, Pamela, Randall Davis, Mitchell D. Kapor, J.H. Reichman, "A Manifesto Concerning the Legal Protection of Computer Programs." Columbia L. Rev. Vol 94: 1401, Dec. 1994: 1495.

for interface information to develop interoperative software is an inherent technological constraint. Prohibiting decompilations could severely weaken that development. Meanwhile, as an example, "add-on" software--interoperative programs that enhance, supplement or modify the functionalities of existing programs--"is very common and is widely regarded as market- and competition-enhancing" in the software industry.[52] In Sega Enters. v. Accolade, Inc.,[53] the copying of a computer program was permitted under copyright statutes to facilitate reverse engineering. The issue here was "fair use." The "fair use" doctrine is difficult for copyright protection in general; in cyberspace, the distinction between "fair use" and copyright infringement is even more problematic because the actual copying of the program and not the result of such copying may be the use alleged to be fair.

The difficulties of applying other copyright doctrines are similarly exacerbated. The merger doctrine holds that copyright protection is not applicable when an idea may only be expressed in one or a few ways such that the expression and the underlying idea are considered to have merged. This again is problematic in software as the range of unique expression may be limited by hardware constraints as well as programming efficiency goals. For interoperable or add-on software, if the idea is interpreted as the earlier or base program, no software would seem to constitute statutory subject matter for copyright protection.

The scenes a faire doctrine, meanwhile, disqualifies expressions that are common, standard, or incidental to the expression of the underlying idea, as such expressions fail the originality requirement for the copyright of authorship. Again, the nature of cyberspace and computer programming often standardizes many aspects of software development. Program interfaces may be interpreted as standards and incidental for any new software that interoperates with an earlier program. With add-on software, the base program is arguably a standard or incidental to the underlying idea for which the add-on software is developed. In

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[52]Samuelson, supra note 51: 1494-98.
[53]977 F.2d 1510, 1521 (9th Cir. 1992) and modified, No, 92-15655, 1993 U.S. App. LEXIS 78 (9th Cir. Jan. 6, 1993).

fact, what constitutes a copyrightable program may be severely limited as all programs are derivative to some extent of preexisting software.

Congress it seems understood at least some of the implications of software technology in passing 17 U.S.C. Section 117, allowing the copying or adapting of a protected program in two cases: as an essential step in the utilization of the software in conjunction with a machine—ie, loading the software for use—and in no other manner; and for strictly archival purposes as long as the user maintains a legal possession of the program. Though restricted to the use and safeguarding of software by an authorized user, this allowance can have unexpected ramifications. Vault Corporation (VC) produces software that comes with a program lock disabling the software from use if it is copied from its authorized, original diskette. Quaid Software Limited (QSL) developed a program that unlocks VC's software. VC brought legal action against QSL but the Court of Appeals held that QSL did not infringe on VC's rights over its protected software as QSL's program was justifiable for the archival copying of VC's software by authorized users who would otherwise be unable to store backup copies of their VC software in case of damage.[54]

Despite such potential lapses in protection, for computer video games as audiovisual works and for computer code as literary works of authorship, copyrights offer well established and considerable protections against the copying of texts, images and audiovisual expressions generated by programs. The implication then is that copyright protection in cyberspace should, therefore, be maintained but limited, for software, to these specific cases, where the programs' primary value is the particular forms of expression and not expression concepts, or ideas.

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[54]847 F.2d 255 (1988).

PATENTS

Software is otherwise difficult to protect with copyrights because a program's value is most often derived from what the program does and not from its literal text. As with menu screens and data arrangements, the functionality of a program may be achieved by other software using different codes. Accordingly, a computer program may be considered as a process carried out by a computer system that transforms the system through the program's instructions set to a different state, to produce a given result. As such a process, software is, in principle, protectable by patents.

The US Constitution grants Congress the authority to "promote the Progress of Science and the useful Arts, by securing for limited Times to Authors and Inventors the exclusive Rights to their respective Writings and Discoveries."[55] Congress thus created a 17-year exclusive right patent granted to inventors for their discoveries.[56] Patent protection is theoretically broader than copyright protection. In addition to forbidding the copying of protected subject matter, under patent protection, independent development of a protected item constitutes infringement, regardless of the infringer's knowledge or intent.[57] The present interpretation of patents for cyberspace has developed through law cases that initially held that computer programs, as purely algorithms, were not patentable.

In Gottschalk v. Benson, a patent was claimed for a method of converting digital signals from binary-coded decimal numbers into pure binary numbers, using a mathematical algorithm. Finding that the claim would cover any use of the mathematical method in a general-purpose digital computer, the US Supreme Court denied patent protection to prevent the granting of patents in cases that would encompass and proscribe ideas—in this case, using the formula for the numerical conversion— or natural laws or conditions of nature. Patent claims, the

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[55]U.S. CONST. art. I, § 8, cl. 8.
[56]35 U.S.C. §§ 1-376 (1988).
[57]Kewanee Oil Co. v. Bicron Corp. , 416 U.S. 470, 478 (1974).
[Burk, supra note 1: 28; Soma, supra note 43: 546.]

Court held, to a mathematical algorithm or those that effectively appropriate for exclusive use a mathematical algorithm are invalid, as mathematical formulae are fundamental to nature, and thus nonstatutory subject matter.[58]

In Dann v. Johnston, the Supreme Court side-stepped the issue of patentability. The Court of Customs and Patent Appeals (CCPA) had narrowly interpreted the Benson decision by distinguishing between apparatus claims and process claims and by recognizing that processes were only unpatentable where the claim would preempt all uses of an algorithm or mathematical formula. The CCPA then held that the bank record keeping system in this case was patentable subject matter. The Supreme Court, however, overturned that decision, holding that the invention was "obvious" and thus unpatentable. The Court did not address whether or not the computer program in question was patentable subject matter.[59]

Parker v. Flook involved a patent claim for a method of updating the alarm limits for catalytic conversion process variables. Flook argued that his claim was within the Benson decision because it specified a use for the alarm limit after its calculation and because the claim was limited to a particular technological field. The US Supreme Court, however, rejected Flook's argument holding that "the only difference between the conventional methods of changing alarm limits and that described in respondent's [claimant's] application rests in. . . the [use of the] mathematical algorithm or formula" and that a post-solution application did not distinguish this claim from Benson as patentable. As such, the Court held that the application failed to meet the subject matter requirements for patentability.[60]

35 U.S.C. Section 101 states: "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title." In the Flook case, three of the Supreme Court Justices dissented, with Justice Stewart stating in his opinion that the

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[58]409 U.S. 63 (1972).
[59]425 U.S. 219 (1976).
[60]437 U.S. 584 (1978).

criteria of novelty and inventiveness, conditions of patentability as required in Section 102 and 103, had been ill-applied to subject matter. To Stewart, while the Benson case was indeed a claim for an algorithm not "limited to any particular art or technology, to any particular apparatus or machinery, or to any particular end use,"[61] the Flook case raised the issue of "whether a claimed process loses its status of subject-matter patentability simply because one step in the process would not be patentable subject matter if considered in isolation. ... No patent should issue on the process claimed in this case, because of anticipation, abandonment, obviousness, or for some other reason. But in my [Stewart] view the claimed process clearly meets the standards of subject-matter patentability of Section 101."[62]

This would appear to be the correct view because any invention, and in fact every aspect of our existence, is rooted somehow in one or more fundamental laws of nature. Justice Stewart compellingly states that "thousands of processes and combinations have been patented that contained one or more steps or elements that themselves would have been unpatentable subject matter[, such as,] ... [in] Eibel Process Co. v. Minnesota & Ontario Paper Co., 261 U.S. 45[, ... where] the Court upheld the validity of an improvement patent that made use of the law of gravity. ..."[63] Curiously, the majority opinion does in fact also state: "Respondent's process is unpatentable under [35 U.S.C.] Section 101, not because it contains a mathematical algorithm as one component, but because once that algorithm is assumed to be within the prior art, the application, considered as a whole, contains no patentable invention."[64]

This resulting confusion would seem to be clarified in Diamond v. Diehr, a landmark case for software patentability. Here, a patent claim was made for curing synthetic rubber in a heated press, the process requiring continuous measurements of the temperature in the press; these measurements are then fed to a digital computer that calculates the curing time, using a well-known mathematical formula, the Arrhenius equation, and then opens the press when the

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[61]409 U.S. 64 (1972).
[62]437 U.S. 584 (1978).
[63]Ibid.
[64]Ibid.

proper time has elapsed. Here the Court held that "when a claim containing a mathematical formula implements or applies that formula in a structure or process which, when considered as a whole, is performing a function which the patent laws were designed to protect. . . , then the claim satisfies the [statutory subject matter] requirements of Section 101." The Court thus held that the claim in this case was patentable. The mathematical formula in the claim was used in a computer to repeatedly calculate the cure time for rubber. This cure time was now more accurate because its innovative use of continuous mold temperature measurements. The patent thus issued for an improvement process and not for a mathematical formula with or without a prescribed post-solution activity.[65]

As presented here, the Diehr decision would seem to be clear but four Supreme Court Justices dissented in this case on the basis that the Diehr claim failed the subject matter patentability requirement because it did not contribute any new knowledge to the rubber curing process. While the Diehr process does improve the temperature reading of the rubber molding press, it does so without any new method of measuring the temperature but only with a new number of temperature readings.[66] The question then is whether such an innovation qualifies as an invention or discovery. Thus, while in the Flook case the dissenting opinion held that novelty had been wrongfully applied to subject-matter patentability requirements, in the Diehr case the dissenting opinion suggests that novelty has been confused for the requirement that the patent claim a new invention or discovery. It may also be worth noting that four out of nine justices did in the end disagree with the majority ruling. This raises the question of judicial capability to appropriately consider the role of software in such disputes.

The computer program aspect of the Diehr case was almost incidental to the Court's determination. With respect to software, the above cases suggest that the patentability of software is a matter of its context: the Benson and Flook cases both dealt with a program to calculate a number, while in the Diehr case the program was part of a novel process. In the Diehr case, the algorithm thus plays a functional role in a process claim as an element of an apparatus. For software

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[65]450 U.S. 175 (1981).
[66]Ibid.

considered as a process in and of itself, the above cases do indicate how patentability will be difficult to determine.

Returning to the MUD example, the computer programming principles that form a generic MUD, the underlying computer scientific algorithm, is an unapplied natural law and, therefore, nonstatutory subject matter and not patentable. The computer program, written by Bruckman and Resnick, that creates MediaMOO and enables MediaMOO users to create objects and rooms and their MediaMOO world would be granted a patent as a configuring process or method. MUD technology is thus left free for the public domain.

Some of the difficulties in determining cyberspace patentability will result in the legal working definition of algorithms: "The Court is underinclusive in saying that an algorithm is a procedure for solving a mathematical problem, unless such procedures as knitting a sweater or building a model plane are regarded as mathematical problems."[67] Certainly, the Court's definition of an algorithm is problematic but the link apparent in the above cases of this narrow definition to computer programs in general might simply reflect the fact that all computer programs fundamentally involve numerical manipulation; the Court may not have had the computer scientific expertise to consider their position more precisely.

In any case, the resulting difficulty is essentially semantical. What the computer scientists mean by "algorithm" is the process that a computer program performs or realizes. Patent protection is sought for the computer scientist's algorithm, not the Court's algorithm. What the Court means by "algorithm" are the mathematical equations that a computer program uses. The key concern is whether or not a patent claim would effectively preempt a mathematical equation as a natural phenomenon from the public domain. Scientists and engineers would refer to these mathematical equations as "formulas" or "principles", or "theories" for which they might wish appropriate development credit but not for which they would, or should, expect rights of exclusive use.

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[67]Swinson, John. "Copyright or Patent or Both: An Algorithmic Approach to Computer Software Protection." 5 Harv. J.L. & Tech. (1991): 176-77.

The use of formulas or principles are the bases on which a computer scientific algorithm is built. In order to run, a computer operates by manipulating strings of numbers that are strictly comprised of 1's and 0's. All information is translated and handled in terms of these binary-coded data strings, a reflection of the "yes" or "no," "on-off" logic from which computers were developed. This binary constraint is an example of a "natural law" of computer science. How a computer program uses a natural law is not, or should not be, patentable. What that use of a "natural law" accomplishes may be.

Because of such technological parameters inherent to computer programming, what might seem to be a process, especially to a non-expert, might actually be a fundamental law, and perhaps vice versa. Patent claim review procedures must therefore be highly extensive. The inappropriate grant of a patent to a process that effectively places a fundamental law of cyberspace under exclusive use would either severely constrain cyberspace users and the further development of cyberspace or it might create havoc through resultant disregard for the law in cyberspace. Imagine, for example, if an inventor was mistakenly given exclusive rights to the application of the law of gravity.

From the cases cited above, most computer programs would seem to be patentable in the US unless a software parallels or comprises an unapplied mathematical equation. Patentability nay then largely depends on how the invention is claimed. The US Patent and Trademark Office (PTO) now routinely issues patents for software inventions that are claimed in the correct manner. The following illustrates possible claim approaches:[68]

- "means plus function"--software that configures a physical machine--
    the focus of the claim is on the functional components of the special
    purpose machine created by the software.
- software that refines or limits steps of a process.
- software that defines the structural relationship between physical elements
    of an apparatus.

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[68]Burk, supra note 1: 31-32.

- software that transforms something from one physical state to another.
- software as a method.
- software as a product or article of manufacture.

At the same time, software patents, in fact, may be difficult to claim. This apparent dichotomy is not a contradiction--the potential to award patents inappropriately and the potential to deny patents inappropriately are not mutually exclusive--but reflects the difficulty of applying patent statutes to cyberspace.

Software patents may be difficult to claim because software innovation is incremental and may fail the novelty or invention/discovery requirement for patentability. Software development is technologically approached as an engineering discipline that builds on itself systematically, discouraging random, custom innovations to promote greater flexibility within and compatibility between programs and their applications. Modularity in software components, for example, is taught as a programming design step that reflects "good programming." Such programming principles promote the derivative nature of software, the building on the framework of existing programs.

Assuming, that the novelty/inventiveness requirement is met, the type of protection afforded by patents is suitable, in principle, for software as a process. Practically speaking, however, the main objection may become the period of protection. Because of the nature of software innovation as just described, long periods of exclusive rights to innovation may seriously constrain cyberspace development. For example, would patent rights over program interface information exceedingly restrict the potential innovation of interoperative software developers? Such concerns are central to the principles behind patent protection. Overprotection could prevent software development from keeping pace with cyberspace development in other countries. This loss to industry would then thwart the government's primary motive for patent protection.

To redefine the period of exclusive intellectual property protection for software will require an understanding of both the technical realities of software development and the context in which that development will take place--in other

words, the physical world parameters that will ultimately define the course of cyberspace development, as well as intellectual property protection there. Lastly, a more precise rendering of software intellectual property would eliminate the difficulties of applying patent statute requirements to a technological industry that merits such protection but that is in at least some respects inherently difficult to frame in patent terms.

IV.   Cyberspace Intellectual Property Protection in Practice

To understand better the difficulties of cyberspace property protection in practice, the following section describes the physical world setting for cyberspace property disputes and its implications. Much of the material presented here is a review of earlier writings, in particular Dan L. Burk's, "Patents in Cyberspace: Territoriality and Infringement on Global Computer Networks" (Tul. L. Rev. Vol. 68, No. 1, November 1993).

i.)   Jurisdiction, Regulation, and International Political Issues

US PATENT PROTECTION

We first consider the US position and record for cyberspace property protection. Though we make no evaluation as to the similarity of issues between copyright and patent protection, we focus our discussion here on patent protection as a pseudo limiting case; the greater exclusive rights granted by patents may allow us to concentrate more on matters like jurisdiction, regulation, and international respect of sovereignty, by eliminating issues of substantial similarity, rightful use, and other complications germane to any discussion of copyright protection.

The US Process Patent Amendments were established specifically to balance patent holders interests with those of importers. Consequently, the applicability of these amendments to cyberspace may be limited. At the same

time, the purpose of the legislation was to protect against infringement and the
language of the statutes can, in at least some cases, be interpreted virtually.[69]

Under Process Patent Amendment (PPA) 35 U.S.C. § 271(a), infringing
use must be "within the US."[70] In Deepsouth Packing Co. v. Laitram Corp.[71] US
patent protection was recognized as limited to within the US territorial market. In
response to the Deepsouth decision, however, Congress enacted 35 U.S.C. §
271(f) (1988) which provides that if a "substantial portion" of the components of
a patented device are shipped outside the country, certain types of liability may
become enforceable.[72] Other, similar enactments were adopted through the end of
the 1980's to increasingly allow for extraterritorial liability; today, only a few
exceptions to extraterritorial liability seem to remain: the selling of an item for
extraterritorial use in a patented process is not actionable by itself[73]; the
extraterritorial use of a patented component in a noninfringing process is not
actionable.[74]

Court decisions similarly make clear the current position of US courts to
favor enforcement of patent protection against foreign infringers if any link to US
territory is established.[75] As developed in case law[76], this link to US territory

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[69]Burk, supra note 1: 64.

[70]Burk, supra note 1: 41.

[71]406 U.S. 518 (1972). [Burk, supra note 1: 32-33.]

[72]Burk, supra note 1: 34.

[73]Standard Havens Prods. v. Gencor Indus., 953 F.2d 1360, 1374 (Fed. Cir. 1991), cert. denied,
113 S. Ct. 60 (1992). [Burk, supra note 1: 34.]

[74]Amgen, Inc. v. United States Int'l Trade Comm'n, 902 F.2d 1532, 1540 (Fed. Cir. 1990).
[Burk, supra note 1: 34.]

[75]In the 1990 Spindlefabrik Suessen-Schurr v. Schubert & Salzer Maschinenfabrik
Aktiengesellschaft case, where an injunction was upheld preventing a foreign infringer's use of
devices manufactured abroad in relation to an infringing product for use in the United States, 903
F.2d 1568 (Fed. Cir. 1990). [Burk, supra note 1: 33-34.]

[76]From Alford v. Loomis [252 F.2d 571 (Ct. Cl. 1958)], "operation of an integrated
instrumentality, a substantial portion of which is within the US, and which is operated by and for
the residents of the US[, is] not removed from the US by reason of projection of some elements of
the instrumentality beyond the political boundaries of the US because of the space requirements of
the instrumentality in its field of practical application." [Burk, supra note 1: 42-43.]

From Rosen v. NASA [152 U.S.P.Q. (BNA) 757 (Patent Off. Bd. of Patent Interferences Sept.
30, 1966)]: when considered with its ground control, the system in question did constitute an
invention that extended beyond the geographic boundaries of the US but it was situated "in this
country" for purposes of reduction to practice. [Burk, supra note 1: 42-43.]

In both of the above decisions, the issue was reduction to practice as opposed to infringement.
The standard for reduction to practice: all elements of the invention be operated in combination

establishes the concept of the extended instrumentality exception to territoriality. For the globe-spanning networks of cyberspace, this doctrine provides a means to extend patent law to network software infringement for the determination of liability and for enforcement.

Imported information is not patentable subject matter and probably not protectable by patent. However, information retrieved or processed by offshore software that would infringe a valid US (process) patent could fall under statutes which address the importation of products of an infringing process. PPA 35 U.S.C. § 271(g) and 19 U.S.C. § 1337(a) grant relief to the owner of an infringed process when the process is used outside the US to produce a product that is imported into the US, whether or not the product itself is patented or patentable. PPA 35 U.S.C. § 271(g) does not differentiate between physical and nonphysical products and can thus be applied to software processes.[77] The Process Patent Amendments also allow for a rebuttable presumption of infringement if there is substantial likelihood of infringement and if the patent holder has made reasonable efforts to show infringement.[78]

Under certain circumstances, patent law enforcement can be applied to activity entirely outside the US through the concept of inducement to infringe.[79] Inducement liability provides a deterrent against extraterritorial activity that would contribute to direct infringement within the US. In cyberspace cases, if a direct link infringement within the US is established, liability for inducement might then be applied to an extraterritorial party controlling, providing, or running the infringing software. Activity (steps to urge or encourage direct infringement)--not a requirement for direct infringement--is required for inducement liability.

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under conditions demonstrating that they work as intended to work in its practical contemplated use (Bedford v. Boothroyd, 319 F.2d 200, 209 [Ct. Cl. 1963]). The applicability of their decisions to patent law enforcement are answered in Decca Ltd. v. United States [Burk, supra note 1: 43.]

In Decca Ltd. v. United States [544 F.2d 1070 (Ct. Cl. 1976)], the Omega system, a worldwide broadcast system built by the US government, extended beyond US borders, like the Alford case. The Omega system enabled ships and aircraft to determine their location based on synchronized signals from transmitters located both in the US and in various other nations. The decision was in favor of the plaintiff, holding that the Omega system did infringe on the plaintiff's patent, based on the Rosen decision. [Burk, supra note 1: 43.]

[77]Burk, supra note 1: 45-46.

[78]35 U.S.C §§ 287(b)(5)(D), 295. [Burk, supra note 1: 64.]

[79] 35 U.S.C. § 271(b). [Burk, supra note 1: 44.]

Some knowledge, therefore, of the infringed patent and of the consequences of the actions that result in infringement are required as well. Knowledge, however, may be inferred by the inducer's actions. Solicitation does not need to be active but may include an "entire 'range' . . .[of possible activities], such as advertising or giving instruction regarding the infringing activity."[80]

Despite the consistent US position of applying patent protection to cases where any link to US territory may be established, the only clearly demarcated territory in virtual reality is the whole of cyberspace. In addition, the difficulties of international law enforcement are magnified in cyberspace by the aforementioned limited regulation capability of Internet information exchange; likewise, there is as yet no cyber-policing.

PATENT INFRINGEMENT

Because software patents are claims to a process or method, infringement will likely occur by using the software. (The unauthorized writing or selling of protected software may more likely fall under copyright infringement.) Patent infringement in cyberspace would, by definition, be extraterritorial in many cases, as no physical boundaries could delimit US territory. In fact, without physical, geographic, political, or temporal barriers, network users may risk violating the laws of one country or another by simply logging into a network.

The criteria for and the extent of patent protection for software both vary from country to country. In the US intellectual property law is fundamentally concerned with promoting innovation and creativity for the benefit of society. In France the focus of concern is the creator's best interests.[81] French and US intellectual property regimes are similar in origin but have diverged in development. This is perhaps a result of a greater influence of English philosophy (Lockean labor theory, utilitarianism) on American thought. But Australia, like America, is a common-law country with the same basic copyright regime. Yet,

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[80]Burk, supra note 1: 45.
[81]Ginsburg, Jane. "A Tale of Two Copyrights: Literary Property in Revolutionary France and America," 64 Tul. L. Rev. 991 (1990). Reprinted in W. Fisher, 'Property Law: Theoretical , Historical, and Comparative Perspectives' course notes (1994): 1141-1146.

differences exist, such as the lack of an Australian equivalent to the American merger doctrine.[82] As perhaps a more impressive example, China did not even recognize intellectual property rights before modern Western influences in its recent history.[83]

Cyberspace itself is not uniform in its manifestation in different parts of the globe. In the US, the Federal Research Internet Coordinating Committee has attempted to set standards and protocols for the Internet.[84] In Europe, by contrast, private entities have been predominantly responsible for the rise of networks and, as a result, few of these networks have policies outlining standards of acceptable use.[85]

With a network, and with distributed processing, software may be running at several different places at once or parts of it may run in different places at different times. If patent protection is extendable in some of those places but not others, infringement could then occur only in some instances and not others. Cybernauts also often lack knowledge or control over what software is in use or if such use would qualify as infringing activity. A user may also only have an indirect connection to software running at remote and/or distributed locations. In such cases, the user may not be technically "using" the software.

In Bauer & Cie v. O'Donnell , however, the Supreme Court states that "[t]he right to use is a comprehensive term and embraces within its meaning the right to put into service any given invention."[86] Logging in and benefiting from computer networked software is likely to constitute a necessary level of use or "putting into service" and, recalling that inadvertent or unconscious infringement still triggers patent liability, the unknowing cybernaut would most likely still qualify as an infringer. The language, in fact, is broad enough that most

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[82]Swinson, supra note 29: 177, 185.
[83]William Alford, "Don't Stop Thinking About . . . Yesterday: Why There Was No Indigenous Counterpart To Intellectual Property Law in Imperial China," 7 Journal of Chinese Law 3 (1993). Reprinted in W. Fisher, 'Property Law: Theoretical , Historical, and Comparative Perspectives' course notes (1994): 1183-85.
[84]Burk, supra note 1: 8.
[85]Burk, supra note 1: 18.
[86]229 U.S. 1, 10-11 (1913). [Burk, supra note 1: 40-42.]

unauthorized activity with respect to a protected software would likely qualify as infringement.[87]

To avoid any infringement, therefore, a user might need to adopt a position of non-use of a network or any other computer or machine other than his or her own. This sort of limitation is obviously not desirable, both for users and for the continued development of networks and cyberspace. On the other hand, unintentional infringement produces the same negative effects for the patent holder as intentional infringement would. If patent protection were limited to intentional infringement, this would also be problematic, as intentional infringement may be very difficult or impossible to establish, prove, detect, or stop. This, after all, is an argument for favoring patent protection over copyright protection, through, for example, the copyright's "fair use" doctrine.

STATE INTERESTS

State responses to cyberspace property further complicate its protection. If we consider again our MUD example, specific intellectual property claims of MediaMOO's creators would need to be internationally recognized if users from any nation are to be allowed to freely log in and participate in MediaMOO without corrupting the MUD--for example, by inappropriate conduct or use. International respect for licenses and access fees is likewise necessary if such arrangements are to be effective or beneficial as discussed earlier. Such respect would be necessary if those revenues are to prevent the draining of resources, if only of the support structure: online MediaMOO monitoring and maintenance personnel, hardware to run the software and enable distributed input to be processed, connection and usage costs to the primary hardware.

While cooperation in the case of MUDs would seem beneficial for all parties, cooperative agreements in general are not always easily reached for cyberspace. For example, intellectual property protection is typically viewed by developing countries as a means of developed countries to monopolize and thus cripple the development of new technology in less developed nations. The

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[87]Burk, supra note 1: 40.

abilities to collect, store, access, process, and transmit information bring economic, political, and social advantages to a nation with these abilities. Similarly, the inability to control information leads to a weakened ability to make decisions to lead the country,[88] while control over another country's information can lead to economic and political control over that country.[89]

Some nations have responded to cyberspace protection defensively, such as Brazil, which has adopted policies discouraging the exportation of local data and requiring foreign interests to process data locally.[90] Some countries even argue that national sovereignty may be compromised by the cultural dependence which may arise in a country that relies on another country's information resources. Cultural identity may thus be threatened, presenting a more subtle challenge to national identity.[91] Thus, physical territorial concerns transfer to the virtual world and issues like sovereignty, research, rights over information, and the international exchange of information are demanding re-examination for cyberspace.

Cyberspace intellectual property protection must also take into account its resultant, international consequences and the potential for retaliation by other countries. The Norwegian extraterritorial data protection policy, for example, applies to its ships in international waters and to its offshore platforms on the continental shelf but it does not apply in Spitzbergen where it may conflict with the interests of Russian settlements.[92] France, England, Australia, and New Zealand have enacted statutes forbidding compliance with extraterritorial judicial orders requiring the transfer of data. Canada has recognized the sensitivity and complexity of data-access restrictions to the protection of national interests and

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[88]The inability of certain countries to obtain or control information about their resources, such as fisheries, leads to the inefficient utilization of those resources.

[89]Developing countries have long objected to the pilfering of their resources by developed countries with greater information about the developing countries' resources than those countries themselves.

[90]Burk, supra note 1: 52.

[91]This is the same argument that the French government has proffered in support of its position to limit the number of imported American television programs.

[92]Burk, supra note 1: 54.

has advocated the practices of pre-notification and consultation with foreign governments before restricting its data access or that of its nationals.[93]

The aggressive protection of US interests in data communications and information resources has already been perceived internationally as the attempt by the US to enforce US laws abroad.[94] A General Agreement on Tariffs and Trade (GATT) ruling has also already found the US in violation with GATT treaty obligations, holding that the US § 337 Tariff Act of 1930 unfairly discriminates against foreign companies by denying them the choice of forum and procedural safeguards available to US companies in federal district courts.[95] The United States Trade Representative (USTR) could have blocked adoption of the report by the GATT Council but US opposition was withdrawn to avoid possible international sanctions. In fact, the USTR has since published (in the Federal Register) possible modifications for US trade laws to conform with the GATT ruling.[96]

National interests in information regulation clearly involve more than the promotion of innovative development and there may be times when these other interests will outweigh the protection of a creator's virtual property rights. Given the physical world implications of authority in cyberspace, intellectual property protection in cyberspace must clearly be tempered by respect for other nations' sovereignty, as well as international protocol and political bargaining.

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[93]Burk, supra note 1: 54.
[94]The US acted against a French subsidiary of Dresser Industries, cutting off the company's access to its North American database to prevent the completion of an industrial contract for the Soviet Union. The US froze Iranian assets during the Iranian revolution and hostage crisis and sought to sever Iranian access to the international Intelsat satellite information service. US courts have twice enforced contempt orders against a foreign bank that refused to divulge confidential banking records protected by Bahamian banking laws. [Burk, supra note 1: 52.]
[95]Akzo N.V. v. United States International Trade Commission. 808 F.2d 1471, 1485 (Fed. Cir. 1986), cert. denied, 482 U.S. 909 (1987). [Burk, supra note 1: 58-59.].
[96]Burk, supra note 1: 59.

ii.)   Implications and Recommendations

COURT EXPERTISE

While debates may continue as to the appropriate methods and scope of virtual property protection, courts will of course continue to render decisions in legal disputes that may set precedences and influence the development of virtual property law. In addition to the potential consequences with respect to cyberspace development, cyberspace-inexperienced courts trying to enforce US virtual property protection may also seriously compromise US political relations. To ensure that their decisions are appropriate, courts must have access to the expertise of cyberspace authorities as well as international advisors. This must be considered as essential in cyberspace-related cases.

TOWARDS AN INTERNATIONAL REGIME

State interests in virtual property expand our range of consideration outside of computer science. Increasing political and economic dependence between countries is promoting a re-examination of national boundaries, as evidenced by the formation of the European Economic Community and by the North American Free Trade Agreement. The Information Superhighway that runs through and between these countries plays a growing part in multinational relations and multilateral negotiations. In fact, a recent provision at the Uruguay Round of revisions to the General Agreement on Tariffs and Trade (GATT) provides copyright protection to computer programs.[97] Despite these developments, a single world regime in the near future is not foreseeable, and for some not desirable, because of the continuing strengths of national, cultural, and even, unfortunately, racial identifications. Such distinctions, however, are inherently absent in cyberspace; a single physical world regime would be ideal for cyberspace, as any line of differentiation in cyberspace must be forcibly

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[97]General Agreement on Tariffs and Trade—Multilateral Negotiations (the Uruguay Round): Agreement on Trade-Related Aspects of Intellectual Property Rights, Including Trade in Counterfeit Goods, 33 I.L.M. 81, 87 (1994). [Samuelson, supra note 51: 1406.]

maintained to mimic physical reality. Issues of respect for different state regimes in cyberspace and of cooperation to overcome these differences are thus matters of diplomacy and international negotiation. The related Patents in Space Act of 1990[98] is an encouraging example of respect for state sovereignty.

The hostility of developing countries for any regulation in cyberspace is a matter of technology transfer. Developing countries have little incentive to respect cyberspace property. As a cyberspace black market or "data haven,"[99] such countries would be able to capture international information resources for their own use and offer to others cut-rate prices for cyberspace activities, such as data processing In fact, transmission cost may be the only other costs above operational overhead (hardware and basic maintenance). To compete, a copyright or patent holder would then have to supply software licenses at less than the cost of transmission, assuming the patent holder could match the haven's operational costs. This is not likely if, for example, the haven can make use of economies-of-scale factors.

Thus to maximize cyberspace property recognition, developed countries must try to meet at least some of the cyberspace concerns of less developed countries.[100] Developed countries will need to adopt a consistent position for the legitimate transfer of cyberspace resources. Determining this position will require

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[98]35 U.S.C. § 105.

The previous frontier that brought patent protection into some re-inspection was space, outer space. Like cyberspace, outer space is territory outside any national jurisdiction. US patent statute language, however, limited patent statute scope to US territory. Extension of US patent protection to outer space was consequently doubtful or at least problematic. But space offered commercial research possibilities that could develop valuable industrial property.

One proposal to extend US patent law to space adapted the (international) law of the sea: US space ships as extensions of US territory, vis-à-vis ships on the high seas. But this was problematic as well because the jurisdictional character of ships derives more from registry than from territoriality, while the jurisdictional character of patents is territorial.

Congress then enacted the Patents in Space Act in 1990 adding a new section to patent statutes, 35 U.S.C. § 105, that explicitly extends US patent law to activity aboard US registry spacecraft and to foreign registry craft if provided for in an international treaty.

The provision for foreign crafts and international treaties reflects the US' respect for the sovereignty of other nations. At the same time, the statute itself reflects the US's position to protect and promote intellectual innovation in new environments and arenas.
[Burk, supra note 1: 36-38.]

[99]Burk, supra note 1: 48.

[100]This, of course, may not be enough to a country that would pit its cyberspace capabilities as bargaining chips to address other perceived inequities in the world order.

the cooperative efforts of both political and technological leaders. While such transfers will also require international cooperation, in the earlier case of marine resource technology, the result was a codified agreement, as part of the 1982 United Nations Convention on the Law of the Sea (UNCLOS III).[101]

CENTRALIZATION OF CYBERSPACE REGULATION

The "extraordinarily complicated legal regime"[102] created by Part XI of UNCLOS III establishes an "authority" body that provides a centralized organization to regulate activities for deep sea-bed activity.[103] While regulation of cyberspace is technologically opposed by the decentralized Internet, physical world government centralization for the management of cyberspace is key to resolving the inefficiencies of uncoordinated, multiple jurisdictions.

A multitude of US governmental agencies may be involved in an international computer network dispute, including: the Department of Commerce's National Telecommunications and Information Administration; the Department of State's Bureau of International Communications and Information Policy--reporting to the Under Secretary of State for Security Assistance, Science, and Technology--and Bureau of Economic and Business Affairs--reporting to the Under Secretary for Economic Affairs; the Federal Communications Commission; and the USTR. All of these US agencies interact with foreign state counterparts, as well as international telecommunications or information exchange service agencies, including: the Directorate of the GATT, the Organization for Economic Cooperation and Development, the European Telecommunication Standards Institute, the International Standards Organization, and the International Telecommunication Union.[104]

Centralized organization would greatly promote effective cyberspace property protection. To address the policy objectives of its National Information

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[101]United Nations. "United Nations Convention on the Law of the Sea." 1983.
[102]Churchill, R. R. and A. V. Lowe. The Law of the Sea. Manchester University Press, 1991: 182.
[103]United Nations, supra note 101: 42-69.
[104]Burk, supra note 1: 60.

Infrastructure (NII) initiative, the Clinton Administration has established the
Information Infrastructure Task Force and the United States Advisory Council on
the National Information Infrastructure.[105] The NII's agenda should be developed
to centralize regulation of cyberspace activities. Internationally, a similar step is
required. A cyberspace-specialized agency of the United Nations (UN), or
perhaps a special arm of the UN's International Telecommunication Union,
should be established to address cyberspace development issues internationally.
As it has for semiconductor chips,[106] The World Intellectual Property
Organization (WIPO) should draft a single, international intellectual property
legal regime for cyberspace. Cooperation by the international community,
however, will remain the major obstacle. Unwilling to give up national sovereign
rights, nations have rejected previous efforts by the WIPO to enact such
international conventions,[107] sometimes even unanimously.[108]

A BIG OR SMALL GOVERNMENTAL ROLE

Perhaps the greatest obstacle in the US to establishing a highly centralized
government organization for cyberspace is the objection from those in the private
sector who advocate the Jeffersonian ideals of "individual liberty[,] . . . pluralism,
diversity, and community"[109]--or, of little governmental presence--in the virtual
world. Chief among these advocates are the long distance carriers who wish to
develop cyberspace themselves using their existing telecommunications networks.
However, given the less than encouraging private sector history to promote

[105]The White House. "The National Information Infrastructure: Agenda For Action." NII
Agenda <nii@ra.esusda.gov>, 15 Sept. 1993;
Blake, Jonathan D. and Lee J. Tiedrich. "The National Information Infrastructure Initiative and
the Emergence of the Electronic Superhighway." 46 Fed. Com. L.J. 397, June, 1994: 410, 416-
421.
[106]17 U.S.C. §914. "Findings and Purposes." Pub. L. 100-159 Sect. 1(a)(3): 134.
[107]For further discussion regarding the WIPO treaty for semiconductor protection, refer to Part V.
[108]Miller, Nicholas P. and Carol S. Blumenthal. "Intellectual Property Issues." Toward A Law of
Global Communications Networks. Ed. Anne W. Branscomb (1986): 232.
[109]Kapor, Mitchell. "Where is the Digital Highway Really Heading? The Case for a Jeffersonian
Information Policy." Wired 1.3, July/Aug. 1993: 53.

consumer information services, others claim that governmental action is necessary for the initial development of cyberspace.[110]

In other countries, government-owned telecommunications monopolies have already begun to realize common access to cyberspace. Nippon Telegraph and Telephone Corporation has announced plans to lay fiber optic cable for network access to almost every home, office, and factory in Japan.[111] In France, a highly successful consumer network, the Minitel, is already operating in roughly 18 percent of households, providing electronic phone and service directories, mail, travel services, banking, and catalog shopping.[112]

In the US, the debate may have already reached a resolution, as Mitchell Kapor cites:

> By focusing on public and private cooperation, with the private
> sector in the lead role of building the actual networks and
> government in a supporting role, the administration's
> communication technology initiatives have gained favor among the
> titans of the communication industry.[113]

The Jeffersonian ideal of promoting openness and freedom in the development of cyberspace would seem to be effectuated by political, and economic, reality if not idealistic vision. Nevertheless, whether or not the vision is ideal, compromises need to be made on both sides of the big-small government issue. While the private sector may take the lead role in building cyberspace, the government should be supported in reorganizing to centralize its regulatory agencies' roles in cyberspace.

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[110]Bell Laboratories' Picture Phone and Knight-Ridder's videotext Viewtron were expensive failures; Sears-IBM Prodigy information service has relatively few subscribers; and banking by computer, though available, is not generally practiced [Burk, supra note 1: 22.]

[111]Burk, supra note 1: 23.

[112]In fact, the Minitel was effectively the only general route available in France to purchase tickets for the 1992 summer Olympic Games in Barcelona.

[113]Kapor, supra note 109: 55.

V.   Reconfiguring Intellectual Property Law for Cyberspace
With The Semiconductor Chip Protection Act of 1984

The previous section describes the setting in which changes to our present handling of cyberspace property must be made. Given the many interests that must be accommodated, retaining as much of our existing intellectual property regime as possible is both practical and politically advantageous. Fortunately, this regime does in fact provide the necessary tools with which we can begin constructing virtual property law. What follows are elements for a proposed approach to intellectual property for software protection including a new legal protection tool designed specifically for software. Other types of virtual objects may also require specialized statutes that may or may not be similar to those presented here.

We begin with trade secrets. This form of protection is only effective for software that is developed for specialized use and not widely distributed or accessible by many users. For such software, trade secrets may be a very effective means of securing rights over the software and should be considered accordingly, for such limited cases.

We next restate that copyright protection for software should be maintained for those limited cases where the most valuable aspect of the software is not functional but its particular form of expression: actual codes or texts, images and audiovisual expressions generated by programs.

The distinction between idea and expression may remain difficult in software copyright disputes. As described earlier, because of the "uniform" nature of computer programming, independent creation of similar programs that address similar problems may easily result in substantive similarity with a copyright-protected program. This, however, should not constitute infringement. In such cases, therefore, the development process of an allegedly infringing

program needs to be studied to verify independent creation. Because a computer program may be described through many levels of abstraction, a copyright dispute may involve extensive investigation through each abstraction level of the computer programs involved.

The court in Gates Rubber Co. v. Bando American [114] warns: "Application of [the] abstractions test will necessarily vary from case-to-case and program-to-program. Given the complexity and ever-changing nature of computer technology, we decline to set forth any strict methodology for the abstraction of computer programs."[115] This view notwithstanding, the analysis described previously in Computer Associates International, Inc. v. Altai, Inc. is a model that should be adapted and utilized; the court will again need to rely on computer science and software industry expertise to make use of this analysis model effectively and appropriately.

Patent protection for software should be pursued for those cases where the software is clearly part of a patentable process or for those expectedly unusual cases where the software clearly meets the patent criteria of inventiveness, discovery, and novelty.

For cases where the established forms of intellectual property protection do not clearly or easily apply to software, as described above, we propose a specialized type of protection, based on copyright and patent protection but tailored to fit the technological characteristics of software.

We begin with the Semiconductor Chip Protection Act of 1984 (SCPA)[116]. To pass SCPA, Congress decided that semiconductor technology was too functional for copyright law and that it improved too incrementally for patent law to provide protection. Much of the technological innovation in semiconductor chips is inherently accessible from the product itself. While costly to develop,

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[114] 798 F. Supp. 1499, 1513 (D. Colo. 1992), aff'd in part, vacated in part, 9 F. 3d 823 (10th Cir. 1993).
[115] 9 F. 3d: 834-35. [Sprague, supra note 25: 650.]
[116] 17 U.S.C. §901 et seq.

semiconductor designs may be easily copied once the product is available.[117] As described earlier, all of these statements are also true for software.

Working then from this earlier example of specialized, sui generis,[118] information technology protection, we propose that the existing intellectual property regime be adapted for software to incorporate the following provisions, which we refer to as a proposed Software Protection Act (SPA).

Statutory subject matter for software is to be defined as that which:
(1) is original; or
(2) consists of designs that are not staple, commonplace, or
familiar in the software industry, or variations of such
designs, combined in a way that, considered as a whole, is
not original.

To prevent the proscribing of "natural laws":
in no case will protection for software extend to any idea,
procedure, process, system, method of operation, concept
principle, or discovery fundamental to the engineering science
of computer programming, regardless of the form in which it is
described, explained, illustrated, or embodied in such work.

We propose the following exclusive creator rights:
(1) to reproduce the software by any means
(2) to import, distribute the software
(3) to induce or to knowingly cause another person to do any
of the acts described in (1) and (2).
To "distribute" means to sell, lease, bail, or otherwise transfer,
or to offer to sell, lease, bail, or otherwise transfer.

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[117]Samuelson, supra note 51: 1508.
[118]sui generis [Latin]: Of its own kind or class; i.e., the only one of its own kind; peculiar. Black's Law Dictionary (Abridged 6th Ed. 1991): 1000.

Distribution or importation of a product incorporating a
software as a part thereof is a distribution or importation of that
software.

Similar to those granted with patents, the above exclusive rights are to be
comprehensive, proscribing the copying of protected subject matter, the products
of an infringing process, the inducement to infringe, as well as the independent
development of a protected item regardless of the infringer's knowledge or intent:

An "infringing software" is a software which is made,
imported, or distributed in violation of the exclusive rights of
the owner of a protected software.

Any person who violates any of the exclusive rights of the
owner of a software, by conduct in or affecting commerce,
shall be liable as an infringer of such rights.

"Any person" includes any State, any instrumentality of a
State, and any officer or employee of a State or instrumentality
of a State acting in his or her official capacity. Any State, and
any such instrumentality, officer, or employee, shall be subject
to these provisions in the same manner as any
nongovernmental entity.

Because of the nature of software development, however, we also allow
the following limitations on exclusive creator rights:

(a) reverse engineering:

it is not an infringement for—

(1) a person to reproduce a computer program for
the purposes of teaching, analyzing, or
evaluating the concepts or techniques embodied
in the program or its design; or

(2) a person who performs the analysis or
evaluation described in paragraph (1) to
incorporate the results of such conduct in an
original computer program made to be
distributed.

(b) innocent infringement:

an innocent user (a person who uses a computer program
in good faith and without having notice of protection
with respect to the program)—

(1) shall not be liable for importation, distribution,
or other infringing use of the protected software
before the user has notice of protection with
respect to the software; and

(2) shall be only liable for a reasonable royalty on
each importation, distribution, or use of the
protected software after having notice of
protection with respect to the software, for
activity begun before such notice that continues
after such notice.

Reasonable royalty is to be determined by the court in a civil
action for infringement unless the parties resolve the issue by
voluntary negotiation, mediation, or binding arbitration.

The SCPA calls for the Copyright Office to handle semiconductor claims.
The Copyright Office is similarly designated for SPA claims. Compared with
patents, the cost of obtaining a copyright is relatively low and copyright
registration is relatively straightforward and expeditious. Determination of
protectability for software under this SPA is to be modeled, as with the SCPA,
after the copyright examination procedures and not the more lengthy and costly
patent review procedures.

In order to promote the protection of US software interests abroad and to
promote uniform international protection of software property,

subject to the provisions on statutory subject matter, a software
is eligible for protection under SPA if:

(1) the owner of the software is (i) a national or domiciliary, of
the United States, (ii) a national, domiciliary, or sovereign
authority of a foreign nation that is a party to a treaty
affording protection to software to which the United States

is also a party, or (iii) a stateless person, wherever that
person may be domiciled;

(2) the software is first commercially exploited in the United
States; or

(3) the software comes within the scope of a Presidential
proclamation issued under the following:

Whenever the President finds that a foreign nation extends, to
software of owners who are nationals or domiciliaries of the
United States, protection (1) on substantially the same basis as
that on which the foreign nation extends protection to software
of its own nationals and domiciliaries and software first
commercially exploited in that nation, or (2) on substantially
the same basis as provided here in these provisions. The
President may revise, suspend, or revoke any such
proclamation or impose any conditions or limitations on
protection extended under any such proclamation.

In a commercialized cyberspace, software property recognition will
become even more significant. Software usage fees may become standard to
recoup the costs of development as well as maintenance. Such fees may also
become a standard means for creators to realize profits. If the software is
distributed to various computer sites, licenses may be used for regulation to
ensure program integrity. License fees may be charged to cover organizational
and coordination costs as well as local maintenance costs. Licenses will insure
continued access to the user. License arrangements or contracts may also
explicitly free the creator from later liability for misappropriation or misuse of the
software by others.

Other specifications that are crucial for effective software property
protection require the expertise of computer science and of the software industry.
In order to make a new SPA as precise as desired--for, say, utilitarian as opposed
to expression software--the definition for "software" as stated in copyright law
should be reconsidered before being applied to a new SPA. Another principal
determination is the duration of protection.

A proposed (economic) market-based legal protection regime for software specifies this duration as the amount of time necessary for the creator to establish a niche in the market without a second producer establishing an niche in an adjacent market and undermining the creator's efforts.[119] While this suggestion is attractive and would seem to allow for the most efficient development of the software industry, a market-based approach to the protection of virtual property may not accommodate interests other than economic ones. Would it, for example, prevent a second producer from implementing a software attributed to a first creator in ways that the creator finds offensive, even though the creator's market niche is established? Such injuries to personal utility may in turn discourage the incentive to expend the labor to innovate.

On the other hand, a neglect of personhood or personal utility concerns may be counterbalanced by the benefits to cyberspace development that a market-based regime may provide. With the market as the primary determinant, the number of claim disputes and avenues for such disputes would most likely diminish as the range of concerns would be restricted to market considerations; likewise, the resolution of any disputes that do occur may be facilitated. The incentive to innovate may thus be preserved. However, it seems equally possible, if not more likely, that without the protection of personal utility, there may not be many claims to potentially infringe.

The duration of exclusive rights for software protected under a new SPA should be determined from the technological nature of software development. The SCPA grants ten years of protection to semiconductor claims, significantly less than that for general patents. Given the rapid development of cyberspace and the common, engineering principles that govern software development, the infringing, independent creation of an "original" software by a second developer may be expected in a short amount of time. As patents in general are limited by the "inevitability" of the discovery or creation protected, the period of exclusive rights over a software by a first creator must likewise be limited according to the technological reality of software and cyberspace development.

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[119]Samuelson, supra note 51: 1511-1512.

As with patents and semiconductor chip protection, the SPA duration of protection should also be limited to a length of time suitable to the recovery of the protected software's development costs. Software development does not normally involve the millions of dollars that are typically invested for semiconductor chip innovations. In addition, the useful life of a software is normally only a few years. Given the above considerations, the SPA period of exclusive rights is expected to be less than the ten years specified for semiconductor chips under SCPA. Like determinations of software originality, setting an appropriate protection period will require computer science and software expertise.

Enforcement of exclusive rights and infringement determination remain extremely problematic. The costs in time and money and effort of any claim review will be quite high, both to the public and the individual. As was the case in the only significant SCPA infringement case to date,[120] tests for substantial similarity like those developed for copyright infringement cases may be used to determine SPA infringement of a protected software. SCPA-like remedies specifications, similar to those for copyright, should be made for SPA infringement committed after software protection has been established.

Infringement of the exclusive rights in a software may be pursued by civil actions, including temporary restraining orders, as well as preliminary and/or permanent injunctions to prevent or restrain infringement. The court may similarly order the impounding of all software products or products by which the software may be reproduced that are claimed to have been used in violation of the owner's exclusive rights. Awards may include actual damages suffered by infringement, as well as the infringer's profits attributable to infringement but not taken into account in computing the award of actual damages. An award for statutory damages may be pursued instead. Full recovery of costs may include reasonable attorney's fees. The court may also order the destruction or other disposition of any infringing software products or products by which the infringed software may be reproduced.

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[120]Brooktree Corporation v. Advanced Micro Devices, Inc. 977 F.2d 1555. Fed. Cir. 1992.

With respect to infringement, detecting the cybernaut infringer remains the limiting difficulty. For both infringement and enforcement, because the technology of the Internet enables computer crime to remain elusive from the law, it may only be through technology that we can develop the means to better effect the law.

A new federal SPA will preempt state laws that grant rights or remedies equivalent to those provided by the act. The new specialized software protection is to be utilized in conjunction with the other, already established forms of protection—copyrights, patents, and trade secrets—as appropriate. For example, trade secret protection may be a viable form of protection during software development stages that occurs prior to public disclosure. The laws for these already established protections will be unaffected by the SPA.

Despite the patent-like exclusive rights granted by this proposed SPA, traditional copyrights, patents, trade secrets will likely remain the preferred instruments of protection, when appropriately applicable, as specified above. Copyrights for example offer a substantially longer protection period.[121] The traditional regimes are well established, while a new legal regime is likely to require initial procedural delays in obtaining protection claims and transitional periods of protection as the existing legal regime adapts to the new legal protection instrument.

LEARNING FROM THE SEMICONDUCTOR CHIP PROTECTION ACT

The SCPA is now more than ten years old and in that time period there has been only one major case, Brooktree Corporation v. Advanced Micro Devices, Inc., in which a $27 million judgment was found against the defendant for SCPA infringement, as well as patent infringement.[122] There are at least two possible reasons that there has been so little dispute resulting from SCPA protection. Firstly, the SCPA may so adequately address the protection of semiconductor

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[121] 17 U.S.C. §302.
[122] 977 F.2d 1555. Fed. Cir. 1992.

chips that potential infringement of SCPA protected masks is both discouraged by the act itself and clearly avoidable by the industry. If this is true, a similar law for software would greatly simplify the often arguable protection schemes that must be orchestrated for software at present.

A second possible reason for the SCPA dispute record is that the SCPA is so inadequate that industry effectively does not utilize its protection: "The general counsel of several semiconductor companies have [expressed]. . . that protection under SCPA is relatively meaningless." Because it permits reverse engineering for analysis and study of a protected chip's design, the SCPA is said to be unable to protect these costly design innovations from copying. For software, as discussed earlier, to whole genres of software products, like add-on software, patent-like protection preventing access to software design for original development based on such designs would severely constrain the growth of software industry. Arguably, the costs to society of such protection would then outweigh the benefits of that protection. For this reason, the proposed SPA is based on both copyright and patent laws, and not one or the other. Just as the SPA duration of protection is to be limited to prevent the hampering of industry growth, the degree or extent of protection must be tempered to allow reverse engineering and the other exceptions to exclusive rights as given above.

Reaching the market first was also deemed by semiconductor companies' counsel as "more important" as late entry with a copied chip design might prevent profitability.[123] But, as discussed earlier, intellectual property protection involves personal and utilitarian concerns beyond pure profits. From another semiconductor company representative, we are told that the SCPA would be stronger if it specifically protected discrete cells in a larger chip design and that the ability of a jury to reject infringement claims on the basis of insufficient substantial similarity would become more and more problematic with smaller and more complex chip designs.[124] Again, fixing protection to discrete cells may defeat SCPA protection if the industry should develop such that substantial

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[123]Ladra, Michael A. and James C. Otteson. "Chip-Protection Law May Miss the Mark." The National Law Journal, Section: Intellectual Property. (Copyright 1994. The New York Law Publishing Company.) Jan. 24, 1994: S8
[124]Ibid.

similarity may be found within a cell of an allegedly infringing work. That juries or courts decide substantial similarity allows the determination of infringement to evolve along with the industry; the use of industry expertise in infringement claims allows for findings appropriate to the development of the industry itself. The same would apply for a specialized software based on the SCPA. In fact, because this argument already applies to present software copyright disputes, it is not effective against a proposal for a new specialized SPA.

OTHER COUNTRIES AND THE US SCPA

While intellectual property protection remains problematic between developing countries and industrialized ones, many industrialized countries, like Switzerland,[125] and Japan,[126] have incorporated software in their copyright laws as well as adopted sui generis legislation for integrated circuits. Canada, Australia, Austria, Finland, and Sweden have also adopted similar laws.[127] As mentioned in Section IV, the WIPO drafted an international semiconductor chip protection treaty. The United States and Japan, however, refused to sign, while the Netherlands abstained. With the United States and Japan producing about 80 percent of the world's semiconductor chip business and the Netherlands also a major producer, these three countries control almost all of the world's supply of integrated circuits. According to the US. Patent and Trademark Office, the WIPO treaty was "unacceptable" to the United States because the protection it grants is less than what the US SCPA already provides.[128]

[125]Probst, Franz and Georg Rauber. "Swiss Copyright Law Revisions and Protection Of Computer Programs And Integrated Circuits." The Computer Lawyer, Section: International, Vol. 7, No. 4. (Copyright 1990 Prentice Hall Law & Business.) April 1990: 1.

[126]"How To Protect Technology That's Transferred To Japan; Computer Software, Semiconductor Chip 'Mask Works'." East Asian Executive Reports, Section: Japan; United States, Volume 12, No. 2. (Copyright 1990 East Asian Executive Reports, Inc.) Feb. 15, 1990: 7; "Chip design protection law outlined." Japan Economic Journal (Copyright 1985 The Nihon Keizai Shimbun.) Jan. 29, 1985: 1.

[127]"PTO Announces Its Extension of Interim Chip Protection Orders." BNA International Trade Daily. (Copyright 1991 The Bureau of National Affairs, Inc.) July 26, 1991.

[128]"U.S., Japan Refuse To Sign WIPO Treaty On Protection Of Integrated Circuits." International Trade Reporter, Section: General Developments: Intellectual Property, Vol. 6, No. 23. (Copyright 1989 The Bureau of National Affairs, Inc.) June 7, 1989: 742.

While it will be difficult to change the global practice for software protection, reconfiguring software protection with a specialized intellectual property instrument is conceivable, given the leading role the United States played with sui generis semiconductor chip legislation.[129] Japan's semiconductor chip protection act was developed in accord with the US SCPA[130], as was semiconductor chip protection legislation by the United Kingdom (UK) and by the European Community (EC).[131] It is possible that a new US software protection act would likewise prompt similar legislation in other countries.

FINAL NOTE

We end with a return to the Office of Technology Assessment's "Intellectual Property in an Age of Electronics and Information"[132] and this report by Science magazine:

> [A]ccording to Stanford University law professor Paul Goldstein, chairman of the OTA's advisory panel for this report,...[t]he best approach may be to cope with each technological case as it comes along.... ...Congress should try to fit each new technology into the existing legal framework, but, where this would create a clear distortion, it should...enact a new law. This is what Congress did in 1984 with the creation of the novel Semiconductor Chip Protection Act.... This approach has proved more effective...than the decision in 1980 to amend old copyright laws to accommodate the needs of software writers."[133]

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[129]The United States has previously enacted controversial legislation that has effectively required global adherence in its Oil Pollution Act of 1990. Under this act, for example, oil tankers entering US ports are required to have double hull construction. While the international community was displeased with this unilateral ship design directive, countries have complied rather than refrain from trade with the US.

[130]East Asian Executive Reports, supra note 126: 7;
Japan Economic Journal, supra note 126: 1.

[131]Hermann, A. H. "Protecting Invisible Property." Financial Times, Section I; Business Law. (Copyright 1989 The Financial Times Limited.) Feb. 2, 1989: 41.

[132]Office of Technology Assessment, supra note 8.

[133]Marshall, Eliot. "Copyrights obsolete in an electronic age, OTA finds; Office of Technology Assessment." Science, Vol. 232, ISSN: 0036-8075. (Copyright American Association for the Advancement of Science, Copyright 1986 Information Access Co., a division of Ziff Communications Co.) May 2, 1986: 572.

Conclusion

The virtual interface with the physical world would seem to insure that intellectual property law will most likely not fall to the wayside in cyberspace, a reality of the human condition as well as a simply political one. Similarly, the idea that cyberspace creator rights could be protected by non-legal standards of behavior or by economic initiative alone is not realistic given that individuals-- and even countries, such as developing ones--will almost definitely be interested in taking advantage of such an approach to further their own virtual interests.

Access to cyberspace is generally held to be a common right and not a privilege. With the number of users increasing dramatically and with the expected general commercialization of cyberspace, the potential onslaught of rules and regulations to preserve the community property nature of cyberspace would not be welcomed by users. Furthermore, the resulting complications that usually accompany such rule-making might outweigh those arising from individual property claims. These problems are most often due to the inability of existing intellectual property protections to address cyberspace property concerns effectively.

Copyrights emerged largely in response to the development of printed expression--the printing press, books, and their resulting widespread availability; likewise, patents were established with industrialization, machine processes. As another revolutionary and revolutionizing development, cyberspace would seem to warrant a novel form of intellectual property protection. Congress responded accordingly in passing the 1984 Semiconductor Chip Protection Act (SCPA) for an information technology with significant similarities to software.

Based on the SCPA, the proposal described in this paper calls for a new software property regime that combines the affordances of copyright and patent protection, while eliminating their applicability constraints to software. In current

practice, software patents may effectively protect expression much in the same way that copyright protection does. This might further support the adoption of a compositely based system. The proposal here only addresses software. A cyberspace property regime, meanwhile, must also be able to accommodate other virtual objects, like databases. Unless a virtual property protection tool can be fitted for all of cyberspace, a regime that includes specific statutes for different types of virtual objects may be required.

Upholding theoretical principles with respect to ownership is essential for effective virtual property protection. As in the physical world, individuals can and do develop "territorial"-like attachments to virtual objects on which they have labored; for the continued development of cyberspace and cybernauts, it seems likely that extensions of these attachments to individual property claims will also develop. A strictly market-based legal regime for cyberspace property would thus seem inadequate, for example. The recognition of intellectual property in cyberspace is supported by theoretical, political, as well as economic or practical bases. These physical and virtual world realities, along with our existing intellectual property law, provide the foundation and structural framework through which creator rights protection goals may be realized for virtual property. Successful strategies must also remain flexible enough to consider the creator's benefits from such protection relative to its impact on overall national utility. International utility should be similarly considered.

As with the international cooperation evidenced positively in the exploration of and policies toward Antarctica, we must remember in our colonization of cyberspace that we are not the only settlers, that our cultural viewpoint is not the only reality, nor is it dominant or preferred. The variety of past and present intangible property ownership--from the oral tradition before book publishing in Europe to Imperial China's lack of intellectual property as a concept, to modern exemptions from American copyright law for works of tribal origins--indicates that a cyberspace property regime may be approached very differently by different peoples.

The resistance to intellectual property law for cyberspace may be initially positive if it will help us to anticipate and prepare for the introduction to cyberspace of an effective intellectual property law. If we consider the persistence of such law a given condition, our challenge is to realize an effective application of intellectual property law in the virtual world. The proposal developed here is essentially a model from which to further our efforts to develop a suitable, comprehensive virtual property regime. Intellectual property law is a tool. If we can utilize our experiences with it, we can use this tool in cyberspace to our advantage.