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THE BIOLOGY OF THE BROADCAST FLAG

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by

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I. Summary

In February 2003, more than seventy lawyers and engineers from the U.S. information technology, consumer electronics, and video content industries gathered outside Washington, D.C. to begin consideration of technologies that would ensure that embedded copy protection signals remained persistent when information was changed from digital to analog form. During this meeting, a Warner Bros. representative said that the absence of rules in the analog world was preventing natural evolution towards the broad use of digital forms of high-quality content, even though digital was clearly a superior technology that should “win” the evolutionary battle.¹ In other words, this individual was claiming that the existence of machines that do not follow content industry rules is unnatural—because use of such machines will slow natural evolution towards a well-controlled, successful digital future. Such a use of evolutionary theory is indicative of the industry’s firmly-held belief that it has a natural right to prevail, and that its current business models should be protected by courts, legislators, and regulators.

As part of this believed biological imperative, the Motion Picture Association of America (“MPAA”) and its content affiliates (broadly referred to as the U.S. “content industry”) would like all consumer electronics and information technology companies to innovate “according to the rules.” This would ensure that Hollywood’s movies are specially protected from unauthorized redistribution inside and outside the home through adherence to a “broadcast flag” scheme (proposed to be implemented by the FCC) and through anticipated legislation that will require U.S. manufacturers to follow policies designed to ensure that protection signals are not lost in any digital-analog-digital conversions (so that the “analog hole” is closed). The triggering event for the broadcast flag/analog hole discussion is the digital television (“DTV”) transition, a step that is supposed to occur by 2006. Moving to DTV will release a good deal of radio spectrum for new uses (because the broadcasters will use only their digital spectrum and will give back their analog spectrum), and the FCC will auction licenses for this spectrum—with the proceeds going to the federal government. Congress has been assuming in its budgeting

1. Author’s personal notes from February 12, 2003 meeting of Analog Reconversion Discussion Group. No reporters are permitted to attend meetings of the Analog Reconversion Discussion Group, and there is no published record of this February 2003 meeting.

process that revenues from the resulting spectrum will be more than \$6 billion. Thus, there is tremendous pressure to complete the DTV transition. Hollywood is using this pressure to ensure that its rules are adopted, saying that unless their high-quality content is adequately protected it will not be broadcast, and that no one will want to watch low-value broadcast content. Because the DTV transition is dependent on consumers buying new digital televisions, and presumably consumers who do not want to watch low-value content will buy new machines, Hollywood's threat has facial appeal to regulators.

While it is beyond question that the digital world poses special threats to businesses that live or die on their ability to control the distribution of content, the arguments made by the MPAA and its content colleagues in support of national (and, eventually, global) control over the functionality of the devices that manipulate content are fundamentally troubling for the future of innovation and the future of law itself. It is easy enough to think of innovation as a kind of mechanical evolution. The preserving of the rich evolution of any system necessarily involves a willingness to allow the system to mutate or be random at various points in order for there to be choices that can be selected. If choices are squelched through technical mandates directed at assuring the survival of particular business models, new and interesting creatures—machines, applications, and ways of interacting—will not come into being. The approaches taken by the content industry in the broadcast flag and analog hole contexts, if successful, may have the unintended (or intended) consequences of (1) keeping new creatures (or new machines) from appearing and (2) keeping a particular creature (the studios' business model) from becoming extinct. Social Darwinism of the kind being invoked by the MPAA has a long history in the U.S., and has been used as justification for any number of ultimately undesirable end-goals. Usually a Social Darwinist wants to argue against regulation that would bolster a particular group; here, ironically, the content industry is arguing for regulation to support its survival.

But the content industry has (perhaps inadvertently) hit on a very important way of thinking about the law. Attention should be paid to the evolutionary ecosystem of the law as the background medium in which innovation occurs, business models evolve, and social factions grow and prosper. There is now a greater understanding that law and code are complementary; both law and

code shape our world.² This article argues that preserving the flexibility and evolutionary richness of this code/law background medium (“code/law”) should be our aim. Both codes and laws that unduly freeze innovation need to be avoided, so that code/law can continue to evolve. This evolution would seek a “sweet spot” for both code and law, a place somewhere between randomness and order that allows for rich and interesting changes.

Concretely, the content industry should be adopting and using many different forms of private digital rights management (“DRM”) techniques in which encryption follows the content, rather than being applied by machines. More decentralized, contractual forms of legal order such as those promoted by private DRM systems will allow innovation in code/law to continue. No centralized decision maker can adequately judge whether the particular tradeoff between protection of content (“protect our material or broadcast television as we know it will cease to exist”) and innovation in machines (“manufacturers will be able to innovate as long as they follow the rules”) being urged by the content industry in 2004 is the right one. These genes need to be tested in many places, allowing a cumulative assessment to emerge. The FCC and Congress, by contrast, have only interest groups to talk to, and cannot possibly come to the optimal decision that will protect innovation and content in just the right way. Protecting content locally, contractually, and privately will encourage continued availability of choices, both of machines and of content. This is the “sweet spot” of law and code that is more likely to produce a fertile background environment for continued innovation and change.

Part II of this Article draws out the key factual and legal themes at play in the broadcast flag, plug and play, and analog hole discussions now underway in the U.S. Part III presents the structural questions posed by the content industry’s use of evolutionary theory. Part IV plays out the possible consequences of the content industry’s quest of keeping new creatures from appearing, keeping old creatures alive, and trumping copyright law through technology. Part V presents the “sweet spot” analysis for the code/law petri dish, and suggests that private DRM efforts are more likely to produce innovation than technology mandates, provided that competition among DRM platform providers remains lively.

2. See R. Polk Wagner, *The Case Against Software*, ___ U. Penn. L. Rev. ___ (2003) (working draft available at <<http://www.law.upenn.edu/fac/pwagner/research.html>> (accessed Nov. 9, 2003)) (proposing a new analytic framework for evaluating cyberspace policy, based on reconceiving software as complementary to law).

II. Background

More than three years ago, Napster focused global attention on the challenges facing copyright owners in the digital age. Since then, downloading, sharing, ripping and burning of online music files have become widespread practices. While some of these uses are arguably reasonable and legal, the Recording Industry Association of America (“RIAA”) and many in the recording industry believe that illegal online file sharing has caused a significant decrease in CD sales.³ The video content industry, for its part, is anxious to avoid the 30 to 40 percent loss in revenue that it believes has been experienced by the music industry by filesharing, and is searching for legislative and other solutions that will stave off similar losses.

The threat of digital redistribution is particularly acute for movie studios and other video content producers because their business models are today highly dependent on repurposing programming. The current movie studio business model is based on studios’ ability to exploit multiple distribution streams for each work they produce. Licensing and distribution agreements for these windows, domestic and international box office, airline performances, pay-per-view, rental, home sale, satellite, premium and basic cable, over-the-air broadcast, etc., result in payment to the studios.⁴

3. According to data from The NPD Group, more than half of lost music sales during the year between the fourth quarter of 2001 and the fourth quarter of 2002 can be attributed to file sharing. But 60 percent of music consumers with access to the web have not downloaded any music for free, and sales to those customers are off by as much as 7 percent. In general, consumers across all demographics are purchasing less music now, in 2003, than in the past two years. Total full-length CD sales were down 13 percent Q4 2002 compared to Q4 2001. Sales during the first quarter of 2003 were down by nine percent. NPD Group, *Declining Music Sales: It's Not All Digital Downloading, Says The NPD Group*, Press Releases <http://www.npd.com/press/releases/press_030605.htm> (June 5, 2003). According to a recent Pew Internet and American Life Project survey, two-thirds of internet users who download music do not care whether they are violating copyright laws. The survey estimated that roughly 35 million American, representing 29 percent of internet users, adults use file-sharing software. Pew Internet Project, *Music Downloading, File-sharing and Copyright: A Pew Internet Project Data Memo* <<http://www.pewinternet.org>> (July 2003).

4. By 2006, movie theater admissions and the movie aftermarket (DVD sales, rentals, TV) will be generating more than \$50 billion in North America, according to PricewaterhouseCoopers. Robert La Franco, *Lots of money has been pumped into Hollywood's first online movie distribution model, but is it really a viable business? Truth is, it doesn't have to be*, Red Herring <<http://www.redherring.com/mag/issue122/5934.html>> (Feb. 3, 2003). Arguably, although the “broadcast flag” scheme discussed in this article covers digital television, very few “high-quality” movies (protection of which is presumably driving Hollywood to seek FCC protection) are seen first on television. Television has traditionally been an aftermarket for theatrical releases.

In March 2002, at the urging of the video content industry, Sen. Hollings introduced his Consumer Broadband and Digital Television Promotion Act. The Hollings bill, Sen. 2048, would have allowed the FCC to mandate a security standard protective of digital content for all “digital media devices”; the government was to develop a standard if the private sector was unable to agree to one on its own. Under the bill, it would have been illegal to make or provide a digital media device that did not contain such standard security measures (or to remove such measures).⁵

Proponents of the Hollings bill argued that the growth and development of digital content (and broadband deployment generally) was being stalled by the absence of protection systems, and suggested that digital content would not be secure, and would not be made available for distribution, until some form of DRM was installed in all devices capable of displaying digital content. The Hollings bill would have prohibited the sale or distribution of nearly any kind of electronic device, from TV sets to personal digital assistants to wristwatch cell phones to general purpose computers, unless the device included DRM meeting standards set by the federal government. Disney and others insisted that the consumer electronics and information technology industries would not voluntarily agree to DRM usage, because it would add costs to the devices without providing consumers with what they would perceive to be added value, and therefore, the government must mandate the inclusion of DRMs.⁶ When public outcry forced the abandonment of the Hollings bill, the content industry went back to the drawing board.⁷ They found a convenient place for a precedent-setting “mini-Hollings” approach in the context of the country’s move towards digital television.

A. Broadcast Flag Overview

The triggering event for the broadcast flag discussion is the digital television (“DTV”) transition scheduled to occur by 2006.⁸ Moving to

5. Sen. 2048, 107th Cong. § 5 (2002).

6. In testimony before Hollings’ committee in connection with the bill, Disney Chairman and CEO Michael Eisner accused technology firms like Intel Corp. of profiting from digital piracy, and said they were not interested in working out a way to fix the problem. Reuters, *Digital Copyright Bill Inspires Flurry of Criticism* <http://emusician.com/ar/emusic_digitalcopyright_bill_inspires/> (Apr. 10, 2002).

7. *Id.*

8. According to the Balanced Budget Act, 2006 is a target date for the transition; however, FCC chairman Michael Powell admitted at the 2004 Consumer Electronics Show that the 2006 date was “an aspiration date,” not the final date. *See also In the Matter of*

DTV will release a good deal of radio spectrum for new uses (because the broadcasters will use only their digital spectrum and will give back their analog spectrum), and the FCC will auction licenses for this spectrum, with the proceeds going to the federal government. Congress has been assuming in its budgeting process that revenues from the resulting spectrum will be more than \$6 billion. Thus, there has been tremendous Congressional pressure to complete the DTV transition, and heavy political pressure has been exerted on the FCC to do its part.⁹

Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television, 17 FCC Rcd. 15,978, 15,978-79 (2002); Mark Hachman, *Powell Riffs On DTV, Wireless, Regulation*, PC Magazine <<http://www.pcmag.com/article2/0,4149,1430119,00.asp>> (January 9, 2004). The Commission has provided a second channel for each existing full service to use for DTV service in making the transition from the existing analog (NTSC) TV technology to the new DTV technology. At the end of the DTV transition, which is currently scheduled for December 31, 2006, broadcasters must relinquish one of their two channels. A finding that the digital transition has occurred in a particular area is dependent on penetration of DTV devices, for example, if 85 percent of receiving homes have switched to DTV devices, the transition will be found to have occurred. As of October 2003, less than 1 percent of television households have a DTV receiver. Some have argued that the DTV transition has nothing to do with the broadcast flag, and that the transition provides only a useful regulatory moment for action. *See, e.g.*, Letters from Consumers Union and Public Knowledge, *infra* n. 23.

9. Title III of the Communications Act covers DTV issues, including broadcaster eligibility for DTV licenses, DTV signal quality, and DTV ancillary and supplementary services. *See, e.g.*, 47 U.S.C. § 302(a) (granting authority to regulate home electronic equipment in order to ensure that the equipment can withstand interference); *Id.* § 303(s) (granting authority to regulate television receivers in order to ensure that all such receivers adequately receive all television broadcasting signals); *Id.* § 303(u) (instructing Commission to require that television receivers be equipped to display closed-caption television transmissions); *Id.* §§ 303(x), 330(c) (instructing Commission to require that television receivers to be equipped to permit viewers to block the reception of programs with a common rating). Critics of the FCC's assertion of authority in the flag proceeding have said that this DTV-related Title cannot be extended to cover manufacturers because it is explicitly limited to broadcaster issues, and have argued that in the absence of explicit statutory authority the Commission may not act to regulate consumer electronics interoperability and adopt encoding rules in the broadcast arena. FCC's jurisdiction to regulate consumer electronics/IT devices has been questioned. The Notice of Proposed Rulemaking issued by the FCC in connection with the broadcast flag proceeding sought comment on "the jurisdictional basis for Commission rules dealing with broadcast copy protection." *In the Matter of Digital Broadcast Copy Protection*, Notice of Proposed Rulemaking, MB Docket No. 02-230 (August 9, 2002), at 3-4. It is fair to say that the FCC's jurisdiction in this area is far from certain. Indeed, the FCC devoted more than five pages of its Report and Order to explaining why it had jurisdiction to issue such a set of rules, and appears to be anticipating near-term challenges to its assertion of rulemaking authority. *In the Matter of Digital Broadcast Content Protection*, Report and Order and Further Notice of Proposed Rulemaking, MB Docket No. 02-230 (November 4, 2003), pp. 13-18 (hereinafter "Order 02-230"). And "key Members of Congress are split about the FCC's jurisdiction in this area. Some members of Congress (Hollings and Tauzin) believe that the FCC has authority to impose broadcast flag regulations while others believe that

DTV will be broadcast “in the clear” (in unencrypted form).¹⁰ Movie studios and other video producers are concerned that homes and individuals with internet access will soon be able to share movie-length digital broadcast files that they receive with the same ease that they now share unencrypted music files, and that widespread online piracy will be the result. In the absence of a copy protection scheme, some content providers have asserted that they will not permit high quality programming to be broadcast digitally.¹¹ Without such programming, the fear is that consumers will not buy DTV transmitters, which will delay the DTV transition.¹²

such regulation is outside the FCC’s purview (Leahy and Sensenbrenner).” Comments of Philips Electronics North America Corporation (Philips) in MB Docket No. 02-230 (Dec. 6, 2002), at 32. In comments submitted to the FCC on September 23, 2003, Philips questioned the FCC’s jurisdiction in the absence of an express statutory mandate, pointing out that the Plug and Play Order (discussed *infra*) was based on statutory authority conferred by Sections 624A and 629 of the Communications Act of 1934. Philips also noted that the “no tech mandates” clause of the Digital Millennium Copyright Act, Section 1201(c)(3), expressed a Congressional policy against imposing specific content protection mandates on electronics manufacturers. *Notice of ex parte meeting*, Philips Electronics, FCC MB Docket No. 02-230 (submitted Sept. 23, 2003). The FCC, for its part, did not assert in its Order adopting the flag scheme that it had direct, explicit statutory authority to regulate equipment manufacturers. It did, however, reject the argument that an explicit grant of authority from Congress was required for it to act, asserting that it had ancillary jurisdiction based on the relationship between the broadcast flag rules and its broad jurisdiction over radio broadcasts. Order 02-230 at 17. The FCC “recognize[d] that the Commission’s assertion of jurisdiction over manufacturers of equipment in the past has typically been tied to specific statutory provisions and that this is the first time the Commission has exercised . . . jurisdiction over consumer equipment manufacturers in this manner,” but stated that “even though this may be the first time the Commission exercises its ancillary jurisdiction over equipment manufacturers in this manner, the nation now stands at a juncture where such exercise of authority is necessary.” *Id.* The FCC apparently believed that lack of jurisdiction was not enough of a reason not to act, given the enormous pressure being exerted on the agency by the content industry.

10. There is no regulatory mandate that television broadcasts be unencrypted. However, the U.S. tradition of “free” over the air broadcast leads many to believe that television broadcasts should not be encrypted at their source. The question the broadcast flag proceeding presents is, “If encryption is necessary to protect high-quality digital content, who does the encryption—the broadcasters or the machines that receive the signal?” The content industry wants to ensure that machines do this work. As suggested later in this Article, it is not clear why broadcast television should be protected so fiercely by the FCC.

11. *See, e.g., Comments of Viacom*, FCC MB Docket No. 02-230, at 2-4 (submitted Dec. 6, 2002). Viacom notes that “In the 2001-2002 season, all but one of CBS’s scripted prime-time programs were broadcast in HD. And for the 2002-2003 season, CBS is offering all 19 of its prime-time comedies and dramas in HD.” Viacom later withdrew its threat not to broadcast high-quality content.

12. Thus, from the content owners’ perspective, public policy makers are asking them to urgently do something to promote the digital transition; content makers will not put high quality programming out unless it is protected; so the broadcast flag rules need to be put in place right away to protect the fall lineup. Now that the fall lineup is already being

In order to provide some measure of protection for DTV content, the MPAA and the Digital Transmission Licensing Administrator, LLC (“DTLA”) proposed a “broadcast flag” scheme to the FCC (the “MPAA/5C Proposal”).¹³ In essence, the studios proposed that any future device capable of modulating or demodulating DTV content be designed to:

- check for the presence of a flag;
- encrypt any flagged content using approved technologies;
- allow creation of digital recordings of flagged content using only authorized copy protection technologies; and
- allow digital transmission of flagged content only via secured digital outputs to other “compliant” devices (authorized devices that are appropriately secure and themselves ensure that protected content cannot be digitally retransmitted in an insecure fashion to noncompliant devices or over the internet).

In other words, the proposed rule (largely adopted by the FCC in November 2003) mandates that DTV demodulators and all devices receiving content from them (including computers, DVD recorders, digital video recorders, and other devices) be built to robustly protect digital content marked by the flag. Starting in 2005, all newly-manufactured equipment capable of demodulating, storing, or copying content that originates as a DTV signal will have to have

broadcast, the MPAA has switched to another rationale for quick adoption of the broadcast flag: avoiding the creation of heaps of “noncompliant” legacy devices. “Until rules requiring devices to respond to the Flag are in effect, every DTV device sold becomes a legacy device that will delay full realization of the objective the Flag is intended to achieve—curtailing the redistribution of DTV content on digital networks. . . . Delay now places more legacy devices in the market three or four years from now, when redistribution of video files could force content owners to migrate from free broadcast television to more secure delivery systems. The time to close the barn door is before, not after the horse has escaped.” Order 02-230, *supra* n. 9 (Letter from Fritz Attaway, MPAA Executive Vice President, Government Relations, to Kenneth Ferree, FCC Media Bureau, Oct. 8, 2003).

13. In a highly unusual regulatory move, the Commission’s notice of proposed rulemaking did not include the text of an actual proposed rule. *In the Matter of Digital Broadcast Copy Protection*, MB Docket No. 02-230, *Notice of Proposed Rulemaking*, 67 Fed. Reg. 53903 (Aug. 20, 2002) (“NPRM”). A proposed rule is attached to the *Joint Comments of the Motion Picture Ass’n of America, et al.* (submitted Dec. 6, 2002), filed in connection with the FCC’s NPRM. The “5C” consortium is made up of Hitachi Ltd., Intel Corporation, Matsushita Electric Industrial Co. Ltd., Sony Corporation, and Toshiba Corporation. 5C has developed the Digital Transmission Content Protection System, or DTCP, which offers secure electrical transmission of compressed content over particular interconnections. DTLA is the licensing authority joint venture founded by the 5C companies, which administers the licensing of DTCP.

approved copy protection technologies built in. These devices will include future digital televisions and set-top boxes, as well as computers or other future hardware or software capable of demodulating a DTV broadcast (or receiving content from a device that has demodulated the signal). Approved technologies will use encryption-based digital content protection to ensure that the standards for use and distribution are obeyed and, in particular, to ensure that content cannot be sent “out” of digital outputs in the device unless the content provider so authorizes. Only approved content protection technologies will be permitted to handle marked programs. Only approved content protection technologies will be permitted to handle marked programs.¹⁴ Obviously, this approach entails mandating design changes in a range of consumer-electronics and information-technology devices, to ensure that these devices monitor incoming data streams for the presence of flags.

Because all devices touching DTV content would have to incorporate approved technologies, the process for approval has been both critical and controversial. The MPAA/5C proposal contemplated that technologies could be added to a Table A when they were used or approved by three major studios or ten major device manufacturers. The technologies could also be added when the technology was found to be “at least as effective” as other Table A technologies. The FCC was supposed to rule on all applications under any of these criteria for addition to Table A, and to revoke Table A authorization if the technology has been “substantially compromised.”¹⁵

As part of the process that led up to the MPAA/5C Proposal, Fox suggested that a particular suite of copy protection technologies, the 5C suite, which includes DTCP, HDCP, D-VHS, and CPRM, be added to Table A immediately.¹⁶ None of these technologies allows

14. Order 02-230, *supra* n. 9, at pp. 25-27.

15. *Id.* at 14.

16. This proposal was made as part of the proceedings of the Broadcast Protection Discussion Group (“BPDG”), which is a subgroup of the Copy Protection Technical Working Group (“CPTWG”). CPTWG was formed in 1996 by members of the information technology, consumer electronics, and motion picture industries. Led by the MPAA, it is “a non-exclusive, non-legislative, non-binding forum that [meets] regularly to investigate and seek consensus on technological solutions for various content protection challenges. . . . [T]he CPTWG is not a standard-setting organization and has no authority to promulgate or even recommend particular technologies. Even where consensus on a particular technological approach has been reached within the CPTWG, implementation is always left to entities outside the forum.” Testimony before House Committee on Energy and Commerce, *Protecting Content in the Digital Age*, Statement of Mr. Peter Chernin, President and Chief Operating Officer, News Corp. (Apr. 25, 2002) (available at

transmission over the internet (even secure transmission) of any flagged content.¹⁷ The MPAA/5C Proposal also stated that regulated products may not include switches, buttons, or functions that allow the Compliance Requirements to be defeated. Nor may they allow defeat of these requirements by widely available tools or inexpensive software.¹⁸

The licensing rules accompanying Table A technologies will have significant impact. For example, the DTLA license for DTCP does not allow digital outputs of content save to devices that use one of the other three “5C suite” technologies.¹⁹ This means that once a

2002 WL 20316553). The BPDG Co-Chairs, Robert Perry of Mitsubishi Digital Electronics America, Michael Ripley of Intel Corporation, and Andrew Setos of Fox Group / Fox Technology Group, released a report in June 2002 that forms the basis for the MPAA/5C Proposal. See Robert Perry, et al., *Final Report of the Co-Chairs of the Broadcast Protection Discussion Subgroup to the Copy Protection Technical Working Group* <<http://www.cptwg.org/assets/bpdg/bpdg%20report.doc>> (Jun. 3, 2002). The Co-Chairs’ report did not represent a “consensus” view of the information technology, consumer electronics, and motion picture industries. Comments opposing the conclusions reached in the report were submitted by Philips, Thomson, and Zenith, among other companies. The Philips/Thomson/Zenith comments noted that these companies “fundamentally object[ed] to the process by which BPDG was conducted”—most if not all of the key negotiations were conducted behind closed doors among the studios and the 5C companies. See Phillips, et al., *Comments Submitted by Philips, Thomson and Zenith on the Report of the Broadcast Protection Discussion Subgroup to the Copy Protection Technical Working Group* <<http://www.cptwg.org/assets/bpdg/tab%20p-04.doc>> (May 29, 2002).

17. DTCP offers secure transmission of compressed content over electrical interconnections (USB, IEEE 1394, and MOST); CPRM offers secure storage of compressed content; HDCP offers secure transmission of uncompressed protected content over an electrical interconnection (DVI); and D-VHS offers secure storage of uncompressed protected content. Thus, each of these technologies does a different thing. The DTLA has approved only three technologies to protect DTCP-protected content: CPRM, D-VHS, and HDCP. Until recently, none of these technologies allowed transmission of flagged content over wireless networks. DTCP, for example, was designed to operate over IEEE 1394 (“firewire”) and USB networks, but not over WiFi. In late September 2003, the DTLA proposed a form of DTCP for WiFi (DTCP-IP) to the FCC. The MPAA/5C Proposal states that DTCP, CPRM, D-VHS, and HDCP “have already gained sufficient industry acceptance to qualify as authorized technologies.” MPAA/5C Proposal, *supra* n. 13, at 57.

18. The MPAA/5C Proposal contained an absolute requirement: to “effectively frustrate attempts to defeat” its proposed compliance requirements. Some IT companies have argued that this standard will be prohibitively expensive to meet. See, e.g., *Letter from the Business Software Alliance and the Computer Systems Policy Project* (collectively, the “IT Coalition”) to the FCC, MB Docket No. 02-230, October 2, 2003. The FCC adopted an “ordinary user” effectiveness standard in its Order. Order at p. 23.

19. See Digital Transmission Licensing Administration, *DTCP Adopters Agreement*, example B, Part 1, Section 4.4 <http://www.dtcp.com/data/DTCP_Adopters_Agreement010730.PDF> (July 2001). The DTCP license does permit “constrained” (down-resolutioned, or “down-rezzed”) digital output over a DVI interface to computer products manufactured before 2005. Because data traveling through a DVI

consumer initiates a home network based on DTCP, the network will form a closed circle. Thus, no devices can be added to that network unless they also are part of the 5C world. No 5C devices will interoperate with non-5C devices according to the current terms of the 5C license.²⁰ These licenses could contain any number of overreaching terms.²¹

In order to ensure that it is not too easy to circumvent the protections offered by an approved technology, a set of “Robustness Requirements” for the flag were also proposed by the MPAA. These required that products meet a specified level of secure design and construction by employing encryption techniques and being tamper resistant.²² The standard proposed by the MPAA in Section X.17 of their proposed broadcast flag rule was that content protection systems should be implemented so that they could not be defeated by using general purpose tools widely available at a reasonable price. Robustness rules generally exclude open source software products from consideration because users can modify these products.

As of October 2003, the FCC had received both initial and reply comments on its broadcast flag NPRM. More than 6000 comments, many of which came from individuals, were filed in this proceeding. As rumors of an October 2003 action by the FCC in the flag

interface is uncompressed (and therefore hard to manipulate easily), and because restrictions on image quality are unlikely to be appealing to consumers, this exception does not appear terribly meaningful. The DTCP license also allows the use of technologies other than CPRM or D-VHS for the making of up to two first-generation copies, provided that the copy cannot be played on any device other than the (secure, compliant, 5C-world) device making the copy.

20. *Id.* In other words, existing DVD recorders and players (of which there are 41 million already in consumers’ hands) and all other existing storage or copying devices will not work with a flag-compliant TV receiver. This may mean substantial upgrade costs to consumers, who will not be able to watch DTV on their DVD players. An October 16, 2003 letter from Senator John McCain (R-Ariz.) to Chairman Michael Powell of the FCC made many of the points urged by consumer advocates in this setting, and stated, “[T]housands of American consumers have filed comments with the Commission, and consumer advocate groups contend that granting this petition would significantly impact the commonplace viewing and recording of broadcast television that consumers have become accustomed to since the introduction of the VCR more than twenty years ago.”

21. For example, the privacy impacts of redistribution-control technology are unknown, and license agreements could require consumers to agree to many varieties of tracking. Having the ability to offer consumers finely-tuned rights packages carries with it the ability to know what each individual is watching, where that person lives, and how long they watch what they watch, currently broadcasters do not collect this information.

22. See *Comments of the Motion Picture Association of America, Inc., et al.*, MB Docket No. 02-230 (filed Dec. 6, 2002), at 10 (stating that “[t]he Commission should adopt rules implementing the Broadcast Flag solution” as well as “rules to resolve any outstanding compliance, robustness, and enforcement issues”).

proceeding began to circulate, several industry and consumer advocacy groups urged the FCC not to act on the entire MPAA/5C Proposal, but rather to divide the proceeding into two parts: (1) adopting the labeling standard for the flag that has been chosen by the NTSC (but not yet adopted by the FCC), and (2) issuing a further rulemaking notice seeking comment “on complex and critically important certification and de-certification rules for technologies authorized for digital broadcast copy protection.”²³ The MPAA reacted strongly to this suggestion, saying: “The IT Coalition has asked the Commission to follow the lead of Nero—to fiddle while Rome burns. The public interest requires more responsible action.”²⁴

In November 2003, the FCC issued a Report and Order in the broadcast flag proceeding.²⁵ In a gesture towards consumer advocates, the Commission established an interim process for certification of approved content protection technologies to be managed by the FCC rather than the studios, and did not expressly adopt the 5C suite. Many commentators believe, however, that the 5C suite will be approved in short order, thus creating the lock-in and interoperability “first mover” effects discussed above.²⁶

23. Letter from BSA and CSPP (IT Coalition Letter), MB Docket No. 02-230 (filed Oct. 2, 2003). *See also* Letter from Consumers Union and Public Knowledge (filed Oct. 3, 2003) (supporting IT Coalition approach). A larger point made by consumer advocates and computer companies has been that the broadcast flag simply will not be effective, given that it does not constrain the analog outputs that link consumers’ televisions with their cable and satellite set-top boxes, their VCRs, their TiVos, and their DVD recorders. *See* Section II(C), *infra*, concerning “plugging the analog hole.” There are many other “holes” that will continue to allow leakage of digital broadcasts for years to come: the “legacy hole,” by which the millions of existing unprotected digital outputs on legacy devices that do not recognize the flag can be used to transmit digital broadcast files (the Consumers Electronics Association has estimated that 700,000 DTV receivers have been manufactured); the “studio hole,” by which studio insiders, their reviewers, and theaters leak digital copies (*see* Simon Byers et al., *Analysis of Security Vulnerabilities in the Movie Production and Distribution Process* <<http://www.pdmcdan.com/docs/drm03.pdf>> (Sept. 17, 2003)); and the “photon hole,” by which cameras are held up in movie theaters to record films, *see* Ed Felten, *Committee on Commerce, Science, and Transportation, Hearing on Consumer Privacy and Government Technology Mandates in the Digital Media Marketplace* <http://www.freedom-to-tinker.com/FeltenTestimony_091703.pdf> (Sept. 17, 2003).

24. Letter, MPAA to Kenneth Ferree (Oct. 8, 2003).

25. FCC, *In the Matter of Digital Broadcast Content Protection*, Report and Order and Further Notice of Proposed Rulemaking <http://www.hraunfoss.fcc.gov/edocs_public/attachmathch/FCC-03-273A1.pdf> (Nov. 4, 2003).

26. *E.g.* Rob Pegoraro, *FCC Deserves a Digital Thanks For Nothing*, Washington Post F07 (Nov. 9, 2003): “As for new digital cables, the FCC ruling does not mandate any one copy-control technology, leaving it up to companies to choose from competing options. But this competition probably won’t happen. Most of the electronics industry has anointed one system, called “5C” after the five corporations that developed it (Hitachi,

B. Plug and Play Overview

Meanwhile, the FCC has taken up the cable compatibility “digital plug and play” proceeding.²⁷ For nearly a decade, Congress has been urging the FCC to adopt technical standards to allow a direct connection between your television products and cable service. The cable and consumer electronics industries reached agreement on standards, but the content industry intervened and asked that copy protection technologies be included in any “plug and play” agreement—including “encoding rules” dictating what uses could be made of cable broadcasts by consumers. Additionally, Hollywood asked that (1) “selectable output control” be permitted (which would mean that a content owner could remotely control which outputs work on users’ sets, making it possible to block analog outputs in favor of secured digital outputs); and (2) manufacturers be required to “down-res” (make less sharp) content flowing out of any analog output on a digital cable receiver. Both of these steps were aimed at assuring a controlled digital future by (eventually) making analog outputs unusable.

The plug and play proposal was designed to result in regulations that codified an agreement reached between major cable system operators and consumer electronics managers.²⁸ This proposal would allow consumer DTV sets to be connected directly to digital cable systems as long as the outputs of the consumer DTV sets were sufficiently secure, thus eliminating the need for special cable set-top boxes. The idea is that the availability of digital cable television receivers and products will encourage more consumers to convert to DTV, thereby furthering the DTV transition.

Under the proposed Memorandum of Understanding (“MOU”), only devices using only wired digital network connections (IEEE

Intel, Matsushita, Sony and Toshiba) and already approved for the digital outputs on future cable boxes and cable-compatible TV sets. The FCC can approve other copy-control schemes, but 5C-compliant hardware may not be upgradeable to support these competing mechanisms, placing them at a disadvantage. Once a show enters the 5C copyright cocoon, your options to use it shrink. The FCC’s statement that “the flag does not restrict copying in any way” ignores the fact that 5C eliminates your ability to play back recordings on existing hardware, since almost none of it complies with the 5C standard.”

27. See *In the Matter of Compatibility Between Cable Systems and Consumer Electronics Equipment*, Notice of Proposed Rulemaking, PP Docket No. 00-67 (Apr. 14, 2000).

28. See *Ex Parte Letter and Memorandum of Understanding (“MOU”)* (with attachments), CS Docket No. 97-80, PP Docket No. 00-67 (Dec. 19, 2002) (filed by major cable system operators and consumer electronics managers) <http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-03-3A2.pdf> (accessed Jan. 4, 2004).

1394) (and 5C copy protection technologies) could be labeled as “Digital Cable Ready,” and thus Bluetooth and Internet Protocol connections would not be allowed on such devices.²⁹

On October 9, 2003, the FCC released its Second Report and Order and Second Further Notice of Proposed Rulemaking in the Plug and Play proceeding. It adopted the labeling rules proposed in the MOU, but concluded that additional public comment was needed in order to determine how and on what conditions new connectors or content protection technologies will be approved for use with unidirectional digital cable televisions and products.³⁰ The FCC also decided to ban selectable output control and down-rezzing, and to limit the levels of copy protection that could be applied to various categories of programming. In other words, the FCC split the proceeding into two parts: labeling (now decided on), and new copy protection beyond the 5C suite of technologies (still under discussion).

Because 65 percent or more of US consumers receive their television through cable connections,³¹ the decision in the plug and play proceeding effectively pre-decided the broadcast flag (DTV) questions: it would have made little sense, the content industry argued, to have one set of content-protection rules apply to cable and satellite and a different set of rules apply to broadcast.³² Digital cable-

29. This means that personal computers may not be able to be labeled as Digital Cable Ready under the current form of the plug and play regime. Microsoft and others have argued that the FCC should ensure that PCs and other open-architecture consumer IT devices are not foreclosed from being marketed as Digital Cable Ready. *See, e.g.*, Microsoft August 8, 2003 ex parte communication and Comments of ATI Technologies, Dell Computer Corporation, Hewlett-Packard Company, Intel Corporation, Microsoft Corporation and NEC Corporation, filed March 28, 2003, both in PP Docket No. 00-67.

30. *Id.* at 35.

31. The FCC released a report in December 2002 stating that 85.3 percent of “television households” in the US receive their signals through cable and/or satellite systems. *See* FCC Ninth Annual Report, *Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, MB Docket No. 02-145 (Dec. 31, 2002). The National Cable & Telecommunications Association reports that the cable penetration of US television households in May 2003 was 67.4 percent. *See* National Cable & Telecommunications Association, *Homepage* <<http://www.ncta.com>> (accessed Aug. 11, 2003).

32. The MPAA took the position at the FCC that the version of the plug and play proposal before the Commission as of August 2003 “perpetuates the analog hole and discourages a complete transition from analog to digital,” yet another invocation of the need for a complete “evolution” towards digital. MPAA Ex Parte Presentations in CS Docket No.97-80 (Implementation of Section 304 of the Telecommunications Act of 1996; Commercial availability of Navigation Devices); PP Docket No.00-67 (Compatibility Between Cable Systems and Consumer Electronics Equipment); and MB Docket No.02-230 (Digital Broadcast Copy Protection) (Aug. 13, 2003) (emphasis added). Whether

ready devices must use the 5C suite of technologies in connection with receiving digital cable.³³ This means that the lock-in effect of 5C had already happened, no matter what the FCC did with the broadcast flag. Because the licenses associated with the 5C suite forbid interoperating with other copy protection technologies, we will all soon be in a world in which only 5C-protected digital interfaces are authorized.

C. Analog Hole Overview

At a Cato Policy conference on February 5, 2003, Andy Setos of Fox made clear that even if the broadcast flag scheme was implemented as proposed it would not be adequately effective to stop the digital copying of copyrighted DTV works.³⁴ The reason? The broadcast flag proceeding deals only with locking down digital outputs of devices, and the resulting rule will not constrain analog outputs. This means that “flagged” digital material could be captured from an analog output such as one contained in an analog video display device (e.g., a VCR), transformed into high-quality analog form, and then redigitized—in the process, the “flag” being considered by the FCC would be lost (because it was not part of the analog content), and the result of this digital-analog-digital conversion would be a high-quality file that was available for perfect and unlimited digital copying and transmission with no “flag” attached.³⁵ The content industry is concerned that control needs to be

broadcast and cable need to be protected by the same copy protection technologies is an assumption that is questioned in Section IV(B) *infra*. At any rate, the oddness of the MPAA’s pushing for the broadcast flag, which leaves the analog hole unplugged (*see infra* Section II(C)), at the same time it opposed the plug and play agreement on the grounds that it perpetuated that same analog hole, is notable.

33. See Ex. B to the Cable/CE MOU (Compliance Rules), Section 2.4, *supra* n. 28, at 61: “A Unidirectional Digital Cable Product shall not output Controlled Content, or pass Controlled Content, to any output in digital form except as permitted by this Section 2.4.” Sections 2.4. 1 and 2.4.2, in turn, require use of DTCP and HDCP, both members of the 5C suite.

34. Fritz Attaway, Motion Picture Association of America; Jim Burger, Dow, Lohnes & Albertson; Mike Godwin, Public Knowledge; Andy Setos, Fox Entertainment Group, Address, *Battle over the Broadcast Flag: The IP Wars and the HDTV Transition* (Feb. 5, 2003) (copy on file with Cato Policy Forum), audio / video available at <<http://www.cato.org/events/030205pf.html>> (accessed Jan. 4, 2004).

35. Closing the analog hole would require finding a means to secure “component video analog outputs” in ways similar to means available for digital video interfaces. Consensus “watermark” coding would have to be read by downstream analog-to-digital converters able to handle DTV content; the converted digital video would have to be handled “securely” in the same manner as digital interfaces for the same content. Legislation would be required to mandate such changes. Shapiro testimony, *supra* n.16.

extended to any outlet through which digital material could “leak” into analog form without the flag and then be redigitized—in popular parlance, they believe that they have to plug the “analog hole.”³⁶

In an April 2002 “Content Protection Status Report” provided to the Senate Judiciary Committee by the Motion Picture Association of America, the MPAA said that analog-to-digital converters needed to be regulated to ensure that they responded to a “watermarking” technology that would survive digital to analog conversion.³⁷ This is a very broad goal, because analog-to-digital converters are present in any number of machines that are basic to science, computing, mathematics, health, and many other fields.

For the process of plugging the analog hole to proceed, a watermarking or other technology will need to be chosen that survives digital-analog-digital conversion. Led by the MPAA, the information technology, consumer electronics, and entertainment industries formed a discussion group in February 2003 (the Analog Reconversion Discussion Group, ARDG or “are-dog”) to work on this issue. ARDG’s charter states that it will “identify[] technological tools that may be relevant to addressing security issues arising from the conversion of protected, copyrighted commercial audiovisual content from digital to analog format and reconversion to digital format.” So far, the ARDG is discussing various technologies that might (or might not) carry rights signaling information from protected digital sources across analog interfaces. This rights signaling

36. Interestingly, the MPAA has frequently referred to the existence of the analog hole in defending against attacks on digital rights management (DRM) systems. Both in the Library of Congress DMCA rulemaking hearings, and in the “2600 litigation” (lawsuits brought against 2600 Magazine over its publishing an article containing DVD decoding software and linking to the software; *see generally* <http://www.eff.org/IP/Video/MPAA_DVD_cases/> (accessed Jan. 4, 2004)), content industry representatives suggested that people wanting to make fair uses of DVDs which were prevented by content scrambling technology (CSS) could use analog outputs to make those uses. In the broadcast flag proceeding, the MPAA has pointed to the continued availability of unprotected analog connections as the reason why the proposed broadcast flag scheme “would not impact” (and would therefore not trouble) individual consumers:

The Broadcast Flag requirement will have no impact on consumers’ existing equipment. . . . Since analog outputs are a permitted output under the Requirements, existing analog displays, players, and recorders will continue to function with the new compliant products under the Compliance and Robustness Requirements.

MPAA/5C Proposal, *supra* n. 13, at 27-28.

Obviously, closing the analog hole does not fit with this statement. As noted above, the MPAA is pushing towards a complete “transition” away from analog.

37. *See* MPAA, *Content Protection Status Report* <http://judiciary.senate.gov/special/content_protection.pdf> (Apr. 25, 2002).

information will then need to be detected by devices that reconvert the content to digital form. The overall goal is to find some way of preserving “states” of content protection through digital-analog-digital conversions.

In a slide presentation during an early meeting, the Chief Technology Officer of the MPAA framed the issue confronting the ARDG in terms of evolution:

- For legacy analog devices, protected digital video content must be converted to analog video signals.
- Analog video signals can be easily converted to digital without any obligations to preserve the content’s usage rights information.
- Since the usage rights are not managed equivalently, *the natural transition from analog to an all-digital world is impeded.*³⁸

As discussed earlier, a content industry representative put the issue even more strongly during an early ARDG meeting, saying in effect that the absence of rules in the analog world was preventing natural evolution towards digital, even though digital was clearly a superior technology.³⁹

Thus, the challenge undertaken by the ARDG world is to guarantee “equivalence” between digital outputs subject to the broadcast flag scheme and analog converters. Assuming that digital outputs will be controlled by approved content protection technology under the broadcast flag scheme, the content industry’s goal is to ensure that any analog output is at least as controlled as the digital. This will mean that analog converters and devices will have to be sufficiently robust (non-tamperable by users) and compliant (“watching” for flagged content to arrive, and ensuring encryption of flagged content) to meet the broadcast flag standards.

As of the date of this paper, the ARDG had issued a Call for Information that included a matrix of questions against which available technologies can be measured (e.g., “How does the scheme carry rights signaling information from protected digital sources across analog interfaces and back into a digital sink?”),⁴⁰ and had

38. Brad Hunt, Chief Technology Officer, MPAA, Presentation to the Analog Reconversion Discussion Group, *Analog Reconversion Reference Architecture Proposal* <<http://www.cptwg.org/Assets/Presentations/ARDG/AnalogReconvRefArch03-05.pps>> (Mar. 5, 2003) (emphasis added).

39. See Author’s Personal Notes, *supra* n. 1.

40. Copy Protection Technical Working Group, *ARDG Call For Information and Matrix* <www.cptwg.org> (Jul. 30, 2003). The Matrix includes the following question: “To

listened to presentations from manufacturers of technologies who believed their products should be recommended by ARDG (but not subjected to independent, third-party testing).⁴¹ Observers predict that the resulting filled-in matrix document (containing the manufacturers' representations about their technologies in answer to the ARDG's questions) will be sent to Congress with a demand for a bill that will require development of (and use of) technologies meeting the stated requirements.

III. Evolution and Innovation

Evolution is a simple process: genes fluctuate or mutate. Individuals are selected. Populations change. Without fluctuation in the genes (or whatever other unit of inheritance is of interest), evolution cannot occur.

Evolution is not necessarily progress, although it is tempting to think of man as the final, triumphant link in an ever-improving chain of being. Organisms do not evolve so that they will be more efficient or useful later. Instead, populations adapt to their current surroundings through aggregated selection events, when chance fluctuations result in an increase in the reproductive success of their carriers. In order for this adaptation to take place, for natural selection to operate, there must be mechanisms to increase or create genetic fluctuations which are themselves the result of chance. Evolutionary theory is not deterministic; it does not suggest that there is a "solution" to any evolutionary "problem." Evolution is about variation. Modern biologic empirical work focuses on the distribution of characteristics within populations, rather than positing that there will be one particularly adaptive feature that has enabled a particular organism to survive.

Biological systems are part of a larger category of complex adaptive systems,⁴² which include the environment, insect populations,

what extent, considered purely as a technical matter, and considered apart from rights-allocation choices made by the content owner or distributor does the scheme create side effects in the use of material?" This question will be the repository for consumer groups' concerns about fair use of material.

41. Copy Protection Technical Working Group, *Agenda and Meeting Notes* <www.cptwg.org> (Oct. 22, 2003).

42. Generally, a *complex* system is understood as a set of interacting elements in which the interactions are nonlinear. A *complex adaptive system* (or CAS) is a complex system that has the capacity to modify its own state (through, e.g., evolutionary change). In CAS, patterns at higher levels emerge from local processes and selection operating at lower levels. Complexity as a field is associated with the Santa Fe Institute. See Ted Fuller & Paul Moran, *Small Firms as Complex Adaptive Systems: A Review* <<http://www.santafe.edu/~paulmoran/>>

the economy, the human brain, law, and many others⁴³—that are characterized by irreversibility,⁴⁴ stability,⁴⁵ bifurcation⁴⁶ and symmetry breaking.⁴⁷ From complexity theory we know that adaptation is the key to innovation, resilience, and sustainability in any complex system, and no discipline teaches us more about adaptation than biology. Perhaps biology has something to teach us about innovation and law.⁴⁸

shaer.uca.edu/Research/1999/ICSB/99ics052.htm> (accessed Jan. 21, 2004). The study of CAS is focused on how complicated structures and patterns of interaction can arise from random actions. The essential elements of any CAS are: different and diverse parts (sustained diversity and individuality of components); localized interactions among those components; and an autonomous process that selects from among those components, based on the results of local interactions, a subset for replication or enhancement. Simon A. Levin, *Ecosystems and the Biosphere as Complex Adaptive Systems*, 1 *Ecosystems* 431, 431-436 (1998).

43. J.B. Ruhl, *Thinking of Environmental Law as a Complex Adaptive System: How to Clean Up the Environment by Making a Mess of Environmental Law*, 34 *Hous. L. Rev.* 933 (1997); Margaret Gruter et al. (eds.), *Law, Biology and Culture: The Evolution of Law*, Ross-Erikson (Santa Barbara, CA) 1983; E. Donald Elliott, *The Evolutionary Tradition in Jurisprudence*, 85 *Colum. L. Rev.* 38 (1985). The Law and Biology movement has provided biological models that help us understand the dynamics of legal change. We can gather data about a legal situation and decide, through pattern recognition, whether we have a particular instance of a biological phenomenon before us. Elliott, *Law and Biology*, 41 *St. Louis L. Rev.* 595, 621 (1997).

44. Complex adaptive systems do not have the same outcomes when they are run from the same initial conditions, so they are not deterministic. Random processes like these (non-deterministic) are subject to the irreversible consequences for future behavior of the system; they are subject to the “legacy of history.” Laura Gonzalez-Guzman & Peter T. Hraber, *What is Complexity?* <<http://sevilleta.unm.edu/~ehdecker/complexity/96fall/complexity.html>> (accessed Oct. 3, 2003).

45. CAS tend to settle into stable organizational patterns, but different stable organizations in different environments.

46. “The most exciting aspect of nonequilibrium phenomena is that the same physical system can show a great variety of behaviors, each corresponding to a different attractor. The mechanism which is at the origin of this diversification is the instability of a reference state and the subsequent bifurcation of new branches of states as the parameters built in the system are varied.” Gregoire Nicolis, *Physics of far-from-equilibrium systems and self-organisation*, in *The New Physics* 316, 333-34 (Paul Davies ed., Cambridge University Press 1989).

47. An imaginary person inside a system at equilibrium (a cube of water, for example) would have no perception of time or space; everything would seem the same. If the system is pushed far from equilibrium (by heating, for example), a notion of space will emerge in this minute observer, because collective, complex actions inside the system will occur. “We call this emergence of a notion of space in a system in which, until then, this notion could not be perceived in an intrinsic manner symmetry breaking. In a way, symmetry breaking brings us from a static, geometrical view of space to a view whereby the space is shaped by the functions going on in the system.” *Id.* at 318.

48. In other words, through pattern recognition we may see some things in law and innovation that remind us of what we have learned about biology. The basic notion is that law and innovation both use information and selection in a way that is similar to genetic reproduction, variation, and selection. Biology provides a useful metaphor for

Complex adaptive systems are nonlinear, and thus unpredictable. While this nonlinearity may be an annoyance for those who would like to predict where a particular system may end up, it is the system's adeptness at avoiding being locked into linear behavior that allows it to adapt to changing circumstances—just as innovation in consumer electronics allows adaptation to the changing world. Researchers have found that the most resilient systems are those that manage to stay balanced between extreme order (such as a monoculture that embraces a single PC operating system) and extreme chaos (in which no computer could interact with any other). In a sense, these systems are drawing as much as possible from the adaptive qualities of nonlinearity without falling all the way into nothingness/randomness. They are being held back from the edge of this cliff by the presence of ordered, linear behavioral qualities in the system—such as, in the case of biology, natural selection. The next sections of this article map these qualities of complex adaptive systems to the current debate about the broadcast flag, the plug and play agreement, and the analog hole.

A. Survival of the Fittest

It is very strange for the MPAA to say that the natural order of things requires that rules be imposed to allow progress to result, that only regulation will allow the “survival of the fittest” dictated by Charles Darwin's theories. But that is, in fact, what certain elements of the content industry are asserting: that some forms of technology (uncontrolled digital and uncontrolled analog) have to be held back and controlled in order for another (controlled digital) to flourish.⁴⁹ Let's take this assertion apart.

First, the makers of this statement are proclaiming that digital technologies are “better” than analog, and that for that reason the content industry should be protected by rules that make it more likely that the digital transition will take place. This is an argument for imposition of the broadcast flag and adoption of the plug and play proposal.

Second, this statement asserts that once the broadcast flag is in place locking down digital outputs and digital machines, analog

understanding legal development and innovation in a general sense. I am not suggesting for the moment that biologists will be able to tell policymakers what sort of intellectual property legal regime would better fit human nature. Others may wish to undertake this task.

49. MPAA ARDG slides, *supra* n. 38.

outputs and analog machines should not be subject to different, looser rules because, again, digital is the better technology and the natural transition to that technology will be held back if people continue to use analog devices. This is an argument for closing the analog hole.

More generally, the content industry is using selectively the notion of “survival of the fittest” to support its claim that a controlled digital future would be better for us all and thus nothing should be left to chance. In their minds, control over adequately secure machines in addition to both digital and analog outputs essential steps for the digital transition to occur both in the television world and in the broader content community. They are saying, in effect, that the consumer electronics and information technology companies should innovate “according to the rules.”⁵⁰

By making these arguments, the movie studios are aligning themselves with a view of evolution as forwarding “progress.” The notion that progress results from evolution was discarded by biologists years ago, because traits or strategies that are successful for a given population at one time may not work at all at another time. Evolution is contingent, contextual, and filled with chance. Any organism’s success depends on the behavior of its contemporaries. Evolution is not necessarily progress.⁵¹

50. A requirement that other industries innovate “according to the rules” is a strongly-held view of some elements of the content industry. In a public copyright debate held at the New York Bar Association on May 5, 2003, Chuck Sims of Proskauer Rose (a lawyer who has represented a wide variety of content owners) made the following statement (paraphrased): “All creativity has to live within certain boundaries; the fact that sonneteers live within parameters doesn’t mean that their First Amendment rights have been violated.”

51. If we think of law as evolving, an intellectual approach often identified with Oliver Wendell Holmes, we also understand that law does not necessarily progress. As Donald Elliott notes in discussing the study of legal evolution, “For Wigmore, the true study of legal evolution does not simply identify and universalize abstract patterns of legal change; it must relate changes in the law to the local environmental conditions which cause them. Nor does he believe that evolution in the law implies progress in a normative sense. Rather, legal evolution means only that the law continually adapts to changes in the environment.” Elliott, *supra* n. 43, at 49; *see also, e.g.,* Wigmore, *Planetary Theory of the Law’s Evolution*, in 3 A. Kocourek & J. Wigmore, at 532. “The evolution of law, which we seek to discover, does not imply progress, either morally or otherwise, but merely movement; . . . but always including the cause with the effect.” *Id.* Owen Jones has noted, “Individual traits may be measured against their alternatives, which may provide advantage, no advantage, or disadvantage, and may thus be measured as ‘good’ or ‘bad.’ The evolutionary process responds to no such measurement, since the ‘process’ is universal and cannot be compared to anything.” Owen D. Jones, *Reproductive Autonomy and Evolutionary Biology: A Regulatory Framework for Trait-Selection Technologies*, 19 Am. J. L. & Med. 187, 211 (1993).

The same “progress” worldview advanced during an ARDG meeting in favor of a controlled, regulated digital future has been used selectively by many policymakers over time. 19th and 20th century Social Darwinists argued that social policy should be designed to allow the weak and unfit to fail.⁵²

Similarly, Sarah Cleveland has noted that “pseudo-scientific theories of racial superiority have been used to justify the exclusion of other peoples from democratic governance.” These theories use Charles Darwin’s *The Descent of Man* and Herbert Spencer’s *Social Statics*, in which Darwin’s work was transformed into a doctrine of “survival of the fittest,” to justify WASP superiority.⁵³ Andrew Carnegie called on Darwinian evolutionary theories to justify industrial inequities,⁵⁴ while eugenicists like Francis Galton used evolutionary science to support the view that governmental regulation was necessary to prevent the genetic spread of inferior races.⁵⁵ These Social Darwinists did not keep the worlds of the descriptive “is” and the normative “ought” separate, thus committing the “Naturalistic Fallacy” by arguing that what “is” is what “ought” to

52. Turn-of-the 20th century policymakers used Darwin’s theory of evolution in order to make “the plunder of America [by corporations for their own financial advantage] sound like divine right,” by promoting as “the natural order of things, the notion that progress resulted from the elimination of the weak.” Any who opposed the oligarchy were smeared as disturbers of the peace, socialists, anarchists, or worse, and government was used only to forward money-making ends. Bill Moyers, *This is Your Story—The Progressive Story of America. Pass It On, speech to the Take Back America* <http://www.ourfuture.org/projects/national_conference/2003/index.cfm> (Jun. 4, 2003).

53. Sarah H. Cleveland, *Powers Inherent in Sovereignty: Indians, Aliens, Territories, and the Nineteenth Century Origins of Plenary Power over Foreign Affairs*, 81 Tex. L. Rev. 1 (2002). Charles Darwin, *The Descent of Man* (1871); Herbert Spencer, *Social Statics* (1892); Herbert Spencer, *The Principles of Biology*, in *Synthetic Philosophy* 444 (1866).

54. Cleveland cites Andrew Carnegie, *Wealth*, 148 N. Am. Rev. 653 (1889), reprinted in *A Documentary History of the United States* 172-79 (Richard D. Heffner ed., 12th ed. 1965) (arguing that competition insures survival of the fittest, even in the industrial context).

55. See Daniel Kevles, *Annals of Eugenics: A Secular Faith*, *The New Yorker* 5 (Oct. 8, 1984) (cited in Cleveland, *supra* n. 53, at 259). Cleveland notes that the term “eugenics” was coined in 1883 by Charles Darwin’s cousin, Francis Galton, who sought to use Darwinian science to improve human stock “by giving the more suitable races or strains of blood a better chance of prevailing speedily over the less suitable.” *Id.* at 51. Galton’s positive eugenics, which encouraged reproduction of the elite, quickly devolved into negative eugenics, which suggested that undesirables’ reproduction be limited; ultimately, genocide was the result. Jane Rutherford, *Juvenile Justice: Caught between The Exorcist and a Clockwork Orange*, 51 DePaul L. Rev. 715, 724 (2002). After a long silence based on revulsion against Nazi eugenics, “Social Darwinism” surfaced again in Richard J. Herrnstein & Charles Murray, *The Bell Curve: Intelligence and Class Structure in American Life* (The Free Press 1994).

be.⁵⁶ As Fred Bosselman puts it, “The survival of the fittest has historically been used by those who have survived to suggest that they should have survived because they and their ancestors were the fittest.”⁵⁷

Social Darwinists also focused sharply on resource scarcity, arguing that in the face of a competition for scarce resources, *no* government regulation made sense and, in fact, the interference of the state would only slow down human evolution.⁵⁸ Herbert Spencer trumpeted the belief that “every person may expect nature to take its course free from unreasonable private or state interference” and that legal rights “were the products of evolutionary development from economic necessity.”⁵⁹ Insofar as the content industry is using the language of evolution and “progress” to support their quest for regulation in a context in which scarcity is not an issue,⁶⁰ they have taken a bizarre new path: *without* rules, they are saying, appropriate evolution cannot occur.

Any focus on “evolution” as a justification for the flag and hole proposals is troubling. “Natural selection” does not necessarily promote “progress,” and “survival of the fittest” should not require governmental assistance. This is true particularly when the assistance is directed at keeping unapproved consumer electronics equipment from reaching the marketplace and keeping PCs from participating in home networks that include cable input.

56. See, e.g., Owen D. Jones, *On the Nature of Norms: Biology, Morality, and the Disruption of Order*, 98 Mich. L. Rev. 2072, 2087 (2000) (book review).

57. Fred P. Bosselman, *Limitations Inherent in the Title to Wetlands at Common Law*, 15 Stan. Envtl. L.J. 247, 312 (1996). According to E. Donald Elliott, “The phrase ‘the survival of the fittest,’ which does not come from Darwin but Herbert Spencer, has probably created more misunderstanding than any other phrase in science. The core of the problem with this phrase is the implication of the term ‘fittest.’ In biology, it is very rare that there is only one unique solution that will survive. . . . There is a very broad range of characteristics that can survive and exist within the population.” E. Donald Elliott, *Law and Biology: The New Synthesis?*, 41 St. Louis L.J. 595, 599 (1997) (citations omitted).

58. Herbert Hovenkamp, *Evolutionary Models in Jurisprudence*, 64 Tex. L. Rev. 645, 654 (1985).

59. *Id.* at 669 and 645 n. 3.

60. See generally Ex. B to the Cable/CE MOU (Compliance Rules), *supra* n. 28, regarding the scarcity argument. Because there are now so many forms of electronic entertainment, the DTV stream will be just one stream among many. The absence of scarcity militates against applying special rules to broadcast, including rules designed to ensure the survival of broadcast.

B. The Role of Chance

In addition to assuming that “progress” stems from natural selection, the content industry’s survival of the fittest argument proceeds from the assumption that static elements of systems are chosen for success, plucked from a list in order to dominate the environment. This assumption, however, misses the key role of chance in evolution.

Any interesting system that is far from equilibrium⁶¹ (like innovation, the economy, or the host of machines that might touch digital content) can adjust to its environment in several different ways at the same moment. We know that at a certain critical constraint level (when enough real or metaphorical heat has been applied to the system), a given system will become organized and characterized by correlations across great distance. This organization is analogous to natural selection. In contrast to the determinism of this phase change (we know that organization will happen), we do not know which particular choice will be selected. Simultaneously stable stationary states can coexist under exactly the same experimental conditions. Only chance, in the form of the particular ripple in the system that was present at the time the selection took place, will decide whether a given element within the system has characteristic A or B.⁶²

Indeed, all systems (chemical, physical, and perhaps even political) are characterized by an amazing interaction between chance and constraint. Fluctuations arising from random motions are analogous to changes (or new machines or technologies), and for any bifurcation event to occur most interestingly choices need to be present.

But not all possible choices need to be present. The complexity of natural objects (or of innovation) should be at a “sweet spot” somewhere between “perfectly predictable” and “completely

61. Systems at equilibrium will all have the same temperature (like a body of water) and an observer inside the system will not be able to tell where he is—he will have no way to measure space or time. If there are perturbations in this system, they will die out quickly, and the behavior will eventually be as simple as at equilibrium. By removing the system from equilibrium further and further, through an increase in some constraint (like density or heat), experimenters see at some critical level of the constraint that matter in the system begins to perform a bulk movement. Nicolis, *supra* n. 46, at 316.

61. *Id.* at 341.

62. The mechanism by which this choice is made is called “bifurcation.” At the crucial moment of transition between one state and another, the system performs this bifurcation, and no one knows beforehand what the outcome will be. Chance will decide, through the effect of fluctuations and the presence of multiple attractors. *Id.*

random.” Having completely predictable evolution may well put any population at great risk.⁶³

Consider the ant. Ants as individuals have highly chancy behavior patters, even though as colonies they act quite coherently. Some randomness is an adaptive value in the organization of ant society.

If two food sources are presented to an ant colony, and that colony as a whole is not very good at assembling ants around a food source, a large number of ants will fail to be “recruited” around the first source that is found and will wander off. Those wandering ants, who have lost the trail because of “errors,” will quickly find the second source of food. Then, the colony as a whole will act: if the two food sources are the same quality, it will focus all of its attention on the first source until it is gone, and then it will eat the second—without a break in its rate of food collection. If the second food source is better (because of its concentration of glucose), it will eat the second source, but will not completely ignore the first one. Some level of randomness allows the colony to switch between these two modes of behavior, by increasing the possibility of finding the second source of food. The colony can then focus its efforts on the most rewarding resource, while promoting the work to find and use resources which will be fully exploited later. Indeed, experiments show that, where there is more than one source of food, there is an “optimal” value of error that defines this level of randomness. Had the colony been perfectly good at gathering the ants around the first source of food (perfectly deterministic and predictable), it never would have found the second. Had the colony been perfectly random, it never would have found the first source of food.⁶⁴

What we look for in the evolution of languages, art, music, innovation, and law is a “process capable of producing with high probability a complex, information-rich, . . . sequence of states.”⁶⁵ Such a process will be neither completely random nor completely predictable. Mutation in innovation (or law) is whatever process provides an environment that is hospitable to this complex, information-rich sequence.

63. “The extent to which an organism can evolve is relative to the ability of its genes or combinations of genes to adapt to environmental change (referred to as ‘evolutionary plasticity’). As a result, the natural selective preference of the evolutionary process should, over the long term, lead an organism to retain those genes with greater, rather than lesser, plasticity.” *Id.* at 313-14.

64. This story is told in Nicolis, *supra* n. 61, at 318.

65. *Id.* at 341.

Notwithstanding what Hollywood has been telling Congress and the FCC, the key threat to innovation posed by the digital age may not be piracy of copyrighted works. A more serious threat to this complex adaptive system may be the actual or attempted control over chance.⁶⁶ Complete randomness is meaningless, but some randomness is necessary. Without retaining some helpful level of chance, we run the risk of failing to find new sources of food or creating new, as-yet-unimagined machines that could assist us in understanding and displaying digital content.

IV. What Happens Next?

The Hollings-like approaches taken in the broadcast flag and analog hole contexts, if successful, may have the unintended (or intended) consequences of (1) keeping new otherwise-lawful creatures (or new machines) from appearing and (2) keeping a particular creature (the studios' business model) from becoming extinct. If we assume that the studios will persuade the FCC, the Congress, and the international community to see the world their way, as a place in which a secure digital future is possible and desired, we will be living in a world in which technology has permanently trumped law.

A. Keeping New Creatures From Appearing

Both the broadcast flag and analog hole proposals are focused on ensuring that no device (or software) capable of displaying, storing, or converting digital content that is not "subject to the rules" will be sold to consumers in the U.S. This means that every device will have to adhere to the broadcast flag rules: incorporate approved copy protection technology; encrypt flagged content; allow transmission of flagged content only over approved connections to other broadcast-flag-compliant devices; be sufficiently untamperable so that no hobbyist can change the device's settings; and comply with whatever additional license requirements are created by the proprietors of approved copy protection technologies (including requirements that licensees' machines not interoperate with any unapproved devices).

66. See, e.g., E. Donald Elliott, *The Genome and the Law: Should Increased Genetic Knowledge Change the Law?*, 25 Harv. J. L. & Pub. Pol'y 61, 62 (2001) (arguing that "governmental reinforcement of prevailing scientific orthodoxy and regulatory impediments to the development of useful technologies" is a greater danger than new genetic technologies).

This is a breathtakingly broad set of goals, and it is important to understand the implications of the content industry's plan. First, the proposed broadcast flag/analog hole efforts are not limited to preventing massive online redistribution of works to the public. The MPAA/5C flag proposal, for example, states that the goal of the regulation is: "*Protection against unauthorized redistribution, including internet redistribution, of protected content.*"⁶⁷ This means that any redistribution, to any machine (including machines within consumers' homes) will have to be authorized.⁶⁸ Any machine not in compliance with the flag system, i.e., a system built to recognize and adhere to the flag rules, will not be an authorized machine. Machines designed for use within consumers' homes that are not authorized will be unable to store, manipulate, display, or transmit flagged materials. Thus, consumers will have to pay for the hardware, software and license fees needed to protect content when the flag is present (or could be present). They will also be subject to the inevitable frustrations of not being able to use products they purchased legally, when the technology does not work properly with DTV content. For example, "a cable system recently turned on a content control bit (similar to the flag descriptor), and consumers with new D-VHS recorders suddenly found that they could not record any programs from the cable system."⁶⁹ In the broadcast flag world, once a consumer receives a television program on a flag-compliant device, he or she will not be able to store or play that program on any non-compliant legacy device.

Second, consumer electronic/information technology product development may become subject to a variety of "gatekeeping" mechanisms. All technology touching digital television content will have to use Table A copy protection technologies approved by others—in the interim, the FCC, but later, likely the video content industry.⁷⁰ As discussed above, certain proprietary technologies

67. *Supra* n. 13 (emphasis added).

68. Although the major broadcast owners and their studio owners have been saying from the outset of the flag debate that their narrow goal is to prevent redistribution to the public of their high-value HDTV works over the internet, the language of the proposed rule covers *all digital broadcast content* (not just HDTV and high-value content) and *all unauthorized distribution* (not just to the public at large over the internet). *Id.* This means that transmissions over the internet of any broadcast content from a home to an office would be barred unless explicitly authorized.

69. Craig Birkmaier, *Retransmission Control*, Broadcast Engineering <http://broadcastengineering.com/ar/broadcasting_retransmission_control/> (Dec. 1, 2002).

70. In its November 2003 Order, the FCC initiated a Further Notice of Proposed Rulemaking to seek additional comment on the post-interim approval process for approved content protection technologies. Order at 26.

(known collectively as the “5C suite”) have been pre-selected by the content industry as “approved technologies” that every “compliant” device will have to include. Once the 5C suite is on Table A, there will be very few incentives for manufacturers of other content protection technologies to have their products added to Table A. The 5C suite (which covers both storage and transmission) will interoperate only with other 5C technologies, and once locked in to the 5C circle consumers will not want to purchase non-interoperable equipment.

If the studios are successful in getting their version of Table A approval past the FCC, even those manufacturers who feel they have sufficient monetary incentives to try for Table A admission will have a hard time getting there. Under the original MPAA/5C Proposal, a technology could be added to Table A only by (i) being used or approved by three major studios; (ii) being used or approved by three major television broadcast groups (of which at least two must be major studios); (iii) being licensed by ten major device manufacturers and used or approved by two major studios; or (iv) being found “at least as effective at protecting [content] against unauthorized redistribution (including unauthorized internet redistribution) as is any one of the technologies then listed on Table A.”

The first three of these routes to Table A listing would have allowed self-interested industry members to make decisions about new proposed technologies. Even the “as effective as” proposal created a risk that future innovators would not diverge from approaches that were similar to those taken by the 5C suite of technologies.⁷¹ Although the FCC has (for the interim, at least) taken the studios out of the gatekeeping role, the paths to approval still appear highly subjective.⁷²

71. The FCC recognized this risk in the Order, stating:

[W]e are concerned with one industry segment exercising a significant degree of control over decisions regarding the approval and use of content protection and recording technologies in DTV-related equipment. Nor are our concerns alleviated by the “at least as effective” alternative, because such a test is limited by what has already been approved under other alternatives and thus amounts to an indirect form of control.

Order at 26.

72. See Order at 27 (FCC will examine factors including “level of security, scope of redistribution, means of authentication, upgradability, renewability, interoperability, and ability to revoke compromised devices,” as well as the licensing terms associated with the proposed technology.) Although the FCC has labeled these factors “functional criteria,” the absence of quantifiable milestones makes that label suspect.

For example, if someone develops a method (Technology 6Y) for securely e-mailing content to a member of a pre-existing home network (and erasing the original copy), how will the FCC decide if 6Y method is “as effective as” the 5C suite of technologies (including the licenses that accompany these technologies)? The 5C suite would not allow such e-mailing to take place. Similarly, what if someone develops Technology 6Z, which allows 15-second clips of content to be taken and e-mailed to friends? Again, how would anyone decide whether such a technology was “as effective as” the 5C suite, which does not allow such uses. By requiring new technologies to compare themselves to already-approved technologies, relative criteria tether future innovators to the technologies and techniques of the past. Any technology that does not do what the 5C suite of technologies does, does less than the 5C suite of technologies, or does what it does differently, will be an apple in the face of FCC’s oranges.

The CE and IT industries in the U.S. were concerned that the Table A process proposed by MPAA/5C would have allowed self-interested studio gatekeepers to apply subjective standards in withholding approval of new products. The high-tech industries have suggested that neutral, functional criteria to which manufacturers could self-certify would be better than the Table A standards that have been proposed by MPAA/5C. But it would be even better, they suggest, to have no technology mandates at all in this area.

Had the VCR been invented after the flag rules went into effect, it would not have been allowed to be marketed. VCRs neither protect against the unauthorized copying of content nor secure content from onward transmission, including transmission over the internet. They do the opposite: VCRs allow consumers to copy broadcasts and share them with family and friends. Indeed, at the time the current VCR entered the consumer market, Motion Picture Association of America (MPAA) president Jack Valenti told the House Judiciary committee that “the growing and dangerous intrusion of this new technology” threatened his entire industry’s “economic vitality and future security.”⁷³

73. As it turns out, VCR rental income (revenue drawn from an earlier “big idea”) has been an enormous boon to the movie industry. U.S. consumers spent roughly \$8.7 billion on video sales and rentals (mostly movies) in mid-2002, and nearly \$10.2 billion on DVD rentals and purchases during the first half of 2003. Video Business, *2002 & 2003 Midyear Report* <<http://www.videobusiness.com>> (accessed Oct. 3, 2003). Most new technology developments touching high-value content have prompted resistance in the courts and Congress—the player piano, cable TV, television, the VCR, and the DVD are examples that come to mind. For the first four, compulsory licenses were enacted. See

Implementation of the flag and plug-and-play schemes will clearly have deleterious effects on innovation because of the simple fact that designs of otherwise lawful consumer electronics devices and information technology products will be dependent on approval by a U.S. agency. The chilling effect of the flag discussions has already changed the course of product development in the U.S. Similarly, “closing the analog hole” (if such a thing is even possible) will have enormous effects on innovation, as every device accomplishing an analog-digital conversion will need to incorporate approved technology and be sufficiently non-tamperable to be considered “robust.”

The special case of the general purpose computer provides a clear example of the effect on innovation and the course of product development that the flag/hole schemes and the plug and play proposal may have.⁷⁴ The open-platform personal computer is a symbol of American innovation. Prompted by the extraordinary progress that has been made in speeding up processing and compressing storage enabled by personal computers, new products, services, and communications patterns have rapidly emerged. Indeed, the “end-to-end” principle of the internet, which has brought so much change to our lives, mirrors the openness of the personal computer. Just as internet standards have purposely not been optimized for any particular application (thus encouraging explosive development work), the design of computers should not be constrained. Otherwise, we risk preventing the emergence of new big ideas.⁷⁵ Yet the current proposals for mandating particular technological protection mechanisms involve setting constraints on the design of all digital devices (or, in the case of the cable plug and play proposal, not allowing computers to participate at all). We have observed years of litigation over whether private control over innovation in the personal computer market should be permitted through anticompetitive practices in the operating system market. Mandating

Jessica Litman, *Revising Copyright Law for the Information Age*, 75 Or. L. Rev. 19, 27-29 (1996).

74. Work that I did during 2003 for Elliot Maxwell in connection with his production of a white paper for the Digital Connections Council of the Committee on Economic Development relates to the concepts in this section, and I am particularly grateful for his discussions with me about these issues.

75. See Marjory S. Blumenthal & David D. Clark, *Rethinking the Design of the Internet: The End to End Arguments vs. The Brave New World*, ACM Transactions on Internet Tech. <http://www.ana.lcs.mit.edu/anaweb/PDF/Rethinking_2001.pdf> (Aug. 2001).

particular design constraints for the personal computer so as to protect digital content seems to be moving in the opposite direction.

If the MPAA is successful in achieving its broadcast flag and analog hole goals, it will have ensured that the variability and fluctuations necessary for evolution to occur in consumer electronics and information technology products that are capable of manipulating DTV content (as in any other complex system) do not exist.⁷⁶ This effort will keep new creatures (such as new machines, new innovations, and new communications methods) from coming into being.

B. Keeping Your Own Creature From Becoming Extinct

The oft-repeated statement of the MPAA is that if the flag and hole schemes are not implemented, broadcast television “as we know it” will cease to exist.⁷⁷ By this they mean, presumably, that shows beloved by Americans will cease to be available for free.⁷⁸ But why should broadcast television be singled out for special protection against its environment?

Many Americans have a special fondness for the television programs of their youth. The movie industry has a strong growth rate and a positive trade balance, and deserves attention as a producer of jobs for Americans as well as a projector of the American character

76. The analog hole scheme, for example, if successful, will dictate that all future innovation in this area will strike a “ceiling” of whatever rules are required in the broadcast flag scheme. The role for analog outputs will be to support legacy equipment, in the eyes of the MPAA. This is a major change from the status quo that has given us innovations like the VCR, where analog outputs not only supported legacy devices, but were generally available to support innovative products not yet imagined.

77. This is not the first time the broadcast industry has made this claim. See Joel Brinkley, *Defining Vision: How Broadcasters Lured the Government into Inciting a Revolution in Television* 19, 209, 347, 352, 362 (Harcourt Brace 1997), listing other occasions on which the industry has claimed that broadcast television “as we know it” is threatened.

78. Broadcast television, of course, is not really “free” because consumers buy the products advertised on the shows. “Although few would argue that the profusion of new media technology has reached the point at which broadcast television can be eliminated entirely, the FCC’s ‘free’ television mantra nevertheless shows signs of being more myth than reality. Although viewers pay no fee to receive programming over broadcast television stations, they must pay for the equipment itself—a television and antenna. Advertising finances the cost of programming, thus creating ‘free’ television programming but raising the cost of all products and services advertised on television. Although harder to compute in dollar impact, social costs such as decreased attendance at community functions and decreased membership in fraternal organizations arguably lead to reduced societal productivity and involvement.” Richard L. Weber, Note, *Riding on a Diamond in the Sky: The DBS Set-Aside Provisions of the 1992 Cable Act*, 40 Wm. & Mary L. Rev. 1795, 1832 (1999) (footnotes omitted).

around the world. Despite the recent slump, however, activity in the consumer electronics market directly or indirectly impacts ten percent of U.S. economic activity (GDP)—producing nearly \$950 billion in commerce yearly.⁷⁹ Revenues for consumer electronics products are expected to total a record \$99.5 billion in 2003, marking a 3.5 percent increase over 2002.⁸⁰ The information technology industry (computer hardware, software, and services) was the engine of economic growth in the 1990s. While IT-producing industries represent only 7 percent of all U.S. businesses, they accounted for roughly 28 percent of overall real economic growth between 1996-2000.⁸¹ IT's share of GDP rose from 3.2 percent in 1990 to 4.9 percent at the peak in 2000, and still accounts for 4.2 percent.⁸² These numbers overshadow the revenues of the movie and video industry over the same period.⁸³ While it is important to ensure the proper functioning of the copyright system, it is fair to ask whether shifting encryption and design costs to the information technology industry, and constraining this industry's ability to innovate, makes sense.

Attempts to control bits and force the production of lower capability devices, in the face of technology trends that continue to improve the ability of these devices to record, store, manipulate, and transmit digital information, also ignores the significant economic activity entailed by consumers' participation in digital content. Much consumer activity in this arena is legal. Billions of dollars are spent annually by consumers for internet access, and this number is increasing daily as broadband penetration continues to grow. The growth in the number of devices (particularly portable devices) that allow users access to content has been dramatic. Six million portable

79. Consumer Electronics Association, supplementary comments, *In the Matter of Application for Approval of Agreement by the International Air Transport Association*, OST-2003-14480 <http://www.ce.org/shared_files/recent_actions/100CEA%20supplementary%20comments.pdf> (May 29, 2003).

80. Consumer Electronics Association prediction, *2003 U.S. Sales of Consumer Electronics to Hit New Record, Kissing \$100 Billion, Says CEA* (Home Toys News Release) <http://www.hometoys.com/releases/jan03/cea_01.htm> (accessed Oct. 28, 2003).

81. Information Technology Association of America, *The U.S. Information Technology Industry: A Brief Overview* <<http://www.ita.org/news/gendoc.cfm?DocID=120>> (accessed Oct. 28, 2003).

82. Steve Hamm et al, *Tech Comes Out Swinging*, Business Week 62 <http://www.businessweek.com/magazine/content/03_25/b3838603.htm> (June 23, 2003).

83. Motion picture and video industry revenues were estimated at \$49.6 billion in 1998, growing to \$57.2 billion in 2001. U.S. Bureau of the Census, *2001 Service Annual Survey: Information Sector Services*, Table 3.0.1 <<http://www.census.gov/svsd/www/sas51.html>> (accessed Oct. 28, 2003).

digital media players were shipped in 2001, up 50 percent from the year 2000.⁸⁴

As a legal matter, protecting broadcast television has also been sharply questioned. The original scarcity arguments that provided a rationale for regulating broadcast television have lost persuasiveness over time, as innumerable means of reaching the public now exist.⁸⁵ Now that scarcity in the broadcasting market is no more severe than in any other communications arena, there is no justification for Congress to apply any different rules to communications technology beyond those to which all businesses are subject, such as competition and labor laws.⁸⁶ One bit is very much like another.

Natural selection involves removing “unsuccessful” gene combinations (combinations that have not adapted successfully to a particular environment) from a population. Vacuum tubes are no longer being manufactured, because their place has been taken by transistors. Similarly, broadcast television’s role in American culture and the American economy may have been overtaken by other forms of digital information.⁸⁷ More people are spending more time in front of television screens, but the screens are not showing them broadcast television. Instead, people are watching internet programming of various kinds, as well as cable and satellite programming for which they pay subscription fees. The idea of protecting “free,” unencrypted, over the air broadcasting by crippling all devices that are capable of receiving it (including devices that are traditionally thought of as open platforms) does not make much sense.⁸⁸ Indeed,

84. Raymond James & Associates, *Investment Opportunities in Digital Media* <<http://170.12.99.3/researchpdf/iDig021003fullrpt.pdf>> 48 (Feb. 10, 2002).

85. See *Red Lion Broadcasting Co. v. FCC*, 395 U.S. 367, 396-401 (1969) (upholding “fairness doctrine” in part because of the physical scarcity of spectrum).

86. See John O. McGinnis, *The Once and Future Property-Based Vision of the First Amendment*, 63 U. Chi. L. Rev. 49, 93-94 (1996) (under property-based view of the First Amendment, “the way to protect material property rights essential to the operation of the press was to ensure that only rules of the kind that were applied to other business enterprises could be applied to the press”; questioning decision in *Turner Broadcasting v. FCC*, 114 S. Ct. 2445 (1994), for failing to adopt property-based approach), *id.* at 110-114.

87. Nielsen’s February 2003 ratings sweeps found one million fewer U.S. households watching prime time television versus the same period in 2002, and CommerceNet recently reported that North American online audience had doubled in the past 18 months. “Overall, internet users watched less television in 2002 than 2001; 11.2 hours per week in 2002, compared to 12.3 hours in 2001.” UCLA Center for Communication Policy, *The UCLA Internet Report—“Surveying the Digital Future”* <<http://www.ccp.ucla.edu/pdf/UCLA-internet-Report-Year-Three.pdf>> (accessed Aug. 11, 2003).

88. Theoretically, DTV movies and shows could be protected from piracy by encrypting the digital broadcast before transmission (“encryption at the source”). Microsoft has argued to the FCC that the “[c]urrent proposal fails to protect content

from the consumers' point of view the content *will* be encrypted: it does not make a difference to the consumer whether the encryption was accomplished at the broadcast tower or inside their own machine.

The MPAA is seeking not only to protect broadcast television "as we know it," but also to protect the studios' particular business model. This business model depends on controlled re-release of content through various windows in carefully-delineated regions of the world. This business model is based on historical control over distribution of hard copies of works.

When content was physically distributed in the form of objects that humans could handle (such as books and music stored on physical media), rights holders could assert greater control over distribution of rights and allocation of their sticks inside the bundle of intellectual property rights both geographically and temporally. During this era, for example, early release of a book in England would not necessarily mean that many copies of that object would appear in the U.S.—or, at least, not quickly. The physical difficulty and expense of copying and shipping books militated against simple or sweeping piracy, while the costs of such piracy were modest enough that book publishers could continue to operate without feeling threatened.

Now, in the digital era, the friction and cost involved in copying and distributing content has greatly lessened. Peer-to-peer filesharing, email, and web hosting services make it possible for individuals to make their files available to the world. Because the internet allows worldwide, inexpensive, and apparently instantaneous copying of digital materials, high-investment content owners are frightened. The video content world has responded to this fear by asserting that they need legal protection that will allow them to replicate in the digital world the friction found in the analog world. Indeed, the MPAA even

effectively" because "[c]ontent encrypted at the source is more secure." Microsoft ex parte filing in the broadcast flag proceeding at 5 (Aug. 1, 2003). There are political issues embedded here, however. The continued availability of "free" over-the-air television is almost an article of faith at the FCC, even though there is no regulatory requirement of non-encryption. See Order, *supra* n. 82. See, e.g., Comment of FCC Commissioner Gloria Tristani in January 2001: "I am committed to preserving consumer access to free, over-the-air television," . . . "A substantial percentage of American households still rely on free, over-the-air broadcasting for their local news and information." Jay Wrolstad, *Wireless NewsFactor, U.S. Won't Aid Wireless Channel Clearing*, <<http://www.wirelessnewsfactor.com/perl/story/6966.html>> (Jan. 24, 2001). Again, however, between 65 percent and 85 percent of American homes receive television over cable or satellite systems, not using "rabbit ear" antennae. See Microsoft August 8, 2003 ex parte communication and Comments of ATI Technologies, Dell Computer Corporation, Hewlett-Packard Company, Intel Corporation, Microsoft Corporation and NEC Corporation, *supra* n. 29.

speaks of the broadcast flag and analog hole efforts as creating “speed bumps” that slow down the ease of reproduction and transmission of their content in the online world.

Of course, this physical friction still exists in the digital world, for the practical reason that it is now prohibitively time-consuming for consumers to transmit digital video files online.⁸⁹ This situation is likely to remain for the next three or four years.⁹⁰ Some commentators have argued that the existence of this digital last-mile friction dictates that the FCC does not need to act quickly.⁹¹ Predictably, the content industry has responded that they are only being prudent, by planning ahead for regulatory action so as to avoid the manufacture of legacy (read: currently legal) devices that do not adhere to the flag rules.⁹²

The studios, as far as anyone can tell, are not aggressively pursuing online content business models.⁹³ Instead, they are working

89. A VCR-quality hour of standard (analog) television would require one to four hours to download on a standard home broadband connection; an hour of high definition digital television would take about fourteen hours to download. Ed Felten, Comments of Public Knowledge, *supra* n. 23.

90. MPAA President and CEO Jack Valenti testified during September 2003 before the Senate Governmental Affairs Committee’s Permanent Subcommittee on Investigations that the problem of video downloading is “three or four years away.” Jack Valenti, President and CEO, MPAA, Testimony, *Privacy & Piracy: the Paradox of Illegal File Sharing on Peer-to-Peer Networks and the Impact of Technology on the Entertainment Industry, Before the Senate Governmental Affairs Committee, Permanent Subcommittee on Investigations* (beginning at 1:22:20) <http://govaffairs.senate.gov/audio_video/093003subvideo.rm> (Sept. 30, 2003).

91. Bifurcation comments of IT coalition, filed ex parte on Oct. 2, 2003; Letter from Consumers’ Union and Public Knowledge, *supra* n. 23.

92. Ex parte letter MPAA to FCC, Oct. 22, 2003.

93. Led by Sony, the studios (Warner Bros., Paramount, MGM, Universal, and Disney) have opened up an online movie-download site called MovieLink. The site is not yet a success, and The New York Times has noted “Movieline stand[s] out primarily for [its] puny selection, poor video quality and overly rigid copy protection. . . . It boggles the mind that these services don’t exploit the potential of the internet. Any number of improvements could make them more attractive than other video outlets. Online movie stores could offer tens of thousands of movies, dwarfing the selection of video stores. Digital rentals could last two weeks, not 24 hours, without costing the companies a penny more. And there should be a choice of download speeds; people willing to wait longer for superior quality should be allowed to. It is executives, not technology, who keep these services from greater success.” David Pogue, The New York Times, *Film Rentals, Downloaded To Your PCs*, <<http://hodder.org/nytimes/FilmRentalsDownloadedPC.htm>>. (May 15, 2003); see also News.com, *Movieline, Disney ink film download pact* <<http://news.com.com/2100-1026-5053552.html>> (July 24, 2003).

at many levels (international agreements,⁹⁴ treaties,⁹⁵ federal⁹⁶ and state⁹⁷ law) to make the online world adapt to them.

94. The Free Trade Area of the Americas (FTAA) is the formal name given to an expansion of the North American Free Trade Agreement (NAFTA) to every country in Central America, South America and the Caribbean, except Cuba. Negotiations began after the completion of NAFTA in 1994 and are to be completed by the end of 2004, to be implemented in 2005. FTAA, *Draft Agreement-Chapter on Intellectual Property Rights* <<http://www.ustr.gov/regions/whemisphere/ftaa2002/tnc-w-133-11of12-eng.pdf>> (Nov. 1, 2002). Article 21 of the draft FTAA agreement incorporates prohibitions consistent with Title I of the Digital Millennium Copyright Act (DMCA) which implements in U.S. law the circumvention provisions of the WIPO Copyright Treaty and WIPO Performances and Phonograms Treaty. However, the exceptions to the circumvention prohibitions that are found in 17 U.S.C. §§ 1201(c)-(k) are not included in the Draft. Additionally, Article 8 of the draft requires each agreeing party to “grant the authors of literary and artistic works the exclusive right to authorize any communication of their works to the public by wire or wireless means, including the making available to the public of their works, such that members of the public may access them from a place and at a time individually chosen by them.” This seems to be a broadcast flag/analog hole theme. See Supplemental Comments of the American Library Association et al., *Second Draft Consolidated Texts of the Free Trade Area of the Americas Agreement* <<http://www.arl.org/info/frn/copy/FTAASuppComments.pdf>> (accessed Dec. 3, 2003) (arguing that the entire copyright chapter of the draft agreement should be eliminated because the agreement “would serve to unduly extend intellectual property rights beyond what is available under the laws of the United States”). Concerns have been expressed concerning the criminal penalties established in the treaty for file-sharing. E.g., IP Justice October 20, 2003 white paper. <http://ipjustice.org/FTAA/IPJ_FTAA_White_Paper_r_1_2.html> (accessed Nov. 9, 2003). The white paper concluded that “unless the draft intellectual property chapter is substantially reformed or deleted in its entirety, the treaty will grant even greater control to major intellectual property holders to chill freedom of expression, prevent competition, restrict consumer rights, and stifle innovation.” *Id.* The US has already agreed to bilateral Free Trade Agreements (FTAs) with Chile and Singapore that include similar provisions—and the MPAA has had a great deal of influence on these agreements. Dugie Standeford, Washington Internet Daily, *Trade Pacts Could Broaden IP Law and Harm Poorer Economies*, <<http://hilltop.bradley.edu/~bbrown99/MM450%20Site/Current.html>> (April 15, 2003).

95. The World Intellectual Property Organization (WIPO) Standing Committee on Copyright and Related Rights (SCCR) met in Geneva from June 23 to 27, 2003. At the urging of MPAA members, the committee considered scheduling a diplomatic conference with respect to a draft Broadcast Treaty that would grant more exclusive rights (and thus greater legal control) to broadcasters. WIPO Update, Geneva, *WIPO Member States Make Progress in Shoring Up Protection for Broadcasting Organizations* <<http://www.wipo.int/pressroom/en/index.html>> (June 30, 2003).

96. On the U.S. federal level, an RIAA lawyer, Russell Frackman, recently publicly claimed that the Copyright Act required installation of blocking or filtering tools in technology products if necessary to prevent infringement. According to the Washington Internet Daily, Mr. Frackman said the requirement was “‘nothing new in the law,’ but was founded on the exclusive reproduction and distribution rights that Section 106” of the Copyright Act accords copyright holders. Louis Trager, Washington Internet Daily, *Entertainment Lawyers: We Already Have Federal Tech Mandate* (Aug. 12, 2003).

97. At the state level, attempts are being made to pass legislation that the MPAA claims will update the DMCA to help combat digital piracy. The MPAA also claims that new “criminal and civil penalties against internet pirates and hackers of communications

By contrast to the video-content approach to the world, the music industry is beginning to adapt to the digital environment by creating new business models. Apple's iTunes Music Store, provides music downloads from a large library of songs. The Music Store processed as many downloads on its opening day in May 2003 as had been collectively requested from the other competing download services over a six-month period (more than 200,000) and has since processed 500,000 downloads a week, for a total of 10 million downloads as of September 2003.⁹⁸ The reasons for the Music Store's popularity are many. Rather than streaming music, it offers all the songs available for download from the big-five record labels for \$.99 each and is very easy to use. Users can save downloaded tracks on multiple devices (and, through taking several steps can translate these files into MP3 formats), and can copy music onto their own CDs, which allows time- and space-shifting.⁹⁹ Apple iTunes has just been ported to the PC, so Windows users may now adopt this technology. More forms of private music DRM are already arriving online, and several will likely be successful in the marketplace.

The video content industry should be left to adapt to the changed conditions of the online digital world, just as the audio content industry has had to do. The video content industry's approach has been, instead, to act as if their particular creature should be globally protected from extinction by imposition of a monoculture of code/law, a very unnatural request.

services" at the state level are "an essential tool to complement resource-limited activity at the federal level." (MPAA one-pager, on file with the author). By including none of the limitations set forth in the DMCA, the proposed state legislation strikes a very different balance than that found in the DMCA, and may harm technology companies, universities, libraries, and users. While styled as "theft of service" legislation, the broad and ambiguous bills that have been proposed (and, in some cases, passed) would potentially subject consumers and manufacturers to criminal penalties and fines for attaching devices (e.g., TiVos) to their broadband connection that have not been "approved" by the connectivity provider. Additionally, such liability could be found based on an "intent to defraud" standard—a subjective yardstick that would be subject to case-by-case interpretation and expansion. Faced with potential liability under these laws, retailers may choose not to sell legitimate products. As of the date of the drafting of this article, state "super-DMCA" bills have been passed or are under consideration in Arkansas, Colorado, Delaware, Florida, Georgia, Illinois, Massachusetts, Maryland, Michigan, Oregon, Pennsylvania, Tennessee, Texas, and Virginia. See Public Knowledge, *Super DMCA's* <<http://www.publicknowledge.org/issues/super-dmcas.html>> (accessed Oct. 6, 2003).

98. Apple press release, *iTunes Music Store Sells Ten Millionth Song*, PR Newswire (Sep. 8, 2003).

99. The iTunes Music Store uses the Advanced Audio Coding (AAC) format—a form of DRM. Downloaded files can be played on up to three computers and can be copied onto CDs. An album can be copied no more than ten times. See Apple, *iTunes* <<http://www.apple.com/itunes>> (accessed Oct. 6, 2003).

C. Trumping Copyright Law Through Technology

The content industry's suggestion in the broadcast flag/analog hole contexts is that copyright law be instantiated in code (in content protection software systems that all U.S. manufacturers will have to include in any new device that touches particular digital content). But, unlike choices made by programmers, here the choice of what "code" to put in place will be made by the sovereign at the request of a single industry, and refusal to use particular software will be a violation of law. What relationship will the broadcast flag code have to copyright law?

For their part, the supporters of the broadcast flag and analog hole proposals assert that implementation of their plans would do no more than ensure that copyright law is followed by users. They say, for example, that if the broadcast flag scheme is passed into law consumers will be allowed to make as many copies of DTV content as they want within their home networks, and that only a very generous reading of copyright law would allow this.¹⁰⁰

But this statement is misleading. In the 5C world, once flagged content is recognized by a 5C compliant device, it cannot be transmitted to (or played on or copied by) any noncompliant legacy device. So, if 5C is an approved technology listed on Table A, consumers will be able to copy content only on (or transmit content only to) compliant devices. For many consumers, this may mean substantial (and perhaps surprising) required upgrading of their home networks, and it is not at all clear that copyright law would require this.¹⁰¹

More generally, the broadcast flag proposal will require users to operate machines that automatically prevent all "unauthorized" uses—even uses that are not necessarily infringements of copyright. By contrast, copyright law is based on the grant of specifically-defined rights to prevent (or remedy damage caused by) particular actions of other people. The copyright holder can choose to enforce her rights and obtain money damages or an injunction. The owner may also choose not to enforce her rights, because a particular abuse is not worth the investment. Many small infringements that have no

100. MPAA/5C Proposal, *supra* n. 13, at 6 n. 3 (Dec. 2002).

101. For example, if the flag rules are promulgated as suggested by MPAA/5C, no existing DVD player will be able to play DVDs recorded on future "flag-compliant" DVD recorders. There are now 45 million DVD players in consumers' hands. Edward W. Felten, Prof. of Computer Science, Princeton University (Washington, D.C., Sept. 17, 2003) (Testimony before Sen. Com. Comm.).

particular economic consequences (or may even be good for the copyright holder by increasing awareness of the work) get ignored. And many individuals choose to use content in ways they believe to be reasonable.

For example, the flag scheme leaves no place for so-called “first sale” rights. In the old world of copyright, it is perfectly legal to sell or give away your copy of a book. But in the new world of technologically-enforced permissioning through the flag, which entails only licenses, not sales, that use might not be authorized. In the analog world, resale of objects that have been distributed is generally legal. In the world of the flag, “everything not permitted by the copyright holder is prohibited.”¹⁰²

Similarly, neither the flag scheme nor any hole proposal takes account of fair use rights. This may be an unfair criticism because it would be impossible to program something as context-dependent as fair use, which requires an after-the-fact review of the circumstances under which a particular infringement took place. Fair use does not lend itself to clear and precise rules; for example, it is not clear whether sending an entire copy of a film or song to a friend over the internet is a fair use or not. Any coded description of what a reasonable use of particular content is would be very likely to bar future uses that might (in the context of a different time) be considered fair. But the answer of the content industry to the effect that “home copying is allowed,” so no fair use concerns could possibly exist, and no online transmission of their content could possibly be fair, is insufficient.¹⁰³ By fixing the MPAA’s vision of copyright law in

102. The so-called “first sale” doctrine embodied in Section 109(a) of the Copyright Act of 1976 provides that the copyright owner’s right to control distribution of copies only extends to the “first sale.” 17 U.S.C. § 109(a) (1976). In other words, the Copyright Act grants to authors the exclusive right to distribute copies of their work, but limits that right by distinguishing between ownership of a copyright (the bundle of exclusive rights) and ownership of a copy (the tangible material in which a work is fixed), and by extinguishing the copyright owner’s distribution right after the first sale of each copy. This right is the basis for standard practices such as used book markets, library lending, and exchanges of copyrighted works between friends and family. This first sale doctrine has allowed the creation of libraries that provide access to copyrighted works to people who might not otherwise have such access. A library can buy a single copy of a work and then loan it to dozens or hundreds of people, one at a time, and, because of the first sale doctrine, such loans are not considered infringements of copyright. Although these loans might be seen as making it impossible for the publisher to make additional sales, as all potential purchasers are potential library patrons, we know that the creation of libraries did not kill the publishing industry in this country. Both authors and publishers have benefited from a broadly educated public.

103. In the recent *Eldred* decision, the Supreme Court recognized that copyrights were not necessarily “categorically immune from challenges under the First Amendment,” but

code, a body of code/law that does not map to current copyright law will be produced that will not acknowledge first sale, fair use rights, or the duration of copyright or the idea/expression dichotomy.¹⁰⁴ And the path dependencies of code will ensure that code continues to trump law.

V. The Role of Code/Law

Although the MPAA is humorously wrong to suggest that evolution of a “better” form of content requires imposition of global technical mandates, they may have hit on a key theoretical step that deserves attention. We can assume that law is a complex system that has the capacity to modify its own state through evolutionary change.¹⁰⁵ We know that code, as well as law, has regulatory effects.¹⁰⁶ As Lawrence Lessig has argued, software copyright protection programs that make software difficult to steal are a form of regulation created by programmers instead of legislators.¹⁰⁷ Further, Tim Wu has

held that as long as Congress did not “[alter] the traditional contours of copyright protection, further First Amendment scrutiny is unnecessary.” *Eldred v. Ashcroft*, 537 U.S. 186, 221 (2003). Thus, any Congressional action that has the effect of substantially narrowing the public domain and/or eliminating fair use (perhaps by mandating particular DRM measures that made no allowance for fair use) might be subject to First Amendment scrutiny.

104. Flagged material will include ideas that, once flagged, will not be free to spread in unapproved ways. They will be free to be received inside a closed, approved circle within the home network, but will not be available for transmission online. Information, unlike energy, is not (usually) conserved; in the flag context, it will be.

105. Many scholars have asserted that law is a complex adaptive system, characterized by unpredictability and sensitivity to initial conditions. David Post and Michael Eisen have described law as a fractal “tree” that involves choices at ever-lower levels. David G. Post & Michael B. Eisen, *How Long is the Coastline of the Law? Thoughts on the Fractal Nature of Legal Systems*, 29 J. Leg. Stud. 545, 546 (2000) (“We believe, more specifically, that legal arguments have a kind of fractal structure—recursively generated and possessed of a branching, self-similar, treelike structure at all levels of the argumentation hierarchy.”). Fractals are jagged curves or surfaces that retain the same level of jaggedness when viewed at any level of minuteness. Coastlines, for example, are fractal; the big bays and inlets will have little bays and inlets of the same general pattern. *See also* J.B. Ruhl, *Thinking of Environmental Law as a Complex Adaptive System: How To Clean Up the Environment by Making a Mess of Environmental Law*, 34 Hous. L. Rev. 933 (1997); J.B. Ruhl, *Is the Endangered Species Act Eco-Pragmatic?* 87 Minn. L. Rev. 885 (2003). J. B. Ruhl, *Complexity Theory as a Paradigm for the Dynamical Law-and-Society System: A Wake-Up Call for Legal Reductionism and the Modern Administrative State*, 45 Duke L. J. 849, 893-926 (1996) (using complexity theory to develop a general behavioral model of legal system).

106. *See, e.g.*, Lawrence Lessig, *Code and Other Laws of Cyberspace* 6 (1999); Lawrence Lessig, *Law of the Horse: What Cyberlaw Might Teach*, 113 Harv. L. Rev. 501 (1999); Wagner, *The Case Against Software*, *supra* n. 2 (“The idea that code has regulatory effects similar to law is firmly cemented into the consciousness of cyberscholars.”).

107. Lessig, *Code and Other Laws of Cyberspace*, *supra* n. 106, at 89 (1999).

reminded us, “The prominent effects of computer code have made it difficult to ignore the fact that code can be used to produce regulatory effects similar to laws.”¹⁰⁸ We are learning that code and law are complementary, and that lawmakers need to take seriously their obligation to “preempt” code (or contractual agreements about code) that do not fit social norms.¹⁰⁹ But how does all of this code versus law talk fit in to a coherent approach to code *and* law (taken together) as an evolutionary ecosystem? And what relationship does this ecosystem have to fostering innovation?

We need to gaze through a biological lens when looking at regulation by code/law. Biology teaches us that preserving the diversity of the gene pool of any complex adaptive system is extraordinarily important. Monocultures do not do well in the battle for survival, as the example of the food-seeking ant colony reveals.¹¹⁰ Diversity of the gene pool, by contrast, leads to a wider field on which selection can operate. Systems that are as complex and interesting as possible, without falling over the cliff into chaos, do best because they are resilient and adaptable. Selection in such interesting systems has more choices on which to operate. We need to think hard about what kind of legal stance (implemented in code *and* law) would favor this “sweet spot” of gene pool diversity. Diversity, in and of itself, is a state to be wished for.¹¹¹

108. Tim Wu, *When Code Isn't Law*, 89 Va. L. Rev. 679, 680-81 (2003).

109. See Wagner, *supra* n. 2.

110. The monoculture of the Microsoft operating system has also been demonstrated to be weak and open to attack. See Dan Geer et al., *CyberInsecurity: The Cost of Monopoly: How the Dominance of Microsoft's Products Poses a Risk to Security* <<http://www.ccianet.org/papers/cyberinsecurity.pdf>> (accessed Dec. 3, 2003). The massive power outages experienced in the northeast portion of the US and parts of Canada on August 14, 2003 will give rise to many thoughts about networks: “The lesson of this loss [i.e., the power outages] is that networks aren't machines. We cannot control networks the way we control machines. We must decentralize our control, distribute intelligence and allow the network to learn and adapt. We will find someone to blame and throw some bums out of office. We will serve ourselves well if, at the same time, we add to our ability to trust innovation.” Paul Philp, *The Long Harvest, The Center Cannot Hold* <www.longharvest.com/archives/000138.html> (Aug. 15, 2003).

111. Justin Hughes has recently raised this idea in the form of a question: “[W]e have reached a point where we treat preservation of cultural diversity in the same paradigm as preservation of biodiversity. But one rarely hears the same concern for diversity in law. “Multiculturalism” has legions of advocates and defenders, but “multilegalism”—if there were such a word in English—would not make a very good battle cry. Imagine going to a university campus and trying to hold a rally to defend the arcane, highly localized customs, practices, regulations, and procedures of the world's lawyers and bureaucrats.” Justin Hughes, *Political Economies of Harmonization: Database Protection and Information Patents*, Paris Draft (on file with author). This article is indeed a cry for “multilegalism”—paying attention to the diversity of legal systems, and not forcing harmonization where the

Although Polk Wagner has argued that because software is inflexible and unaccountable we need more law and less software,¹¹² I disagree with this premise. Both law *and* code establish the bases on which they will change in the future—code, like law, can change—and both need to be looked at in terms of their effect on mutation, change, and overall diversity.

A. The Sweet Spot for Law

Whether we understand “law” to be either social patterns that are labeled “law,” per Robert Cover,¹¹³ or a complex social institution, per H.L.A. Hart,¹¹⁴ we do not think of law as a regime of its own. Law is not something that exists in the abstract, in a fixed state, and is handed down to citizens from above. Law cannot be, we believe, separated from the constituencies that are affected by law’s statutes, court decisions, and other expressions. Law is an emergent phenomenon that contains rules by which these constituencies can express themselves and change the rules. Law does not enforce a particular worldview coming from just one of these constituencies. In its most enlightened form, it is a platform that does not favor particular regimes or rulesets. Without a social agreement to the contrary, law should not cut across the protocol stack, making certain applications (or rulesets) more difficult to use.¹¹⁵ Law should facilitate

local populace does not wish it, is a form of legal stewardship that will allow for appropriately structured experimentation.

112. See Wagner, *supra* n. 2.

113. Robert M. Cover, *The Folktales of Justice: Tales of Jurisdiction*, 14 Cap. U. L. Rev. 179 (1985).

114. H.L.A. Hart, *The Concept of Law* 1 (1st ed., Clarendon Press 1961).

115. “Telecommunications and computer networking experts have long conceived of networks and their associated computers as exhibiting a variety of well-defined ‘layers.’ At the bottom of this ‘stack’ are the physical links between computers. Proceeding ‘upward’ through the stacks, there next come the protocols necessary to run the links, the protocols necessary to connect the links together, the protocols necessary for two computers at the ends of the links to communicate, the protocols necessary for the two computers to open communications sessions, the protocols necessary for the computers to associate data with the appropriate applications, and the protocols necessary for the computer to execute the application associated with the data. TCP/IP is an effective communications protocol for inter-networking because it confines its standardization to the middle of these layers. Although it forces standardization on the network connection protocols, it permits substantial flexibility at lower levels of the protocol stack (permitting various types of heterogeneous networks to connect) and at the higher levels of the protocol stack (permitting various types of applications to network communication).” James Speta, *A Common Carrier Approach to Internet Interconnection*, 54 Fed. Comm. L.J. 225, 246-47 (2002) (footnotes omitted). “Cutting across the protocol stack” means optimizing one level of the stack for one particular use at a higher level, or otherwise privileging (or discriminating against) a higher-level application. One could re-

the emergence of regimes with their own rulesets, like religions and private groups, and keep the effects of each of these groups from slopping over into the realm of other groups in ways that would cause harm.¹¹⁶ Law is supposed to tolerate the existence of multiple regimes, and should not allow one sphere to mandate rules in another. Indeed, arguably the only thing law can do wrong is to turn itself over to one regime. When constituencies affected by particular laws feel that their interests are not being taken into account, unrest and revolution is more likely.

Thus, the sweet spot for law is one that allows for multiple sets of rules to operate, as long as most people affected by them are willing to go along.¹¹⁷ This spot, this balancing, looks similar to Jefferson's view of Constitutional interpretation: reading the Constitution so as to preserve the structural conditions that lead to competition among jurisdictions.¹¹⁸ To bring the discussion down to a more concrete level, the sweet spot for copyright law may not be a monoculture of identical, harmonized policies worldwide that is the desired expression of a single regime.¹¹⁹ It may be a better idea to provide for

conceptualize arguments concerning the separation of church and state as “whether or not to cut across the protocol stack” to favor or disfavor religious activities. *See, e.g.*, Robert Justin Lipkin, *Reconstructing the Public Square*, 24 *Cardozo L. Rev.* 2025, 2032-78 (2003) (asking what role religion should play in democratic debate).

116. *See, e.g.*, Paul Schiff Berman, *The Globalization of Jurisdiction*, 151 *U. Pa. L. Rev.* 311, 370-441 (2002) (overview of jurisdiction literature; asking why non-state actors should be privileged in the consideration of jurisdictional questions).

117. Interjurisdictional diversity can help adjust the fit between the level of public goods and the resources of a local population; it can also act as a check on inefficient governmental actions. Jonathan Duffy, *Harmony and Diversity in Global Patent Law*, 17 *Berkeley Tech. L.J.* 685, 689 (2002) (arguing that diverse jurisdictions can provide information to other jurisdictions about the value of different legal rules). Professor Duffy argues that “complete international harmonization of patent laws—particularly, the institution of a single, integrated global patent system—would eliminate interjurisdictional competition and substantially stifle innovation in patent law.” *Id.* at 691.

118. *See* John O. McGinnis, *In Praise of the Efficiency of Decentralized Traditions and Their Preconditions*, 77 *N.C. L. Rev.* 523, 535-536 (1999).

119. *Cf.* Graeme B. Dinwoodie, *A New Copyright Order: Why National Courts Should Create Global Norms*, 149 *U. Pa. L. Rev.* 469, 471 (2000) (“[I]t is a truism that contemporary problems in copyright law demand international solutions.”) There are, of course, strong arguments in favor of harmonization, including lowering costs of governance, lowering jurisdictional externalities, and preventing protectionism. Duffy, *supra* n. 117, at 694-703. But tolerating legal diversity may permit legal innovation to occur in ways that provide a better fit with the desires of a local citizenry: “[i]t is one of the happy incidents of the federal system that a single courageous state may, if its citizens choose, serve as a laboratory, and try novel social and economic experiments without risk to the rest of the country.” *New State Ice Co. v. Liebmann*, 285 U.S. 262, 311 (1932) (Brandeis, J., dissenting). If we think of law as a complex adaptive system, it becomes clear that diversity is a feature, not a bug.

copyright law that varies by geography and industry, and allows easily for change.¹²⁰

B. The Sweet Spot for Code

Similarly, code does not only constrain, like law, it sets rules for itself about how it will be modified. Code is modular (or not), or open source (or not). Code can be monopolistic if its use is so pervasive that no real choices exist because the switching costs of moving away from it are prohibitive. Code can encourage innovation by allowing other applications to ride above it, or can make this impossible. Code can allow mutation and variability, or it can stamp it out. Code can be globally mandated, or it can be locally variable. Code comes in many varieties, and some are “better” (in terms of encouraging diversity of the gene pool) than others. The sweet spot for code may be a state that allows follow-on innovation.¹²¹

C. The Code/Law Petri Dish and the Broadcast Flag

Now that we understand that law and code are complementary, working to produce regulatory effects on individuals and providing opportunities for paying attention to the variability of their gene pools, it is a short step to argue that both law *and* code should provide a rich background medium, a sort of petri dish, in which innovation can take place. Both law and code should provide ecological niches,

120. Tailoring by industry may already be a fact of life in intellectual property law. *See, e.g.*, Dan L. Burk & Mark A. Lemley, *Is Patent Law Technology-Specific?*, 17 *Berkeley Tech. L.J.* 1155 (2002) (arguing that while patent law is technology-neutral in theory, it is technology-specific in application). Although a full discussion of this issue is beyond the scope of this article, there is extensive literature on developing countries' requests that intellectual property rights be tailored by geography. *See, e.g.*, Susan K. Sell, *TRIPS and the Access To Medicines Campaign*, 20 *Wis. Intl. L.J.* 481, 496-498 (2002) (noting that post-TRIPS developing nations' battle over “TRIPS-plus” world intellectual property standards is continuing).

121. It is not clear whether open source software is likely to be more successful than proprietary software. *See, e.g.*, David S. Evans & Bernard J. Reddy, *Government Preferences for Promoting Open-Source Software: A Solution In Search of a Problem*, 9 *Mich. Telecomm. & Tech. L. Rev.* 313, 314 (2003) (suggesting that “[t]here is no evidence of any significant market failures in the provision of commercial software and no evidence that the establishment of policy preferences in favor of open-source software on the part of governments would increase consumer welfare”). But it is beyond question that innovation in computer programs is mostly incremental and cumulative. *See, e.g.*, Pamela Samuelson, Randall Davis, Mitchell D. Kapor, & J.H. Reichman, *A Manifesto Concerning the Legal Protection of Computer Programs*, 94 *Colum. L. Rev.* 2308 (1994). Thus, because innovation stems from programs being “available” in some fashion, whether in source or machine code form, it may be socially desirable to encourage availability. Openness to modification is a particular form of availability.

allowing marketplaces for applications and business models to flourish.

Because both law and code establish the conditions under which they will allow change, we should not necessarily privilege law over code as a regulatory medium. But nor should we privilege code over law. Fostering the optimal background medium of code/law for innovation requires attention to the variability of the code/law gene pool. Thus, for any particular thorny regulatory question, we have a framework for questioning both the code and law involved: are they appropriately supporting gene pool diversity? Or are they crowding out change? It seems that there is a “sweet spot” stance towards change (or variability) that both law and code should take.

We should not stand to one side with our law/policy hats on, deciding whether to use Polk Wagner’s “preemptive law” or any particular combination of code or law at any given time. If we avoid laws *and* codes that unduly stamp out change or innovation, then the combination of code and law will evolve in a more interesting way. Because evolution in complex systems depends on many populations of genes that generate many different context-sensitive competitive changes, there is little chance that a single central authoritarian rulemaker (such as Congress or the FCC) will be able by itself to make the right choices that produce an interesting mix of innovation and protection. Public choice theory (read most simply) suggests that these institutions will be incapable of coming to the right choices, because they will be so strongly influenced by the most established firms in the relevant industry sectors.¹²² Whether or not humans (or lobbying firms) act out of self interest (a proposition that seems easy enough to accept on its face), it seems unlikely that centralized legal institutions will have enough information to make adequate innovation/protection tradeoffs—or tradeoffs that are as “interesting” as those that might be found privately.¹²³

Looking through the biology lens at the broadcast flag/plug and play/analog hole debate reveals that adoption of the MPAA proposals may poison the Post-Eisen fractal tree of copyright law, and

122. See Daniel A. Farber & Philip P. Frickey, *Law and Public Choice: A Critical Introduction* 23-24 (Chicago 1991); Jonathan R. Macey, *Public Choice: The Theory of the Firm and the Theory of Market Exchange*, 74 *Cornell L. Rev.* 43, 43 (1988) (stating that “[p]ublic choice . . . applies game theory and microeconomic analysis to the production of law by legislatures, regulatory agencies and courts”).

123. Centralized planning might not allow the complex, interacting decisions required to deliver the goods in this context. See F.A. Hayek, *The Use of Knowledge in Society*, 35 *Am. Econ. Rev.* 519 (1945).

dampen innovation, by ensuring that evolution in both law and products unapproved by the MPAA will not occur. With respect to its desired legal regime, the MPAA is not taking anything for granted; it will be extraordinarily difficult to dismantle the framework of international treaties, federal decisions, and state laws that they are building to ensure that no “unauthorized” devices touch their content. And the view of copyright law held by the MPAA may not map to current overall social pictures of that same body of law.

The technological approach the MPAA is suggesting in the broadcast flag/analog hole proposals will instantiate a particular vision of copyright law in mandatory code that will eventually be globally pervasive. But law is supposed to be a social conversation about collective values. Using code in this way to mandate one view of copyright law may create path dependencies that will be very difficult to change, cut off all social conversation about the course of the law, and allow one regime to set rules for another without a social agreement that such rules are necessary. This description states the issue far too mildly. The MPAA is attempting to create an alternate, technical walled garden that will seek to control the channel for worldwide expressions—without a social consensus that such control is appropriate.

Additionally, this mandatory code will not permit unauthorized devices to manipulate flagged content—or even connect to authorized home network devices. Thus, if global technical mandates are put into effect implementing the broadcast flag requiring the plug and play agreement and closing the analog hole, there is a real risk that innovation will suffer. Diversity and change will be extraordinarily difficult in consumer electronics and computing devices that touch any digital content to which the studios attach value, because the particular code that the MPAA seeks to mandate (use of the 5C suite of technologies in all devices; requirement that all machines be adequately secure) will be subject to change only if the content industry agrees. This cannot be a desirable outcome.

There is nothing wrong with the content industry building gates around its own content, which is what private DRM systems are. But there *is* something wrong with the content industry using code/law to force groups that do not want gates (and are otherwise acting in a law-abiding fashion) to build them, particularly when the social conversation for copyright law has not chosen to outlaw these

otherwise legal devices.¹²⁴ Some manufacturers will not want their devices to be crippled. Some manufacturers will believe that PCs should remain open platforms. And many people will not want to buy replacements for devices that are legal. Rather than grant unlimited property rights, as the MPAA suggests, copyright law confers particular rights limited in time and scope as circumscribed by statute. It does so, ultimately, as a means of encouraging innovation for the benefit of the public, not for the benefit of the copyright holder.¹²⁵

Both the code and the law under discussion in the broadcast flag/plug and play/analog hole debates, and their combination as a code/law petri dish, arguably fail the variability-of-the-gene-pool test. By contrast, private DRM systems, like the iTunes system, will provide the variability, choice, and fluctuations that are needed to provide a fertile environment for innovation, while, in the meantime, protecting content. Such systems may provide the “speed bump” that MPAA says it is looking for, without the imposition of a global, uniform solution that eliminates helpful variability. If this industry is so concerned about losing control of their content, they should act to protect it in ways that vary from movie to movie, from platform to platform, and from moment to moment.¹²⁶ Consumers will vote with their feet, more and more slivers of choices for use of content will be marketed, interoperable machines will continue to flourish as consumers embrace them, and new ways of doing business will emerge. The problem with mandating a particular content protection technology and form of “approved” devices, across the globe, is that it will narrow choices and frustrate many desirable evolutionary processes for both innovation and code/law. That is not a tradeoff the

124. The MPAA and its member companies were worried enough to use litigation to attempt to shut down the VCR industry in the 1970s. In 1984, the Supreme Court ruled that manufacturers of VCRs had not acted as contributory infringers because VCRs are capable of substantial non-infringing uses. See *Sony Corp. v. Universal City Studios, Inc.*, 464 U.S. 417, 442, 448-56 (1984). Here, similarly, most of the devices that will be required to adhere to the flag/hole schemes will be capable of substantial non-infringing uses. Rather than grant unlimited “property rights,” as the MPAA suggests, copyright law confers particular rights limited in time and scope as circumscribed by statute. It does so, ultimately, as a means of encouraging innovation for the benefit of the public, not for the benefit of the copyright holder. See *20th Century Music Corp. v. Aken*, 422 U.S. 151, 156 (1975).

125. See *Id.*

126. The Berkman Center and the Gartner Group recently released a report making much the same recommendation. See GartnerG2 and The Berkman Center for Internet & Society at Harvard Law School, *Copyright and Digital Media in a Post-Napster World*, <<http://cyber.law.harvard.edu/home/uploads/254/2003-05.pdf>> (Aug. 2003) (flexible DRM can accommodate consumers’ needs while stopping rampant copying).

content industry should be willing to endorse, however firmly-held its belief in its “natural” prowess and importance.

As long as there is adequate choice in DRM systems (something with which global competition law should be concerned), evolution of devices and uses (and copyright law) can continue to flourish. In a vibrantly competitive market,¹²⁷ software DRM systems are a useful example of spontaneous order arising from the one-by-one decisions of individuals and corporations without the central direction of government.¹²⁸

VI. Conclusion

The encouragement of innovation has long been a goal of intellectual property law. Achieving this end is now complicated, however, by the fact that law and code need to be looked at together for their effects on innovation. The challenge for the next generation of intellectual property policymakers is to design and implement rich background code/law environments that allow for continued evolution.

From this perspective, the MPAA’s use of code/law to instantiate their particular vision of copyright law (and assure a controlled, “successful” digital future for their products) looks unattractive. A heavy reliance on technology mandates makes sense if today’s decisionmakers are both capable of predicting which innovations are likely to be most beneficial to the overall state of the world and correct in striving to impose one regime’s view of copyright law on the future. But neither proposition makes sense, either as a descriptive or normative matter. We have very weak powers to predict the future, and the one thing we do know is that a more

127. I recognize that the assumption of a competitive market for DRM systems is an optimistic one. It is of course possible that one firm will dominate media platforms worldwide. It will be important to focus on the choices (and absence of choices) provided by DRM systems generally, and on whether concentration in the market for such systems has effectively removed choice altogether. Making these marketplaces visible will be a key advance. See Susan P. Crawford, *Who’s In Charge of Who I Am? Identity and Law Online* (forthcoming)(actions of online intermediaries that affect identity should be visible).

128. See, e.g., David G. Post & David R. Johnson, “*Chaos Prevailing on Every Continent*”: *Towards A New Theory of Decentralized Decision-Making in Complex Systems*, 73 Chi.-Kent L. Rev. 1055 (1998); David R. Johnson & David Post, *Law and Borders—The Rise of Law in Cyberspace*, 48 Stan. L. Rev. 1367 (1996); see also Mark A. Lemley, *The Law and Economics of Internet Norms*, 73 Chi.-Kent L. Rev. 1257, 1266-93 (1998) (noting problems with deferring to private norms, including that norms change over time, internet norms may not be understood, norms do not adequately account for externalities, and network effects make exclusionary norms undesirable).

interesting future (in a biological sense) will be more resilient and adaptable.

There is reason to suspect that instead of helping us to achieve progress, the broadcast flag, plug and play, and analog hole proposals now under discussion may cause legal and technical problems for later innovators and consumers. Members of the present MPAA may need to conclude that their conception of “survival of the fittest” will have to change, because their creatures (i.e., their business plans) may become extinct in light of the realities of the digital world. Instead, the best strategy may well be to adopt private DRM solutions, with the hope and expectation that new forms of content and new privately-ordered marketplaces will arise. Hollywood may have to abandon the illusion that they have some natural right to preservation that can be implemented by restricting the choices of future generations. Their successors in business will thank them. Loss of resiliency and adaptability, both in innovation and in law-creation, may not be worth trading away.