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Computer RAM 'Copies:' Hit or Myth? Historical Perspectives on Caching as a Microcosm of Current Copyright Concerns

I. Trotter Hardy
William & Mary Law School

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COMPUTER RAM “COPIES”: HIT OR MYTH? HISTORICAL PERSPECTIVES ON CACHING AS A MICROCOSM OF CURRENT COPYRIGHT CONCERNS

Professor I. Trotter Hardy

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COMPUTER RAM "COPIES": A HIT OR A MYTH? HISTORICAL PERSPECTIVES ON CACHING AS A MICROCOSM OF CURRENT COPYRIGHT CONCERNS

*Professor I. Trotter Hardy**

I. INTRODUCTION

Technological change presents challenges to the law. Perhaps no other context for this challenge has drawn as much public attention as the challenge of Internet technologies to our legal system generally,¹ and especially to our primary reservoir of information law principles, the copyright law.

Copyright issues bedevil commentators and practitioners alike in this evolving world of Internet communications. They are each worthy of a detailed analysis. Yet many raise the same general issues that new technologies have long raised for copyright: should this or that new "work" be copyrightable? Should this or that new use of an existing work be an infringement? How should copyright owners respond to a rise in the ability of individuals to make adequate—or worse, from the owners' perspective, perfect—copies of commercial works in the privacy of their own homes?

To address these issues in a general way runs the risk of speaking so abstractly as to appear irrelevant to real world problems. On the other hand, to address a single small issue might seem to miss the forest for the trees. I would avoid both extremes in this article by taking a single area of current concern—the "caching" of information on the Internet—to analyze it both for its own sake, and more importantly to analyze it in the context of illustrations from other technologies from copyright's past for lessons about copyright and technological change.

Caching is the temporary storage of information traveling over a network. It is typically done to improve the speed of access to the same information if it is needed later: the information can be pulled from the "cache" faster than from its original source. In informal conversations, and in equally informal discussions on the Internet, one frequently hears about the benefits of caching. In particular, one view expressed commonly and casually can best be summarized as saying, "Caching is a great help to the Internet. If caching is "copying" and hence a copyright infringement, then something is wrong:

* Professor of Law, the William and Mary School of Law, Williamsburg, Virginia. E-mail address: <thardy@facstaff.wm.edu>. I thank: the commentators at the University of Dayton's conference on "Internet and Copyright" who made many helpful comments on my presentation of the ideas contained in this article; Walter Echwald for close and careful editorial advice; and Mark Lemley and Shira Perlmuter for very helpful comments. Needless to say, the views expressed here are my own personal views.

1. See, e.g., I. Trotter Hardy, *The Proper Legal Regime for 'Cyberspace,'* 55 U. PITT. L. REV. 993, 996-1015 (1994). See also I. Trotter Hardy, *Law and the Internet*, BUS. L. TODAY, Mar./Apr. 1996, at 8, for an informal discussion of why changing technology poses new legal issues.

caching *ought not to be an infringement.*"²

This article takes the form of a reply to that stylized argument. In a narrow sense, I think it especially important to formulate such a reply to the caching issue now, before commentators and industries alike have hardened their views into fixed positions and the industries have expended time and energy in lobbying Congress for changes to the Act. In a broader sense, the "caching argument" is of a piece with similar arguments that have been made in the past about other technologies—and to which I offer the reply here. In this sense, I hope to provide a more general analysis of copyright's response to technological evolution.

I will start by discussing the technology of caching; explain why widely accepted beliefs in the Internet world about caching's virtues are false or misleading; and then illustrate problems we have experienced in the past because we misunderstood the potential of other, roughly analogous technologies like cable television. Finally, I will focus on caching as a part of the larger debate over "temporary copies in a computer's RAM³ memory."⁴ I will suggest that far from being silly or too-literal-minded, courts using the "RAM copy" doctrine are quietly evolving a new law of information that is in fact based on "access and use" rather than "copying."

II. WHAT IS "CACHING"?

Computerized information traveling over a network like the Internet sometimes arrives at its destination quickly and sometimes slowly—often painfully slowly, as any frequent "surfer" on the World Wide Web can attest. Speed of communications depends on many things: the speed of the computer that is providing the information initially; the speed of the slowest "link" in the network chain; the number of other users using the same computer or the same network at the same time; and so on. Other things being equal, if a unit of information can originate at a point closer to the ultimate consumer rather than farther, or from a computer that is faster or less congested than another, the consumer will be able to obtain it more quickly.

Mechanisms to do that—to store information temporarily "closer" to the consumer or on a more powerful or less congested computer, in order to speed up access—are generally referred to as "caching."

The concept of a "temporary" storage location or "cache" for computer-handled information has a wide variety of interpretations. Do we mean "temporary" in human time? Then perhaps a cache would last a few days. Or

2. This is a hypothetical. I use it merely to characterize the issue. I am not aware of any formal, scholarly proposals about caching or of any movement in Congress at this point to introduce legislation.

3. "RAM" stands for "random access memory." Its use in the phrase "RAM memory" is therefore redundant, but common nonetheless.

4. See generally 2 PAUL GOLDSTEIN, COPYRIGHT § 5:28-44 (2d ed. 1996).

do we mean "temporary" in computer time, which might mean a few milliseconds.⁵ Or do we mean something in between: seconds, minutes, or hours. All of these differing times can be and often are thought of as "caching," which perhaps means that like beauty, "temporariness" is in the eye of the beholder.

Whenever a temporary—however defined—copy of information is created, it will likely be a copy not just for computer purposes, but also for copyright purposes. One can certainly argue that a millisecond storage time is not in any practical or legal sense a "copy" of anything, and that argument can even extend to the several-second time frame. But two observations make it impossible to dismiss the issue of caching as creating a "copy" for copyright purposes.

First, a number of courts, most notably the Ninth Circuit in *MAI Systems Corp. v. Peak Computer, Inc.*,⁶ have determined that the loading of a computer program into the memory of a computer does indeed constitute the making of a "copy" for copyright purposes.⁷ Perhaps this line of case law authority will one day be overturned legislatively, but it remains the generally accepted view of in-RAM copies today.⁸ Indeed, recent proposals to amend the Copyright Act on this point have provided that temporary copies in RAM for certain, defined purposes, such as maintenance and repair would not be considered infringements.⁹ By implication, even this ameliorative legislation supports the view that *other* forms of computer-memory copies, made for other purposes, would indeed continue to be considered "copies" for copyright's purposes.

If the brief appearance of information in computer RAM, which in most personal computers today is erased when the power is turned off, is nevertheless a "copy," then *a fortiori* a temporary copy on a hard disk would be a "copy" because such storage typically does not become erased when the power

5. Many personal computer systems provide caching internally, not for purposes of accessing information on the Internet—the focus of this paper—but for even faster access to information stored on a PC's hard disk or RAM memory. Even though access to today's hard disks is at speeds almost unimaginably fast, to a computer, accessing information on a hard disk is dramatically slower than accessing that same information from RAM memory. Consequently, some computers "cache" information they read from the hard disk in RAM. It is also possible to achieve speed gains from caching some information that is accessed from RAM memory in a smaller, faster memory located adjacent to the processing unit. One therefore hears of processor chips, such as the Pentium, which have an "on-board" cache of 256 kilobits or 512 kilobits or the like. The principle of these caches within a single desktop computer is the same as that for access to information over the Internet, but it is only the Internet caching issue that I address in this paper.

6. 991 F.2d 511, 518-19 (9th Cir. 1993), *cert. dismissed*, 114 S. Ct. 671 (1994).

7. *Id.*; see also *Triad Sys. Corp. v. Southeastern Express Co.*, 64 F.3d 1330 (9th Cir. 1995), *cert. denied*, 116 S. Ct. 1015 (1996); *Vault Corp. v. Quaid Software, Ltd.*, 847 F.2d 255, 260 (5th Cir. 1988); *Advanced Computer Servs. v. MAI Sys. Corp.*, 845 F. Supp. 356, 362-64 (E.D.Va. 1994); *Telerate Sys., Inc. v. Caro*, 689 F. Supp. 221 (S.D.N.Y. 1988) (receiving data from a remote database constitutes making a "copy" of the data in the terminal); *Apple Computer, Inc. v. Formula Int'l, Inc.*, 594 F. Supp. 617 (C.D. Cal. 1984) (by implication); see generally GOLDSTEIN, *supra* note 4, § 5:28-44.

8. GOLDSTEIN, *supra* note 4, § 5:28-44.

9. See Computer Maintenance Competition Assurance Act of 1997, H.R. 72, 105th Cong., 1st Sess. (Jan. 1, 1997).

is turned off. Much caching is in fact accomplished by storage on hard disks.¹⁰

Second, when a "temporary" cache can mean anything from milliseconds to "maxi"-seconds to days or weeks, even die-hard opponents of the RAM-copies-are-copies line of cases will admit that at some point a "copy" has been made for copyright purposes. In fact, many caching schemes today are quite persistent. Internet "browser" software often stores information on a user's own hard disk and only infrequently or never erases it.¹¹

For at least these two reasons, then—that even a brief appearance of information in computer memory for caching may be "copying" for copyright purposes, and that some caches are far more persistent than brief—the issue of caching and copyright is an extremely significant one.

The significance of the issue raises the question of how the legal system and more particularly the copyright law ought to respond. The spectrum of responses runs from doing nothing, to litigating to force a judicial interpretation, to enacting legislation codifying the rules—whatever they may be—in the copyright statute.

Because judicial decisions so far do support the view that caching constitutes the making of a "copy" under the statute as it now stands, it is unlikely that legislation would be needed to *establish* infringement liability for caching. If we were to resort to a legislative resolution of the caching issue, then, it is likely that the legislation would take the form of "legalizing" caching or perhaps defining some subset of all "caching" behavior and legalizing that subset, while preserving infringement liability for other subsets.

How *should* we respond? The answer is clear: by a judicial, case-by-case approach based on fair use or implied licensing—*not* with legislation or broadly applicable precedent.

I will not argue in this paper whether the "better" doctrine would be implied license or fair use; I think there is room for both approaches, even in a given case. Rather, I will argue that both of these doctrines have the great virtue of being dependent on the facts at hand. Implied licenses are

10. Browsers like Netscape's Navigator and Microsoft's Internet Explorer create caches on a user's own hard disk. Netscape's Navigator users can look for a directory somewhere on their disk titled "Netscape\Navigator\Cache," which on Windows95 machines is likely to be under a directory titled "C:\Program Files". Internet Explorer users running Windows95 can look for a directory most likely titled "C:\Windows\Temporary Internet Files" or "C:\Windows\Microsoft Internet\cache" for their browser's cache. (I apologize for not knowing where things are stored on other machine types and operating systems.) On my own hard disk, as of this writing (Nov. 15, 1996), I had over five megabytes of Netscape cached files dating back two months; thirty (30) megabytes of Internet Explorer 2.0 cached files dating back six months and thirty-six (36) megabytes of Internet Explorer 3.0 cached files dating back three months.

11. Perhaps, one might argue, if users themselves are unaware of this fact, then these browser-cached "copies" are like the noise of trees that fall in the forest when no one is there—who cares how loud the trees are or how long unknown copies lie around in the forgotten corners of one's hard disk? Well, one answer is that some users *do* know what is on their hard disk. I myself have found cached information in the form of bit-mapped images on my computer disk when conducting a general search for image files. I had no idea that the cached images were there, but a simple search across my entire hard disk yielded hundreds of them placed there by my browser software.

fact-dependent because the court can determine what is "implied" only by looking at the facts surrounding the actions of the parties. Fair use is already defined in the statute as, and widely understood to be, very fact-dependent.¹²

In the remainder of this paper, I will show why any approach that establishes a broadly applicable rule—judicial or statutory—to the caching question would be ill-advised. I will reach that conclusion by examining four fallacies that crop up repeatedly in the conversations I have with technical and even legal experts—what I think of as four influential "myths" about caching on the Internet. Each of these myths is wrong in some respect; cumulatively, their flaws show that it is essential to avoid a general rule about "caching" and instead, deal with the issue on a case-by-case basis.

III. MYTH #1: CACHING IS ESSENTIAL FOR THE INTERNET

To those who are "Internet savvy," caching seems as inevitable for a networked world as wind and weather are for the world of the outdoors. It exists to speed up communications over the Internet, and because of that, it will always be a part of the Internet.

Or so goes the argument. But is caching really inevitable for networks like the Internet? Is it going to be with us as long as digital communications are with us? Not necessarily. Caching is actually a response to the particular implementation of networked communications that we happen to have in place, an implementation designed for a much lower level of usage than we actually have today.¹³ Caching, in short, is a response to "the bandwidth problem:" that the bandwidth available for most users much of the time is less than they want. That simple observation, that we have "a bandwidth problem," leads to an important conclusion: *If the Internet were fast enough, caching would not be necessary.*

This conclusion leads in turn to two additional thoughts. First, because caching grows from a desire to speed access, and speed of access is a function of the Internet's current bandwidth, there is a tendency to view "the bandwidth problem" as a purely technical problem—and therefore one with a purely technical solution. Second, if bandwidth is not primarily a technical problem (I shall argue that it is at least as much an *economic* problem), the best solution has nothing to do with increasing overall bandwidth, but rather with differenti-

12. See, e.g., H. R. REP. NO. 1476, 94th Cong., 2d Sess. 65-66 (1976), reprinted in 1976 U.S.C.C.A.N. 5654, 5678-80 (noting in regard to fair use that "the endless variety of situations and combinations of circumstances that can rise in particular cases precludes the formulation of exact rules in the statute"); see also Jessica D. Litman, *Copyright, Compromise, and Legislative History*, 72 CORNELL L. REV. 857, 887 & n.197, 898 (1987).

13. I do not say that the Internet's *architecture* was designed for a lower level of usage. The architecture is very scalable; I mean that what we have in the way of wires and cables and their speeds—today's *implementation*—is not up to the task we impose on it. That is why browsing the Web is so slow at times.

ating among bandwidths and by *pricing* each separate "piece" of bandwidth appropriately. Under either view, however—technical or economic—there is no warrant for developing long-term rules for caching.

A. Bandwidth As a Technical Problem

A popular view of the slow access speeds of the World Wide Web ("WWW") is that speed is merely a technological issue, an issue of limited bandwidth specifically. The Internet was never designed for the amount of usage it sees today, so naturally, goes the argument, its present implementation does not gracefully handle the load.

A great strength of the Internet's architecture, however, as opposed to its particular implementation today, is that it is readily "scalable." That is, the same basic techniques of dividing information flows into packets, the use of decentralized computers for the switching and routing of those packets, and so on, can be applied on a much larger scale—apparently indefinitely.¹⁴ In short, if all the various links and switches and routing computers of the Internet were substantially "beefed up," information would flow faster. Congestion—at least substantial, irksome, congestion—would be a thing of the past.

Crucial to my argument is the fact that if the "bandwidth problem" is in fact solved, and congestion fades from memory, then the need for caching will fade as well. Why cache information if access to it in its original location is just as fast as access from a cache?

Everyone wants information access to be faster, of course. So the idea that speed is a technological problem has great appeal: technological problems have technological solutions. And because everyone wants faster access, surely everyone has an incentive to accomplish exactly those technological solutions: the "beefing up" of communication links and computers to greater speeds and capacity. Bolstering this view is the undisputed fact that many providers of Internet access are indeed busy installing greater and greater capacity.¹⁵

If in fact limited bandwidth is a technical "problem" with a technical solution just on the horizon, then it makes no sense to adopt a general rule about caching—caching will disappear as soon as bandwidth is no longer a limitation. When everyone can access any part of the Internet without delay, the need for caching to speed up access is gone; with the bandwidth "problem" solved, there are no delays by definition. Thus there would be no need to worry about caching because it is destined to be a short-lived phenomenon in

14. Personal conversation with Internet co-founder Dr. Robert Kahn, President of the Corporation for National Research Initiatives (July, 1996).

15. See, e.g., MCI News Bureau, *MCI and BT Announce Largest International Merger in History: Move Creates First Global Communications Company for the 21st Century* (visited Feb. 25, 1997) <<http://207.17.62.161/deal/release.htm>>, especially the listing of communications ventures around the globe.

the history of the Internet, soon to disappear.

B. Other Evolutions in Internet Technology

Moreover, there are other "technical" solutions to the bandwidth problem that will likely arise in the near future. These solutions center on a shift from the Internet's current "one-size-fits-all" bandwidth to a system of multiple, differentiated, bandwidths and features for a variety of purposes.

The net is currently "one size fits all" because, with modest exceptions, it is indifferent to the type of content passing through it. To be sure, different communications standards (called "protocols") are used for different types of transmissions: e-mail may use a communication standard that calls for Internet switching computers to recognize "From" and "To" addresses, whereas another type of file downloading might use a different standard because "From" and "To" do not make sense in the same way. But within one of these broad protocol types such as "e-mail," the various packets that make up an e-mail message might contain text, audio, video, or a computer program. And the net overall would not know or care about the difference.

This "content-blind" architecture¹⁶ is considered the great strength of the Internet: almost everything is just a stream of bits, so people can experiment with clever techniques to make it transmit text, audio, images, video, etc. The phenomenon of a single transport mechanism carrying every sort of media is often described as "convergence."¹⁷ It allows a great deal of experimentation with new forms of communications because those experiments do not require the "cooperation" of the network—they can be done by users at the ends of the communication link with neither technological nor managerial "permission" from within the network.¹⁸

Of course, technology rarely provides a wholly unalloyed benefit; the content-blind nature of the Internet is no exception. The drawback to a highly general-purpose network is that the network itself *cannot* cooperate even when that cooperation might produce benefits. For example, the Internet today does not make allowances for the fact that interactive video streams require greater bandwidth and may be far more dependent on timely delivery than e-mail

16. I do not address here the economic analysis of networks put forward by economists Jeffrey MacKie-Mason, Scott Shenker, and Hal Varian. See J. MacKie-Mason et al., *Service Architecture and Content Provision: The Network Provider as Editor* (visited Nov. 1, 1996) <<http://www.sims.berkeley.edu/~hal/people/hal/papers.html>>. In this fascinating article, the authors point out that all things being equal, a network that is "content-aware" will provide more mass-market goods than a network that is more "content-blind." *Id.* at 9. The latter will tend to provide more "niche" goods. *Id.*

17. NICHOLAS NEGROPONTE, *BEING DIGITAL* xx (1995).

18. The notion that a network "permits" certain things and "disallows" others means that networks can create "laws" of their own, enforced through technology. See David G. Post, *Anarchy, State, and the Internet: An Essay on Law-Making in Cyberspace*, 1995 J. ONLINE L. art. 3, ¶ 12 <<http://www.wm.edu/law/publications/jol/>>. Non-compliance is not problematic; the non-complying party is simply unable to make use of the network.

messages. If the network *were* able to distinguish these two forms of content—if the Internet were “content aware”—the net could be “fine tuned” to provide a higher level of service quality for the video communication.

Is such a shift in Internet technology—from content-blind to content-aware—likely to happen? I think it is very likely, based partly on historical parallels, and partly on current undertakings. If that happens, the need for caching will be lessened.

The history of a variety of technologies suggests that if better performance matters, we may well give up generality for the performance gains that come from greater specialization, in this case from making the net more aware of content. Here is one quick example from the history of audio devices. In the early days of audio technology, a microphone could also be a loudspeaker.¹⁹ This was accomplished simply by using the device “in reverse.” The same coil of wire wrapped around a paper cone and centered in a magnetic field could operate in either “direction.” If a voice caused the cone to vibrate back and forth, the wire coil moving in the magnetic field caused the generation of an electrical signal representing the spoken voice—the device functioned as a microphone. On the other hand, if a variable electrical signal were run through the wire coil, it created a varying magnetic field in the coil, which in the presence of the constant magnetic field surrounding it, caused the cone to vibrate back and forth and produce sounds—the device was a loud speaker. This is an extraordinarily elegant and bi-functional design.

One does not encounter such dual-function audio devices today, however. Why? Because large performance gains can be achieved by engineering devices that are optimized for microphone use on the one hand, and separate devices that are optimized for loudspeaker use on the other. Elegance and general-purposeness have given way to the pressure for greater performance that can only be achieved through increased specialization. Hence microphones and loudspeakers diverge sharply in their design and characteristics.

One sees similar developments in other areas. Some word processing programs, for instance, have a built-in mechanism to work with spread sheets. They can store rows and columns of numbers, do simple math calculations, and so on. But I doubt that those who “do numbers” for a living, like accountants and budget planners, rely on their word processors for that purpose. I imagine that they make use of the more specialized and customized features of a dedicated spread sheet application. At least we know that in spite of the existence of powerful, numbers-capable word processors, there is in fact a market for even more powerful spread sheets as a separate tool.

No doubt that some people in the PC world long for the “good ol’ days”

19. For example, Bell’s early telephone “consisted of a transmitter, a receiver, and a single connecting wire. The transmitter and receiver were identical; each contained a flexible metallic diaphragm and a horseshoe magnet with a wire coil.” MICROSOFT ENCARTA Telephone (1994).

of DOS, where one could type a few simple commands and the machine would obediently, if dumbly, obey them—including copying one file right on top of another, even if that meant a newer version of the same file was erased by an older version. Nowadays sophisticated Windows and Mac machines do preliminary checks to warn users if that will happen. More recent PCs have, in short, more specialized features than older ones—pieces of the "COPY" program that pay closer attention to what a user is copying and make distinctions as a result. This specialization means more complexity, but it is a complexity that offers greater or more helpful performance to most users. And as with microphones and speakers, and spread sheets and word processors, so with PC operating systems, the broader picture is that the evolution of technical devices is generally *not* toward a greater, more elegant simplicity. It is typically rather towards greater complexity to achieve greater performance.²⁰

That is why the need for enhanced communications performance may bring about an eventual separation of today's single, general-purpose stream of bits over the Internet into "specialized streams," perhaps running on specialized networks, so that greater performance gains can be reached. We may soon see the Internet move away from the currently-touted "convergence"²¹ of all media on a single type of network and toward a new digital "divergence" into many different networks.

Already we are hearing of the "Internet II," a separate network being implemented by the National Science Foundation precisely for the purpose of achieving greater transmission speeds than now available on the "regular" Internet.²² NSF is also working on projects such as "RSVP," a technological means of allowing one to reserve bandwidth in advance of use.²³ Such

20. I speak of technology from the "engineer's" view, as opposed to the user's. Compared to a poorly designed user-computer interface, for example, a well designed interface might appear "simpler" and "more elegant" to its user. But underlying the appearance of simplicity will inevitably be a greater engineering complexity. Consequently, as the Internet evolves, it may well appear to be simpler to its user audience. The World Wide Web ("WWW") and browsers like Netscape certainly give the Web an appearance of simplicity and elegance to users compared to pre-WWW days.

21. A search of LEXIS, News Library, CURNWS File (last two years) (Nov 18, 1996) for "convergence w/5 digital w/5 internet" yielded thirty-four articles.

22. Bob Metcalfe, *You Really Think That the Internet Isn't Collapsing? Universities Are Bailing Out*, INFOWORLD, Nov. 11, 1996, at 48:

Private TCP/IP networks are already avoiding the public Internet in droves. Now our nation's great research universities, the builders and first users of the Internet—Harvard among them—are preparing to join in the desertion of their sinking ship. Last month, 34 universities proposed that the Clinton administration buy higher education a separate Internet. Privatizing its backbones has left our universities with a 'commodity' Internet that cannot serve the needs of research and education. See also David S. Hilzenrath, *Mixed Returns on the Net: Election Night Surfers Saw the Web's Weakness*, Power, WASH. POST, Nov. 10, 1996, at A1.

23. See George Strawn & Mark Luker, *High Performance Connections to the Internet for Research and Education and NSF's Very High-Performance Backbone Network System (vBNS)* (last modified Sept. 27, 1996) <<http://www.cise.nsf.gov/ncr/vbns-evol-sep96.html>>:

[A] high-performance network is more than a high-bandwidth network. Additional characteristics, such as the capability to reserve network resources in advance and to guarantee performance to match specific qualities of service are needed. With such services, the high-performance Internet will be

reservation technologies enable one to be sure, for example, that a scheduled transmission of gigabytes of telescope or supercomputer data, or a live video conference, can be made at the appointed hour, without regard to the Internet's congestion.

The significance of this shift toward a more differentiated network is that if the shift happens and the Internet is no longer a "one-size fits all" network, then the pressure to provide caching as a means of speeding up performance will be considerably lessened. The point of a "diverging" network is that it can achieve better performance: it can better accommodate video streams because it will be aware of those streams and can pick optimal paths and configurations for them. It can better accommodate e-mail and other forms of digital communication also, for the same reasons. Better accommodation equals better performance, and better performance means a decreased need for caching as a means of enhancing performance.

In sum, we will likely see an Internet tomorrow on which either the bandwidth "problem" has been solved with greater speeds for all;²⁴ or we will see a transition to much greater differentiation in service levels so that applications needing greater bandwidth can get it. In either case, the need for caching will be substantially reduced. Once again, we would be mistaken to adopt any fixed rules about caching today.

C. Alternate View: Bandwidth Is an Economic Problem

Bandwidths and levels of bandwidth quality sound as though they were entirely technical problems. I have accordingly sketched out above two "technical" responses to these problems that obviate much of the need for caching. But in fact, an alternative view of bandwidth limitations is that it is much less a technical problem than it is an economic one, a problem of limited network resources that must be allocated to varying applications and users.²⁵

Viewed as a limited resource in economic terms, bandwidth is no more a technical problem than is milk or furniture or bank loans or apartments.

able to support delay-sensitive, bandwidth-intensive applications such as distributed computing, real-time access and control of remote instrumentation, and efficient multicasting to support video and multimedia collaboration. Moreover, the most demanding new applications will require automated methods of scheduling and allocating major network resources, much as has been done with supercomputers over the years.

Id. (emphasis added).

24. I think "unlimited bandwidth" is the least likely outcome, see *supra* notes 23-24 and accompanying text, but I point out the consequences of unlimited bandwidth for caching for those who think it more likely than this author does.

25. This economic aspect of the problem goes hand in hand with the previous discussion of specialization in the form of a "content-aware" network. Network providers have a very strong incentive to try to optimize service through specialization, after all, only if they can find a way to increase profits from doing so. The way to do that is to be able to offer different levels of service at different prices.

These resources, like all resources that are worth talking about,²⁶ are "limited" in the sense that there is not enough of any of them to give everybody all that they want for free.²⁷ They must be allocated in some way. Typically, with milk, furniture, etc. we allocate the resources through the mechanism of prices. Even though milk, like "bandwidth," is a limited resource, we do not perceive the availability of milk as a "limited milk problem" or a "milk shortage problem" because we expect that things of value will have a price, and that the price will lower the demand enough to balance with supply. That is indeed the function of prices in a market economy.²⁸

We can draw the same balance in the same way with bandwidth on the Internet.

To some extent, we do this already. One can buy modem access to the Internet by paying for a connection to a dial-up Internet Service Provider. A modem connection presently allows 28.8 or 33.6 kilobits-per-second access.²⁹ One can also, however, acquire faster access through a non-dial-up network. One could (at least in many locales), for instance, acquire what is called an "ISDN line" and operate at about 128 kilobits per second, or a T1 line at 1.5 million bits per second, or even higher speed communication lines. The latter simply cost more than the dial-up modem connection. Greater bandwidth costs more money, and that is a way to prevent shortages of bandwidth.

If we take the economic view, then the solution to the bandwidth problem is not "more bandwidth" but rather *the pricing of bandwidth so that supply and demand balance each other*.

Unfortunately, to price bandwidth in a way that *eliminates* the demand for caching is not so easy. Required would be one or both of two things: First, we will need a much more fine-grained differentiation in service levels than the coarse distinctions we have today among modems, ISDN, T1 lines and the like. Second, we will need a pricing structure that makes it cheaper to move up to the next higher level of service than to cache.

By "a fine-grained differentiation in service levels" sufficient to obviate the need for caching, I mean that there would be no available increment of bandwidth between any two service levels *X* and *Y* that caching could offer.

Let us see why that is true. First, I am assuming that caching is something that is provided by third parties between the source of the informa-

26. In contrast, air to breathe is a resource, but there *is* enough of that for everyone to have all that they want to have. So we do not worry or talk about "air to breathe" as an issue.

27. ARMAN A. ALCHIAN & WILLIAM R. ALLEN, *EXCHANGE AND PRODUCTION: COMPETITION, COORDINATION & CONTROL* 2 (3d ed. 1983).

28. *Id.* at 57-64.

29. By the time this article reaches print—after it has been "cached and re-cached" by various law review editors—modem speeds will be greater. One might make such a prediction on the basis of general technological evolution, but in fact I make it more confidently on the basis of an announcement from U.S. Robotics, a leading manufacturer of modems. See U.S. Robotics Press Release, *U.S. Robotics Shatters Speed Barrier: Delivers 56 Kbps over Standard Telephone Lines—Internet Service Providers Embrace New x2 Technology; Plan Field Trials & Roll-Out* (Oct. 16, 1996) <http://www.usr.com/aboutusr/103_64.html>.

tion and its "consumption." If caching as a technical matter was entirely under the control of the information source, then the issue I am about to address would not arise.

Suppose company "ISP" offers three levels of Internet access: one at "slow" speed, one at "medium" speed, and one at "high" speed. In a coarse way, this offering provides the appropriate service and price structure: those users who put a high value on speed can pay extra for the high speed access; others may pay less for lower speed access. Let us suppose that End-User desires middle-level service, and consequently contracts with ISP for "medium" speed access to the Internet. Now suppose further that another company, called Intermediary, can affect the packets of information as they travel from various sites to End-User and that Intermediary is unaffiliated with ISP.

If Intermediary can offer through caching a speed of access that is higher than "medium" even if lower than "high speed," Intermediary can provide that service to End-User. If the pricing is right, both Intermediary and End-User can come out ahead. This means that with a relatively coarse service structure, there will still be a strong incentive for intermediaries to provide caching services. The converse of that proposition is what I asserted at the beginning of this section: if the levels of service that ISP offered were very fine grained, there would not be any "room" for the Intermediary to slip in and offer caching as an advantageous service.

Second, whether there is any "room" for caching to be advantageous also depends on costs and prices. If there were a large amount of bandwidth between service levels *X* and *Y*, for example, but any caching that would provide an intermediate level of service would cost more than the next higher level of service, then caching would not be worth it and would not take place.

Whether we will end up with finely-grained service level distinctions and an appropriate pricing structure that together leave no "room" for caching to add value is not clear at this stage in the Internet's evolution. Perhaps it will not be possible; perhaps it will be. But it is at least clear that the need for caching is not inherent in "the Internet;" rather that need depends on the relative coarseness or fineness of service levels and pricing structures—matters that will only become known to us over time. Until then, we should avoid definitive rules on caching.

IV. MYTH #2: CACHING HELPS EVERYBODY

The most pervasive myth about caching is that it is good for everyone. After all, how could anyone object to "better" performance from the too-slow Internet? To be sure, caching may currently be vital to network performance. With its clogged arteries these days, anything that avoids an Internet heart

attack³⁰ by speeding up performance would seem to be an unambiguous good. But we should understand that "speeding up performance" would only be an unambiguous good if we all wanted the same thing from the Internet, namely, more speedy access to Web sites. But unfortunately the interests of various parties on the Internet already differ in significant ways, resulting in many situations today in which all parties involved do not want the same thing from the Internet and for whom caching accordingly can be something undesirable.

A. Loss of Hit Measures

The most obvious objection today to caching is that it can deprive site owners of the "hit count" for their sites. All web sites can be configured to keep a running log of the number of requests to visit the site. Each such "visit" is termed a "hit." The number of hits is loosely correlated³¹ with the amount of interest in a site, and functions as a sort of "Nielson rating" for the popularity of sites. When a site is cached by another site, it is the second site that records the "hit," not the site from which the cached material originated. Absent some arrangements to have the hit count returned to the original site,³² the owner loses valuable information from the caching.

B. Loss of Frequent Updating

Professor David Post has told the story³³ of working at his office during the World Series baseball games and wanting to get updated scores over the Internet. They were indeed available over the net, but he noticed that every time he checked, the score was still the same—even the same runners were on base and the same batter up at bat! Finally, he noticed a small button on the screen of his browser about "caching" that he clicked on, only to be told that if he wanted the up-to-date scores, in real time, he needed to turn *off* the

30. Notice here that I shift from the "Internet-as-highway" metaphor to the "Internet-as-sick-patient" metaphor, by clever use of the dual-function term "artery." To my knowledge, this is the first use of such a medical metaphor for the Internet. In the face of apparently limitless uses of the highway metaphor, surely this discovery of a new metaphor deserves as much credit as Professor James Boyle's declining to mention "Madonna." See JAMES BOYLE, SHAMANS, SOFTWARE AND SPLEENS: LAW AND THE CONSTRUCTION OF THE INFORMATION SOCIETY at xvi (1996).

31. The correlation is loose for several reasons. For one, a single viewing of a page by one user for a half second and another by another user for 60 seconds both get logged as undifferentiated "hits" to the site. The log can of course record the duration of a visit, but the "hit count" is a readily available number and often listed by sites themselves. For another reason, the hit count can also be easily distorted. Web site owners wanting to make their sites appear more popular than they actually are can simply go through other computers and visit their own sites repeatedly, boosting the hit count each time.

32. I understand that some commercial sites that do a lot of caching have worked out arrangements with some of the commercial sites that they cache to send back hit counts to the original site on a regular basis.

33. Address at the University of Dayton School of Law Scholarly Symposium on Copyright Owners' Rights and Users' Privileges on the Internet (Nov. 1-2, 1996), from which this symposium issue of the *University of Dayton Law Review* is being drawn.

caching that his browser otherwise was engaged in.

In other words, the game appeared to be completely static because every time he requested the page with scoring information, his browser pulled the page from the cache on his hard disk, instead of from the original site where the updating was taking place. Although perhaps a trivial example in its particulars, this story does illustrate a situation in which a Web site owner of very actively updated content might well prefer its site not to be cached by others.

C. Misleading Performance

A practitioner of my acquaintance recently told me a similarly ironic story about caching for greater performance that also “backfired” for the site’s owner. A client corporation had worked through its lawyer to contract with a third party software firm for Web site design and hosting services. This software firm completed the design and duly posted the client’s Web pages on its server, making them accessible across the WWW. The client frequently looked in on the site in its early days to see how it appeared to others—whether it was attractive and helpful, and whether it downloaded with reasonable dispatch. In all respects, the client found the software firm’s work product satisfactory: the site was attractive, and yet even with its heavy dose of graphic imagery, it still seemed to download quickly.

The lawyer, however, experienced the client’s site much differently. Though attractive with its colorful graphics, the site was so slow to materialize that the lawyer promptly conferred with the client to begin discussions on remedying the situation. The client was surprised, and averred that no problems were evident.

Eventually, the lawyer figured out that the client visited its own site through a commercial service that featured extensive caching. The client was actually accessing its own site—and accordingly gaining its own impression of how the site appeared to others—from its ISP’s cache, not from the third party hosting site itself. The lawyer, however, used a different ISP that did not offer such a large cache; he was therefore learning that the third-party software firm was using a computer server that was not up to the task of handling all the traffic the client’s web pages was generating. Here, then, is another illustration that caching is not always in everyone’s interests: it masked a serious business problem that was injurious to a corporation’s image.

The larger point—and it is a crucial point—is this: Caching performance is outside the technical control of a site’s owner; yet caching and hence speed of performance is an important quality of service. If cachiers were also to be outside the *contractual* control of a site’s owner, as would be true if caching were declared to be non-infringing, a crucial element of Web site quality would remain beyond the site owner’s control. This is yet another reason that we do not want definitive rules “legalizing” caching activity.

V. MYTH #3: WE KNOW WHAT "CACHING" IS

Often we think the future will be the present magnified. We have trouble envisioning the use tomorrow of things we do not use today.

A. Telephone

Shortly after its invention, for example, the telephone in some quarters was viewed as a "fake, . . . as an agent of the supernatural, or with contempt as something vulgarly new."³⁴ A common view in Britain was that the telephone was no more than a "scientific toy."³⁵ Indeed, British newspaper editors early on considered that phones were useful for "divers and coal miners."³⁶ American writer Robert Louis Stevenson chanced upon a telephone in Hawaii in 1889, and complained in a letter to the local newspaper about "the problem of admitting 'this interesting instrument. . . into our bed and board. . . bleating like a deserted infant.'"

The logic of that time was compelling: A telephone would be useless for business purposes because, unlike the telegraph, a telephone call left no written record. Businesses depended on written records, and hence of necessity had to continue to use the telegraph for shorter communications, and couriers for longer ones.³⁷

On the other hand, the telephone was useless for the home for a different reason: a telephone was, after all, a sophisticated instrument of technology; obviously it could not be safely lodged in the average home where children of all ages would be certain to damage it or themselves.³⁸

Those with greater vision, including the telephone's inventor Alexander Graham Bell himself, saw the telephone as an instrument better suited to broadcasting than to personal communication. Bell imagined that live concerts would be brought into homes over the telephone, and so serve to entertain those unable or unwilling to attend the real thing.³⁹

Of course, we can see that all parties were wrong. The telephone is used for business; it is used for personal calling; it is not used for broadcast concert performances. But this just shows how hard it can be to predict the future course of acceptance and use of technologies.

34. JOHN BROOKS, TELEPHONE: THE FIRST HUNDRED YEARS 64 (1976).

35. *Id.* at 92.

36. *Id.*

37. LEWIS COE., THE TELEPHONE AND ITS SEVERAL INVENTORS 76 (explaining that Western Union refused to buy the rights to the telephone because the "proposals to place [Alexander Graham Bell's] instrument in almost every home and business place [were] fantastic").

38. *Id.*

39. *See id.* at 78 (discussing Thomas Edison's efforts to perfect the telephone); *but see id.* at 8 (noting that Mark Twain wished "everlasting rest and peace and bliss" on the whole world "except the inventor of the telephone").

B. Closed Circuit TV

Other examples abound of technologies that were either, like the telephone, under-appreciated in their early days, or like closed-circuit television, over-appreciated.

Closed circuit television was developed in the 1950's. It was a kind of cable television in its day. The novelty of closed circuit TV was that broadcasts could be confined to a particular audience. We might today call it "narrow-casting," because it is television confined to a designated audience. Some public school officials thought that this new system would revolutionize public school education: the finest teachers and scholars from around the world could be "brought" by television to lecture at the poorest, most isolated schools.⁴⁰

Alas, it never happened. We far over-estimated the impact of an otherwise quite promising technology.

C. Recorded Sound

Over and under-expectations like the telephone and close-circuit television are common. Perhaps even more common in copyright cases, especially, is the misplaced perception that the role of a new technology will remain that of an enhancement to an existing technology. Let us take as an instructive example the very difficult case of the accommodation sought for recorded sound in copyright law, an issue that vexed Congress throughout the 1909 Copyright Act revision. First developed around the turn of the century, both piano rolls and later the phonograph—the first popular technologies for recording sound—were well-established media by the turn of the century, though the legal rights governing them were by no means well established.

Two issues in particular arose, of which only one will concern us here. That issue was whether a composer's right to control the copying and vending of a musical composition⁴¹ extended to the recording of a performance of the composition and the subsequent sales of the recording.⁴² The legal view at the

40. Comments made to the author when he took a closed-circuit television calculus course in high school. It was horrible, by the way.

41. Copyright Act of 1831, 4 Stat. 436 (1831). The 1831 Act first extended copyright protection to musical compositions, which at the time meant sheet music. The 1897 amendment dealt with the right of public performance for musical works.

42. The second issue was whether recorded sounds themselves—as opposed to the tune or lyrics the sounds embodied—could be copyrighted. Congress determined that they could not be and so did not add them to the 1909 Act's list of copyrightable subject matter. In fact, recorded sounds remained uncopyrightable for the next 60 or so years. Not until the advent of a major music bootlegging industry that grew up with cassette tape recorder technology in the 1960s did Congress finally declare, in 1971, that recorded sounds were indeed copyrightable. See Pub. L. No. 92-140, 85 Stat. 391 (1971), amended by Pub. L. No. 93-573, 88 Stat. 1873 (1974) (codified as amended in scattered sections of 17 U.S.C.).

time was that it did not,⁴³ and much of the debate on the issue in several 1909 Act hearings centered on whether it should.⁴⁴

Various arguments were raised by each side during the debate,⁴⁵ but one assumption remained unquestioned by both sides: that the commercial effect of allowing composers to control the making of sound recordings was relevant only to the "real" market at issue, the market that every participant—with only rare exceptions⁴⁶—*believed was the only important one to consider*—the market for the sale of sheet music to the home.⁴⁷

In the nineteenth-century, "music in the home" meant that members of families often took piano lessons and played the piano "live" for each other's enjoyment.⁴⁸ When new tunes became popular in the late nineteenth and early twentieth centuries, people would rush to a sheet music store to buy sheet music copies of the song.⁴⁹ The same way music lovers today rush to music stores to buy the new release of a popular band's CD.

Naturally, the recording companies argued against a composers' right to control recordings of their compositions.⁵⁰ With the state of the law at the time, a recording company did not need to seek permission from composers or pay them royalties. More surprisingly to our twentieth-century view, many composers themselves routinely encouraged recording companies to produce

43. See *Stern v. Rosey*, 17 App. D.C. 562, 564-65 (1901) (finding phonograph records did not infringe composers' reproduction rights, citing *Kennedy v. McTammany*, 33 F. 584 (C.C.D. Mass. 1888), which held that perforated rolls for hand organs did not infringe composers' reproduction right).

44. See *To Amend and Consolidate the Acts Respecting Copyright: Arguments on S. 6330 and H.R. 19853 Before the Comms. on Patents*, 59th Cong., 1st Sess. (1906) [hereinafter *Hearing One*], reprinted in 4 E. FULTON BRYLAWSKI, *LEGISLATIVE HISTORY OF THE 1909 COPYRIGHT ACT* at pt. H (1976).

45. One argument was that the mechanical fixation of sounds could not be considered a "writing" within the meaning of the Constitutional clause authorizing Congress to protect the "writings of an author." See, e.g., *Hearing One*, *supra* note 44, at 102 (statement of G. Howlett Davis).

46. Richard Bowker, representing the American Copyright League, noted with regard to "talking machines" that "[i]f more and more music should be produced in that shape it stands to reason that the returns to the author, instead of increasing with the development of invention and the consequent benefit to the public, will be reduced." *To Amend and Consolidate the Acts Respecting Copyright: Arguments on S. 6330 and H.R. 19853 Before the Comms. on Patents*, 59th Cong., 2d Sess. (1906) [hereinafter *Hearing Two*] (statement of Richard R. Bowker), reprinted in 4 BRYLAWSKI, *supra* note 44, at pt. J.

47. See, e.g., *Hearing One*, *supra* note 44, at 156 (statement of Paul Cromelin). Representatives of the recording companies introduced into the Hearings in 1908 a number of letters from composers asking the recording companies to record their songs, apparently because of the beneficial advertising effects from distribution of the resulting phonographs and piano rolls. See *To Amend and Consolidate the Acts Respecting Copyright: Hearings Before the Comms. on Patents*, 60th Cong., 1st Sess. 285-90 (1908) [hereinafter *Hearing Three*] (statement of Frank L. Dyer, Edison Phonograph Company), 333-37 (statement of Paul Cromelin, Columbia Phonograph Company), reprinted in 5 BRYLAWSKI, *supra* note 44, at pt. K. Even proponents of composers' right to control sound recordings focused on their effects on the sheet music market. Composer Reginald De Koven, for instance, argued that the beneficial advertising effects were less than the recording companies were saying, but he did not question that sheet music sales constituted the proper focus. *Hearing Two*, *supra* note 46, at 199 (statement of Reginald De Koven).

48. See generally LEONARD FEIST, *AN INTRODUCTION TO POPULAR MUSIC PUBLISHING IN AMERICA* 27-28 (1980).

49. See *id.* at 33 (noting that between 1900 and 1910, one hundred songs in sheet music form sold a million copies or more each).

50. See sources cited *supra* note 47.

recordings of their compositions.⁵¹ Again, both sides were concentrating on the market for sheet music sales—far and away the major source of income at the time for most professional composers. The only debate even possible with that perspective was whether the sale of recordings actually enhanced sheet music sales.⁵²

With hindsight, we can see that the market for sheet music sales was destined to decline substantially over the years. Far from remaining mere advertisements for sheet music, at first piano rolls and then later the more versatile phonograph recordings, came to supplant almost all of the demand for sheet music for home playing.⁵³ The phonograph and phonograph recordings along with radio, *became* the market for music in the home.

The lesson for us today is that new technologies are often perceived at the time as being no more than an adjunct to or even an advertising gimmick⁵⁴ for some existing and well-established technology. Yet, the new technology may come to replace—in the case of phonograph recordings, almost entirely supplant—the existing technology's market.

D. Cable Television

The notion that a new technology will primarily supplement existing technologies is a familiar one throughout American copyright history. If nineteenth-century recording technology seems too remote to be a useful parallel, we need only look at the more recent history of cable television for another illustration of the point.

Early cable television was thought to be simply a way of bringing

51. See sources cited *supra* note 47.

52. See sources cited *supra* note 47; see also *Hearing Three*, *supra* note 47, at 188-90 (statement of Victor Herbert).

53. The progress of phonograph records was not an even march to success. Technical limitations kept recording quality rather low until after World War II. Moreover, radio operated as a substitute that was "free," a point of enormous importance during the Depression, when phonograph sales declined sharply. ROLAND GELATT, *THE FABULOUS PHONOGRAPH: FROM EDISON TO STEREO* 255-56 (1965).

54. The parallel that immediately comes to mind is the use of the Internet for audio broadcasting. A large number of audio CD's are currently made available over the Internet. See, e.g., Audionet, *Jukebox*, (visited July 21, 1997) <<http://ww2.audionet.com/jukebox/jukeask.htm>>. It is my understanding that royalties for these "performances" are not always being paid to the holder of the copyrights. Some of those performing others' music over the Internet would doubtless justify their actions on the grounds that wider public exposure to the music results in greater sales of the CD and hence helps the rights holder. The observation may well be true today, and it might well result in a finding of "fair use" of the recordings if the matter were litigated. But it is entirely possible that music broadcasting over the Internet might one day cease to be simply an adjunct to or an advertisement for CD sales, and might instead, like the phonograph in an earlier day, *become* the major market for music, eclipsing CD sales altogether. To those who would say "If that happens, we can change the statute at that time," I reply: If it is so easy to change the statute, (a) why did it take seventy-two years between major enactments (1909 to 1976), and (b) why was Congress so concerned in the 1976 Act revisions to produce a statute that did not have to be changed with every new change in technology? See generally H.R. Rep. No. 1476, *supra* note 12, reprinted in 1976 U.S.C.C.A.N. 5654 (discussing the 1976 Act's provisions for new subject matter, however, not for "new uses" of copyrighted works).

broadcast television to a wider audience. It was merely an adjunct to or extension of the "real" market, which was broadcast television.

Rural homes in the 1950s, especially those in valleys or on the far side of mountains, were often unable to receive television signals with sufficient clarity. It seemed a logical improvement for someone to erect a large receiving antenna on, say, the top of a mountain, and "pipe" the received signal along a wire cable to those rural homes. Even the early name for cable reveals these origins. The first term coined was "CATV," which stood for "community antenna television."⁵⁵ Quite simple in concept, the idea of bringing television signals over a wire instead of through the air, was novel. But it was successful, and the cable industry began to grow.

Not surprisingly, the copyright owners of the television programs being picked up by cable receiving antennas and transmitted to additional homes, began to demand royalty payments from the cable companies, which were refused; lawsuits for copyright infringement followed soon thereafter. Two similar cases involving these facts reached the U.S. Supreme Court a few years apart, in the *Fortnightly*⁵⁶ and *Teleprompter*⁵⁷ cases.

The issue in both cases was whether a cable station that, without authorization, received and further transmitted a copyrighted program should be held to be a copyright infringer. The cases arose under the 1909 Act, which of course contained no explicit references to cable television or to television at all. But television stations carried movies, plays, and the like, things that had long since been found to fall under copyright's umbrella.⁵⁸ The question, then, was not whether a television program was copyrightable subject matter—it clearly was—but whether the unauthorized transmission over a cable system of such a copyrighted program was an infringement.

Again, the Act contained no explicit reference one way or the other to "transmitting" copyrighted material. Plaintiffs' theory was that such a transmission constituted a "performance" of the copyrighted works. As the performances were to the public and for profit, cable companies were not "eleemosynary" institutions,⁵⁹ and were accomplished without permission or royalties, plaintiffs argued that they infringed their copyright rights.

The defendant cable companies argued, quite straightforwardly, that merely by picking up a signal and passing it on, they did not "perform"

55. See *Fortnightly Corp. v. United Artists Television, Inc.*, 392 U.S. 390, 391 (1968); see also MARY ALICE MAYER PHILLIPS, *CATV: A HISTORY OF COMMUNITY ANTENNA TELEVISION 2* (1972).

56. 392 U.S. 390.

57. *Teleprompter Corp. v. Columbia Broadcasting Sys., Inc.*, 415 U.S. 394 (1974).

58. At issue in *Fortnightly* were movies, which had been copyrightable subject matter since the 1909 Act was amended for that purpose in 1912. See Amendment of Aug. 24, 1912, 37 Stat. 488.

59. *Herbert v. Shanley Co.*, 242 U.S. 591, 594 (1917). In 1948, an early cable system was created by John Walson, part owner of an appliance store, to boost sales of television sets in the local—rural—area. PHILLIPS, *supra* note 55, at 7-8. Initially given away, this cable service proved so popular that the very next year, 1949, Walson was supposed to have been charging a \$100 installation fee and \$2 per month for the service. PHILLIPS, *supra* note 55, at 8-9.

anything.⁶⁰

The Plaintiff owners of copyrighted television programs had a precedent closely on point for their argument. Years earlier, in the 1931 case of *Buck v. Jewell-La Salle Realty Company*,⁶¹ the Supreme Court held that a hotel infringed copyrighted radio broadcasts when it picked up the radio signals and re-transmitted them to individual hotel rooms. This act of radio retransmission—as with cable retransmission decades later—involved no judgment or discretion or editing or creativity by the hotel at all. The hotel simply fed the signal directly to its customers' rooms. The Court concluded nevertheless that this action constituted a "public performance for profit" of the radio broadcasts and hence if unauthorized, was an infringement.⁶²

The District Court in the cable case, *Fortnightly*, found the 1931 *Buck* opinion controlling and concluded that for the same reasons, a cable television station infringed the copyright in the TV signals it rebroadcast.⁶³ The Court of Appeals agreed.⁶⁴ The plaintiffs' complaint, the District Court and the Appellate Courts' opinions, were all based on well-established copyright principles of the day.

Plaintiffs lost in the Supreme Court, however. The Court found that cable systems did not "perform" the shows they transmitted. This conclusion was founded largely on the reasoning that cable companies were merely passive carriers⁶⁵ that did not rise to the level of "performing" in the ordinary sense of that term—or as the Court put it, "[b]roadcasters perform. Viewers do not perform."⁶⁶

60. *Fortnightly*, 392 U.S. at 395 (arguing "that its CATV systems did not 'perform' the copyrighted works at all").

61. *Buck v. Jewell-La Salle Realty Co.*, 283 U.S. 191 (1931). The holding in *Buck*, that a hotel transmitting radio signals into the rooms of guests "performed" the transmitted works for copyright purposes, was effectively overridden by the provision in the 1976 Copyright Act governing the liability of "secondary transmissions." 17 U.S.C. § 111(a)(1) (1995).

62. *Buck*, 283 U.S. at 198 (explaining that "the novelty of the means used does not lessen the duty of the courts to give full protection to the monopoly of public performance for profit which Congress has secured to the composer.").

63. *United Artists Television, Inc. v. Fortnightly Corp.*, 255 F. Supp. 177, 207-08 (S.D.N.Y. 1966).

64. *United Artists Television, Inc. v. Fortnightly Corp.*, 377 F.2d 872, 879-80 (1st Cir. 1967).

65. Note that the cable companies were not "passive carriers" as that term is often used in connection with telephone companies or Internet Service Providers. In the latter cases, the carrier is in a contractual relation with the sender of the information in question. With the cable companies, there was no contractual relation with the sender—the broadcasting companies—at all.

66. *Fortnightly Corp. v. United Artists Television, Inc.*, 392 U.S. 390, 398 (1968). The Court announced that it would not simply look to the ordinary meaning of the word "perform," noting instead that: [A]t the outset it is clear that the petitioner's systems did not 'perform' the respondent's copyrighted works in any conventional sense of that term, or in any manner envisaged by the Congress that enacted the law in 1909. But our inquiry cannot be limited to ordinary meaning and legislative history.

Id. at 395 (citations omitted). But in fact, that is largely what it did: "Broadcasters perform. Viewers do not perform. Thus, while both broadcaster and viewer play crucial roles in the total television process, a line is drawn between them. One is treated as active performer; the other, as passive beneficiary." *Id.* at 398-99 (citations omitted).

This was a surprisingly superficial explanation to be coming from the highest court in the land: as discussed below,⁶⁷ the word "perform" had long since acquired a very technical meaning in copyright law, a meaning that did not conform to the popular understanding of the word. At issue was not the question whether cable companies were "active" or "passive" or whether their activities corresponded to the lay use of what had by then become highly specialized legal terms. The issue was rather whether cable companies should be obliged to pay royalties for what they did. The Court's nominal explanation for its conclusion offered nothing to *justify* its actual holding.

What did justify the holding? Without access to the Justices' inner thoughts and conversations over the issue, one can only guess. But I am persuaded by dissenting Justice Fortas's opinion, that the Court simply thought it was a good idea to provide a quiet subsidy for a new technology—a new technology that after all, was nothing more than an adjunct to and enhancement of what was seen at the time as the "real" market: broadcast television. That the Court viewed cable as merely an adjunct to broadcast television is evident from its observation that cable systems

have nothing to do with sponsors, program content or arrangement. They sell community antenna service to a segment of the public for which [broadcasters'] programs were intended but which is not able, because of location or topographical condition, to receive them without rebroadcast or other relay service by community antennae.⁶⁸

1. What Happened When Congress Considered Cable Under the 1976 Act?

When Congress revised the Copyright Act in 1976, the cable industry was a major economic force,⁶⁹ with a substantial customer base built, in part, on the fact that cable stations had no royalty obligations to copyright owners. At that point, it was both politically difficult and an unfair reversal of legitimate expectations for Congress to force cable companies to switch cold-turkey to full copyright liability. Yet it was clear that the industry was well beyond the point of simply extending existing broadcast signals to a wider and rural audience. Cable was becoming an alternative network, competing with

67. See *infra* text accompanying notes 95-99.

68. *Fortnightly*, 392 U.S. at 400 n.28 (quoting *Intermountain Broadcasting & Television Corp. v. Idaho Microwave, Inc.*, 196 F. Supp. 315, 325 (S.D. Idaho 1961)). Understandably, the Court cannot conjure up facts not before it, or base its decision on a future that neither it nor anyone else can now see. It must decide the case before it on the basis of the facts of that case, not some other possible set of future facts. But the Court is also concerned with establishing precedents that have some lasting value. To that end, I am suggesting only that the Court could have recognized, not some particular set of future facts, but the more general fact that when it comes to technology, the future may look different from today. Acknowledging, even implicitly, that today's technology may evolve differently tomorrow, might have led the Court to a different conclusion.

69. As Congress itself took pains to point out, by roughly the mid-1970s, nearly 3500 cable operators served 7700 communities, reaching 10.8 million homes and earning revenues of \$770 million. H.R. REP. NO. 94-1476, *supra* note 12, at 88, *reprinted in* 1976 U.S.C.A.N. at 5703.

broadcast networks.⁷⁰

In the give and take of interest-group wrangling during the 1976 Act revisions, a compromise was reached:⁷¹ cable companies would pay a royalty, but the royalty would be fixed by Congress.⁷² The outcome was officially justified as bringing about a reduction in the high transaction costs that would be entailed in cable companies' trying to license all the shows they carried.⁷³ But other copyright collectives, notably ASCAP and BMI, experience far greater transaction costs in licensing bars, theaters, clubs, concert halls, universities, aerobics studios, and even unsuccessfully fast-food fried chicken restaurants.⁷⁴ Yet ASCAP and BMI carry on; their practices make the claim of high transaction costs for cable companies dubious at best. Indeed, the real reason for the compromise seems to be that powerful industries on both sides of a controversial issue could come to no other agreement but a compulsory license; a bedeviled Congress was only too happy to go along.⁷⁵

2. Compulsory License: No Economic Sense

Economically, the compulsory license outcome makes no sense. The ASCAP and BMI example shows that there is no reason that members of the communications and entertainment industries cannot pay royalties to one another. Indeed, even Congress' purported rationale centering on transaction costs is misleading. A reduction in transaction costs through legislation is beneficial only if all sides benefit from the reduction. If one side benefits but only to the corresponding detriment of the other side, then Congress has merely shifted resources from one side to the other by a form of price-fixing.⁷⁶ A practice that if done by the parties outside of Congress's purview could immediately and successfully be challenged as a per se violation of the antitrust laws.⁷⁷ As it is, the cable compulsory license simply ensures that entertainment and information resources are badly allocated and wasted, as is typically true of resource allocation whenever prices are fixed in the absence of compelling national need.⁷⁸

70. GOLDSTEIN, *supra* note 4, § 5.8.2, at 5:171.

71. Litman, *supra* note 12, at 874-75.

72. See 17 U.S.C. § 111 (1995).

73. H.R. REP. NO. 1476, *supra* note 12, at 89, reprinted in 1976 U.S.C.C.A.N. at 5703-04.

74. See *Twentieth Century Music Corp. v. Aiken*, 422 U.S. 151 (1975) (dealing with the reception of broadcasted copyrighted musical compositions at a small fast service food shop known as George Aiken's Chicken).

75. See Litman, *supra* note 12, at 874-75.

76. In the case of cable royalties, the price is based on a station's annual revenue and determined from a complex series of conditions. See 17 U.S.C. § 111(d).

77. See, e.g., *Addyston Pipe & Steel Co. v. United States*, 175 U.S. 211 (1899).

78. See Stanley M. Besen & Robert W. Crandall, *The Deregulation of Cable Television*, 44 LAW & CONTEMP. PROBS. 77, 77-79 (1981). Note that the topic under discussion is not the government's role in setting prices during wartime, economic depression, run-away inflation, natural disaster, or other exigencies. The issue is the government's setting of prices for the day-to-day operation of the entertainment business

E. Any Similar Tendencies with Caching?

What should we make of these various histories for purposes of our caching inquiry? Having seen that some fairly benign "helper" technologies quickly outgrew their "helper" role to become substantial industries in their own right, we ought now to take a moment to see if we can identify any similar tendencies with caching. To be sure, I do not rest my argument on the ability to project any particular scenario. I think it sufficient to say that in the past we have often been egregiously wrong, as in the case of cable television. For that reason alone we ought not to conclude that we know what "caching" means for now and ever more. But, with only modest effort, we can sketch out some possible futures in which caching would be far from the benign expediter that we tend to view it as today.

1. Editing Cached Material

Let us see how it might work. Suppose an Internet Service Provider ("ISP") provides caching services for its users. Now suppose further that the ISP discovers that whenever its users browse site *X*, they tend to follow immediately by browsing site *Y*. Upon investigation, the ISP learns that its users find the information from the two sites is most useful when combined.

The ISP sees a business opportunity. By combining the information from sites *A* and *B* itself, the ISP could save users the trouble of that extra mental step. This action provides added value for customers, for which, at the margin, the customers would be willing to pay. ISPs could begin to create entire new categories of works by combining material cached from a variety of sites—why stop our example with only two sites' worth of caching?⁷⁹ Perhaps a new art form might arise, with some serious and some satirical purposes, effectuated through clever juxtaposition of caches from various sites. Any of these activities might come to have commercial value. Caching in general already has value, and one would expect that entrepreneurs are trying to find a way to capture some of that value.

In fact, they are. In the last several months, a handful of new software packages called "Offline Browsers" have come on the market.⁸⁰ These Offline

extending over a period of decades.

79. Those who object at this point that the ordinary rules of copyright about derivative works would stop this activity, please see the text accompanying *infra* note 86.

80. See, e.g., David D. Busch, *Web Browsing, in Context*, WINDOWS SOURCES, Dec. 1996, at 102 (reviewing *FlashSite* by InContext Corp). "One 10-minute download session yielded hundreds of pages." *Id.*; advertisements for Folio Web Retriever by Folio Corp., WINDOWS SOURCES, Dec. 1996, at 175.

While other browsers are trained to simply fetch content, Folio's technology goes well beyond that by taking Web information and automatically putting it into a Folio infobase on your local hard drive. Infobases offer a dynamic environment, giving you the industry's most powerful search engine, plus

Browsers have a single purpose: to browse the Internet automatically, visiting sites pre-identified as of interest by the software's user, and to collect all the pages from different Web sites into copies on the user's own hard disk. Typically the user will specify what Web sites are of interest, and the caching software will "log on" at night, while the user sleeps, to fetch whole sites with all their pages for storage on the user's PC. The next day, the user can "browse" the local hard disk as if it were the Web, but at hard disk speeds—hundreds of times faster than actually browsing the Web. This caching software can also check for updating at periodic intervals and alert the user whenever a site has changed, saving even the short time necessary to browse the hard disk just to find out if anything is new.

Commercially available caching programs can do this today. It does not take a great imagination to picture them doing even more tomorrow: just as with the ISP that edits cached material, local caching software could easily combine the information from several different sites to bring the user a customized view. Indeed, sites on the Web already attempt to do something like this by maintaining a profile of users and daily searching out and combining information from other Web sites that match the user's profile.⁸¹

2. Stripping Ads from Cached Material

Other elaborations of the basic "caching theme" are also possible. Already a lot of Web sites maintain themselves by advertising. A caching site like an ISP might develop ways of filtering out the advertisements from other, cached sites. Although a service, perhaps, to the ISP's customers, this action would run afoul of the cached site's desires. For that matter, if the disappear-

the ability to highlight text, add hypertext links, user notes, and more—shaping raw data into useful information. Retriever makes building your own repository of information easy. Get the latest industry news, that article you missed in your favorite on-line mag, or that golf [tip] to fix your slice. If it's out there, it's yours.

Id.; *OM-Express* by Open Market, Inc. ("Avoid the World Wide Wait"), *NETGUIDE Mag.*, Oct. 1996, at 29; *Freeloder*, presumably by the "Freeloder Co.," *NETGUIDE Mag.*, Nov. 1996, at 54; *Web Buddy* by DATAVIZ, *id.* at 64 and *WebClip* by PaperClip Software, Inc., *id.* at 130. A particularly interesting new application to expedite "live" Web browsing has recently been announced. The product is called "Net.Jet," and appears to "anticipate" where one will browse next. It does this by pre-loading—another form of caching—all links from the page one is currently viewing. See advertisement for net.jet by Peak Technologies, Inc., *NETGUIDE Magazine*, Nov. 1996, at 146; see also the Peak Net.Jet (visited Nov. 8, 1996) <<http://www.peak-media.com/netjet/netjet.html>> (describing Net.Jet product features).

Real Time Acceleration: Peak Net.Jet will dramatically speed up your browsing when you are visiting new sites that contain reading material or articles that you spend some time reading. You will find that as you read through different articles on a site, the new pages you go to will appear almost instantly As soon as you load in a new page, Peak Net.Jet puts your modem to work and loads all available links on that page into its cache. Then when you click on a link, Peak Net.Jet delivers it to you directly from its cache.

Id.

81. See, e.g., *Business Wire*, *BW Personal Web Box*, (visited Nov. 18, 1996) <<http://www.businesswire.com/pwb.htm>>; *MCI*, *FYI Online*, (visited Nov. 18, 1996) <<http://www.fyionline.com/>>; *PointCast*, *What Is the PointCast Network?*, (visited Nov. 18, 1996) <<http://pioneer.pointcast.com/whatis.html>>.

ing ads leave a gap in the page, the ISP could even fill those spots with advertisements of its own, compounding the harm from the perspective of the original site.

3. In-Line Links

So-called "in-line links" are another type of activity that could fall under the rubric of "caching." An in-line link is a pointer to a document somewhere on the WWW contained in another's Web page. Let us say that Web page owner *A* puts up a document on *A*'s web site. Part of that document contains a link to a picture located on, say Web site *B*. Many such links are used to direct a user "out" to another image or bit of text. In contrast, the in-line link, in effect, pulls the other image or bit of text into the current document for display. In other words, the user looking at site owner *A*'s Web page will see on that page an image that actually was "pulled in" from site owner *B*'s Web page. This action could certainly constitute a form of caching if the image were to be kept on *A*'s site for some period of time.⁸² Yet, though definable as "caching," this type of storage begins to look more like plain old plagiarism than just an expeditor of Internet access.⁸³

Or an ISP might retain caches of material coming from sites that seem especially likely to disappear: some sites might be clever, for example, but poorly financed; an ISP might see value for its users in "preserving" such sites in a long-term cache.⁸⁴

For any of these types of caching, the ISP would be providing a service to its users, a service for which it might charge extra. Indeed, "caching" could even in its simplest form become a money-making service in its own right. That seems to be happening already. As mentioned in the description of caching above,⁸⁵ several companies are now selling software to end-users to accomplish caching of entire Web sites overnight.

Do any or all of these evolutions of caching cause harm to copyright owners that we would all agree ought to be remedied? Perhaps they do, perhaps they do not; it does not matter. We need not decide the point now, because all of these examples show the broader point that we do not know now

82. The image would not necessarily be kept. It could be pulled in "afresh" every time a user accessed owner *A*'s page. The image, however, could easily be cached, and *A* would have a strong incentive to do so, because it would speed up others' access to *A*'s site—exactly what caching is designed to do.

83. For a while Dan Wallach, an individual at the Massachusetts Institute of Technology, kept an in-line link to the Dilbert cartoon of the day. The cartoon actually resides on the copyright owner's site. Scott Adams, *The Dilbert Zone* (visited Feb. 14, 1997) <<http://www.unitedmedia.com/comics/dilbert/>>. Nonetheless, to browser's of the Wallach site, the cartoon appeared to be residing on his site. United Media sent Dan Wallach a "cease and desist" letter, after which Wallach removed the in-line linking.

84. See, e.g., INTERNET ARCHIVE, BUILDING A DIGITAL LIBRARY FOR THE FUTURE (visited Apr. 23, 1997) <<http://www.archive.org/home.html>>, which is attempting to preserve the entire Internet on a daily basis.

85. See *supra* text accompanying footnote 80.

what or how caching will evolve tomorrow. We may or may not want to immunize caching sites from copyright liability for any of these activities. We may one day disagree vigorously over that very question; but we are simply not in a position today even to frame the issues because caching may evolve in these—or in entirely different and unforeseeable ways—in the future.

4. Reverse Caching

The world of computing, software, and Internet access is a hotly competitive one. Large numbers of “players” in the market are constantly seeking a competitive advantage over rivals. Accusations of anti-trust behavior are not uncommon, as evidenced by the Justice Department’s periodic examination of Microsoft and others.⁸⁶

Suppose a commercial Internet provider, say ISP #1, does a lot of caching as a service to its users. ISP #1 is, let us say, in hot competition with ISP #2, a similar company. Suppose that “caching” were immunized from copyright liability. Would this situation create any incentive for ISP #1 to examine all facets of its operation for possible competitive advantage over rival ISP #2? One would certainly expect so. And if caching is lawful behavior, then perhaps it can be enlisted in the competitive fight. What would stop ISP #1 from using the cache selectively, or to *delay* access by its users to other sites?

One might reasonably ask why an ISP would delay its customers’ access to anything, especially since speed of access would be a major selling point. But it is not hard to imagine such a circumstance. Suppose that ISP #1 notices that some of its own customers on occasion are browsing the “subscriber information” page of rival ISP #2—the page that shows how much better and cheaper ISP #2’s Internet access is than ISP #1’s? ISP #1 might very well see a distinct advantage in using its cache of rival ISP #2’s content to *slow down* its own customers’ access to ISP #2.

Perhaps the reader will think this an unlikely scenario. Perhaps indeed no upstanding ISP would stoop to such conduct; we can hope so. But unpleasant competitive conduct has happened before, otherwise, why would we have the anti-trust laws? Moreover, one does not have to imagine conduct so devious as to use caching to deliberately delay customers’ access to other sites. One can imagine a much milder, but still effective, type of conduct: ISP #1 could simply cache all “favored sites” on the WWW, but decline to cache “disfavored” sites, such as those of rival ISP #2. By caching everyone else, ISP #1 can make access to that rival appear relatively much slower than it need be.

86. See *Business Brief: New Probe of Microsoft Is Launched by Justice*, INVESTOR’S BUS. DAILY, Sept. 20, 1996; Kathleen Doler, *An Inside View of Feds’ Scuffle with Microsoft*, INVESTOR’S BUS. DAILY—COMPUTERS & TECH., June 15, 1995 (stating that “[t]he way the government watches it, one might think Microsoft Corp. had mob ties. Last week, the company acknowledged it is the target of another antitrust investigation—the third such probe in six years”).

If caching were legitimized, an ISP could, either through affirmative delays or by simply declining to cache, turn a shield of caching immunity into a sword of anti-competitive conduct. Surely that is not a desirable outcome.

F. Could Not a Narrow Statute or Ruling Prevent All These Activities?

One may object to the above parade of horrible examples that any judicial or statutory rule designed to legalize caching would surely exclude the sort of editing, compiling, advertisement-replacing, reverse-caching behavior I have tried to imagine. Under the law as it now stands, it is true, many of these things like extensive editing and re-arranging would certainly be a violation of the author's right to make derivative works.⁸⁷ So one rebuttal to my concerns would be to say: let us draft a statute or craft a holding narrowly enough to permit the "good" things about caching and still prohibit the "bad" things like editing, reverse caching, etc.

My concerns are real-world ones, however. If we were to define a statutory right to cache, with enough generality to accommodate all presently unpredictable types of "caching" behavior and with enough nuances and subtleties in its generality that it only applied to "good" and not to "bad" caching behavior, then we would in effect have recreated the Copyright Act and the Fair Use provision of section 107—which we already have. The whole point of the Act and of fair use is precisely to prevent "bad" (unjustified, wrongful, harmful) acts of copying, while at the same time permitting "good" ones—those that amount to the taking of ideas or unoriginal expression, for example, or that constitute fair use. It is difficult to imagine a statute (or a bright line, broad judicial holding like the ones for cable television in *Teleprompter* and *Fortnightly*) that could duplicate that outcome for caching specifically without also duplicating the Act's existing language and principles. We need not, and should not, do that. We should rather decline to establish any special rules for caching and rest our concerns on the case-by-case decisions of implied licensing and fair use.

VI. MYTH #4: "COPY" IS AN ANACHRONISM AND NO LONGER APPLIES TO EXPLOITING WORKS IN THE DIGITAL WORLD

The caching issue replays in the small what is in fact a much larger issue: should "copying" continue to be the focus of copyright's concern in the digital age?⁸⁸ Recall that the reason for our attention to caching as a copyright issue

87. See 17 U.S.C. § 106(2) (1994).

88. See, e.g., Ira L. Brandriss, *Writing in Frost on a Window Pane: E-Mail and Chatting on RAM and Copyright Fixation*, 43 J. COPYRIGHT SOC'Y 237, 239 (characterizing the RAM-copy issue as a "fierce debate [sic] among scholars"); David Post, *New Wine, Old Bottles: The Evanescent Copy*, AM. LAW., May 1995, at 103.

is an assumption that caching does or can constitute the making of a "copy," and that "copying" is almost the essence of copyright infringement.⁸⁹

Should copyright law continue to define, or be interpreted to define, the crucial term "copy" in such a way that brief appearances of copyrightable works in computer memory are "copies"?⁹⁰ The argument that it should not is based on the observation that a reliance on "copying" for copyright purposes arose when "copies" were very tangible, long lasting objects like books, 35mm film reels, audio tape cassettes, etc.⁹¹ These objects are produced deliberately, typically under the direct control of a single entity, such as a record company or a book publisher. Imposing liability for copying in a world of this sort of tangible objects seems to make intuitive sense and be relatively straightforward.

The Internet, in contrast, works with information "packets" that are routed through any number of computers before reaching their destination. Each of these intermediate computers makes a literal "copy" of the packets as an inevitable part of the process of receiving and forwarding information. Consequently, unlike book or CD distribution, Internet "distribution" of works necessarily entails the making of lots of temporary copies by lots of entities, most of whom are not under any sort of control by the original producer. Note that these temporary copies are not just for caching to improve performance, but are the basic means that information is transferred over the Internet. Caching is only one species of this sort of wide-spread "copying" that takes place daily on the Internet.

I suspect that so far most commentators would be in substantial agreement on these points. The disagreement begins with the conclusions one should draw from the premise.

A. Different Conclusions from Fact of Internet "Copying"

One oft-cited conclusion is that in cyberspace copyright should either not apply or should apply in a very attenuated way.⁹² After all, copyright works for tangible, relatively permanent "copies." The Internet creates intangible, impermanent copies; therefore, copyright just will not work well on the

89. I speak loosely here, and am well aware that infringement also takes place with certain performances, displays, and the like.

90. See cases cited *supra* note 7.

91. Raymond T. Nimmer & Patricia A. Krathaus, *Copyright on the Information Superhighway: Requiem for a Middleweight*, 6 STAN. L. & POL'Y REV. 25, 32 (noting that "[t]he rights and the preconditions in copyright law flow from a print and mass market era"); OFFICE OF TECHNOLOGY ASSESSMENT, 99TH CONG., 2D SESS., INTELLECTUAL PROPERTY RIGHTS IN AN AGE OF ELECTRONICS AND INFORMATION 59 (1986) ("The present system of copyright law, which evolved under the model of print publication, may no longer serve to determine the boundaries of ownership in computer-based methods of creation and dissemination.").

92. See, e.g., John P. Barlow, *Everything You Know About Intellectual Property Is Wrong*, WIRED, Mar. 1994, at 85, available at <<http://www.wired.com/wired/2.03/features/economy.ideas.html>>; Jessica Litman, *Revising Copyright Law for the Information Age*, 75 OR. L. REV. 19 (1996).

Internet. A second and very different conclusion is that copyright law should give up its focus on "copying" and instead be reoriented—presumably through statutory amendment—to focus on "access" or "use" of information.⁹³ It is these facets of our information economy that make sense today, not "copying," so we should frankly acknowledge that fact in the statute.

I propose a third conclusion: that "access and use" of information are indeed a proper focus of copyright's concern, *and* that courts have begun to reach that conclusion by their interpretation of the term "copying."⁹⁴

B. Courts Always Give Technical Meanings to Legal Terms

Courts can and do reinterpret judicial, statutory, or Constitutional language in accord with changing circumstances. Some of these reinterpretations have trivial substantive consequences. The law of Tort repeatedly refers to "master-servant" relations, for example. This term is antiquated, perhaps even an anachronism. Very few people today employ what the layperson would call "servants." But every lawyer understands that "master-servant" should be read as "employer-employee." The term is old; the interpretation is technical, but adapted to current times. No one seems harmed by this.

Perhaps more controversial is the area of Constitutional interpretation, where substance comes very much into play. To pick but one quick example, we can look at interpretations of the term "Due Process." Today, that term imports the concept of a "right to counsel," paid for if need be at taxpayers' expense.⁹⁵ In the eighteenth-century, however, it imported no such notion. Whether our interpretation today is "good" or "right" is not the point. It is rather that our legal system does permit older terms to acquire new, and perhaps even very different, meanings to accommodate modern times.

C. Term "Perform" Has Technical Meaning

We can take another useful example from copyright law itself. The term "perform" has undergone a reinterpretation over the years that parallels what I argue is now happening with "copy." The ordinary, lay interpretation of

93. Nimmer & Krathaus, *supra*, note 91, at 32-33.

94. Nimmer & Krathaus hint at this outcome, though they conclude that copyright is an inapt mechanism for controlling access and use because of its required "preconditions" in the form of originality and expression that are of little relevance in the world of information sales. *Id.* at 33. "We need to develop a new language [i.e., not copyright law] and a focused approach to allocating rights on the information superhighway of the next decade." *Id.* at 39. With the Supreme Court's holding in *Feist Publications, Inc. v. Rural Telephone Service Co.*, 499 U.S. 340, 351-52 (1991), that unoriginal facts cannot be copyrighted, the development of the copyright doctrine of "copying" as a surrogate for access and use may be unsatisfactory for many factual works. Its use can, however, continue for copyrighted (i.e., original and expressive) material. Unoriginal databases specifically are the subject of current legislative proposals for protection based on the Commerce clause in the U.S. H.R. 3531, 104th Cong., 2d Sess. (1996); see *Bill, Treaty Proposal Would Create New Protection of Databases*, 52 Pat. Trademark & Copyright J. (BNA) 141 (1996).

95. See *Gideon v. Wainwright*, 372 U.S. 335 (1963).

"perform" carries the notion of some creative activity by a "performer." This might be an actor or musician or dancer, but the common understanding is that "performing" is something done by specially trained, artistic individuals whom we call "performers."

Some copyright decisions have adhered to that line. In a radio case from the 1920s, for example, the District Court held that "perform" must be assessed by the ordinary, everyday meaning, finding it necessary to make:

a determination whether the broadcasting of a rendition of complainant's musical composition was a performance of it publicly for profit in the common, ordinary, and reasonable acceptance of this phrase. . .

Funk & Wagnalls' Standard Dictionary (1911) defines a performance: "(2) Specifically a representation on the stage or before an audience or spectators; an exhibition of feats; any entertainment at a place of amusement; as, two performances daily."

While not found in other standard dictionaries, it is just this idea which we think Congress had in mind in passing the enactment in its present form.⁹⁶

But notably, this decision was reversed on appeal in favor of a finding that radio broadcasting did indeed—in the copyright sense—constitute a "performance" of the music in question.⁹⁷ For copyright purposes, then, the term has acquired a technical meaning. Indeed, it has become a "term of art." Far from being confined to creative artists who work in front of an audience, the term now applies broadly to the use of a work that unfolds through time. Thus, today even turning on a radio or a CD player can be the "performing" of the music that plays as a result⁹⁸ though not necessarily an *infringing* performance.⁹⁹ The individual who turns on the device and hence "performs" the work need not provide any creativity or artistic impulse whatsoever.

D. "Employment" Has Technical Meaning

We see the same dichotomy between the interpretations of ordinary speech and technical legal interpretations in other areas of copyright law as well. The Supreme Court had occasion to explicitly consider the difference between those two types of interpretation in *Community for Creative Non-Violence v. Reid*.¹⁰⁰ At issue was the interpretation of the copyright statute's use of the terms "employment" for purposes of the work-for-hire doctrine. By

96. *Jerome H. Remick & Co. v. American Auto Accessories Co.*, 298 F. 628, 630-31 (S.D. Ohio 1924), *rev'd*, 5 F.2d 411 (6th Cir. 1925), *cert. denied*, 269 U.S. 556 (1925).

97. *Jerome H. Remick & Co. v. American Auto. Accessories Co.*, 5 F.2d 411 (6th Cir. 1925), *cert. denied*, 269 U.S. 556 (1925).

98. "To 'perform' a work means to recite, render, play, dance, or act it, either directly or by means of any device or process . . ." 17 U.S.C. § 101 (1994). *See generally* Goldstein, *supra* note 4, § 5.7.1. *See also id.* § 5.8.2, at 5:164 (characterizing the definition of perform in the 1976 Act as "sweeping").

99. The copyright owner's rights extend only to the "public" performance of works. Playing a radio or CD player at home is not a "public" performance and hence not an infringement.

100. 490 U.S. 730 (1989).

the time the issue reached the Supreme Court, several courts of appeal had considered the issue and had reached different interpretative conclusions. In *Dumas v. Gommerman*,¹⁰¹ the Ninth Circuit interpreted the term "employment" as used in the statute to be "employment" in the lay sense of formal, salaried employment.¹⁰² At least one commentator reached a similar conclusion.¹⁰³

The Supreme Court, however, explicitly rejected that interpretation and adopted instead the legal interpretation of "employment" that derives from agency law and that governs issues like *respondeat superior* liability.¹⁰⁴ The result of this decision is that many persons who would never consider themselves "employees" of a hiring party may nevertheless be "employees" for copyright purposes.

E. Even "Copy" Already Has Technical Meaning

For that matter, even the word "copy" itself in the Copyright Act already has a technical meaning. The statutory definitions in the Act make clear that the word "copy" for copyright purposes includes the "original" version of the work.¹⁰⁵ To say that "an original" is "a copy" is the very opposite of how most people in ordinary speech use the term "copy,"¹⁰⁶ yet that is exactly the definition that applies in the copyright context.

F. Technical Terms Are Counter-Intuitive

All of these interpretations—"perform," "employment," and "copy as original"—are, to be sure, counter-intuitive to most non-copyright specialists (even to non-copyright lawyers). That a term is counter-intuitive is certainly a drawback.¹⁰⁷ But it is not overwhelming nor rare in our legal system, as all of these examples help to illustrate. To the contrary, technical legal definitions can be very helpful. By defining "copy" to include the original, for example, the Copyright Act can refer to "copy" without constantly having to say "the copy and/or the original." Closer to the point of my argument is the technical definition of "perform." By making the word a term of art, "perform" very nicely accommodates an evolving world of mechanical and electronic devices

101. 865 F.2d 1093, 1105 (9th Cir. 1989).

102. Other cases had reached different results. See, e.g., *Easter Seal Soc'y v. Playboy Enters.*, 815 F.2d 323 (5th Cir. 1987), *cert. denied*, 485 U.S. 981 (1988); *Evans Newton, Inc. v. Chicago Sys. Software*, 793 F.2d 889 (7th Cir.), *cert. denied*, 479 U.S. 949 (1986); *Aldon Accessories, Ltd. v. Spiegel, Inc.*, 738 F.2d 548 (2d Cir.), *cert. denied*, 469 U.S. 982 (1984).

103. See I. Trotter Hardy, *Copyright Law's Concept of Employment: What Congress Really Intended*, 35 J. COPYRIGHT SOC'Y 210 (1988).

104. *Community for Creative Non-Violence*, 490 U.S. at 739-40.

105. 17 U.S.C. § 101 (1994) (definition of "copy").

106. Brandriss, *supra* note 88, at 245.

107. See Jessica D. Litman, *The Exclusive Right to Read*, 13 CARDOZO ARTS & ENT. L.J. 29, 48-52 (1994).

that offer new ways of exploiting certain types of copyrightable works.

G. Refusing to Adapt = Original Intent

Those who refuse to adapt older terminology to the modern needs of copyright in this way are, in effect, adopting a form of "original intent" thinking about copyright law. That is, they are saying that "copy" can only mean today what "copy" meant at some earlier time, perhaps the time it was first incorporated into copyright law.

There is something to be said for an "original intent" approach to legal interpretation, to be sure. Particularly with statutory law, adhering to an original intent philosophy forces the legislature to pay more explicit attention to changing circumstances; perhaps that is good. My point, however, is not that original intent is good or bad—rather that it is only one way of accommodating change. For that matter, it is a way that by and large has not been treated favorably in the area of Constitutional law, where it has received the most attention.¹⁰⁸

If we are comfortable redefining "master-servant" and "due process" and "perform" and "employment" and a wide variety of other terms to accommodate changing circumstances and purposes, there is no reason we cannot do the same with the term "copy." We define it to include "original"; we can certainly define it to include the temporary fixation of digital information in the RAM memory of a computer.

H. We Can Redefine Terms—But Should We?

To say that we can define "copy" in this sense, of course, is not by itself a good reason to do so. *But doing so helps copyright law to become the law that de facto governs access to and use of information.*

There is much to be said for this shift of focus, though I will only touch on a few reasons here. For one thing, many state laws that might have served the purpose of controlling access to and use of information may well be preempted by the Copyright Act.¹⁰⁹ State privacy law is a likely candidate. Suppose that "private" information—for example, an embarrassing personal diary—were stolen from an individual and distributed over the Internet. The individual might appear to have a state law cause of action for "public

108. PHILIP BOBBITT, CONSTITUTIONAL INTERPRETATION 11-22 (1991); ERWIN CHERMERINSKY, INTERPRETING THE CONSTITUTION 51-80 (1987).

109. On preemption generally, see GOLDSTEIN, *supra* note 4, § 15. On the problems of preemption relating to software license agreements, see Maureen A. O'Rourke, *Drawing the Boundary Between Copyright and Contract: Copyright Preemption of Software License Terms*, 45 DUKE L.J. 479 (1995). For a discussion of why the digital age may give rise to an increasing focus on the preemption issue relating to contracts, see I. Trotter Hardy, *Contracts and Copyright Preemption in a Digital World*, 1 RICH. J.L. & TECH. 2 (April 17, 1995), available at <<http://www.urich.edu/~jolt/v1i1/hardy.html>>.

disclosure of embarrassing private facts."¹¹⁰ The Copyright Act would preempt that action, however, under section 301's preemption provision.¹¹¹

The state laws that come closest to controlling "access" to computerized information are not privacy laws, however, but a large set of variously worded state criminal laws on "computer trespass."¹¹² These laws govern what is generally defined as unauthorized entry to a computer system. They were passed some twenty years ago in the age of mainframe computers and those who tried to "hack" their way into them. I am not aware of cases challenging these statutes on preemption grounds, but it is entirely possible that any such challenge would succeed. Unauthorized entry necessarily invokes the running of computer programs; the running of such programs has been found to have copyright significance.¹¹³ I do not argue that such laws *should* be preempted, so that copyright can become the *de facto* law of information access; that would be circular.¹¹⁴ But with or without such an argument, the possibility remains that many "computer trespass" laws are a matter of state statutory law, and therefore run the risk of copyright preemption. Were that to happen, much of what states have wanted to control would suddenly fall outside their control.

Second, allowing copyright to become the law of information access would simplify the legal system. No one can think that copyright alone is a "simple," let alone a common-sense, body of law. The Act is complex, and becoming increasingly so.¹¹⁵ But surely copyright law alone is more simple than copyright law plus a large body of state law. State laws vary across all fifty states and include sharply differing common law rulings (on privacy, for example) and statutory law (on computer trespass, for example).

Finally, a complex body of copyright law might, in the abstract, be less desirable than a new body of law created for the purpose of controlling information access and use. A new body of law would have the advantage of not having the baggage of hundreds of years of history. But sometimes one's baggage contains useful things; in copyright's case, the many years of history help to bring understanding to a complex area. It is no accident that in the 1976 Act, Congress noted that it did not want to jettison a long history of case

110. See RESTATEMENT (SECOND) OF TORTS § 652D (1977); W. PAGE KEETON ET AL., PROSSER AND KEATON ON THE LAW OF TORTS § 117, at 856-63 (5th ed. 1984).

111. Section 301 preempts any state law action that applies to something within the subject matter of copyright, and for which the right being asserted is equivalent to one of the Copyright Act's list of rights. With this hypothetical, the plaintiff would be asserting rights in a "diary," which would be a "literary work" under the Copyright Act and hence well within copyright's subject matter. The right being asserted would be to enjoin, and perhaps collect damages for, public distribution of the diary. Such a right is equivalent if not identical to copyright's right to control "public distribution." See 17 U.S.C. § 301 (1994).

112. See Raymond T. Nimmer, *The Law of Computer Technology* ¶ 12.12, at 12-29 (2d ed. 1992).

113. See *supra* notes 5-12 and accompanying text for a discussion of RAM copying.

114. Part of my argument for copyright's being the preferred law is that state laws may be preempted. I do not argue, therefore, that such laws ought to be preempted.

115. See, e.g., Audio Home Recording Act of 1992, Pub. L. No. 102-563, 106 Stat. 4237 (codified at 17 U.S.C. §§ 1001-10), which added several pages of almost impenetrable language to the statute.

law, but rather to codify many of its aspects like the fair use doctrine.¹¹⁶ In addition, the battles over copyright as it stands today are fierce enough; there is no reason to think that a major new body of law would ever be introduced by Congress, let alone achieve passage in less than ten to twenty years.¹¹⁷ We will have to resolve a lot of disputes over information between now and then; copyright is something we have in place already.

Whether one agrees that copyright law is appropriate for the task of controlling the rights of information access and use, I believe that it is rapidly becoming such a law. Indeed, I will show that the RAM-copy cases are best understood as effectuating the creation of exactly that right.

I. Brandeis and Warren: Historical Parallel

We have a nice historical parallel to help us understand what copyright courts are doing today. Over a hundred years ago, at a time when there was no recognized or established right to privacy, Justice Louis Brandeis and Samuel Warren wrote what has become a famous article on privacy.¹¹⁸ Their method of argument was to discover a line of cases that seemed to deal with privacy concerns, but that courts had explained in other terms. Principally these other concerns lay in literary property in documents, like diaries, never intended for publication; but also in a breach of implied contract or breach of trust or confidence.¹¹⁹

Many of these cases strain the doctrines they rest on. Warren and Brandeis illustrate the point by arguing that cases alleging breach of an implied contract when one publishes a private letter make little sense as contract cases: there is hardly a good ground for a contract of any sort.¹²⁰ Other cases not discussed in their article might make similar illustrations. *Bouillon v. Laclede Gaslight Co.*¹²¹ is a good example. The case featured a meter reader who tried to force his way into the chambers of the plaintiff, a pregnant woman. All

116. See H.R. REP. NO. 1476, *supra* note 12, at 66, *reprinted in* 1976 U.S.C.C.A.N. at 5680 (stating that "[s]ection 107 is intended to restate the present judicial doctrine of fair use, not to change, narrow, or enlarge it in any way"); *id.* at 57, *reprinted in* 1976 U.S.C.C.A.N. at 5671 (adding that "[s]ection 102(b) in no way enlarges or contracts the scope of copyright protection under the present law. Its purpose is to restate, that the basic dichotomy between expression and idea remains unchanged").

117. Work on what became the 1976 Act began in 1955 and continued almost without cessation until passage of the bill. See *id.* at 47-48, *reprinted in* 1976 U.S.C.C.A.N. at 5660-61 (detailing the various studies, meetings, hearings, and other processes leading up to the Act).

118. Samuel D. Warren & Louis D. Brandeis, *The Right to Privacy*, 4 HARV. L. REV. 193 (1890).

119. Warren & Brandeis, *supra* note 118, at 198. "[T]he legal doctrines relating to infractions of what is ordinarily termed the common-law right to intellectual and artistic property are, it is believed, but instances and applications of a general right to privacy, which properly understood afford a remedy for the evils under consideration." *Id.* "We must therefore conclude that the rights, so protected, whatever their exact nature, are not rights arising from contract or from special trust, but are rights [not based on] the principle of private property . . . [but on] the right to privacy . . ." *Id.* at 213.

120. *Id.* at 211.

121. 129 S.W. 401 (Mo. Ct. App. 1910).

indications were that he was only seeking access to the meter, nothing more, but was rude and abrasive in his manner, to the plaintiff's great distress and discomfort. He was successfully charged with a trespass to land, on the grounds that his hand had been on the door when it was opened a little ways into the plaintiff's room.¹²² One struggles to learn anything useful about the doctrine of "trespass to land" from these facts: does a repairman's hand on a partially open door invoke any serious challenge to the landowner's right of exclusive possession? Does it facilitate access to a court for the purpose of trying title? Obviously not; this was a case far more concerned with privacy or emotional distress than with trespass to land—and the case tells us far more about those notions than it does about real property law.

Brandeis and Warren's great contribution to these cases was to show that, although the cases made very little sense in terms of their cited doctrines, they made a great deal of sense when explained as *privacy* cases. Brandeis and Warren concluded that courts were slowly finding their way to a new cause of action for the invasion of privacy, yet all the while adhering verbally for the sake of precedent to older and better established doctrines.¹²³

The RAM copying cases similarly do not make a great deal of sense as "copying" cases. In *Telerate Systems*,¹²⁴ for example, defendants downloaded small amounts of data from an online database. The court found in part that the downloading of the data into the terminal's memory constituted the making of a copy under the Copyright Act.¹²⁵ Obviously it is not the "copying" of the information that was of concern to the plaintiffs; they wanted to control the access to their database.

Again, in *MAI Systems v. Peak*,¹²⁶ plaintiffs sold computers and software to clients under contract terms that allowed only the buyer to make use of the software. One of their buyers contracted with a third-party maintenance firm. In the process of providing maintenance, this third party necessarily turned on the computers. By design, the act of turning on the computers necessarily brought about the result that some of the plaintiff's computer programs were invoked, and then used by the third party maintenance firm. Plaintiffs sued for copyright infringement for this brief use of their software. The court agreed, concluding that unauthorized "copies" were indeed made when the computers

122. *Id.* at 401.

123. They based the bulk of their arguments on situations in which documents were published or distributed to others. They argued that most such cases of intellectual property—sometimes called "common law copyright"—were really based on privacy. Warren & Brandeis, *supra* note 118, at 198. Ironically, most such cases today would once again be based on intellectual property law, specifically copyright, because any state law for invasion of privacy would likely be preempted by § 301 of the Copyright Act!

124. *Telerate Sys., Inc. v. Caro*, 689 F. Supp. 221 (S.D.N.Y. 1988).

125. No doubt that the "infringement" portion of this holding would today be overridden by *Feist Publications, Inc. v. Rural Telephone Service Co.*, 499 U.S. 340 (1991), but the "copying" portion of the holding would not be.

126. 991 F.2d 511 (9th Cir. 1993).

were first turned on.

Here, too, the case makes little sense in terms of the conventional use of the term "copy" for copyright purposes. Clearly plaintiffs were trying to control both the sale and maintenance of their software—in a broad sense, that is, to control access to and use of their software much more than the "copying" of their software.¹²⁷

In both *Telerate Systems* and *Peak*, as well as other RAM copy cases, courts have been faced with non-traditional copyright issues. These cases are not like the publication of a novel, or the showing of a movie. Copyright's tools had not been well-fashioned to accommodate the more modern and appropriate inquiries centering on "access and use" of information that these cases raised. But in the common law tradition, the courts have preferred not to throw up their hands in the face of difficulty, but rather to craft the proper new tools by using the language of the older ones of copyright.¹²⁸ Thus, even though the cases do not make a great deal of sense explained in terms of *traditional* notions of copyright "copies," they do make sense as ones in which the courts are building on a more modern interpretation of "copying" to find their way to a new copyright law that is based on controlling access to and use of information.¹²⁹ As Warren and Brandeis themselves noted, "[p]olitical, social, and economic changes entail the recognition of new rights, and the common law, in its eternal youth, grows to meet the demands of society."¹³⁰

VII. CONCLUSION

In the world of digital communications, the phenomenon of "caching" is wide spread. Caching means the temporary storage of information at a computer other than the "home" computer, done typically for the purpose of speeding up access to the information. A number of court decisions, notably *MAI v. Peak*,¹³¹ have concluded that the short-term appearance of copyrighted information in computer memory constitutes the creation of a "copy" of the

127. To be sure, trying to control both the market for sales of the software initially, and the market for maintenance of the software, plaintiffs were engaged in a tying arrangement. Such an arrangement might or might not be illegal under antitrust law, but quite clearly the attempt at issue was based on a desire to control use of the software than on any desire to make money from the publication or distribution of the software.

128. Warren and Brandeis, *supra* note 118, at 200-01. "[W]here the value of the production is found not in the right to take the profits arising from publication, but in the peace of mind or the relief afforded by the ability to prevent any publication at all, it is difficult to regard the right as one of property, in the common acceptance of that term." *Id.* (emphasis added).

129. Nimmer & Krathaus, *supra* note 91, at 32-33. Needless to say, I disagree with commentators who argue that "copying" in the memory of a computer should not be interpreted as an act of any copyright significance, or more precisely, that it is not within the current statutory definition of "copying." See, e.g., Jessica Litman, *Revising Copyright Law for the Information Age*, 75 OR. L. REV. 19, 21-22 (1996).

130. Warren and Brandeis, *supra* note 118, at 193.

131. 991 F.2d 511, 518-19 (9th Cir. 1993).

information and hence that copyright law is involved. Caching entails a similar phenomenon, so these decisions will presumably mean that with caching, copyright law is once again invoked. Should it be? If unauthorized, should caching be deemed lawful, or be deemed a *prima facie* infringement? Because of its close affiliation with the notion of temporary "RAM" copies, caching also constitutes a microcosm of the issues of copyright and digital communications generally—it therefore merits our close attention.

Caching is so common and is used in multiple different forms today, that many in the technical community would say it "ought" to be legal, and if it is not, then something is wrong with copyright law. But this view is based on a number of mistaken beliefs about caching and temporary computer "copies," beliefs so strongly and instinctively held that I think it fair to call them "myths." When these myths are exposed to scrutiny, they turn out to be wrong. The lessons from copyright's history argue strongly that caching ought not to be "legal" in any sweeping sense, but rather ought to be held to the fact-sensitive, case-by-case determinations of implied license and fair use.

The first myth is that caching is essential for the Internet. In fact, the Internet's *architecture* does not depend on caching, but can accommodate high or low speeds, with or without network congestion, depending on how that architecture is implemented. Caching is the natural result of limited bandwidth that is itself a function of today's particular technical implementation and also the pricing structure of the Internet. If either the bandwidth is increased significantly, or a pricing mechanism is implemented that is more sensitive to bandwidth distinctions than presently, the need for caching will diminish.

Myth number two is that caching helps everybody. It does not. To be sure, all things being equal, "speeding up access" is generally a good thing. But the Internet is a very diverse place, and rarely will "all other things" be equal. For example, some sites change their content frequently—even minute by minute in the case of some news and sports delivery sites. Any caching of their sites may mean that their users are getting out of date information and is hence undesirable. For another example, many sites want to keep statistics on the number of visits or "hits" to their site. Whether these numbers are in fact indicative of anything, they are often treated by their gatherers as indicative. Caching can have the effect of depriving them of "hit counts" that they want to have and is undesirable for that reason.

The third myth is the most pernicious, namely that we know precisely what caching "is." Caching reflects current Internet economics and technology. If there is anything we know, it is that the Internet and its various technologies are not "static" or even "stable." Rapid change is the order of the day; caching is not likely to be an exception. Caching already takes many forms: it can be anything from millisecond storage to overnight storage to days and weeks of storage; it can be implemented as an automatic function of software that is beyond an end-user's control; or it can be a commercial

package bought and configured for the purpose of caching by end-users themselves. Tomorrow, caching may evolve into other manifestations quite different from today's.

History is a useful guide here. Societal perceptions of the role of previous technologies like the telephone, the phonograph, radio, and cable television, have often been wildly wrong. In particular, many new technologies started out as enhancements to and advertisements for an existing market, but eventually grew to dominate and displace the market they were thought merely to enhance. If caching turned out to exhibit a similar development, we would be mistaken to formulate rules based on its current status. Because we do not now know how it will develop, we would be mistaken to formulate specific rules of any sort.

Finally, myth number four is that reliance on computer-memory or "RAM" copies as a vehicle for copyright law is an anachronism that is inapposite and harmful to progress in today's world. This myth is powerful and consequently a crucial one to analyze. It forms the basis of many popular and scholarly critiques of our current copyright system.

The reason it is a myth is that it rests on the belief that statutory language must be interpreted with reference to "original intent." In particular, that "copy" must mean today what "copy" meant in 1976 or 1909 or some earlier day.

In fact, statutory language, like Constitutional language, evolves in meaning over time. Of course, one can argue that this is bad. Many who follow an original intent philosophy for Constitutional interpretation would say that it is. But it is unquestioned that countless legal terms have, in fact, acquired over time meanings that are substantially, if not wholly, at odds with their original use. A few examples from "Due Process" to "master-servant" to "perform"—and even to "copy"—show that our legal system has seen enormous changes in interpretation over time.

For the most part, these changes serve to keep legal doctrines abreast of changing technologies, economics, mores, and the like. The evolution of "copying," from its original and lay sense of tangible reproduction, to something more abstract that applies to temporary appearance of information in the memories of computers is a natural progression of the law.

This evolution enables courts to develop a new copyright law that is based not on tangible reproduction—useful for an era of books, magazines, and the like—but rather on controlling *access to and use of information*—an alternative focus necessary for today's world of intangible, digital works of authorship. A hundred years ago, Warren and Brandeis "discovered" the law of privacy in a series of court decisions nominally based on other theories.¹³² So today we can examine a line of computer-memory cases nominally based

132. Warren and Brandeis, *supra* note 118.

on the copyright doctrine of tangible reproduction in "copies," to discover that they are in fact based on a new, and much needed, theory of control over the access to and use of information.