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ESSAY

A FUNCTIONAL APPROACH TO INFORMATION UPON THE CONVERGENCE OF COMMUNICATION AND INFORMATION PROCESSING

by ROY N. FREED†

I. INTRODUCTION

Computer law has been very good to me. This field of law is a great alternative to the will-o'-the-wisp monkey glands that scientists talked about decades ago. While Ponce de Leon, an early Spanish New World explorer, looked in vain for the literal fountain of youth in Florida almost four centuries ago, I found that fountain, figuratively, in the form of computer law in Philadelphia about four decades ago. Computer technology can work wonders for many people in many very different ways.

Now, at my advanced stage of life, this opportunity to write an essay on my reflections has very poignant meaning to me. This essay enables me to present some basic revisionist ideas I derived by thinking deeply about computer law. Acting in the way my gerontologist wife tells me is typical for people my age, I first reflect on the richness of my long, and still continuing, professional life. Because she believes that reminiscence is good for the psyche of the reminiscer, I take the liberty to use this essay as a foil for my therapeutic self-reflection.

I rationalize talking about myself, however, in the belief that the discussion will stimulate others to be legally curious and creative in our chosen field of information technology law. This essay hopefully demon-

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This essay is a revised version of a keynote speech that the author delivered on April 25, 1996, at the 1996 Computer & Telecommunications Law Update, which was presented by the CLA for its 25th anniversary program in Washington, D.C.

strates what can, and should, be done by all people at all ages. I believe that a review of my life in computer law shows the psychic, intellectual, and professional rewards that open-minded, inquiring lawyers can gain from looking beneath the surfaces of their fixed ideas about the basic factual and legal elements that we work with.

I hope to persuade you, by example, that we should re-examine continuously accepted, ostensibly reasonable views of the nature of computer-communications technology. We should re-examine these views not only from a legal perspective, but also from seemingly fixed legal concepts and rules that we are comfortable applying, on the likely chance that they are out of date in our Protean world.

When done effectively, this constant re-examination makes the activity of understanding, interpreting, and applying the diverse rules of computer law as dynamic as the developments of this technology and its use. The remarkable dynamism of computer technology casts new light on many types of legal fact situations involving information processing. This in turn provides unusual opportunities for constructive legal revisionism and updating.

II. MY ROLE IN COMPUTER LAW HISTORY

I begin my reflections with some early history of computer law. This history demonstrates the real creativity needed for the proper legal treatment of manifestations of computer technology.

The early challenge in the practice of computer law was basic. The challenge was to recognize that, despite the novelty of the technology, the analytical process learned at law school should be used for finding legal rules for the various facets of the new world of machines that perform operations similar to human thought.

We must not stop thinking like lawyers just because a remarkable new technology becomes available; rather, we must think like lawyers even more rigorously. Unfortunately, however, not all lawyers meet this basic challenge of applying traditional legal analysis. Instead, too many lawyers default. They accept, without independent analysis, terms and concepts used by technical people who are oblivious to legal precision. By my standards, the results are unfortunate.

An example of one early such challenge that turned out to be more difficult to meet than necessary involved IBM. This arose when, pushed by the Government's anti-monopoly case, IBM took the ostensibly simple step of unbundling its software from its typically leased hardware, and then offered the two separately. Suddenly, lawyers had to decide for themselves, or others, what "software" was for legal purposes. These legal purposes included: 1) how to get intellectual property protection for software, which, after being given away, became very valuable in the

market; 2) how to structure the various types of leasing, sales, licensing, and genuine service transactions by which software use was made available; 3) how to treat, for tax purposes, the income, expenses, and property related to marketing, creation, and ownership of software; and, finally, 4) how to identify and handle tort, contract, and other liability exposures from software's use and distribution.

That step was part of the unavoidable general challenge to decide, by analogy and deeper analysis, which existing legal rules lawyers should use, probably with interpretation, for aspects of computer technology that satisfied the public policy they were supposed to promote and what entirely new legal approaches, if any, were needed to satisfy it. That presented the major challenge of understanding, from a legal perspective, the real nature of the then-new technology, the uses for that technology, and the various business transactions through which the technology became available.

Specifically, lawyers had to determine if there even was such a thing as "software" for legal purposes (despite the fact that technical people spoke about software incessantly), or whether software was merely a non-legal, indiscriminate catchword for various traditional legal elements. These elements include copyrightable works of authorship that are distributed, and information that is subject to the American version of trade secrecy.

Learning the real meaning of "software" turned out to be difficult for the many lawyers who were influenced by the non-legal use of the word by technical people. Accordingly, many lawyers chose the wrong characterization, which resulted in unfortunate legal results.

I tried to discourage misuse of the term "software" by showing lawyers how to apply traditional legal analysis to the actual subject matter of software. I presented my analysis in an article entitled *Legal Interests Related to Software Programs*.[1] Although my analytical process was valid, I performed the analysis with the common understanding that trade secrecy was a genuine legal interest. I now deny this view after reexamining the nature and scope of unpublished copyright.[2]

The challenge to pick legal measures for protecting property interests in software programs seems to be never-ending. Today, even at this late date, the challenge continues. Because I am completely comfortable with reliance on copyright in published and unpublished works, I object to the persistent attacks on copyright applicability.

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1. Roy N. Freed, *Legal Interest Related to Software Programs*, 25 JURIMETRICS J. 347 (1985).

2. Unpublished copyright was added to Federal law by the Copyright Act of 1976. 17 U.S.C. § 104 (1976) (current version at 17 U.S.C. § 104 (1996)).

Those attacks seem only to be negative and to deny the appropriateness of copyright, instead of proposing an alternative approach for protecting software for assessment in light of public policy for intellectual property. I believe that careful legal analysis of the subject matter will persuade reasonable critics that copyright is the appropriate means.

A. Creativity is Information Processing by the Mind

Let me reflect briefly on the early history of computer law, including my own role and the roles of many others. My personal history as a computer lawyer starts with what Arthur Koestler, a remarkably perceptive Renaissance-man psychologist, would call an "act of creation." I did not follow anyone into the field because there was no one to follow.

In the infancy of computer technology, Koestler wrote a remarkably informative book on the operation of the human mind entitled, *The Act of Creation*.[3] While I enjoyed reading the book immensely as literature, I liked it especially because Koestler examines the creative function of the human mind and supports, by implication, my conviction that computer lawyers should know how the human mind operates in order to properly apply legal rules.

Let me give you some background concerning my own multifaceted creative activity involving computer law. This background information will both provide some computer law history and show the legal significance of knowing how the human mind works as an information processing machine. My creative activity began a long time ago, when I started to use my inherent engineering aptitude and interest in technical subject matter, such as industrial processes and business transactions, with respect to legal subject matter.

However, my computer law creative activity came to fruition through separate exercises of the two modes in which the human mind performs the basic mental information processing operation of thought association. The way thought association takes place in the mind is the Holy Grail for many computer scientists, especially artificial intelligence specialists. Yet other people, including lawyers, should be equally curious about thought association.

Note that I referred to the mechanism of "thought association." I did so to trigger your thinking about how the human mind actually works, both abstractly and concretely from a lawyer's perspective. Thought association is extremely important in understanding the operation of the human mind and, therefore, is tremendously significant to the application of legal rules. After all, the human mind is the control mechanism

3. Arthur Koestler, The Act of Creation (Viking Penguin Inc., New York, 1989).

that influences the actions and responses of people, which are the very subject matter of countless legal rules from many fields of law.

Let me contrast the pre- and post-computer methods of discussing and understanding "thought association." Thought association is a major factor in decision making and the way I became an early computer lawyer. Before the advent of computers, lawyers regarded the very essence of legal analysis—making associations or drawing inferences by analogy—as some nebulous occurrence that they could not even call an activity. They referred to this nebulous occurrence at its highest, most general level, by clichés such as "thinking like a lawyer."

Then, computers came along to show us how minds probably make individual decisions. Computers make individual decisions by recording into their dynamic registers specific digital pulse stream inputs that represent factors relevant to the desired decisions. Computers then combine those pulse streams in a programmed mathematical manner to synthesize the result as a decision.

The term "thought association" suggests to me that an equivalent signal input processing operation takes place in the human mind. That term ceases to refer to a nebulous occurrence because of computer technology. Thought association now means to me a physical process of mentally combining, in a purposeful manner, input streams of specific, differentiated electrochemical pulses that represent factors relevant to the ultimate conclusion or decision to be reached.

I will now explain how the two modes of associative thought, or mental information processing, take place by explaining how I experienced them on my path to computer law. These two modes are: 1) thinking essentially at the somewhat steerable conscious level, and, 2) thinking at the more automatic, unconscious level.

While I describe my mental experiences, think about how individual computers operate by processing input information under the control of software or hardwired programs. Approaching the activity of thinking from a legal perspective, I suggest that the processing of input information in the mind, guided by unique genetic, or operating system, programs and learned, or application, programs, makes the mind a wondrous machine. I will discuss *infra*, in greater detail, the many legal significances of this phenomenon, known as mental information processing.

I am lucky that my career as a lawyer, and my personal interest in human and machine information processing, spanned the pre-computer period and the important early years of computer technology, as well as the more recent Computer Age. That spanning enabled me to accumulate key facts in my mind as input information that eventually led me,

through mental information processing or thought association, to discover computer law.

Practicing law for over half a century enabled me to experience and collect input information on a variety of pre-computer information processing support technologies. These support technologies include: 1) abacuses, during trips to the Orient; 2) people-powered, lever-operated, mechanical adding and bookkeeping machines and cash registers; and, 3) electromechanical punched-card systems that used I.B.M. cards, which were actually developed by Remington Rand for the Census Bureau. Learning solely by observation about these mechanized punched card systems, or getting knowledge inputs about them to process in my mind, brought me to the turning point in my legal career and eventually led me to formulate the ideas I present here.

I literally fell into computer law indirectly in 1959 through the conscious creative act of designing the first mechanized litigation support system. This system was based on machine-sortable punched cards used in accounting, which was the only automatic sorting technology then readily available. Although the idea for such machine systems was about thirty years too early for me to capitalize on, it did lead me shortly thereafter to computer law at just the right time—while computers were new.

I unveiled this rather primitive mechanized evidence management system thirty-six years ago in an article[4] entitled ambitiously, if not presumptuously, *Machine Data Processing Systems for the Trial Lawyer*. Probably no one read that novel article other than the late Paul Wolkin, the publishing journal's imaginative, generous editor to whom I am everlastingly indebted for my computer law career. Although evidence management system's design principles were valid, the technology could not perform needed inverted file searches using Boolean algebra style questions, as computers can.

I designed that stillborn evidence searching system as a very conscious activity, at my awareness level, even though I could not see the specific information processing steps through which I accomplished the activity. I was intentionally trying to provide relief for litigators such as myself who, before computers and xerography, had to manage the overwhelming mass of evidence in big cases with cumbersome, voluminous digests and indices; unwieldy, heavy, glossy, expensive photostats; and untrustworthy human file searching. I started my own file-management suffering in the mid-1940's, while in Boston with the Antitrust Division of the Department of Justice. At the time, I was involved in a vast paper

4. Roy N. Freed, *Machine Data Processing Systems for the Trial Lawyer*, THE PRACTICAL LAWYER (April 1960).

case against United Shoe Machinery Corporation,[5] an old company that made multiple copies of every document and never discarded any of them.

Designing that system after fifteen years in antitrust litigation was literally a matter of necessity. By 1959, I had become so oppressed by repeated searches of the massive transcript in the so-called *TBA Cases* to find items of evidence, that a sudden psychological block prevented me from reading the transcript.

In designing my primitive litigation support system, I used my technical aptitude to perform regular system analysis. At the same time, I kept hearing glowing comments about electronic digital computers, which were just becoming commercially available. Philadelphia was then a computer technology mecca centered around the Moore School of Engineering where, five decades ago, Presper Eckert and John Mauchly created the ENIAC computer for the Army Ordnance Corps. What impressed me were recurring statements that computers would expand the power of peoples' minds the way mechanical machines of the Industrial Revolution expanded the power of peoples' muscles. But I had no conscious inkling of how that wonderful computer technology might tie in with my obvious personal need to find a psychologically and financially more satisfying career path. By extremely good fortune, the unconscious part of my mind took on a major information processing task to find out how that technology might lead me to a new career.

I am impressed by how the mind simultaneously processes information on different subject matter at both the conscious and unconscious level. The human mind is a truly wonderful machine!

We can learn a great deal about the functioning of the human mind merely by noting how our own appears to work. Since the advent of computers, we are helped greatly in that step by drawing on the way those machines operate. This conclusion demonstrates the error of philosophers who reasoned, from a false assumption, that it is impossible to use one's own mind either to learn how that mind operates or to infer how other minds operate.

Thus, I could see that my unconscious mind, which obviously was bombarded with inputs about the wonders of computers at the conscious level, autonomously performed a miraculously associative feat. My unconscious mind produced a key perception that, even at the early stage of the commercialization of computer technology, the time had come to start thinking seriously about the legal ramifications of computer technology's expanding distribution and use. Fortunately, I received that message.

5. United States v. United Shoe Machinery Corp., 89 F.Supp. 357 (D. Mass 1950).

It is interesting to contrast, for legal and other purposes, the forces that direct how computers and the human mind take action from specific subject matter inputs under the guidance of their respective operating system and application programs. Computers are still led by the programs that people prescribe for them. However, by drawing an analogy to computers, the human mind is influenced by programs that are endowed by various forces, either genetically or through circumstances that the mind encounters, such as education and experience. I guess that this observation dredges up the age-old philosophical disputation on free will versus determinism in a newer, fairly concrete context.

The opportunity to engage in preventive law made it advisable to think about the substantive legal ramifications of computers. That triggered the lawyer in me to imagine professionally the many ways computers might be distributed and used and, thus, the potential legal issues that would arise. These legal issues concerned the types of legal entanglements users and distributors might encounter, as well as how these legal entanglements should preferably be prevented or, at a minimum, resolved wisely. Although I dabbled with the engineering design of a machine information processing system, I quickly realized from that exercise that I wanted to devote my mental information processing energies to handling the substantive legal aspects of computers, rather than preparing for their potential uses in the legal system. That mental awareness activity enabled me to produce an article entitled *A Lawyer's Guide Through the Computer Maze.*[6]

This essay reflects some of the wonders of information processing by the human mind. It also shows the comparative examination we should make of the mechanics of human thought and information processing by computers, in order to note their striking similarities and genuine differences.

B. Difficulties In Introducing Computer Law

My frustration during the 1960's with my effort to spread the gospel about the need to address the countless substantive legal questions raised by the use and distribution of computers led me and six others to found the Computer Law Association ("CLA").

Let me give two examples of my difficulty in recruiting enthusiastic disciples to help in my prophetic mission to spread the gospel of practicing computer law as creatively as I thought should be done. I was frustrated during the many years I was active on the predecessor committees of the American Bar Association's Section of Law, Science, and Technol-

6. Roy N. Freed, *A Lawyer's Guide Through the Computer Maze*, The Practical Lawyer (Nov. 1960).

ogy.[7] There, my attempt to sustain serious attention to the substantive legal aspects of computer technology meant jousting with most of the committee members, who were interested only in the use of computers to search law libraries.

With persistence, I managed to pry open opportunities to speak at ABA annual meetings on such topics as the admissibility of computer records in evidence. I recall poignantly having to persuade a colleague that there were other substantive legal issues that merited discussion at those annual meetings, such as intellectual property; income, personal property, and sales and use taxes; and tort liability.

Similarly, I had a real donnybrook in 1964 with the then chair of the ABA's Section on Business Law. I believed that I negotiated for that Section to sponsor my mock trial on how to treat computer-related evidence at the August 1964 ABA Annual Meeting in New York. At the time, many lawyers could not understand how to admit their clients' computer records into evidence under the business records exception to the hearsay rule or to have their adversaries' records treated as admissions against interest.

On the eve of that ABA meeting, the chairperson arbitrarily withdrew his section's sponsorship. I was desperate. By good fortune, Judge Wilfred Feinberg, then a Federal District Judge in New York and later a judge on the Second Circuit Court of Appeals, *ordered* that we go on. We had a large, enthusiastic audience at the mock trial. As a serendipity, I sold an edited version of the script to *American Jurisprudence Proof of Facts Annotated*[8] for enough money to take my family to Europe.

Such were the hazards of the new field of computer law through the ABA. Before the subject caught on, and the CLA was founded, it was an uphill struggle all the way.

American law schools have not been any better in providing significant education on computer law. In fact, I believe that most of them are cheating their students educationally by largely ignoring the subject. The professors overlook the unusually rich, analytical, intellectual challenge that teaching computer law presents. The late Paul Freund, the noted Harvard constitutional law scholar, could be forgiven for observing to me in the late 1960's that computer law undoubtedly would be significant in the future. But I am much less forgiving of a recently-named dean of a top law school, who said the same thing to me in early 1995.

Moreover, some professors have persisted in muddying up legal thinking in our area of law instead of helping to advance computer law. For example, a number of them continue to attack the copyrightability of

7. The committee was originally named the Special Committee on Electronic Data Retrieval and, subsequently, the Standing Committee of the same name.

8. 16 AM. JUR. *Proof of Facts* 273 (1965).

software program materials in general without proposing any better approach. Egregiously, one of them challenged secrecy for copyrighted program source codes *after* the Copyright Act of 1976 made unpublished works copyrightable. The professor argued that copyright exists to foster disclosure of works of authorship and their contents. To support that view, the professor disingenuously quoted language from decisions of the Supreme Court under the 1909 copyright law, which, as we all know, covered only published works.

Other professors attack copyrightability of software programs because most of the programs have short commercial lives, even though many printed works have the same life span. So long as a software program work is in demand, the program should enjoy a copyright. When its market dies, the fact that its copyright term continues is meaningless.

III. RETESTING ASSUMPTIONS OF FACTS AND LAW

Let me now demonstrate the constant retesting that I recommend lawyers and professors of law apply to commonly understood fact situations that are the subject of legal rules and the propriety of legal rules themselves. We need retesting to refresh the body of the law appropriately, due to ever changing social and technological scenarios. I have two examples, again drawn from my own experience.

First, I must mention my pet peeve—revised section 117 of the Copyright Act of 1976.[9] This section is a prime example of legislation that Congress never should have enacted.

I suspect that members of the National Commission on New Technological Uses of Copyrighted Works (CONTU), and the members of Congress who accepted their recommendations, were misled into thinking that revised section 117 was needed to authorize expressly rightful possessors of computer media for software programs to make copies of them for security and backup purposes and to tailor them for particular computers. Perhaps they were hoodwinked by the then-current belief that the fair use doctrine did not authorize the making of a copy of an entire copyrighted work.

When I asserted during a discussion that Congress should not have enacted revised section 117 because the fair use doctrine more adequately grants the needed authorization, a past Copyright Division General Counsel challenged me from the floor with that shibboleth. I replied that the wonderfully elastic fair use doctrine could and should be interpreted for the new factual circumstances—namely, the universally accepted view that rightful possessors of computer media should routinely make and keep copies of them for back-up purposes. Soon afterward, the

9. 17 USC § 117 (1996).

Supreme Court confirmed my reasoned belief that technological developments nullified that old-fashioned view. In *Sony Corp. of America v. Universal City Studios,*[10] the Court ruled that the fair use doctrine permits copying entire television shows for personal time-switching.[11]

Moreover, I believe that Congress should revoke section 117 because the fair use doctrine avoids both the ambiguity in section 117's definition of "computer programs" as a series of steps and use of that term to cover recorded media that are works of authorship and that section's irrational limitation to one back-up copy. Also, that doctrine can and should be interpreted to apply only to recorded computer media that are both easily damaged or destroyed and cost more than a nominal amount to buy.

I never understood why Congress decided to mention the term "computer program" in section 117 to eliminate doubts that recorded computer media were copyrightable. Traditional legal analysis showed me that, for intellectual property purposes, computer programs provide traditional knowledge about the series of steps that computers take in carrying out programs and are the works of authorship on which that knowledge is recorded.

Similarly, by making a more fundamental and pervasive reassessment of the nature and scope of unpublished copyright, I now believe that section 301 of the Copyright Act of 1976[12] preempts the American concept of trade secrecy as to knowledge recorded on works of authorship that are transferred subject to restrictions on their disclosure. In embracing this belief, I recant my earlier and long-held contrary view.

I became disenchanted with this application of trade secrecy when I was a Visiting Research Scholar at the Tokyo University Law Faculty in 1986, searching for a universally acceptable legal measure for protecting software program subject matter. I first rejected this basic American software protection because the Japanese, among many others, do not accept our type of trade secrecy.

I then recognized the artificiality, gross inadequacy, and unsuitability of our unique trade secrecy, probably because I was professionally far removed from the United States. Moreover, I saw how that concept grew out of unfair competition law after the Civil War to support the newly-introduced commercial licensing of industrial processes. People did not understand unpublished copyright (then called common law copyright under State law). I realized that unpublished copyright was a superior replacement for trade secrecy and an ideal concept for universal acceptance.

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10. 464 U.S. 417 (1984).

11. *Id.*

12. 17 U.S.C. § 301 (1996).

Unpublished copyright, which is little understood anywhere, is an orphan legal interest in the United States because unpublished copyright was not included in Federal law until January 1, 1978.[13] People are still obsessed with the deceptive and diversionary false notion that copyright covers only the mode of expression of works of authorship. Those people overlook the critical fact that copyright also covers the entire information content of all unpublished works, except those works that are transferred free from restrictions on their use, their further transfer, and the disclosure of their contents. Copyright also covers some information content of published works, such as the plots and characters of novels, the meaning carried over in translations that produce different words, and, to some extent, the organization, format, and structure, or the "look and feel," of software programs.

Unless unpublished copyright covers information content, it is hardly useful. When unpublished copyright is viewed as covering information content, it becomes a vital, key intellectual property concept ideally suited for the Computer Age; this concept has waited too long to be discovered. Unpublished copyright is superior to trade secrecy, because it arises automatically, has statutory penalties, and is nationally uniform. However, unpublished copyright is enforceable only in the Federal courts.

Moreover, the Computer Age is the ideal time to discover the nature, scope, and value of unpublished copyright. The marketing of software program subject matter by genuine licensing of relatively large programs for mainframe computers was the first commercial distribution of large numbers of unpublished works, even though the activity was often spoken of as trade-secrets licensing. However, licensing is completely different from the actual outright sale of published copyrighted recorded diskettes for personal computers in the mass market, which is camouflaged or misunderstood as licensing.

I always believed that the so-called "shrink-wrap" licensing characterization conceals the fact that practically all personal computer ("PC") programs sold at retail are really sales of published copyrighted works covered by Article 2 of the Uniform Commercial Code. Accepting this basic fact should derail the misguided diversionary efforts to expand the U.C.C. to cover sales transactions under a different name. That false PC program licensing arose when its transactions were introduced, while practically all program transactions were genuine licenses of unpublished copyright works used with main frame computers that were usually characterized as trade secrets licenses. The people who introduced false licensing either did not understand the different nature of the new type of transactions, or sought to overreach by ostensibly imposing unau-

13. 17 U.S.C. § 104 (1996).

thorized obligations on their naive customers. The time has arrived to come clean, dispel the needless legal haze, and stop the effort to expand the U.C.C.

IV. THE PHYSICAL NATURE AND LEGAL SIGNIFICANCE OF INFORMATION

My current retesting of the meaning and nature of the basic, pervasive concept of information, for legal and other purposes, persuades me that it is entirely physical. What could be a more appropriate analytical project for lawyers, with all the talk about the Information Age, a National Information Infrastructure, a Global Information Infrastructure, a Cyberage, and the like? I tried to prepare you for this final step by peppering my ostensibly rambling reminiscence with allusions to the fact that the human mind, as well as computers, performs information processing.

Once I recognized that information actually is processed literally by both human minds and computers, I wanted to know what quality of information makes that possible. My analysis taught me the simple fact that, instead of being nebulous, metaphysical, or abstract, all information is entirely physical energy signals consisting of differentiated batches of analog light, sound, electromagnetic, or similar waves and streams of digital pulses. I also saw that the analog signals for information are useful only for communicating, while the digital signals for information can be processed by being combined mathematically as well as transmitted.

Although I like to be first with good ideas, I must admit that I was upstaged unknowingly by Dr. Claude E. Shannon, the eminent information scientist, when he declared that information is signals that are not noise.[14] While I derived my perception about the physical nature of information independently, I discovered that my exposition of this basic fact is really an elaboration of Dr. Shannon's extremely barebones, and elusive, statement on information.

I then applied my theory as a lawyer. Taking a functional, reductionist approach, I noted that specific items of information, in the form of differentiated batches of physical energy signals, are the basic factual elements to which countless legal rules apply. Two factors moved me to generalize that way. One is the way that computers, as circuitry networks, operate on digital electromagnetic or laser pulse streams to perform widely diverse applications. The other factor is the unfolding revelation by neuroscientists that the human mind is an equivalent, but

14. *See*, Claude E. Shannon: *The Hybrid Mathematician Who Founded Information Theory*, DATA COMMUNICATIONS, May 1985, at 70; John W. Verity, *Where it All Began: Claude E. Shannon*, 30 DATAMATION 153 (Dec. 1984).

far more advanced, biological processing circuitry network through which electrochemical pulses flow purposefully.

When viewed with a scientific and engineering approach, those analog and digital signals are identifiable, measurable, and replicable in the case of computers, and are increasingly so in the case of the human mind. This is because they are subject to the laws of physics and biophysics.

When seen in an elemental, physical state, as batches of energy signals, information appears as a common thread among countless legal rules in diverse fields, even though lawyers and other people might treat information differently as appropriate for their respective social purposes. These diverse legal fields include for example intellectual property; taxation; transaction law; torts, including negligence and such intended harms as defamation, libel and slander, and breaches of privacy; and civil liberties, including freedom to express and receive speech and the right against self-incrimination.

Moreover, the physical nature of information as batches of energy signals provides a new, sounder factual basis for many legal rules, such as torts and copyright. Let me give two examples.

First, consider tort liability for so-called non-physical, or purely emotional, personal injury. During my childhood, I took literally the childrens' rationalizing retort to verbal attacks that, "sticks and stones might break my bones, but names will never hurt me." Not knowing how the mind actually processes, and is literally affected by, input signal sensations such as abusive verbal statements or gestures, people ordinarily did not consider these sensations to be legally significant. But with our new understanding, is it really true that names never can hurt me? Or, as I now believe, might verbal abuse actually have a physical impact on, or figuratively scar, the parts of my mind that influence how I process energy signal inputs received through my senses?

Similarly, when I was in law school, tort damages were denied for emotional harm unless they were accompanied by physical injury. Does this new insight suggest a new approach for tort law?

Likewise and very significantly, my theory makes possible the adoption of a very efficient, elastic, and functional definition of works of authorship that would automatically cover evolving technological developments, thus obviating the need to amend the statute periodically to cover them. Therefore, I suggest that a thing is a work of authorship when it is specially created, in contrast to existing in nature, and used to generate input signals to an information processor for processing, which might be either a human mind or a computer.

V. INFORMATION IS REALLY MESSAGES

Merely knowing that information is created, communicated, and processed as batches of specific analog and digital signals probably does not enable most lawyers to deal effectively with legal issues that involve information. Instead, lawyers need a shorthand characterization for knowledge that not only can be used easily, but also that produces a mental image that they can grasp readily. I propose that the word "messages," rather than "information," is ideal for this purpose because information, as energy signals, exists only in the form of messages and, hence, must be thought of as such.

Even though we might not be aware of this fact, we implicitly think of information input in terms of messages, which have both a physical form for its transmission and a specific content or meaning for its usefulness through processing. We think that way because we are aware that information exists to be communicated, and communication entails messages. The term "messages" aptly suggests the dynamics of communication and signal processing, while the term "information" has a static quality.

Messages have a number of significant qualities in a legal context that can be noted readily and should be recognized. Let me suggest a few to start your thinking. Messages can be of any length and represent any content that can be processed by a human mind or a computer. They can be batches of signals for such diverse things as short oral statements, correspondence, novels, paintings, views of flowers, magazine articles, musical performances, software programs, data bases, and contracts on paper or in digital form.

Thus, the term "messages" has a refreshing inclusiveness that encompasses old and new manifestations automatically. The concept of free speech is a good example. By guaranteeing the right to issue and receive messages, we no longer need to decide if conduct such as flag burning is an exercise of that right. That term can make the term "work of authorship" similarly expansive.

Messages are created only to serve as input to the human mind or to a computer for processing. The only exceptions would be the occasional messages sent into space to search for sentient beings on other planets.

Every recipient of a message, or input, be it a human mind or a computer, always makes a copy of the message automatically upon receipt. That is the only way the message can be processed. Hence, every transmission of a message received by a computer automatically constitutes the distribution of a copy of the work that the message represents. This is most apparent for a message generated by a work of authorship. This simple insight should obviate the legislative change in intellectual property rights the United States Patent and Trademark Office recom-

mended in September 1995[15] by showing that the transmission of signals for works of authorship recorded by their recipients is tantamount legally to the distribution of the works themselves.

Messages as input can be produced in two ways. One is through the initiative of a source that produces output, such as by sending a message. The other is by a recipient's search for input, such as a person asking a question, reading a book, or looking at a sunset, or a computer polling a potential source of input.

Moreover, because they are involved with the processing activity of computers or human minds, messages are always created purposefully. They do not arise spontaneously or in a vacuum.

Similarly, because messages are only batches of signals, they must be distinguished clearly for legal purposes from the things, especially records, from which they can be generated. Messages are generated at their source either passively or actively: passively, by being sought out, such as by reading or viewing books, computer diskettes, art works, or flowers, or actively, by being sent out, such as by people speaking or by computers emitting pulse streams.

Moreover, only messages can be communicated. This is done by sending signals through some medium, such as a wire, an optical fiber, or the air, that is a circuit between the source and the receiver. Thus, despite common belief, the sending of a record, such as a facsimile or a letter, is not the sending of a message. It is merely the relocation of a means for creating a message to another site from which input signals can be generated to a recipient.

Maybe the concept of information as messages, in the form of physical signals, could help eliminate the often awkward, irrational distinction between things tangible and intangible for sales tax purposes. How can we explain to a non-lawyer why the sale of a diskette for a program is taxable as a transfer of goods but the transmission of the signals for the same program is not taxable because the signals are intangible?[16] That anomaly seems to merit Mr. Dooley's deathless comment, "The law is a ass." The concept of intangibility that was intended to shield chose in action from sales taxes is invoked magically to do the same for batches of signals that achieve the same result, for legal and practical purposes, as the delivery of clearly tangible diskettes for generating them. Should we be parties to such transparent abracadabra?

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15. INFORMATION INFRASTRUCTURE TASK FORCE, WORKING GROUP ON INTELLECTUAL PROPERTY RIGHTS, *Intellectual Property and the National Information Infrastructure*, (Sept. 1995) (released by Bruce A. Lehman, Asst. Secy. of Commerce and Commr. of Patents and Trademarks, Chair Information Infrastructure Task Force, and Ronald H. Brown, Secy. of Commerce, Chair.)

16. *See, e.g.*, South Cent. Bell Tel. Co. v. Barthelemy, 643 So.2d 1240 (La. 1994).

Even though the concept of "messages" is inherently more meaningful than "information" because of the general image that messages creates in the human mind, many people can find it difficult to adopt the word messages in place of information. Very likely, the most that can be expected for now is that people will at least start to think in terms of messages and then use that word whenever possible.

VI. CLOSING

This essay presents only the bare bones of my theory of the physical nature of information as messages. A full treatment of the theory will appear in a book on the subject I hope to complete. A slightly expanded treatment appears in an article I wrote entitled, "The Information Superhighway and Intellectual Property Rights—Comments on the Green Paper Entitled 'Intellectual Property and the National Information Infrastructure,'"[17] which is a reprint of my comments on the Green Paper of the U.S. Information Infrastructure Task Force.

In closing, the following are some conclusions from my current exploratory journey through computer law. First, lawyers should examine the idea that information is really active messages composed of specific batches of entirely physical signals, to see how information is relevant to the law. In the process, they would perform the legal function of developing a sound theoretical underpinning for many legal rules; this new theory is more constructive than handling specific matters within the current, often out-dated, frame of reference. Moreover, keeping a theoretical foundation or rationale for legal rules up to date can be an exciting intellectual exercise in itself.

Secondly, lawyers should be sympathetic to the idea that the human mind literally performs information or message processing on specific physical signals in accordance with the equivalents of operating system and application programs and, thus, has many qualities of a relatively autonomous machine.

Thirdly, lawyers should constantly rethink the ways they perceive the facts about the nature and uses of computer technology as dynamically as computer specialists develop this technology and its applications. Simple new insights can shatter accepted understandings, not only about this technology, but also about what people do as instruments of their minds.

Fourthly, lawyers should continually reexamine and update the rationales and scopes of legal rules that relate to the creation and communication of information. This will keep those rules as fresh and pertinent

17. 12 COMPUTER L. & SECURITY REP. 234 (Sept.-Oct., 1995).

as the current knowledge about computer technology and the nature and operation of the human mind.

Moreover, I urge lawyers to be completely objective in conducting these exploratory, up-dating activities, without regard to how their conclusions might affect their clients. It is not enough for practitioners to leave that task to academics. Scholars have not shown yet that they are ready to carry even part of the burden. Law practice should be recognized to be a higher calling than merely trying to win cases. Legal professionalism means earning pride in performance through achieving understanding and knowledge within a general social context, rather than merely winning cases by any means. It is a gross disservice to society to seek victory by distorting, mischaracterizing, concealing, or ignoring knowledge or trying to mislead courts.

Of course, preserving objectivity and putting into practice the results of new understandings requires practitioners to have the fortitude to admit to their clients that they changed their opinions and recommendations. Lawyers usually want to impress their clients with their eternal wisdom. To achieve that fortitude to contribute to the sound growth of the law, they must want to practice law that way. Lawyers should tell their clients that, despite accusations that the legal system lags behind, it actually can and should reflect dynamically changes in technology, social attitudes, and understanding, and that they are energizing the system by keeping themselves and their clients up to date.

Finally, I hope that the CLA will enhance its fine reputation by providing a special forum for lawyers to share their new perceptions into the nature and scope of legal rules as we continue to enjoy the fruits of the related, ever-expanding information technology and research into the functioning of the human mind.