CRITIQUES OF TECHNOLOGY ASSESSMENT

LAW AS TECHNOLOGY ASSESSMENT

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In his recent work, *Le Systeme technicien*, Jacques Ellul contends that the computer has made possible a systematic assessment of technical procedures of all kinds to a degree that in the past could only be remotely approximated through government bureaucracy.[1] He also expresses the view that this prodigious new technology cannot possibly be controlled just by passing laws for this purpose.[2] This combination of admiration and despair in the face of a new technology can perhaps be explained in Ellul's case by the fact that he is singularly knowledgeable about and perhaps as a result lacks confidence in French bureaucracy as a means of controlling technology.[3] Nonetheless, it would be entirely consistent with Ellul's view of "*La Technique*" to consider both bureaucracy and computerization to be alternative technical instruments for fulfilling the same function until such time as one of them proves to be clearly more efficacious than the other.

But to consider both a social and a material technology as comparable objects of study, as does Ellul, among others, is not generally the practice among

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American scholars who study "technology." The broader view does, however, have the advantage of allowing for both longitudinal and evaluative studies of technological change, including such allegedly "peripheral" considerations as the human factors, the appropriateness, and the spill-over effects of a proposed technological innovation.

Consider, by way of illustration, a current proposal to build a Downtown People Mover (DPM) in Indianapolis. What the proposal calls for essentially, is some kind of above-ground, probably monorail *à la* Disney World, system for transporting people over short distances within the immediate downtown area of Indianapolis. Feasibility studies recently completed have focused on the likely competition from such alternative modes as public buses, private automobiles, and, finally, shank's mare. The latter is viewed as the principal threat to this project, which would be largely supported by federal funds.[4] Not even considered is another possibility, namely, conveyor belts (as in some European airports) which would be appropriately protected against inclement weather.

No such "narrow-gauged" technology assessment would be forthcoming from the likes of, say, a Lewis Mumford, who puts social technologies *prior* chronologically and otherwise to material technologies, even though they too are subject to the organizational excess which Mumford calls a megamachine. The broader notion of technology is, in fact, characteristic of any writer on the subject (such as Ellul) who is alert to social, economic, and/or legal ramifications of material technology, as is the case most recently in Langdon Winner's *Autonomous Technology*.[5] It is, in any event, in this broader perspective that one must, I think, approach the role of law as an instrument of technology assessment. Having claimed, however, that law and technology are similar to one another, one might best begin by trying to distinguish them.

Of course, the kind of power associated with law is not ordinarily the kind of power associated with technology, and vice versa. "Legal power" conjures up the image of law enforcement and what that implies, including everything from a subpoena to capital punishment. "Technological power" suggests the capabilities of a given entity's available set of task-oriented tools and, on a secondary level, its set of tool-making tools. From this point of view, then, legal power and technological power are thought to be different ways of getting things done—in part, at least, because the kinds of things to be done are presumably different.[6]

Such simplistic statements of the "obvious" become considerably less persuasive, however, if one takes into account the numerous ways in which these allegedly different realms interrelate, overlap, and on occasion even compete with one another.

Each, however defined, is a means to an end, and may, under a given set of circumstances, become an end unto itself. Each is something used by human beings to exercise some sort of control over their environment. Each, precisely insofar as it is concerned with exercising control, tends to be evaluated (or "assessed") in terms of the efficacy of that control or, in a word, in terms of

power. The various devices aimed at "mind control" or "behavior modification" provide an immediately apropos illustration of the state of affairs.[7] But what this example calls to our attention, especially when dramatized in such works as Anthony Burgess's *A Clockwork Orange*, is that both law and technology are tools not in a vacuum but in a complex of other tools which are at the disposal of a given organized entity. And, as such writers as Jacques Ellul have emphasized, the very organization of the entity—"the government," let us say—is itself a tool or, better, a tool system which utilizes law and technology, each in this usage more narrowly defined, to achieve ends perceived by its lawmakers as desirable.[8]

The manner in which this is done, as often as not, is through the officials and employees of the various agencies that have been established within government for the purpose of dealing with whatever area of concern has been entrusted to them by statute.[9] At times a given agency, e.g., the Federal Trade Commission in recent times, may be thought by some to have exceeded the proper scope of its authority. At other times an agency, e.g., the U.S. Food and Drug Administration almost since its inception, may be thought by some to have failed to exercise adequately the authority which it rightfully has. But however perceived, an agency and its operatives are persistently engaged in the business of assessing technology on the basis of some sort of legal endorsement and procedures. Whether the people thus engaged are at all properly qualified to perform such heady tasks is in this context beside the point, since as a matter of fact our society has decided so to proceed.[10] It does, however, behoove us under the circumstances to try to understand somewhat more particularly just what role law does play in the ongoing work of technology assessment.[11]

My focus will necessarily be on what I know best, namely, law in the United States. Without any pretense as to empirical thoroughness, I shall assume as working hypotheses the two following propositions.

1. In evaluating the social impact of a given technology, the important decision making phases of that technology involve, more or less sequentially, its:

   a. initial development;
   b. improvement;
   c. distribution, including questions of availability, accessibility, and transfer;
   d. use; and
   e. discontinuation.

2. In elaborating social policy with regard to each of these five phases, one may conveniently categorize a society's stance with regard to that phase as one or more of the following:

   a. neutrality;
   b. encouragement, or support;
   c. discouragement, or opposition;
   d. regulation.

A stance of neutrality with respect to some technology would be favored, it seems, only by an individual or group that subscribes to the old doctrine that an untrammeled "market place" will best lead to desirable development. Thus a laissez-faire approach, whether general or specific in scope, seems to be reducible to a special case of encouragement or discouragement. This leaves us, then, with three distinguishable stances, any of which might be adopted with regard to one or more of the above listed decision making phases of a technology's history.

How this works out in practice could be considered in detail with regard to any specific technology or by way of overview of the spectrum of possible configurations. What follows is something of each.

Most technologies, it should be noted, are too complex and too intertwined with other components of man's lived environment to yield readily to straightforward categorization as to phases and stances. But a kind of prototype model might at least be sketched in if the technology in question is simple enough to be manageable. This has been done in detail with regard to the stirrup, the transtlantic cable, DDT, and a number of others.[12] Here consider what is by comparison a humble legal history, that of the social technology known as the bounty.

The payment of a bounty as an inducement to the performance of some publicly favored course of action is now generally obsolete. But at one time, notably during the latter part of the nineteenth century, the practice was fairly common, e.g., to encourage enlistment in the military, production of sugar or salt, the planting of trees, the raising of silk worms, the drilling of artesian wells, and the destruction of animals considered harmful to stock or to humans.[13]

Unburdened by any serious concern about ecological balance, lawmakers in frontier states adopted a familiar linear solution to the perceived problem of predatory animals: kill them so they won't kill you or yours.[14] Animals thus jeopardized by bounty hunters varied from state to state, but collectively included coyotes, wolves, wildcats, bears and mountain lions.[15] Many fine beasts were as a result destroyed, without necessarily thereby benefitting significantly the domestic stock deemed in jeopardy. But no less troublesome than the end were the means so facilely adopted, in particular, the very act of paying money for the claimed killing of a target animal. Note briefly just a few of the kinds of (legal? technical?) issues raised by these old animal bounty statutes: (1) jurisdictional; (2) fiscal; (3) administrative; (4) evidentiary; (5) constitutional; and (6) public policy.

Typically, a state legislature would enact a bounty statute, but would leave it up to county officials to take care of payments for valid in-county kills. The selection of an appropriate official or agency to tend to such payments was problematic enough; but funding, as could be imagined, was crucial—especially in the absence of any "sure-fire" method of avoiding fraudulent claims. To reduce the temptation to submit the same carcass for payment more than once and/or to more than one county, various safeguards were built in, e.g., the claim might have to be made within ten days of the alleged killing, an oath might be

required, and most commonly, some part of the animal (commonly, some specified part of the pelt and/or the ears) would have to be submitted to substantiate the claim.[16] Before the end of the nineteenth century, however, some state supreme courts began shifting responsibility for payment to the counties except where state funds earmarked specifically for that purpose had been appropriated and allocated.[17] From that time on the federal government seems to have become the principal provender of bounties on predatory animals.[18]

The federal bounty program has, of course, been questioned over the years, but apparently not on narrowly legal grounds. Criticism has come consistently from conservationists, occasionally from scientists, especially those equipped to appreciate the ecological role of predation, and, more recently, from observers who conclude that the bounty program is ineffective.[19] Thus has the debate shifted from quirks and quibbles of policy implementation to a basic doubt about the wisdom of the policy itself, regardless of how "well" it is now being implemented.

In a word, the use of a bounty as a social technology for effecting public policy has perhaps just about run its course. And as this technology has moved from the phase of initial development to that of (eventual) discontinuation, public policy in its regard can be seen to have shifted in emphasis from encouragement to regulation and now to discouragement. The details of the history in question do not, of course, always accommodate such a neat transition. But at least the general "life-cycle" of the technology is discernible. No more is asked of this example. It serves merely to introduce a somewhat schematized survey of how more complex technologies have been interfaced with law on the one hand and society on the other, from the phase of initial development to that of eventual discontinuation.

Some amount of research, appropriate to the task at hand, precedes and follows upon any decision to *develop* a particular technology. The nature of that research and its relationship to development may be treated here as a black box out of which comes an awareness of opportunity that may generate development. Whether such development should be officially ignored, encouraged, discouraged or only in some way regulated is to a great extent a public policy determination. A stereotypic breakdown of the active options at this point would associate discouragement with technophobia, encouragement with technophilia, and appropriate regulation with the "rational man" whom proponents of Anglo-Saxon law have sought so long to embody in institutions. The realities are, of course, incomparably more complex and, in many instances, only minimally detailed by historians of technology. What deliberations, for example, preceded the ancient decision to implement the idea of the wheel, or that of trial by ordeal, or that of money? More contemporary instances, on the other hand, are equally challenging not because of a dearth but because of a deluge of information the significance of which is not easy to sort out. As this is being written, for example, discussion at the national level is focused on a considerable variety of proposals each of which if enacted into law would allegedly encourage discovery, devel-

opment, and distribution of domestic supplies of gas and oil. Opposition, however, is already taking shape around the contention that such legislation would do nothing of the kind. Recent history, on the other hand, provides many examples of legislation that *encouraged*, as it was intended to do, the development of a particular technology, e.g., legislation that resulted in the establishment of American Telephone and Telegraph, [20] the Tennessee Valley Authority Act resulting in socieconomically transformative regional electrification,[21] the Communications Satellite Act of 1965 resulting in Comsat,[22] and the various federal enactments that resulted in establishment of NASA and its memorable projects.[23] Technological development has also been brought about by both administrative and common law. Various rulings by the EEOC, itself an offspring of the Civil Rights Act of 1964, have resulted in a complex methodology for fighting employment discrimination against protected groups.[24] *Brown v. Board of Education* (1954) initiated a still-developing methodology for fighting racial discrimination in public education—a methodology commonly referred to simply as "busing."[25]

Regulation of the development of a technology, as exemplified by FCC decisions in the early 1970s regarding domestic communications satellites ("domsats"),[26] may in its effects be equivalent to *encouragement of development*. On the other hand, the very idea of regulation may constitute, or at least be thought to constitute, discouragement of development, e.g., in the area of petroleum exploration and exploitation.

Political and economic theories do, of course, differ markedly as to the proper degree of government intervention in such matters; but the basic question such theories attempt to answer is whether the intervention will help or hinder desirable development. This being the case, it is somewhat difficult to come up with examples of how *law* has *discouraged development*, except where such development is perceived by a society as pernicious. Such was the late medieval position of the Chruch regarding the taking of interest on money ("usury"), a transaction destined to become absolutely essential to the then emerging financial system of modern times.[27] A somewhat comparable example from our own time is that of Congressional refusal to authorize the neutron bomb.

Law-implemented *encouragement for improving* a technology is commonplace in our own times. The Clean Air Act of 1955 and various related enactments have encouraged *use* of available technologies to improve the environmental impact of the automobile.[28] New legislation may be expected to lead to improved, here meaning less prohibitively expensive, systems of utilizing solar energy. Indirectly, at least, anti-trust law is intended, under laissez-faire doctrine, to achieve comparable results in all kinds of industries. Grants to stimulate preferred research, e.g., under the auspices of NSF, NIH, or any of a host of other law-instituted entities, have similar goals, albeit within a more extended time frame.

Regulation of improvements is variously attended to by the U.S. Patent Office, the Federal Trade Commission, and the Food and Drug Administration, among

others.[29] Standard-setting, e.g., by the FCC with regard to communications systems, may determine the functional and technical parameters within which any modification of a technology shall be effected.[30]

Discouragement of improvements would seem at first glance to be an unlikely goal for any law-based endeavor. That a powerful industry might in one way or another seek to render ineffectual any possibly competitive invention would, by contrast, be entirely expected behavior. But to the extent that the institutional source of law is subject to interests favoring the status quo, it too might well assume comparable postures. The history of the FCC and its relationship to AT&T has for many years, until very recently, exemplified just that sort of conservatism,[31] and other government agencies have on occasion had special clients of their own to make happy.[32]

Law-related activity with regard to the availability and/or accessibility of a technology is especially revelatory of the values of a society and is often the first phase during which the general public even becomes aware of a technology's potential. There are many ways in which law might either encourage or discourage, or regulate, accessibility. At a time when Florida's tourist industry was experiencing a multi-million dollar shortfall because of public concern about the availablility of gasoline, Summer 1979, the governor of that state established by executive order a set of some sixty stations which, in return for agreeing to stay open seven days a week, would have a state-guaranteed supply of gasoline.[33]

This *encouragement of access* is counterbalanced by the many licensing statutes, e.g., with regard to attorneys, physicians, pharmacists, and beauticians, which have the effect of *limiting the accessibility* to, and incidentally increasing the economic value of, certain professional skills. Residency requirements, e.g., for access to schools, may have similar consequences at least as to the quality of one's education, just as immigration laws prevent most of the earth's population from utilizing any of our nation's resources (a restriction which, as the "boat people" from Vietnam have learned, is in effect in other coutries as well).

Access to and use of a technology are, of course, closely interrelated and in some law-based arrangements may overlap. But generally speaking it is one thing to limit supply and quite another to limit demand. Oil-producing countries have of late moderated their production precisely in order to increase the value of each barrel produced, thereby augmenting significantly, even in the face of inflation, the value of an exhaustible resource. Demand for available supplies is in this instance greatly enhanced. If, on the other hand, one's goal is merely to *regulate* demand, one might impose any of a number of allocation and rationing plans of the sort recently under discussion. To *reduce* demand, at least according to some economists, one need only somehow increase the price enough to discourage some if not all buyers.

Other examples of how laws may *discourage use of a technology* are plentiful. The old notion of the taboo is, in its essentials, widespread and remains with us still, so pervasively in fact as to almost escape notice. Laws prohibiting the

possession and/or use of marijuana or other "controlled substances" come readily to mind, as do laws regarding possession and/or use of weapons. In a broad sense, substantive criminal law is society's extended commentary on whether and under what circumstances weapons and other instruments, e.g., tools to open locks, may be used. Taxes and other disincentives on "gas guzzler" cars have now begun to effect not only marketing but even production of the old American-style behemoth. But consider also the perhaps more subtle effects of various prohibitions on parking, speed, equipment modification, and so on. Such international accords as the Hague Convention prohibit the use of torture and of various kinds of weapons, e.g., poison gases, in warfare (thereby arguably making war more appealing). As a result of a long and persistent eugenics campaign, laws in many States once tended rather strongly to encourage sterilization of institutionalized "misfits." However, since the eugenics excesses in Nazi Germany, such laws have for the most part now been discredited.[34]

To *encourage use of a technology* various devices are used, including most broadly provision of a legal context within which advertising is minimally restrained. This association of advertising with free speech, though limited by various contractual understandings, has even been held to encompass a product or service prohibited where advertised.[35] Not even concerns about the ability of the wealthy to control the electoral process are considered serious enough to impose meaningful constraints on campaign expenditures.[36] Tax incentives are commonly used to stimulate use, e.g., most recently, income tax credits for home installation of insulation, solar systems, etc.[37] It must also be noted here that a highly effective way to encourage use of one technology is by discouraging use of possible alternatives. This approach has characterized, among others, our laws with regard to energy, zoning, and transportation to the point that the typical metropolitan area in the United States is effectively limited to—and in many respects a vast sprawling victim of—the automobile.[38] The resulting threat of paralysis is well symbolized by the difficulties faced by the bicyclist in search of a reasonably safe pathway of commuting.

No less pervasive in our society are the various legal arrangements which *regulate the use of a technology*. In order to drive a car legally one ordinarily must have a driver's license, auto insurance, and at least transitory ownership; the car itself must be licensed and sometimes approved as safe. Moreover, one drives subject to numerous traffic regulations and elaborate provisions as to tort and criminal liability, each of which may need to be screened by conflict of laws provisions if anyone happens to be involved in an accident outside of one's state of residence. Nor should it be forgotten that the manufacturer as well as the dealer from whom the car was obtained are subject to numerous controls, e.g., with regard to provision of seat belts, emission controls, fuel type restrictions. Common law with regard to trespassing is applicable.[39]

Just about any other technology that has been ensconced in the fabric of our way of life is comparably circumscribed by a panoply of legal regulation, the

efficacy of which will depend upon many factors not the least of which are the characteristics of the technology itself. Prohibitions against unlicensed broadcasting over a CB radio, or sale of a "pirated" movie or TV program, or electronic eavesdropping, or improper storage of information in a data bank are about as effective as the means available to enforce such prohibitions, that is to say, minimally. So also with regard to my ingestion of drugs whose distribution is to be by prescription only, or my failure to comply with regulations posted at a swimming pool. Interest in sliding down an inclined concrete reservoir dam near Indianapolis and escaping on foot into woods beyond may at best diminish now that police enforcement of the utility's no-trespassing signs has turned to horse-mounted pursuit. The activity in question constitutes, of course, an unintended use of the technology involved, but it is a lawyer's delight to argue whether such use was or was not foreseeable and whether, signs notwithstanding, the dam slide is an attractive nuisance. On the other hand, could the inventor of rope have predicted that some unusual individuals might wish to walk across a length thereof suspended between city skyscrapers? And, speaking of skyscrapers, their attractiveness to the more intrepid mountain climbers presents a challenge to anyone interested in limiting the uses to which such architectural wonders may be put. But in its essentials the challenge is no greater than what money presents to regulators and reformists with ideas as to its proper use.

In short, as many people affected by chemical wastes have learned, the capabilities of law are limited once a technology has been fully established in our world. But until that point of arrival has been reached futurist awareness of consequences to come is not easily attained. There was indeed reason to hope at the turn of the century that introduction of the automobile would solve the environmental problem caused by horses defecating in the streets. And, present laws notwithstanding, DDT was *initially* very effective in reducing the population of such pests as mosquitoes.

Purists and even such semi-purists as advocates of "appropriate technology" would place the blame on our failure to prevent the runaway technology at the outset. The ecological architect Paolo Soleri stands ready to replace urban sprawl and its numerous support systems with centripetal urban spaces designed to enhance human interaction. Whether such pioneering endeavors, if ever undertaken beyond the stage of a pilot project in Arizona, would avoid such known concomitants of crowding as violence, discrimination, and mental illness seems to defy prediction.[40] But the experience of various communes, be they pro- or anti-technology, might give one reason to pause. How, then, set about the task of assigning legal priorities to tomorrow's housing patterns? The traditional vehicle of zoning has itself contributed to the sprawl. Should zoning, then, be enlisted in the task of limiting the consequences of sprawl? Or should the law simply encourage more psychotherapists (a) to be trained and (b) to locate their offices in the suburbs?

The principal point of the ruminations on appropriate use of a technology is

that criteria are generally lacking for any overall determination in this regard. The opposite extreme of laissez-faire indifference is as undesirable as motorcycle tracks through my backyard vegetable garden. The task of establishing acceptable limits to individual or collective initiative falls to law, the content of which eventually comes to represent the reflection of many, especially judges, who are compelled by the urgency of events to salvage the insights of the past in spite of oversights discovered only in the present. In times of less rapid change, say, between the invention of the wheel and the invention of the ox-cart, judicial wisdom was able to achieve credibility and reliability. No comparable judicial bliss awaits us from the pronouncement of any lawmaker with regard, say, to property rights over products and processes of mass communication. For, last year's pronouncement may not have taken into account this year's introduction of a new product or process, or simply a new use of an old product or process, that effectively revolutionizes an industry.[41]

A few words, finally, are required to suggest how law deals with *discontinuation of a technology*. No doubt this occurs most commonly by disregard of old laws "on the books," e.g., with regard to property rights to manure left on public thoroughfares.[42] But at times law is more self-consciously active in this area. Controls of one sort or another may be phased out over time. Absolute prohibition, e.g., as attempted by the XVIIIth Amendment with regard to alcohol or many statutes today regarding psychotropic drugs, obviously encourage discontinuation of a technology, a point rendered more visible by U.S. authorized spraying of marijuana fields in Mexico with toxic substances. On the other hand, the *discontinuation* of a technology may be legally *discouraged*, the flow of history notwithstanding, by various efforts to prop it up. Amtrak and Conrail live, but barely, as does message transmission by conventional letter. In the face of agribusiness's growing control of food production, government support of the small farm remains a factor on the rural scene. It may, however, be questioned whether such programs as the Soil Bank, crop price supports, and the like are as beneficial to the small agriculturalist as they are to agribusiness and otherwise disinterested speculators. Less controversial, perhaps, is the value of the cable car to the tourist industry in San Francisco and perhaps now in Detroit as well.

The foregoing discussion is intended to show that law is involved at every phase in the life-history of a technology. It does not, of course, demonstrate in and of itself that law is *nothing but* technology assessment. Such a rigidly reductionist thesis is not only indefensible but ultimately uninteresting. What I have been concerned with showing is that any law may be viewed as some form of official response to technology. The examples introduced are suggestive in this regard, but hardly conclusive, conclusiveness being probably unattainable in such matters. Would it not seem, however, in light of the examples here considered, that technology is an area of concern, indeed a *major* area of concern for law? This area of concern is unquestionably quite complex, but it can all be covered under the extended wings of "technology assessment."[43] This latter

notion, in turn, is called upon in the foregoing analysis (1) to show that government people and technical people are not one and the same (read: "technocrats") but have often divergent interests, and (2) to show how extensively law is used by government people to keep technical people "in line." Whether either group can rightfully claim to be representing "the people" has not here been at issue. But it has at least been implied that the people had centainly better be represented in this ongoing dialectic of power. For, in the words of Joseph Coates, formerly with the U.S. Congress Office of Technology Assessment:

> There is no major problem in our society which is not either directly or at most one or two steps removed from being a direct consequence of the developments of science and technology. . . . Unfortunately, most of the more serious problems stemming from technology. . . tend to be slow-building, convergent with other effects, and not clearly or unequivocally associated with any particular action, event, or decision.[44]

This being the case, the people are not likely to be represented adequately by law-based approaches to technology assessment until the latter come to focus less on the retrospective analysis of torts[45] and more on the prospective synthesis of multiple clues so important to the drafter of contracts, statutes, and codes, as well as of rules and regulations. Such a futurist orientation of legal power can, however, succeed in the long run only if the purpose of the technology is continually questioned in light of public values. Such oversight, in turn, requires appropriate institutions themselves subject to ongoing meaningful review. History provides little assurance that such institutions can long retain requisite goal-directedness. But in the absence of such a fine-honed regulatory apparatus law cannot constitute a truly effective approach to technology assessment.

NOTES

1. *Le Systeme technicien*, Paris: Calmann-Levy, 1977, p. 114. See also pp. 85-86, 313-314. This book has recently been published in English translation as *The Technological System*, N.Y.: Continuum, 1980.

2. *Ibid.*. pp. 119-120.

3. Ellul is the author of a 4-volume study of the evolution of French governmental structures entitled *Histoire des institutions* and published in numerous editions by Presses Universitaires de France between the years 1956 and 1970 or later. See also *Le Système technicien*, pp. 146-156, 330-334.

4. *Indianapolis Regional Center People Mover*, a proposal submitted by Mayor William H. Hudnut, III, to the Federal Urban Mass Transportation Administration, June 30, 1976; *Pedestrian and Transit-Related Survey Results, Indianapolis DPM*, prepared by Barton-Aschman Associates, Inc., Minneapolis, Minn., Nov. 14, 1979.

5. See my review of this work in *Nature and System* 1 (December 1979): 283-286.

6. See L. Loevinger, "Law and Science as Rival Systems," 8 *Jurimetrics Journal* 63-82 (1966).

7. See Perry London, *Behavior Control*, New York: Harper & Row, 1969; Eileen D. Gambrill, *Behavior Modification*, San Francisco: Jossey-Bass, 1977; "Bibliography of Behavior Modification," 13 *American Criminal L. Rev.* 101-113 (1975); R. Martin, *Legal Challenges to Behavior Modifica-*

tion, Champaign, Ill.: Research Press, 1975. Compare D. C. Anderson and T. C. Whitman, "The Control of Behavior Through Law," 47 *Notre Dame Lawyer* 815-852 (1972).

8. See R. von Jhering, *Law as a Means to an End*, New York: Macmillan, 1921.

9. See J. Roland Pennock, *Administration and the Rule of Law*, New York: Rinehart, 1941. For a detailed analysis of federal agency procedures see James R. Michael, ed., *Working on the System*, New York: Basic Books, 1974. See also n. 29, below. And for purposes of comparison see Charles Debbasch and others, *Institutions et droit administratifs*, Paris: Presses Universitaires de France, 1980.

10. C. P. Snow, better known for sorting out scientists and humanists, was also of the opinion that government people and technical people march to different drummers. See Snow, *Science and Government*, Cambridge, Mass.: Harvard University Press, 1960, pp. 72 and 81. Such divergence may, however, become less obtrusive if each is supporting the other's interests. See in this regard Bernard Barber, *Science and the Social Order*, New York: Free Press Collier, 1962, 1952, pp. 227-251. See also Jacques Billy, *Les Techniciens et le pouvoir*, Paris: Presses Universitaries de France, 1963.

11. Disregarded in this discussion is the extent to which the practice of law has been changed by technology. Attorneys, of course, make use of science and technology by having expert witnesses provide technical testimony favorable to their case. And the role of forensic medicine in criminal and tort cases is widely recognized. Far fewer persons, even among lawyers' clients, are aware of the awesome variety of office and case management technologies that are bringing about a veritable revolution in the practice of law while at the same time exacerbating the class distinctions that tend to be operative therein. Some of this technology is indistinguishable from modern office technology in general; some is fairly profession-specific. (See any recent issue of the American Bar Association Journal, especially the advertisements and the section entitled "Legal Aids." See also L. E. Allen and others, *Automatic Retrieval of Legal Literature: Why and How*, New Haven, Conn.: Meyer Research Institute of Law, 1962; Mead Data Central, Inc.: *LEXIS: A Primer*, 2nd ed., Dayton, Ohio, 1975.) Of incomparably greater significance than all the foregoing, however, is the fact, little noticed even by attorneys themselves, that the very scope and content of law is largely a function of a society's level of technology. So much is this the case that the totality of a society's laws might be viewed without serious distortion as its collective response to the technology it has taken unto itself. And from this point of view the comparatively recent developments in such areas as environmental law and consumer law are not so much novel departures as they are predictable continuations of the law's perennial efforts to assess and, as deemed necessary, control technology.

12. See Lynn White, Jr., "The Act of Invention: Causes, Contexts, Continuities and Consequences," in *Technology and Culture*, ed. M. Kranzberg and W. H. Davenport, New York: Schocken, 1972, pp. 277-279; *Medieval Technology and Social Change*, Cambridge: Oxford, 1966; Henry M. Field, *History of the Atlantic Telegraph*, New York: Arno, 1976, 1866; Rachel Carson, *Silent Spring*, New York: Fawcett, 1973. See in general Edward W. Lawless, *Technology and Social Shock*, New Brunswick, NJ: Rutgers, 1977.

13. 8 Am. Dig. Cent. Ed., "Bounties," §§ 40-42, cols, 906-908; 9 Corpus Juris, "Bounties," §§ 35-37, cols, 311-313; 11 Corpus Juris Secundum, "Bounties," § 13, cols. 750-751.

14. This "frontier" mentality dominated assessments of the problem during the first half of the 20th Century. Consider, for example, the following: M. Andrews, "War Declared on Killer Beasts: Wolves, Coyotes, Bobcats and Rats Cost Farmers Millions A Year," *Popular Science* 119 (September 1931): 36-37; P.A. Westerberg, "Killing Off the Killers," *Outlook* 131 (January 7, 1922): 273; R. H. Moulton, "Freeing the Ranges from Predatory Animals," *Outlook* 121 (March 19, 1919): 492. See below, n. 19.

15. See 8 Am. Dig. Cent. Ed., "Bounties," §§ 42, cols. 905-907.

16. *Ibid.*.

17. 8 Am. Dig. Cent. Ed., "Bounties," §§ 37, nn. 66-67.

18. S. Gwinn, "How Uncle Sam Deals Justice to Animal Criminals," *American Mercury* 101

(March 1928): 54-56; W. M. Whiting, "Uncle Sam's Wild Animal Hunters," *Illustrated World* 36 (February 1922): 845-846.

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24. Title VII of the Civil Rights Act of 1964, 42 U.S.C. §§ 2000e-2000e-15; P. L. 88-352, 78 STAT. 241, 253-66, as amended by P. L. 92-261, 86 STAT. 103.

25. Brown v. Board of Education, 347 U.S. 483, 98 L. Ed. 873, 74 S. Ct. 686 (1954); 349 U.S. 294, 99 . Ed. 1083, 75 S. Ct. 753 (1955); Swann v. Charlotte-Mecklenburg Board of Education, 402 U.S. 1, 28 L. Ed. 2d 554, 91 S. Ct. 1267 (1971); Milliken v. Bradley, 418 U.S. 717, 39 L. Ed. 2d 107, 94 S. Ct. 3112 (1974).

26. The history of this revolutionary decision is dispersed throughout many FCC rulings and some court cases. See especially the following phases of the FCC's deliberations on "Domestic Communications Satellite Facilities (Domsats)": Notice of Inquiry, 2 FCC 2d 668 (1966); Supple-

mental Notice of Inquiry, 5 FCC 2d 354 (1966); Report and Order, 22 FCC 2d 86 (1970); Memorandum Opinion and Order, 34 FCC 2d 1 (1972); Second Report and Order, 35 FCC 2d 844 (1972). See also Barton I. Edelson and Louis Pollack, "Satellite Communications," *Science* 195 (March 18, 1977): 1125-1133.

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29. For a representative sample of theoretical analyses of the regulatory process, see Robert S. Summers and Charles G. Howard, *Law: Its Nature, Functions and Limits*, 2nd ed., Englewood Cliffs, N.J.: Prentice-Hall, 1972, pp. 273-274. Meticulous descriptions of the *modus operandi* of the various federal regulatory agencies will be found in James R. Michael, ed., *Working on the System: A Comprehensive Manual for Citizen Access to Federal Agencies*, New York: Basic Books, 1974. The public's image of regulatory agencies is studied by Edward W. Lawless, *Technology and Social Shock*, New Brunswick, N.J.: Rutgers University Press, 1977. For more critical assessments of federal regulation, see Mark J. Green, ed., *The Monopoly Makers*, New York: Grossman, 1973; Morton Mintz, *The Therapeutic Nightmare*, Boston, Mass.: Houghton Mifflin, 1965: James S. Turner, *The Chemical Feast*, New York: Grossman, 1970.

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31. See Beverly C. Moore, Jr., "AT&T: The Phony Monopoly," in *The Monopoly Makers*, pp. 74-99; "The AT&T Case Comes Alive," *Business Week*. September 11, 1978, 104-105; "AT&T's Bold Bid to Stifle Competition," *Business Week*, March 15, 1976, 82-84, 87-88; "A Whole New Way to Figure AT&T's $15 Billion Face-off over Long-Distance Revenues," *Business Week*, October 18, 1976, 116, 118, 120.

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33. *Clearwater* (Florida) *Sun*, July 22, 1979, p. 19.

34. With regard to proscribed weaponry, see Van Wynen Thomas and A. J. Thomas, Jr., *Legal Limits on the Use of Chemical and Biological Weapons*, Dallas: Southern Methodist, 1970. The rise and fall (and resurrection) of eugenics is recounted by Mark H. Haller, *Eugenics: Hereditarian Attitudes in American Thought*, New Brunswick, NJ: Rutgers, 1963. See also Jeffrey M. Blum, *Pseudoscience and Mental Ability*, New York and London: Monthly Review Press, 1978.

35. Bigelow v. Virginia, 421 U.S. 809 (1975).

36. Federal Election Campaign Act of 1971, Feb. 7, 1972, P. L. 92-225, 86 Stat. 3, 2 U.S.C. §§ 431-441, 451-454, 18 U.S.C. §§ 312, 315, 802-805. See Federal Election Commission, Legislative History of Federal Election Campaign Act Amendments of 1976, U.S. Government Printing Office, Washington, D.C., 1977.

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42. Haslem v. Lockwood, 37 Conn. 500 (1871), reprinted in William R. Bishin and Christopher D. Stone, *Law Language and Ethics: An Introduction to Law and Legal Method*, Mineola, NY: Foundation, 1972, pp. 9-14.

43. See in this regard Philip L. Bereano, " Courts as Institutions for Assessing Technology," in *Scientists in the Legal System*, ed. W. A. Thomas, Ann Arbor, Mich.: Ann Arbor Science Publishers, 1974; David L. Bazelon, "Coping with Technology through the Legal Process," 62 *Cornell Law Review* 817-832 (1977); M. Aultman, "Technology and the End of Law," 17 *American Journal of Jurisprudence* 46-79 (1972); L. H. Tribe, *Channeling Technology through Law*, Chicago: Bracton, 1973; Id., "Technology Assessment and the Fourth Discontinuity: The Limits of Instrumental Rationality," 46 *Southern California Law Review* 617-660 (1973); Symposium: "Law and Technology," 52 *Chicago-Kent Law Review* 545-620 (1976): Morris L. Cohen et al., *Law and Science: A Selected Bibliography*, Science, Technology and Human Values, Cambridge, Mass: Harvard University Press, 1978. See also Technology Assessment Act of 1972, Oct. 12, 1972, PL 92-484, 86 Stat. 797, 2 U.S.C. §§ 471-481, 42 U.S.C. § 1862.

44. "Sixteen Propositions about Technology and Its Social Management," p. 14—a paper presented at workshop on Technology and the Future of Society, Warsaw, Poland, September 9-11, 1979. Coates more than any other writer I have encountered approaches the view of law that I seek to articulate in this paper.

45. See in this regard M. Katz, "The Function of Tort Liability in Technology Assessment," 38 *University of Cincinnati Law Review* 587-662) (1969), reprinted as Reprint No. 9, Harvard University Program on Technology and Society.