

6-1-1987

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Recommended Citation

John M. Conley, *The First Principle of Real Reform: The Role of Science in Constitutional Jurisprudence*, 65 N.C. L. REV. 935 (1987).Available at: <http://scholarship.law.unc.edu/nclr/vol65/iss5/15>

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"THE FIRST PRINCIPLE OF REAL REFORM": THE ROLE OF SCIENCE IN CONSTITUTIONAL JURISPRUDENCE

JOHN M. CONLEY†

When I was asked to speak about the Constitution's adaptability to changing technology, my thoughts initially turned to the future. I conjured up a post-Orwellian world and began to speculate about the effect of genetic engineering, computer technology, predictive psychology, and exotic medical procedures on traditional notions of individual liberty, privacy, and freedom of speech. The more I thought about the question, though, the more I began to appreciate how much experience we already have with the role of science and technology in constitutional lawmaking. On a number of memorable occasions, courts facing constitutional issues have looked directly to the most advanced science of the time for crucial evidence, or even for decisionmaking standards. In fact, we have enough experience that not only are we not relegated to speculating about what happens when judges try to adapt the Constitution to changing technology, but we can identify some significant themes in this ongoing process.

In my talk today I will focus on one of these themes, what I call the problem of debatable premises. In my remarks, I will describe the problem with reference to a striking historical example, follow the theme through several more recent cases, and conclude with some thoughts about the relevance of this history to current and forthcoming issues of law and technology.

I doubt that anything brings the entire relationship between law and science into sharper focus than Justice Oliver Wendell Holmes' notorious peroration in *Buck v. Bell*,¹ "Three generations of imbeciles are enough."² Law students and other casual readers tend to take the line as a nasty aside, or perhaps a not-too-subtle expression of class and regional bias. In fact, Holmes intended it as neither. It was, rather, a carefully worded statement of the Supreme Court's—or at least Justice Holmes'—belief that there was an irrefutable scientific basis for upholding the compulsory sterilization of a mentally retarded woman. I want to examine the Court's reliance on this purported scientific basis, not for purposes of criticizing the decision, but in order to expose a conceptual problem that can arise whenever courts attempt to take account of "state of the art" scientific knowledge in deciding cases.

Carrie Buck was a poor white woman who was a resident of the Virginia

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1. 274 U.S. 200 (1927).

2. *Id.* at 207.

State Colony for Epileptics and Feeble Minded.³ She, her mother, and her illegitimate daughter—Holmes' three generations—had all been classified as feeble minded—more specifically, as "imbeciles" in the psychological jargon of the time. In late 1924, when she was eighteen, the state health authorities obtained an order for her sterilization under a statute enacted a few months earlier⁴ that allowed for sterilization of those "afflicted with hereditary forms of insanity" when in "the best interests of the [patient] and of society . . ."⁵ In *Buck v. Bell* the Supreme Court found that Virginia's interest in controlling the propagation of the mentally defective more than outweighed any substantive due process interest that Carrie Buck had in preserving her reproductive capacity.⁶

Statutes such as the 1924 Virginia act were products of the eugenics movement of the 1920s.⁷ The unwitting inspiration for the movement was the Frenchman Alfred Binet, who at the turn of the century developed a standardized test of certain cognitive skills to assist in identifying children with special educational needs.⁸ In the period before World War I, American psychologists, principally H. H. Goddard and Lewis Terman, revised and popularized Binet's test. Whereas Binet had intended only to provide a remedial tool for educators, and had specifically disclaimed any effort to measure the abstraction we call intelligence, the Stanford-Binet test quickly became the primary instrument of a psychological school dedicated to the propositions that intelligence is a measurable entity, that it is largely inherited, and thus little affected by education and other environmental factors, and that intelligence is likely to differ significantly among groups of genetically related individuals.⁹

During World War I, the psychologist Robert M. Yerkes persuaded the military authorities to support a program of mass intelligence testing of army recruits.¹⁰ The administration of the tests was often farcical, as linguistic, cultural, and literacy barriers were ignored or dealt with inadequately (recent immigrants might be marked down, for example, if they could not identify such American standards as Christy Mathewson and the Smith & Wesson revolver).¹¹ Nonetheless, the tests yielded an enormous body of data, the interpretation of which ranged from incompetent to disingenuous.

3. *Id.* at 205. For further background and commentary, see A. CHASE, *THE LEGACY OF MALTHUS* 313-18 (1977); S. GOULD, *THE MISMEASURE OF MAN* 335-36 (1981).

4. Act of Mar. 20, 1924, ch. 394, 1924 Va. Acts 569 (repealed 1974).

5. *Id.* at 569. The statute was finally repealed by Act of Apr. 2, 1974, ch. 296, 1974 Va. Acts 445, and ultimately was replaced by a statute that makes no reference to hereditary mental illness, providing instead for involuntary sterilization when a court finds that a mentally incompetent adult is sexually active and less drastic forms of contraception would be ineffective. See VA. CODE ANN. §§ 54-325.11 to .15 (Michie 1982).

6. *Buck*, 274 U.S. at 207.

7. See A. CHASE, *supra* note 3, at 15-16, 313.

8. See S. GOULD, *supra* note 3, at 146-54. In addition to the Chase and Gould books cited *supra* note 3, readers interested in the history of the eugenics movement may wish to consult H. EYSENCK & L. KAMIN, *THE INTELLIGENCE CONTROVERSY* (1981); and R. LEWONTIN, S. ROSE, & L. KAMIN, *NOT IN OUR GENES* (1984).

9. See S. GOULD, *supra* note 3, at 155-92.

10. See A. CHASE, *supra* note 3, at 226-51; S. GOULD, *supra* note 3, at 192-222.

11. Yerkes, *Psychological Examining in the United States Army*, 15 MEMOIRS NAT'L ACAD. SCI. 1 (1921).

Yerkes found striking differences in IQ among racial and ethnic groups; recruits of Anglo-Saxon and Nordic ancestry fared best, while American blacks and immigrants from Southern and Eastern Europe fared worst.¹² With the aid of some remarkable feats of logic, Yerkes interpreted his data as affirming that IQ differences resulted from differences in inherited and largely immutable intellectual capabilities, ascribing little effect to environmental factors such as health and education. For example, in assessing differences in IQ scores between blacks and whites, Yerkes did acknowledge a correlation between IQ and level of education. But instead of drawing the obvious inference that schooling improved a person's ability to answer IQ test questions, he concluded that blacks chose not to go to school because, as the tests proved, they were innately less intelligent.¹³ Similarly, his data showed a consistent positive correlation between immigrants' test scores and the number of years they had been in the United States. This would seem to be strong evidence that learning English and becoming familiar with American culture improves one's IQ score. Yerkes demurred, however; he and his colleagues mooted the alternative explanation that it was the more intelligent immigrants who stayed in America, while their duller counterparts gave up and went home.¹⁴ Not unexpectedly, the beneficiaries of this explanation were the older, Northern European immigrant stocks; existing prejudices against more recent immigrants from Eastern and Southern Europe were left unchallenged. Throughout the 890 pages of his highly influential monograph on the army tests, Yerkes repeatedly manipulated or ignored data that might have undercut his *a priori* beliefs that IQ tests measure intelligence, and that intelligence is controlled by heredity.

Glossing over Yerkes's analytical shortcomings, a broad alliance of scientists, writers, and politicians seized on his conclusions as support for a legal agenda with clear racist connotations. Princeton psychologist C. C. Brigham, characterizing Yerkes's work as "an investigation which, of course, surpasses in reliability all preceding investigations . . . a hundred fold"¹⁵ warned of "[t]he deterioration of American intelligence."¹⁶ He attributed it to "the change in the races migrating to this country, . . . the sending of lower and lower representatives of each race,"¹⁷ and "the most sinister development in the history of this continent, the importation of the negro."¹⁸ He offered a two-part solution to the problem: first, immigration laws that would be "not only restrictive . . . but highly selective"; and second, and more important, "the prevention of the continued propagation of defective strains in the present population."¹⁹

Lobbying vigorously, the eugenicists—whose ranks in the 1920s included Herbert Hoover, Henry Fairfield Osborn, president of the American Museum of

12. *Id.* at 697, 820; see S. GOULD, *supra* note 3, at 197.

13. Yerkes, *supra* note 11, at 779-83; see S. GOULD, *supra* note 3, at 217-19.

14. Yerkes, *supra* note 11, at 701-04; see S. GOULD, *supra* note 3, at 220-21.

15. C. BRIGHAM, *A STUDY OF AMERICAN INTELLIGENCE* xx (1923).

16. *Id.* at 210.

17. *Id.* at 178.

18. *Id.* at xxi.

19. *Id.* at 210.

Natural History, Charles Darwin's grandson, and an impressive array of scientific luminaries²⁰—brought about a major change in U.S. immigration law. In 1920, the House Committee on Immigration and Naturalization was persuaded to appoint an official called an "Expert Eugenics Agent." This official, Harry Laughlin, was a major figure at the Second International Congress of Eugenics in 1921; through him, the Committee was inundated with "scientific" data demonstrating that intelligence is a measurable entity, hereditarily controlled, and differentially distributed among ethnic groups.²¹ The result of this campaign was the Immigration Act of 1924.²² Its predecessor, the 1921 Act,²³ set national quotas with reference to the numbers of immigrants from given countries who were in the United States at the time of the most recent census. The 1924 Act turned back the clock, setting quotas not according to the current representation of different nationalities, but according to their representation in 1890.²⁴ Because immigration prior to 1890 had been primarily from Northern Europe, the effect of this change was to put severe limits on future immigration from Southern and Eastern Europe.²⁵ In particular, the new system meant that America was closed to many European Jews who might otherwise have found refuge here in the years leading up to World War I.

To return to *Buck v. Bell*, the Virginia sterilization law at issue was also a product of the eugenics movement. In fact, congressional Expert Eugenist Harry Laughlin published a Model Eugenical Sterilization Law in 1922. Ultimately, a majority of the states enacted sterilization statutes.²⁶

The Supreme Court relied explicitly on the eugenics research program in upholding the Virginia statute. In his recitation of the facts of the case, Justice Holmes noted "that experience has shown that heredity plays an important part in the transmission of insanity, imbecility, &c."²⁷ This "experience" was, of course, Yerkes' research on army recruits and the other scientific writing that it spawned. Holmes also acknowledged the finding in the Virginia proceedings that Carrie Buck was "'the probable potential parent of socially inadequate offspring,'"²⁸ a finding based largely on the results of a Stanford-Binet IQ test, interpreted in the light of eugenic assumptions about the inheritable and incorrigible nature of low intelligence.²⁹ Balancing the scientifically justified interests

20. See A. CHASE, *supra* note 3, at 277.

21. See A. CHASE, *supra* note 3, at 289; S. GOULD, *supra* note 3, at 232.

22. Immigration Act of 1924, Pub. L. No. 139, ch. 190, 43 Stat. 153 (1924) *repealed by* Act of June 27, 1952, Pub. L. No. 414, ch. 477, § 403(a), 66 Stat. 163, 279 (1952). For a brief review of the legislative history of the 1924 Act, see E. HUTCHINSON, *LEGISLATIVE HISTORY OF AMERICAN IMMIGRATION POLICY 1798-1965* 185-94 (1981).

23. Act of May 19, 1921, Pub. L. No. 5, ch. 8, § 2, 42 Stat. 5 (1921) *repealed by* Act of June 27, 1952, Pub. L. No. 414, ch. 477, § 403(a), 66 Stat. 163, 279 (1952).

24. Immigration Act of 1924, *supra* note 22, § 11(a), at 159. The Act set even more restrictive quotas which were scheduled to take effect in 1927 but were not actually implemented until 1929. *Id.* § 11(b); see E. HUTCHINSON, *supra* note 22, at 189-94.

25. See A. CHASE, *supra* note 3, at 290-91; S. GOULD, *supra* note 3, at 233.

26. See A. CHASE, *supra* note 3, at 15-16; H. EYSENCK & L. KAMIN, *supra* note 8, at 93.

27. *Buck*, 274 U.S. at 206.

28. *Id.* at 207 (quoting the lower court's finding).

29. See A. CHASE, *supra* note 3, at 313.

of the state against the interests of Carrie Buck, he concluded that "[i]t is better for all the world, if instead of waiting to execute degenerate offspring for crime, or to let them starve for their imbecility, society can prevent those who are manifestly unfit from continuing their kind."³⁰

Holmes' published writings and private correspondence make clear that he took this opinion seriously, and intended it as an endorsement of the role of science in shaping constitutional law. Just after he wrote the opinion, but before it was printed, he described the case to his English correspondent Harold Laski as one concerning "the constitutionality of an act for sterilizing feeble-minded people, with due precaution—as to which my lad tells me the religious are astir."³¹ Science provided an adequate answer to "the religious," however; as he wrote to Laski two weeks later, "I wrote and delivered an opinion upholding the constitutionality of a state law for sterilizing imbeciles the other day—and felt that I was getting near the first principle of real reform."³²

By the time of the decision in *Buck v. Bell*, eugenics had already begun to collapse as a scientific discipline. Walter Lippmann had exposed most of its critical weaknesses in a series of articles in the *New Republic* in 1922. He emphasized the fundamental point that "intelligence is not an abstraction like length and weight; it is an exceedingly complicated notion which nobody has yet succeeded in defining."³³ Then, in 1930, C. C. Brigham, one of the most influential scientific proponents of eugenics, recanted. Accepting Lippmann's point, he accused himself and his colleagues of a "naming fallacy" which allowed them "to slide mysteriously from the score in the test to the hypothetical faculty suggested by the name given to the test."³⁴ He repudiated the whole concept of national and racial comparisons based on intelligence test scores, and then, in what is surely the most remarkable statement I have ever read in a scientific publication, concluded, "One of the most pretentious of these comparative racial studies—the writer's own—was without foundation."³⁵

In subsequent years, much of the most important eugenics research was exposed as sloppy, biased, and, in one famous case, absolutely fraudulent.³⁶ But perhaps the most eloquent critique of eugenics came from Carrie Buck's imbecile daughter, who went to a foster home, attended a regular elementary school, and made above-average grades until her premature death.³⁷

The debunking of the eugenics "experience" that Justice Holmes cited came

30. *Buck*, 274 U.S. at 207.

31. Letter from Oliver Wendell Holmes, Jr. to Harold Laski (Apr. 25, 1927), reprinted in 2 HOLMES-LASKI LETTERS 1916-1935 937-38 (M. Howe ed. 1953). For a general statement of Holmes' views about the relationship between science and law, see Holmes, *The Path of Law*, 10 HARV. L. REV. 457, 469 (1897).

32. Letter from Holmes to Laski (May 12, 1927), reprinted in 2 HOLMES-LASKI LETTERS 1916-1935 941, 942 (M. Howe ed. 1953).

33. Lippmann, *The Mystery of the "A" Men*, 32 NEW REPUBLIC 246 (Nov. 1, 1922).

34. Brigham, *Intelligence Tests of Immigrant Groups*, 37 PSYCH'L REV. 158, 159 (1930).

35. *Id.* at 165.

36. See H. EYSENCK & L. KAMIN, *supra* note 8, at 98-105 (discussing Cyril Burt's twin studies).

37. See Gould, *Carrie Buck's Daughter*, NATURAL HISTORY, July 1984, at 17-18.

too late, however—too late to help Carrie Buck and countless other feeble-minded victims, and too late to alter the fate of millions of Southern and Eastern Europeans, particularly Jews, who were excluded from America by the Immigration Act of 1924. The question for us is what we can learn from this experience. One reaction might be to criticize me for unfair treatment of Holmes and the legislators who accepted the nearly unanimous teaching of the leading scientists of the day. This misses the point, however. *Ad hominem* criticism is not my purpose; I agree that historical figures should be judged by the standards of their own times.

My point, rather, is that the history I have recounted reveals a danger that is present whenever the law, even in pursuit of "real reform," responds quickly and decisively to science. At one level, lawyers, judges, and legislators are quite capable of critical evaluation of scientific proposals. We can, for example, do the kinds of things we routinely do under Article VII of the Rules of Evidence: make sure that the scientist is qualified, has made a careful study of the problem, has followed the methodological canons of his discipline, and has relied on sources reasonably relied on by those in his field. Holmes implicitly raised and answered these questions in *Buck*. But what if there is a problem at a deeper level: what if the fundamental theoretical premises on which the entire discipline is based are suspect or disputed? How can the law recognize such a dilemma, and even if it can, how can it resolve it? Walter Lippmann saw that the eugenics movement was based on a flawed understanding of intelligence, but would it have been reasonable for the Congress and the Supreme Court to disregard the great weight of scientific "fact" and take the word of a young journalist?

One might next ask whether the failure of this particular merger of law and science was not simply an anomaly. Buoyed by, for example, the Court's salutary appreciation of social science data in *Brown v. Board of Education*,³⁸ might we not conclude that the mistakes of the 1920s were a historical accident not likely to recur in more enlightened times? I reject this interpretation for two reasons.

First, some of the very issues raised in *Buck v. Bell* are alive today. There is much discussion of the use of predictive psychological profiles in the bail and sentencing processes.³⁹ Some of the more ardent advocates of these profiles argue for consideration of factors that purportedly indicate a hereditary predisposition to crime. While the argument turns largely on recent and apparently responsible psychological research,⁴⁰ I am troubled that some of the highly publicized sponsors of "predictive detention" continue to cite research contaminated

38. 347 U.S. 483, 494-95 n.11 (1954).

39. E.g., Thompson, *Born to Burgle*, STUDENT LAW., Sept. 1986, at 13. This article and a number of others discuss a quantitative sentencing evaluation system used by the district attorney of Mecklenburg County, North Carolina.

40. E.g., Dunford & Elliott, *Identifying Career Offenders Using Self-Reported Data*, 21 J. OF RESEARCH IN CRIME & DELINQ. 57 (1984); Loeber, Dishion & Patterson, *Multiple Gating: A Multistage Assessment Procedure for Identifying Youths at Risk for Delinquency*, 21 J. OF RESEARCH IN CRIME & DELINQ. 7 (1984).

by eugenical bias.⁴¹

Second, several less dramatic examples from the recent case law suggest to me that the difficulty of identifying suspect premises is as pervasive and persistent a problem as it ever was. In its 1971 decision in *Wisconsin v. Yoder*,⁴² the Court granted an Amish community a partial exemption from a state school-attendance law. The most significant evidence in the case was the testimony of anthropologist John Hostetler, the leading authority on Amish society. He testified without contradiction that compulsory high school attendance would "ultimately result in the destruction of the Old Order Amish church community"⁴³ The Court expressly relied on this evidence in holding that the Amish could withdraw their children from school after the eighth grade to protect themselves against an "objective danger to the free exercise of religion"⁴⁴ The majority rejected Justice Douglas' argument that the right of the children to a full range of career options had been given inadequate consideration.⁴⁵

Once again, my purpose is not to criticize the decision, but to question the process whereby the Court responded to scientific data in defining a constitutional right. As the Court correctly noted, Hostetler is the leading anthropological expert on the Amish;⁴⁶ as it might have noted, he is a careful and ethical scientist. In this case, he presented a wealth of data that seemed to support his conclusion. Moreover, his findings were uncontradicted. Thus, by all the criteria the law usually applies to scientific evidence, his findings were unimpeachable.

However, as one legal anthropologist has noted, the surface unanimity surrounding Hostetler's findings masked a fundamental theoretical dispute within anthropology.⁴⁷ In particular, many anthropologists (including me) would take issue with an analysis of Amish culture (or almost any contemporary culture) as a static entity so free from outside influence that a modest increment in such influence would tip the balance against survival. Moreover, Hostetler was raised as an Amishman. Without questioning his integrity, one could question the objectivity of a study of a culture by someone with an emotional attachment to it. Thus, Hostetler's findings, while unimpeachable in the traditional legal sense, were suspect at a level that the Court and the parties could not reasonably be expected to penetrate. The result, in my view, is a benign version of *Buck v. Bell*: a decision profoundly affecting the lives of people who cannot speak for themselves that conveys a misleading impression of being dictated by scientific fact.

Similar conceptual problems abound in other areas of law. In civil rights

41. *E.g.*, J. WILSON & R. HERRNSTEIN, CRIME AND HUMAN NATURE (1985).

42. 406 U.S. 205 (1972).

43. *Id.* at 212.

44. *Id.* at 218.

45. *Id.* at 245 (Douglas, J., dissenting).

46. *Id.* at 210 n. 5, 212. Much of what the court said about the Amish culture and religion was drawn directly from Hostetler's trial court testimony. See Rosen, *The Anthropologist as Expert Witness*, 79 AM. ANTHROPOLOGIST 555, 562-63 (1977).

47. See Rosen, *supra* note 46, at 564.

and employment discrimination cases, for example, the courts have often permitted statistical proof of unlawful conduct. Statistical tests and standards that are persuasive to one court tend to be permitted by others; some specific techniques have been approved by the Supreme Court.⁴⁸ The courts have developed reasonable facility in qualifying statistical experts, in determining that particular methods are widely used, and in ensuring that analyses are carefully performed. Yet beneath the growing consensus on the use of some methods is an often obscure debate among statisticians about the theoretical justifications for particular methods and the propriety of transferring them from one context to another.⁴⁹ The outcome of these debates could cause today's scientific "fact" to become tomorrow's heresy, and today's enlightened legal decision to become a latter day *Buck v. Bell*.

A related problem has arisen in the abortion case law. Here it is not so much a problem of debatable premises as changing premises. In *Roe v. Wade*,⁵⁰ the Supreme Court's original abortion decision, the Court held that the woman's rights are almost absolute until the end of the first trimester, "because of the now-established medical fact . . . that until the end of the first trimester mortality in abortion may be less than mortality in normal childbirth."⁵¹ At the other end of the continuum, the Court held that a compelling state interest in protecting potential life arises at the point of viability.⁵² The problem with this approach, of course, is that medical technology is constantly improving the safety of abortion, thus pushing the first point forward, at the same time that it pushes the point of viability backward. In Justice O'Connor's words, "the *Roe* framework . . . is . . . on a collision course with itself."⁵³ She questions the propriety of "striking down laws because they do not meet our standards of desirable social policy," under the guise of reliance on neutral scientific data.⁵⁴

To conclude, I want to consider what guidance cases such as these can offer for future interactions between science and the law. To my mind, the fatal flaw in these cases is the misperception of science as a well oiled machine for generating truth, a process somehow less susceptible to human passion and error than is law. When science suggests the resolution of a legal problem, a lawmaker with this view may take comfort in rising above the admittedly human and inherently fallible process of traditional lawmaking—he may believe, in Holmes' words, that he is "approaching the first principle of real reform."

48. *E.g.*, *Castaneda v. Partida*, 430 U.S. 482, 496-97 n.17 (1976) (difference of two or three standard deviations usually significant).

49. *E.g.*, Boardman & Vining, *The Role of Probative Statistics in Employment Discrimination Cases*, 46 L. & CONTEMP. PROBS. 189 (1983) (critique of EEOC statistical guidelines); Kaye, *Statistical Significance and the Burden of Persuasion*, 46 L. & CONTEMP. PROBS. 13 (1983) (critique of law's use of statistical significance).

50. 410 U.S. 113 (1973).

51. *Id.* at 163.

52. *Id.*

53. *City of Akron v. Akron Center for Reproductive Health, Inc.*, 462 U.S. 416, 458 (1983) (O'Connor, J., dissenting).

54. *Id.* at 453 (quoting *Plyler v. Doe*, 457 U.S. 202, 242 (1982) (Burger, C.J., dissenting); see Rhoden, *Trimesters and Technology: Revamping Roe v. Wade*, 95 YALE L.J. 639 (1986).

But as the history I have reviewed demonstrates, and as any honest scientist will admit, science is an all-too-human process, as susceptible as any other to bias, animus, and short-sightedness. The problem is that often the human frailty of science can be detected and exposed only by the trained insider. The outsider, even one as astute as Holmes, may confront a wall of superficial unanimity, and see no cause to inquire further.

So what is the law to do? In my view, it should respond with extreme care when science demands that new legal doctrine be created or established doctrine be altered radically. The more strident the demand, the more cautious it should be. Above all, judges and legislators should look skeptically at the scientific process, remembering that such terms as "fact," "truth" and "law" are, in most cases, as relative for scientists as they are for the rest of us.

Recently, Congress has been widely criticized for failing to make sweeping changes in our copyright law to meet the demands of computer technology.⁵⁵ Similarly, many writers have criticized the Supreme Court for not setting more definitive guidelines concerning the status of genetically engineered life forms and computer software under the patent and copyright clause of the Constitution and the statutes enacted pursuant to it.⁵⁶ Perhaps, as some have claimed, Congress and the Court were overwhelmed by the technological problems and suffered a simple failure of nerve. Perhaps, however, with deference to history, Congress and the Court were implicitly acknowledging the danger of creating novel legal doctrine to meet the exigencies of science.

For whatever reason, in moving slowly and asking more questions than they answered, both bodies did the prudent thing. The findings of science sometimes have appealed to lawmakers as a simple substitute for the complex interaction among precedent, facts, and values that comprise legal decisionmaking, and as a source of certainty in an otherwise uncertain world. But the appeal of science as a first principle of real reform has been often illusory, and sometimes dangerous. If the Constitution is "to endure for ages to come" in the face of technological challenge, real reform must continue to be inspired by the document itself and the eminently human processes it has spawned.

55. In 1974, Congress created the blue-ribbon National Commission on New Technological Uses of Copyrighted Works. Act of Dec. 31, 1974, Pub. L. No. 93-573, 88 Stat. 1873 (1974). In 1978 the Commission delivered a lengthy and scholarly report. The only result of all this effort was a set of 1980 amendments to the Copyright Act, 17 U.S.C. § 101 (1982), which added a definition of "computer program" to existing § 101 and enacted a new § 117 which gave limited reproduction rights to "owners" of computer programs. Act of Dec. 12, 1980, Pub. L. No. 96-517, § 10, 94 Stat. 3015, 3028 (1980). This six-year effort thus resulted in little or no guidance on such critical questions as the scope of protectible expression in computer programs and the standards for proving software infringement. See Conley & Bryan, *A Unifying Theory for the Litigation of Computer Software Copyright Cases*, 63 N.C.L. REV. 563 (1985).

56. In *Diamond v. Chakrabarty*, 447 U.S. 303 (1980), the Court held that genetically engineered microorganisms could constitute patentable subject matter, but provided no definitive guidelines for future cases.

