Chapter 2

Personal Rights and Technological Might

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Chapter 2

Personal Rights and Technological Might

Technology is a powerful force for change. Law, especially constitutional law, is a powerful reinforcer of stability and continuity. The tension between these two has much to do with how well a society's political system can adapt to economic and social forces that affect the distribution of power and wealth.

Between 1787 and 1987, the United States evolved from a small agrarian nation, relatively poor and powerless in the international system, to a modern industrial world leader. The Constitution has provided the political and legal framework for technological change, and it has accommodated both a growth in the role of government and enhanced expectations of individual rights.

In the face of technological, social, and economic change, both Congress and the Supreme Court have repeatedly reexamined the meaning, the intent, and the scope of constitutional provisions. Both, for example, struggled to decide whether the right of people "to be secure in their persons, houses, papers, and effects" does or does not include the right to be secure in one's electric communications (from wiretapping), or protection against having the content of one's blood, breath, or genetic code 'seized' without a warrant.

In constitutional government, the powers of the State are limited and the rights of individuals are acknowledged and protected. The most essential individual rights or civil liberties are, in modern constitutions, nearly always specified in a Bill of Rights.[1] The full meaning of these rights and the strength with which they will be protected become clear only gradually, as statutory laws are written and judicial precedents are set. In the United States, their scope has been worked out by the courts and by the political process, often with reference to English common law. Even the simple and elegant prose of the United States Constitution has required continuing examination, explanation, and interpretation as social institutions, economic forces, and technological conditions have changed.

[1] Ralph C. Chandler, Richard A. Enslen, and Peter G. Renstrom, *The Constitutional Law Dictionary* (Santa Barbara, CA: ABC-CLIO, 1985), vol. 1, Individual Rights, pp. 10-11. Great Britain had no single written "Constitution," but traditional rights of individuals based on centuries of common law were put into statutory form in the Bill of Rights Act of 1689.

TECHNOLOGY AND GOVERNMENT POWER

A constitution empowers a government by giving legitimate authority to its actions as the instrument and agent of the people. At the same time, a constitution, and particularly its bill of rights, is designed to limit the power of government. Its effectiveness depends on the determination of citizens that government shall abide by these limits.

The role that technology plays in the balance between individual rights and governmental power to act in the public interest is seldom explicitly discussed. But technical capability at least partly determines the effectiveness of both government's actions and the legal restraints on those actions. It also increases the individual's power to act in ways that may offend the conscience of the community, or to create and use technology that may adversely affect the welfare of others. Can or should civil liberties, as defined in 1791, restrain governments in regulating such choices?

Opinions on these questions differ dramatically among citizens, among legal experts, among constitutional scholars, among judges, and among courts. Hence, the questions addressed in the several reports and papers coming from OTA's study of "Science, Technology, and the Constitution" are: what new and

emerging technological capabilities may stimulate constitutional challenges in the foreseeable future? How may Congress and the Court be asked to reconsider the scope of fundamental rights? This report considers these questions in relation to several areas in which basic scientific knowledge and related technological capability are making rapid advances: bioengineering, public health and medicine.[2] Before turning to this analysis, further discussion of the basic concepts within the Bill of Rights will be useful.

[2] Two earlier special reports explored similar questions with regard to new technologies for communication and news reporting (*Science, Technology, and the First Amendment,* February 1988) and new technologies for law enforcement (*Criminal Justice, New Technology, and the Constitution,* March 1988). See also *Science, Technology, and the Constitution–Background Paper,* September 1987, for an overview of OTA'S Constitutional Bicentennial Project.

BY POPULAR DEMAND: THE BILL OF RIGHTS, 1787-91

In 1787, many State constitutions included a Bill of Rights, but no Bill of Rights was written into the national Constitution. Several proposals to add one were voted down in the closing days of the Philadelphia Convention with relatively little discussion. Most of the delegates thought that a national Bill of Rights was unnecessary because the new government was to have only limited, delegated powers. An explicit prohibition against the establishment of religion, for example, might imply that the national government would otherwise have the power to regulate the practice of religion. During the critical debate on ratification, a Bill of Rights might thus increase rather than decrease the already widespread fears of the power of a new central government.[3]

The lack of one however, drew more public criticism than any other aspect of the Constitution. The Constitution was finally adopted only with the understanding that the first business of the Congress would be to correct this defect.

Twelve amendments to the Constitution were therefore proposed by the First Congress on September 25, 1789. Ten were ratified by the States and added to the Constitution on December 15, 1791.[4] Since then, the meaning and scope of these rights has been asserted or has been challenged in hundreds of Court cases. Sometimes the questions raised are directly related to new technological capabilities. Often they are indirectly related, because they reflect profound economic, social, and political changes associated with technological change.

It is not only the Supreme Court that interprets constitutional protections, although it does so most formally and definitively. Both Federal and State courts at all levels repeatedly ponder the rights of citizens, the powers of governments, and the nature of due process. Congress and 50 State legislatures declare their understanding of the Constitution in framing legislation. And Americans are generally willing to assert, either in celebration or complaint, their own understanding of their rights. That is one reason we have been called a litigious society.

Federalism—Dual Citizenship and Constitutional Rights

Even when Americans can quote from the Bill of Rights or describe its content, they are

[3] James MacGregor Burns, *The American Experiment: 'he Vineyard of Liberty (New* York, NY: Alfred A. Knopf, 1982), pp. 53-55. Also Chapter 3, "The Experiment Begins, " pp. 86-90. See also, Catherine Drinker Bowan, *Miracle at Philadelphia* (Boston, MA: Little, Brown, 1966). Also Edward S. Corwin and J.W. Peltason, *Understanding the Constitution,* 4th ed. (New York, NY: Holt, Rinehart& Winston, 1967), p. 104. The Constitution already included prohibitions of bills of attainder, and ex post facto laws, and guarantees of the writ of habeas corpus and of trial by jury in Federal criminal cases.

[4] Th, two that were proposed but not ratified prescribed the ratio of Representatives to population and prohibited any increase in Congressmen's pay during a term. They were probably perceived as not properly included in a list of the rights of individuals. Corwin and Peltason, op. cit., footnote 3, p. 104.

often somewhat vague about just whose actions they are protected from. Americans of 1989, unlike those of 1789, usually do not clearly distinguish their rights and duties as citizens of Virginia, New York, or Massachusetts from their rights and duties as American citizens. The consciousness of dual citizenship has faded.

The Bill of Rights itself restricted only the Federal Government, as Chief Justice John Marshall ruled in 1833.[5] In 1868 the addition of the Fourteenth Amendment changed that: it said that all persons born in (or naturalized by) the United States are citizens;[6] and it then continued:

> No State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States. . . .

This was intended to guarantee the rights of those who had been slaves, and their descendants; it extended the constraints imposed on the Federal Government to State governments as well, on behalf of all citizens.[7]

Yet only in the last three decades has the Bill of Rights come to be effectively applied to restrain State governments.[8] In 1873, in the Slaughterhouse Cases,[9] the Supreme Court used tortured reasoning to declare that most key civil and political rights were part of State citizenship, rather than U.S. citizenship. The "privileges and immunities of citizens of the United States, " the Court said, were limited to a few rights such as travel between the States and voting for Federal officials. This declaration has never been explicitly overturned.

But the Fourteenth Amendment went onto say:

> . . . nor shall any State deprive any person of life, liberty, or property, without due *process of law,* nor deny to any person within its jurisdiction the *equal protection of the laws.* (Emphasis added.)

It was these two provisions that the Supreme Court eventually used to extend to the States the limitations placed on the Federal Government by the first Ten Amendments. The Due Process Clause was used until the late 1930s to strike down State laws aimed at improving the lot of workers through economic regulation; the property rights of "corporate persons" were protected through the doctrine of substantive due process. But in a series of cases after the Second World War, the Court has declared that the Fourteenth Amendment "incorporates' most of the protections and rights listed in the Bill of Rights. In effect, it has said that "due process" includes the fundamental concepts of justice and liberty spelled out in the first eight Amendments and further strengthened with the Ninth Amendment declaration that their enumeration does not "... deny or disparage others retained by the people." In the discussion that follows, therefore, note is often made that a particular right has been incorporated by the Supreme Court into the Due Process Clause of the Fourteenth Amendment, and therefore is binding on the States.

The Constitution limits only government actions, not the actions of private persons. Only if discriminatory actions by private institutions are somehow sanctioned by Federal, State or local government (e.g., by licenses, tax exemptions or other benefits that give a private institution a semi- or quasi-public char-

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[5] *Barron* v. *Baltimore,* 7 Peters 243 (1833).

[6] This reversed the conclusion of the Dred Scott Case, before the Civil War, that Negroes even if free were not "intended to be included, under the word 'citizen' in the Constitution, and can therefore claim none of the rights and privileges which that instrument provides for and secures to citizens. . . ." Citizenship was henceforth based on place of birth, not by parentage or race. By statutory law, Congress has also conferred citizenship on those born outside of the United States to U.S. citizens.

[7] The States, of course, had their own Bills of Rights, but Federal courts cannot enforce those protections if the State courts do not.

[8] Three amendments were added immediately after the Civil War, the Thirteenth, Fourteenth, and Fifteenth Amendments. The Thirteenth prohibited forever the institution of slavery; the Fifteenth assured slaves and their descendants of the right to vote. The Eleventh Amendment, which had been added in 1798, provided that individuals cannot sue a State (without its consent) in Federal Courts, thus amending (or clarifying) a provision in Article III, Section 2, which extends the Federal judicial power to "cases and controversies between a state and citizens of another state. " The Twelfth Amendment, in 1804, changed the manner of election of the President by the electoral college; requiring that they cast separate ballots for President and Vice President.

[9] The Slaughterhouse Cases, 16 Wallace 36 (1873). *Twining* v. ZVew *Jersey,* 211 U.S. 78 (1908).

acter), can they be said to violate the Bill of Rights.

The other great principle in the Fourteenth Amendment, "Equal Protection of the Laws," is discussed later. Here we will return to a discussion of the Bill of Rights of 1791.

Fundamental Rights

Freedom of Religion

The First Amendment embodies four freedoms deemed most critical for the preservation of republican government: namely, the freedoms of conscience, expression, assembly, and petition. It begins:

> Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof. . . .

Many of the ratifying generation, or their forebears, had come to this country to be free to worship as they chose. Jefferson and Madison regarded "freedom of conscience" or "the basic inalienable right to religious liberty" as a cornerstone of all other rights and liberties, and the prohibition against state interference with it as a basic tenet of republicanism.[10]

The Establishment Clause applies to State actions, under the Due Process Clause of the Fourteenth Amendment. Scientific research and teaching have stimulated many challenges to the scope of this principle. State laws concerning the teaching of the principles of evolution, which are considered by some churches to be in conflict with their religious doctrines, have several times been struck down, most recently in 1987.[11]

Technology has figured in other challenges. The Court has for example let stand State mandatory vaccination laws in spite of the objections of some religious sects. The Court has also ruled that States may provide transportation for children to church schools, in the interest of promoting the health, safety, and education of children rather than their religious indoctrination.

Freedom of Speech and Press

The First Amendment also forbids Congress to make laws

> . . . abridging the freedom of speech, or of the press. . . .

Freedom of speech and press were in 1791 considered the most powerful popular constraint on government. Because free speech is not truly effective without the means of broader communication, a free press is included within this fundamental right–the only technology specifically protected in the Bill of Rights. *2 The right of free speech was seldom the subject of Supreme Court interpretation until after the First World War, when there began a series of cases involving political and social protest or communication.[13] Congress has by law established, and the Court has permitted, a three-tier system of regulation distinguishing between press, broadcast media, and common carrier systems. But these distinctions are becoming hard to maintain, as discussed in an OTA special report, *Science, Technology, and the First Amendment* (January 1988), as electronic technologies supplement the printed press in the dissemination of news, information, and opinion.

The constitutional status of science, and of scientific communications, is ambiguous. Along with artistic expression, scientific communications probably fall somewhere between po-

[10] Neal Riemer, *James Madison: Creating the American Constitution* (Washington, DC: Congressional Quarterly, Inc., 1986), pp. 14-15, pp. 136-40.

[11] *Edwards v. Aquillard et al.*, 107 Sup. Ct. 2573 (1987).

[12] The Court has established that symbolic expression as well as speech is protected; for example, wearing an armband (in public school) to protest government actions in Vietnam. *Tinker v. Des Moines School District, 393* U.S. 509, 89 S. Ct. 733, 21 L. Ed. 2d 731 (1969).

[13] *Schenck v. United States, 249* U.S. 47 (1919), established a "clear and present danger" test to determine when the government could regulate political expression in the interest of national security. *Gitlow v. New York,* 268 U.S. 652, 45 S. Ct. 625, 69 L. Ed. 1139 (1925) modified this doctrine to allow suppression of speech that might lead to "substantive evil" or unlawful ends. *Dennis v. United States,* 341 U.S. 494 (1951), allowed conspiracy convictions by distinguishing between advocacy of illegal acts and advocacy of doctrines. *Yates v. United States, 354* U.S. 208 (1957), weakened this slightly by requiring that specific illegal acts be shown; membership in an organization advocating them cannot be made a crime.

litical and commercial speech in terms of the protection it is afforded. *Science, Technology, and the First Amendment also* examines the restrictions placed on scientific communications in the name of both national security and technological export controls, and probes the question of whether the cumulative effects of these restrictions are eroding freedoms of speech and press. The present report carries this discussion further, to examine the restrictions placed on science in the interest of religion, ethics, and public safety.

The Rights of Assembly and Petition

As another fundamental protection of political freedom, the First Amendment forbids Congress to abridge:

> . . . the right of the people peaceably to assemble and to petition the government for a redress of grievances.

The Fourteenth Amendment extended this prohibition to the States. State and local governments can to some extent regulate public meetings and assemblies to prevent disorder and violence; but these necessary police functions are carefully and suspiciously examined by the courts.

The Prohibition on Unreasonable Searches and Seizures

The Fourth Amendment, like the First, has repeatedly been brought into question by changing technology. It reads:

> The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath and affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

British authorities in the American colonies issued general "writs of assistance" that allowed searches at will or on slight suspicion, especially for contraband smuggled in violation of Parliamentary duties. The Fourth Amendment prohibited searches without a magistrate's warrant.[14] This constraint applies to the States under the Fourteenth Amendment.

The Supreme Court has in the last 70 years ruled that wiretapping and more recent electronic surveillance devices are "searches," and more recently, has had to decide whether evidence may be seized from bank, medical, and insurance records in computerized databases.[15] So far, the Court has allowed authorities to "seize" a suspect's breath (for analysis for alcohol), or one's urine, semen, blood, or other fluids and tissues for evidence, but these questions are probably not fully resolved.

The Rights of Those Accused and Convicted of Crimes

The rights of people suspected or accused of crime are protected in several places in the body of the Constitution and in the Fifth, Sixth, and Eighth Amendments. These civil liberties constrain or limit how the State may deprive a person of life, liberty, and property in enforcing its laws.[16] The affect of technological changes on interpretation of these Constitutional rights is considered in detail in the OTA Special Report, *Criminal Justice, New Technology, and the Constitution*, April, 1988. For example, the use of biology-based techniques for identifying offenders, such as DNA (genetic) pattern recognition, will probably be challenged constitutionally.

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[14] During an arrest, a warrantless search is permissible if the authority has "probable cause" to believe a crime has been committed.

[15] Chandler et al., op. cit., footnote 1, p. 168, citing *Zurcher v. Stanford Daily* (436 U.S. 547: 1978).

[16] *Palko v. Connecticut*, 302 U.S. 319, 58 S. Ct. 149, 82 L. Ed. 288 (1937), established "selective incorporation" in determining which Bill of Rights provisions related to rights of the accused should be applied to State actions. This was a case involving double jeopardy; the guideline or "rationalizing principle" enunciated by Justice Cardozo, was whether a particular protection is "of the very essence of a scheme of ordered liberty, " such that its bypassing would violate "a principle of justice so rooted in the tradition and conscience of our people as to be ranked as fundamental. This case held that the prohibition of double jeopardy was not so fundamental, but this was overturned later; now only the grand jury provision of the Fifth Amendment and the Excessive Fines and Bails prohibition of the Eighth Amendment have not been "selectively incorporated' as limitations on the States.

Due Process

Both the Fifth Amendment and the Fourteenth Amendment provide that a person may not:

> . . . be deprived of life, liberty, or property, without due process of law. . . .

The Court has developed two complementary definitions of "due process": procedural due process and substantive due process. Procedural due process means that laws, regulations, and government procedures must not be arbitrary, vague, or inconsistent, and the protections set out in the Bill of Rights should be carefully applied. "Substantive due process" suggests that some areas are beyond the reach of government authority, and some laws are unconstitutional because of their intent. This concept has been used to wall off from government interference certain private activities, primarily marriage, procreation, child rearing, and educational choice, held to be beyond the appropriate reach of legislation.[17]

Limitations on Eminent Domain

The Fifth Amendment also says that:

> . . . private property may not be taken for public use, without just compensation . . .

This power of "eminent domain" is an inherent power of all governments. It means that the rights conferred by private ownership of property must, in some cases, give way to the good of society as a whole. Thus, when it is necessary to build a highway in a given location and a landowner refuses to sell land to the government for that purpose, the land may be taken for public use, but the owner must be justly compensated. What constitutes "taking" of property has often been challenged, and some of these challenges have been stimulated by technology. For example, the Court has held that airport noise that renders adjacent land unusable for normal purposes may be a "taking" for which government must compensate.[18]

Retained or Inherent Rights, and Reserved Powers

The Ninth Amendment says that:

> The enumeration in the Constitution, of certain rights, shall not be construed to deny or disparage others retained by the people.

One of the strongest objections raised to a Bill of Rights during the Constitutional Convention and the ratifying process was that the Federal government was not in general expected to act on individual citizens. The Federal government was to have delegated, limited powers, plus those other inherent governmental powers necessary to exercise those authorized functions effectively. The philosophy expressed in the Ninth Amendment is that the "Bill of Rights did not *confer* rights but merely *protected* those already granted by the natural law."[19]

Until 1965 no law had been struck down on the basis of violation of unenumerated rights. In that year, a Connecticut law forbidding the use of birth control was ruled unconstitutional because it violated an unenumerated right of marital privacy, which is "within the penumbra of specific guarantees of the Bill of Rights" and one of those fundamental rights assumed to be "retained by the people" because it has not been delegated to the nation or a state.[20]

The Tenth Amendment further provides along the same lines that:

> The powers not delegated to the United States by the Constitution nor prohibited by it to the States, are reserved to the States respectively, or the people.

It has been generally understood that this amendment did not alter the distribution of power between two levels of government, but merely restated the philosophy of government expressed throughout the Constitution, under which the States retained many sovereign powers not delegated nor clearly necessary to the Federal government. Until the mid-1930s the Supreme Court often used the doctrine of

[17] Corwin and Peltason, op. cit., footnote 3, pp. 124-125.

[18] *Griggs v. Allegany County*, 369 U.S. 841 (1962). Rent-control laws however do not constitute a taking, nor do other legislative actions that may diminish the value of property by regulating how it is used.

[19] Corwin and Peltason, op. cit., footnote 3, p. 132.

[20] Chandler et al., *The Constitutional Law Dictionary*, vol. 1, pp. 369-371.

"Dual Federalism" to prevent Congress from using its powers of taxation or interstate commerce regulation to accomplish other ends, such as making exploitation of child labor unprofitable for interstate businesses. The Tenth Amendment, in this way, reinforced the effectiveness of the Fifth Amendment requirement of "substantive due process" as interpreted by the Court.

After 1937, the Court returned to the view of John Marshall that this Amendment is a truism,[21] which does not by itself limit the national government in exercising powers that it would otherwise be understood to have. Both the Ninth and Tenth Amendments, however, contributed to the development of the constitutional doctrine of "a right to privacy, " in that they emphasize the principle that the people, in forming a government, retained some powers beyond the reach of government.

The Right of Privacy

The Bill of Rights as a whole is understood to indicate a sphere of personal autonomy where government should not intrude, even though this sphere is not exhaustively marked out or specified by any formal listing of rights. This sphere of individual autonomy has come to be called the "right of privacy, " although the word "privacy" is not used in the Constitution.

In one of his classic dissents, in 1928, Judge Brandeis said that the Fourth and Fifth Amendments together recognized "a right to be let alone, and defined this as "the most comprehensive of rights and the right most valued by civilized men. "[22] In a 1958 civil liberties case Justice Harlan spoke of the "vital relationship between freedom to associate and privacy in one's associations. " In a 1969 pornography case Justice Marshall said that regulation of obscenity cannot extend into "the privacy of one's own home, " and that the government has no business to tell a man "sitting alone in his own house, what books he may read or what films he may watch. "

The right to privacy was finally made explicit and definitive in *Griswold v. Connecticut,*[23] in 1965, as the Court struck down a law forbidding contraception. Since then it has been expanded to include other aspects of *marriage,* reproduction, and health.

Equal Protection of the Laws

No discussion of the Bill of Rights can ignore the Equal Protection Clause of the Fourteenth Amendment, which was intended to buttress the rights of former slaves. Yet for nearly ninety years it was not applied as intended. The Court held in 1896 that a legal distinction between the races did not destroy their equal protection or legal equality, as long as they were given "separate but equal" treatment.[24]

This doctrine was finally modified in 1950, and it was definitively struck down in 1954 when public school segregation was ruled unconstitutional.[25] In a further series of cases in the late 1950s and 1960s, the court established that it will look with great suspicion ("strict scrutiny' at any different or special treatment of a class of citizens in applying laws for the purpose of allocating a benefit or imposing a restriction, especially where such classification is based on race. Later Equal Protection cases have extended the scope to classifications other than those based on race. This transfers the burden of proof to the State and demands more than a showing of reasonableness; the State must demonstrate that it has a compelling interest and a critical need to give special treatment to some class of citizens.

In effect, the Court looks at the intent of any classification. If the intent can be shown to be related to a legitimate legislative objective, and not to social discrimination, classifications may be allowed to stand. For example, classifications related to age have been allowed,

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"Quoted in Corwin and Peltason, op. cit., footnote 3, p. 132.

[22] *Olmstead v. United States* (277 U.S. 438: 1928).

[23] 381 U.S. 479

[24] *Plessy v. Ferguson*, 163 U.S. 537 (1896).

[25] *Sweatt v. Painter*, 339 U.S. 629 (1950) struck down one State law requiring separation of races in State law schools; *Brown v. Board of Education, 374* U.S. 483 (1954) definitively ended the doctrine that "separate" could be "equal" in public education and by extension in other public accommodations and services. For discussion of related cases and decisions see Chandler et al., op. cit., foonote 1, pp. 308ff.

to give special services or protections to those under 18 or over 65. Classifications by gender or by indigency are not necessarily suspect, but some classifications based on gender have recently been disallowed.

Special treatment related to fundamental rights, such as the right to vote, the right to cross state lines, or even the right to have certain medical procedures, are subjected to what the Court calls "strict scrutiny. This is especially true when the classification itself is "inherently suspect. "

The Forgotten Amendments

Several of the first Ten Amendments have been of relatively little importance in our constitutional history.

> A well regulated Militia, being necessary to the security of a free State . . . ,

The Second Amendment guarantees the "right of the people to keep and bear arms. " Although it is often loosely cited in debate over gun control laws, there have been few if any judicial interpretations of this clause. According to most scholars, the Amendment was primarily intended to prevent Congress from disarming the State militia, a touchy subject less than a decade after the end of a revolutionary war and at a time when antifederalists feared the creation of a possibly despotic central government.[26] If this Amendment was intended, as some have assumed, to assure the possibility of revolution against despotism, then the modern technology of weaponry has almost surely negated that protection.

The Third Amendment provides that

> No soldier shall, in time of peace, be quartered in any house, without the consent of the Owner, nor in time of war, but in a manner to be prescribed by law.

This provision too was never the subject of judicial challenge.[27] By the time of the Civil War, if not before, it had been rendered obsolete by the advancing technology of warfare and the logistics of modern armies.

[26] *Corwin and Peltason*, op. cit., footnote 3, p. 115.
[27] Ibid.

MOLECULAR BIOLOGY AND NEW TECHNOLOGY

Molecular biology is in this decade an extraordinarily productive field of scientific research and application. The traditional disciplines of biology, chemistry, and physics here converge to support wave after wave of advances in scientific knowledge. New knowledge quickly leads to innovative scientific instrumentation, which in turn produces further advances in knowledge and is also translated rapidly into practical applications, improved testing and measuring techniques, and commercializable technology. In this area, strong social needs indicate that "market pull" as well as "knowledge push" will continue to encourage innovation and commercialization. These social needs are related to both genetic and infectious diseases (especially the new epidemic of AIDS); mental illness and mental retardation; and the mental and physical problems associated with aging.

From advances in the basic science, or sciences, of molecular biology are pouring two mighty streams of further development. One of these is bioengineering, with techniques for use in manufacturing processing, agriculture, and environmental management. The second line of development flowing from molecular biology is concerned directly with the human body, brain, behavior, and genetic inheritance. Much is being learned about the materials and processes of human genetics and about the biochemical basis of body and brain functions. Techniques are being developed for their further analysis, testing, measurement, manipulation, correction, or enhancement.

Some new or proposed techniques are already highly controversial. Such applications are in various stages of study or achievement-some already in limited use, some in laboratory

trials, some only promised or even hypothetical. For example, debate has arisen over mandatory testing for disease exposure and for use of drugs, genetic screening for special susceptibility to environmental risks, human germ cell or somatic cell gene therapy, interspecies gene transfers, brain transplants, fetal surgery, and several kinds of technologies for assisted reproduction, including in vitro fertilization, the freezing of embryos, etc.

Part of the promise of these new biology-based technical capabilities comes from their combination with other especially fruitful areas of scientific research and technological development. Computers and related information technologies have not only made many of the breakthroughs in biology possible, but also make it possible to use this knowledge in ways commensurate with its enormous complexity and data richness. More recent rapid developments in materials sciences and molecular engineering may loosen many constraints associated with the differences in nature between organic and inorganic materials. The cognitive, behavioral, and social sciences offer nearly endless ways to check, extend, and apply knowledge gained through biological and chemical research on human beings.

These combined techniques and technologies are related not only to medicine or public health; they have possible applications in many other fields in which significant issues maybe raised, some of them with obvious constitutional applications. In law enforcement and corrections, the use of biological techniques such as drug or hormone therapy as alternatives to prison could point to a new paradigm of criminal justice—treatment for disorders rather than punishment for crime. In education, prediction of performance could affect (perhaps in one of several directions) the design of or the equal access to educational opportunities and resources. In many other areas, a person may come to be thought of less as autonomous and accountable, and more as manipulatable or predictable.

The opportunities promised by these emerging technologies are immense: more efficient and effective delivery of human services, enhanced human performance, better health and prolongation of useful life, even eradication of tragic physical or mental defects and diseases.

At the same time, many of these biology-based technological capabilities seem to be particularly likely to raise political and ethical issues, which often ultimately become constitutional issues, or are so construed by those seeking their resolution. They may offer alternative explanations of causality in behavior, performance, motivation, or attitude—i.e., biochemical or genetic determinants or influences rather than choice or will. They provide new means of influencing, controlling, or modifying behavior, emotions, or judgment. They may challenge religious definitions and principles. And they may allow individual choices to purposefully change the genetic inheritance of future generation.

These technologies and techniques, in short, enlarge the capabilities of both individuals and the State to make and implement decisions that increase tension between the general welfare and individual rights. The State has always claimed an interest in protection of human life, in reproduction, in decisions made for those who cannot decide for themselves, and in the welfare of future generations. These are also the areas in which people most readily assert their right to privacy, family integrity, and individual autonomy.

This conflict is what creates and defines constitutional issues—the testing of the terms of the social contract. But until recently, only some of the events in these critical areas were within the power of either the person or the State to decide or even to influence; and this has minimized the conflict or tended to limit its effects to the most dependent and powerless members of society. As technology changes this condition and increases the possibility of constitutional clashes, concerned citizens, Congress, and the courts will be called on to reexamine the nature and scope of constitutional principles.