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## Introduction: Legislative, Administrative, and Judicial Nonscience

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## **INTRODUCTION: LEGISLATIVE, ADMINISTRATIVE, AND JUDICIAL NONSCIENCE**

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Samuel D. Estep\*

This symposium deals with the legal issues, or rather some of them, that are created by scientific research. Anyone remotely interested in scientific developments should be aware that even the existence of "new" scientific "facts," let alone the application of such discoveries to everyday activities, gives rise to a host of human value judgments that should be faced and resolved by society. Although these problems are often left in purgatory forever, it is the legal system, broadly defined, that attempts to resolve the conflict of interests (or the balancing of values) when a decision is made. Making this type of "balancing of values" judgments is the overriding—or perhaps even sole—function of the legal system. This is true whether we act through administrative regulations, legislative enactments, or judicial decisions.

Many who are not part of the legal system—including a great many engaged in scientific research—are skeptical of the ability of, if not outright antagonistic towards, those in the legal system who make these judgments. Nevertheless, we know that throughout recorded history, human societies have used legal systems to regulate members' actions. Therefore, whether scientists like it or not, lawyers will intrude on their work because there will be different views as to whether and how to use new technologies.

The geometric growth in the rate of scientific discoveries just since the halfway mark in this century is staggering. Undoubtedly, this explains some of the antagonism between the public and scientists. A lack of understanding about the nature and the very process of scientific research causes some people to automatically and often irrationally fear scientific advances, not dissimilar to the fear of witch doctors and voodoo. On the other side, some scientists have a paranoid fear of interference from nonscientists. Antagonism arises because neither the scientific nor the legal community has tried hard enough to understand

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what the other is saying or doing. Among other things, this would require lawyers to learn a new "language," a task many are not willing to accept. It is time that both sides realize that finger-pointing and name-calling do not solve the difficulty; they only exacerbate it.

I feel very strongly that regulation of science should always be imposed only after thorough consultation with scientists and that scientists must be willing to describe all possible consequences, good and bad, that might flow from some new scientific discovery. This Symposium's audience, however, consists of lawyers and those who work with them. These individuals formulate and impose regulations on how new information will be used and some of them would prevent even the search itself in certain areas. Some of the authors in this Symposium point out just how badly the legal system handles particular science problems and make some suggestions that might improve existing solutions. I will raise some questions and make some comments about these Articles. In addition, however, I will point out how far off base the judiciary—just one part of our legal system—often gets as revealed in cases involving science and law.

My suggestions will emphasize legal system mistakes. Although scientists have made equally egregious mistakes, I am addressing my remarks to those who create and run the legal system. Actually the blame is not just that of scientists and the judiciary, or even of the entire legal system, because other groups are equally responsible for misunderstandings and hence mistakes. Third parties, such as the news media, are responsible for much of the misunderstandings that arise between scientists and the legal system people, particularly in a representative democracy.<sup>1</sup>

In general, those in the legal system not only have not been trained in scientific research, but also have not been sensitized enough to recognize potential problems raised by new scientific developments. Law schools have made some beginnings, through seminars on science and law or on certain specific subject matters. Some mainstream courses, for example, environmental law and medicine and law, provide the typical law student with exposure to scientific issues. In addition, good law teachers manage

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1. Unfortunately, the media suffer from the same malady that afflicts lawyers, legislators, and government administrators—deadlines, competition for attention and advancement, lack of knowledge, too many subject matters needing attention, too little time and energy, and no training sufficient to even recognize potential problems of conflicting values, not to mention biases and prejudices which all of us have to some degree and of which often we are not even aware.

to bring some scientific materials in other courses to the attention of their students. Nevertheless, most law students graduate without a sufficient understanding of the legal ramifications of scientific research. For lawyers who graduated more than ten or fifteen years ago, even this limited knowledge does not exist, unless they have handled a detailed case in a scientific area. Even that sensitizing experience would not carry over to other science areas.

Commentators have pointed out how badly the legal system handles scientific material when science specialists engage in "battles of experts" during a trial.<sup>2</sup> Too often the results resemble those reached during the gun fight at the "OK Corral"—the one with the slickest or fastest moves wins. Another way of putting it is to describe the results as similar to a lottery drawing—winning is dependent on pure chance, not rational sense.<sup>3</sup> The best that can be said for the legal conclusion in most cases is that a definite answer has been reached, not that the result is scientifically valid. The field of tort law is "ripe" with such cases. With our flexible definition of expert, one can almost always be found to support any theory. As a result, a jury made up of nonexperts reaches a definite conclusion to a question that a group of respectable scientific experts would say cannot be answered definitely. A group of the uninformed give a definite answer the informed would never reach! This is not the occasion to rehash this thorny problem and its possible solutions, but it is another example of the difficulties lawyers face when trying to assimilate scientific material into the value-judgment environment of the legal system. This problem is an example of legal nonsense. Reaching a result is not good enough. It should also make scientific sense.

The Symposium's authors are among those who have been concerned with these science and law matters and the Articles not only show the authors' own interests in a particular problem but also are contributing, although often only indirectly, to the education of legal system personnel in this type of analysis. We must strive constantly toward the impossible dream of making all lawyers and legislators aware of new scientific information and the potential value-balancing issues that are raised. As lawyer-citizens, we have a primary responsibility in these matters.

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2. Some of the literature is listed in Jasanoff & Nelkin, *Science, Technology, and the Limits of Judicial Competence*, 214 *SCIENCE* 1211, 1215 (1981).

3. See Estep, *Radiation Injuries and Statistics: The Need for a New Approach to Injury Litigation*, 59 *MICH. L. REV.* 259, 273, 280 (1960).

We must find the "facts" by properly using scientific materials and then put faceup on the table the human values involved and reasons for reaching the balancing judgment we implement.

*Gore: Biotechnology Policy*

Senator Gore correctly emphasizes the role that public perception and political leadership play in the process by which expensive research is funded and application of new scientific knowledge is regulated. As indicated above, I quite agree that scientists must be willing to explain scientific advances in terms that the public will understand. Actually, there are numerous examples of scientists taking an active role in public debate about the use of scientific discoveries and technologies, particularly since World War II. I do not think Senator Gore is correct, however, when he suggests that scientists have the primary responsibility in this informing function.<sup>4</sup> Persons in the legal system—legislators, administrators, and lawyers—should encourage the scientific community to inform the public about advances in knowledge, including the potential good and bad consequences, but should themselves take the "point" position in such confrontations. Actually, Senator Gore was doing just that when he chaired the House hearings in 1982 concerning human genetic engineering.<sup>5</sup>

The Senator's citing of the early development of nuclear technology as an example of failure to develop a "keener appreciation" of adverse consequences demonstrates a dangerous tendency we all have to think hindsight's 20/20 vision could have been foresight if we were just conscientious.<sup>6</sup> In the first place, I am not convinced that hindsight is really all that good. In any event, we seldom apply the lessons of history. More important, however, is the fallacy that diligence will allow us to foresee problems that will arise and will enable us to prevent any disasters. This view is based on a misunderstanding of the very nature of scientific research. By definition research is an endeavor to find the unknown! We cannot expect scientists to tell us what they do not know. It is up to the administrator, the legislator,

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4. Gore, *Federal Biotechnology Policy: The Perils of Progress and the Risks of Uncertainty*, 20 U. MICH. J.L. REF. 965, 966 (1987).

5. *Human Genetic Engineering Hearings Before the Subcomm. on Investigations and Oversight of the House Comm. on Science and Technology*, 97th Cong., 2d Sess. (1982).

6. Gore, *supra* note 4, at 967.

and the lawyer-citizen to elicit the scientific uncertainties and then weigh the risks of not reaping the benefits of a new discovery against the potential suffering from only dimly understood hazards.

The development of genetic engineering, the subject matter of Senator Gore's Article, is another classic example of what can happen if the Luddites become vociferous enough and sell the public on the voodoo image. If DNA research had been halted a decade ago, we would not have a relatively cheap source of insulin and we would have stopped the promising research that is leading us to a better understanding of the human cell, and hence of the human organism. I am not suggesting that scientists should be permitted to make the final decision as to how, if at all, scientific developments should be used. I am imploring the people who administer the legal system to take the primary responsibility for opening up the dialogue with the scientists, acquiring a knowledge of how the scientific community works, and making the human values judgments that will control how scientific knowledge will be pursued and used. We must lead the public in gaining understanding, not let the doomsayers or ardent promoters win by the sheer volume (in both senses of the word) of chanted cliches.

Another pitfall that those who make policy for the legal system frequently do not avoid is to assume the answer before they have informed themselves about both the scientific "facts" and the validity of assumed value judgments. The assumption, for example, that nobody wants the power "to tamper with the genetic makeup of a generation yet unborn"<sup>7</sup> sounds very persuasive until we think about what we already do routinely, and without ethical qualms. We should ask ourselves just why we should draw a line and, if so, where. When we prolong the life of a small child by medical intervention, such as by drugs or surgical procedures, we are altering the genetic makeup of the next and later generations. The medical intervention that saved the child in effect preserved for the genetic pool a potential parent who Nature was going to eliminate. It is extremely difficult to draw a line between curing an illness and making a stronger, faster, or more intelligent individual. When we transplant body parts, at least in some cases, the next generation is affected. I am not saying that we should automatically accept all genetic engineering. Rather I am asking that we honestly identify the human values involved and make a *conscious* decision based on

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7. *Id.* at 967.

an intelligent, not just some emotional and often unstated, rationale.<sup>8</sup>

The interesting suggestions that Senator Gore makes with regard to what might be done by way of regulating the biotechnology industry to protect the public and preserve the world competitive position of this business<sup>9</sup> makes it clear that he is aware of the overall problem of balancing human values. It is crucial that any regulatory authority not only understand the science of biotechnology but also identify the human values potentially affected and state clearly the rationale for tilting the scale one way or another.

### *Adelman: Patents and the Courts*

Professor Adelman's Article deals with patent law, a subject of great interest to the business community but, until recently, badly neglected by law schools. At the outset, I remind the reader to pay careful attention to the footnotes, because they discuss some of the most important basic policy considerations. By actual count of the typed manuscript, there are more pages of footnotes than of text. I too am an academic person trained to be impressed with footnotes, but I consider this to be a sin, albeit a minor one. Just do not let the nuisance effect of skipping frequently to the bottom of the page cause you to miss the much more important analysis and statement of value positions.

Adelman's exposition of the formation of a special court to handle all patent appeals is succinct yet enlightening. Because he uses it only as an introduction to his analysis of how that special court has handled patent matters, he does not consider

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8. Senator Gore presents another example where a conscious and rational decision should be made. The Senator's concern about overproduction of farm products and the possible demise of the small, family farmer is certainly realistic. I would suggest, however, that the main production problem is one of a different economic nature, i.e., the economics of distribution of food to a world with millions of starving people. I have no easy answer as to how to redistribute food resources, but I think before we cut back production any more we at least should ask the question if that is the best decision in the long run, taking full account of the world situation. The legal system first should ask the right policy questions. Likewise, establishing the sociological goal of maintaining the small, family farm unit should only be agreed on after we have asked what is the cause and what the effect, what are the economic consequences, how many people are involved, and what are the relative merits of the possibly conflicting human values. I am not disagreeing with the conclusion reached nor am I approving it; I am asking only that we first ask what human values are being balanced and why we want the judgment to be one way or another.

9. Gore, *supra* note 4, at 976.

the basic issue of whether or not special courts are better for some legal subject matters than courts of general appeal such as the United States Supreme Court. Adelman does make it clear that as a patent lawyer he thinks the Supreme Court made a mess of patent law.

His position, of course, rests on a basic assumption that strong patent protection is vital for adequate economic growth in a capitalistic country. His support of the special judicial appeal process, therefore, is result oriented. The Court is good or bad, depending on whether or not it upholds patent rights, not depending on some strong philosophical or jurisprudential justification. We must evaluate this experience to determine if special courts should be utilized for other areas involving an understanding of complicated concepts.

The next question surely should be whether or not only especially knowledgeable people, with at least some significant training in science, should be appointed to such tribunals. Assuming that Woodward and Armstrong actually know and reported fully and accurately in their book, *The Brethren*, what was said and thought within the Supreme Court chambers and hallways—a rather large leap of faith—the material in footnote 24 gives some support for the argument that members of the judiciary should have a more sophisticated knowledge of scientific matters.<sup>10</sup> Footnote 45 does touch on this problem and indicates some Congressional concern about appointing specialists.<sup>11</sup>

Beginning a fifth of the way through the Article, Professor Adelman deals with the patent questions that have come before the Court of Appeals for the Federal Circuit and evaluates how that court has handled them. Such questions as “nonobviousness,” “infringement,” “inequitable conduct,” and “patent misuse” are described and critiqued. Adelman finds that in general the court is doing a good job and becoming quite knowledgeable in the technology of patent law. The patent practitioner clearly will be helped by this analysis. By observing the experience of this one special court in handling technology matters, however, we may learn something of real value for addressing the basic question of how the legal system generally should handle scientific and technological questions that arise with increasing frequency in litigation.

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10. Adelman, *The New World of Patents Treated by the Court of Appeals for the Federal Circuit*, 20 U. MICH. J.L. REF. 979, 985-86 n.24 (1987).

11. *Id.* at 991 n.45.



The suggestion at the end of Adelman's Article concerning the possible bypassing of juries in patent cases, perhaps even repealing the seventh amendment, raises a fascinating constitutional question. The author does not address whether or not there is a special reason for removing the jury from patent cases but not from other cases involving at least equally difficult science material. Certainly I have serious doubts about the usefulness, efficiency, and even fairness of the use of juries in civil cases in the federal courts, but at first blush I see no acceptable rationale for giving special treatment to patent issues.

### *Green: Scientific Responsibility*

Professor Green discusses the problem of what should be done about allegations of fraud in conducting scientific research and publishing the results of such research. This is a type of question that directly raises the concerns and values which are at the core of the legal system, i.e., how to deal with allegations of wrongdoing by some member of a community. In this case, scientists, such as medical doctors, make up the relevant community, and then the community may be broadened to include those who give institutional or financial support. Ultimately, the community can be expanded to include the government, acting through the financial grant agencies or, if the rights of the parties involved are litigated, through the judicial system. This is exactly the kind of situation, where scientists and members of the legal community clash and begin finger-pointing and name-calling.

Green presents a situation in which this problem arises and the difficulties that face those dealing with this type of allegation well. He then suggests that the legal system could make a real contribution towards handling these cases of alleged scientific fraud. Reprehensible as such fraud is, and *perhaps* even dangerous sometimes, I am not convinced that a case has been made for intervention by the legal profession to any greater degree than now occurs in the form of hearings by granting agencies and occasional litigation, such as libel actions by the accused. Green does not explain how the general public has been so seriously damaged that the almost always cumbersome and expensive (in time as well as money) legal process should be brought to bear whenever such an allegation is made. The expense of such action is well demonstrated by Professor Green's involvement in one case for over five years.

One specific suggestion made in the Article would make for a very interesting variation from the normal legal proceedings. Before giving the accuser something of the role of prosecutor in addition to that of witness in whistle-blower cases,<sup>12</sup> we should consider why this is more appropriate in cases of scientific fraud than for normal criminal trials. The close relatives of a murder victim surely have just as much at stake in getting a conviction as does one who alleges scientific fraud. A sufficient case has not been made yet to convince me that giving the accuser the role of the prosecutor is justified.

Several other questions are raised by Green's comments. Do we really want to adopt as the definition of scientific fraud that terribly vague "I know it when I see it even if I cannot define it"<sup>13</sup> standard that has proved so impossibly slippery in the law of obscenity? How and why did Professor Jacobstein obtain possession of the documents produced in the research of a colleague? Why is it "significant" that Borer was appointed to an endowed chair? What is the evidence to support the suggestion about the motives of NIH? Do we really want to adopt the *Times-Sullivan*<sup>14</sup> rule for protecting the whistle-blower? Why is scientific fraud more reprehensible when financed with federal funds? I do not find sufficient, and in some cases, any reasons given for these comments or suggestions.

### *Langenberg: Federal Funding of University Research*

This report of the committee formed cooperatively by the major higher education associations in the United States focuses on perhaps the most important long-range problem confronting this nation's research effort—how to control the federal funding of research activities of nonprofit organizations, largely but not solely, educational institutions. Certainly for research oriented universities, and, in the long run for the nation as a whole, there simply is no more important problem than making sure in some way that vital research efforts be continued—and this cannot be

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12. Green, *Scientific Responsibility and the Law*, 20 U. MICH. J.L. REF. 1009, 1026 (1987).

13. *Id.* at 4. This test was suggested by Justice Stewart's concurring opinion in *Jacobellis v. Ohio*, 378 U.S. 184, 197 (1964).

14. *New York Times Co. v. Sullivan*, 376 U.S. 254, 279-80 (1964). In order for a public official to recover damages for a defamatory falsehood, she must show that the statement was made with "actual malice"—that is, with knowledge that it was false or with reckless disregard of whether it was false or not."

done without adequate funding. How to provide the funding is just as important as the amount. This report deals with the former.

Some rather esoteric legal, even constitutional questions might be raised<sup>15</sup> with respect to funding criteria and procedures but they do not have any significant impact on the basic issue of how to choose which institutions get available funds. That issue is in the final analysis a political one. That fact is explicitly recognized in the report. Assuming the validity of that assumption, the legal system has very little to contribute except to help draft statutory language expressing the value judgments of Congress and the executive branch.

The one very significant consequence of depending on federal funding for most of the research dollars in this country is only vaguely referred to in the Committee's report. Whoever pays the piper controls the choice of tunes. With certain exceptions arising from the first and fifth amendments to the Constitution, Congress can place almost any conditions on institutions using the federal money. If nothing else, Congress can refuse to provide any funds the next year, even if there are some possible freedom of speech and equal protection restrictions on its congressional power once it makes an appropriation.<sup>16</sup> This means that research institutions may have to conform to some policies they find unwelcome, if they want essential federal research funds.<sup>17</sup>

### *Murray: The Human Body as Property*

Professor Murray's Article deals with a fascinating problem of using one person's body parts to help another person stay alive or to make possible sophisticated research into the basic functioning of the human body. This has become a significant moral and legal problem only in comparatively recent times and only

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15. This is not the place to develop these theories but there surely are some individual liberties that the government cannot affect, even in the form of withholding benefits. See Cantor, *Forced Payments to Service Institutions and Constitutional Interests in Ideological Non-Association*, 36 RUTGERS L. REV. 3 (1984), just for starters.

16. The abortion funding decisions of the Supreme Court are good examples of decisions supporting this conclusion. *Harris v. McRae*, 448 U.S. 297 (1980); *Maher v. Roe*, 432 U.S. 464 (1977).

17. A recent congressional enactment overruling an earlier Supreme Court interpretation of prior Title VII statutory language emphasizes the power Congress has through placing conditions on use of federal money. See *Los Angeles Dep't of Water & Power v. Manhart*, 435 U.S. 702 (1978).

because of remarkable advances in biotechnology. Here we have an almost perfect example of moral, ethical, and, ultimately, legal problems being created by advances resulting from scientific research. The Article presents several dramatic examples of activity that clearly present the human values balancing question of whether or not to treat the human body as property or as something sacrosanct. Recent developments in the use of fetal tissue to treat certain brain diseases or malfunctions present the problem in most dramatic fashion.<sup>18</sup>

Murray is completely honest in presenting the principal ideas and their proponents that address this emotional issue. He is admirably "fair" in presenting the issue. For anyone wishing to be informed of the arguments pro and con in relatively concise form, this Article is "must" reading. I came away, however, with a feeling of being unsatisfied with the final conclusions he reaches and yet I have difficulty identifying specific reasons for that feeling.

Were it my task to write an Article on this subject, I would feel obligated to not only raise questions but also articulate my own conclusions and my reasons for reaching them. Instead, I will only suggest here some of my concerns about accepting the author's conclusions without including my own analysis.

I have serious doubts about accepting the philosophy or theology of proponents or opponents of more or less absolutist views. Basing answers to specific circumstances or cases on a general theory of the nature of the human body and the human mind seems to me much too theoretical and unrealistic. It smacks of "pigeon-hole jurisprudence" to which I object strenuously. I think we should, and in fact are forced by common sense, to draw lines and distinctions between different cases. I have serious doubts about treating the donation or sale of human hair as involving the same moral and ethical concerns that the donation of a kidney does. Taking a heart or liver from someone who has just been declared brain-dead is also a different question it seems to me. Surely we will make some distinctions rather than consider all transfers of body parts the same way. At least I know I would, although I am not clear yet as to what distinctions I would make. The absolutist approach is too simplistic.

At the end of the Article, Murray states that he would draw a basic distinction between transfers of body parts by contract and by gift. This also seems too generalized an answer. We have so many examples of what amounts to some kind of selling of

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18. *Fetus Furor*, TIME, Apr. 25, 1988, at 80.

the human body in today's world that we need to consider what legal distinctions we should make. The world of professional sports is one example of the selling of the physical body for the entertainment of others. Further, when workers agree to perform dangerous tasks, we know that, statistically speaking, some of those bodies will become corpses in the natural course of employment. Before deciding where to draw the line, if at all, between contract and gift transfers of body parts, we need to recognize possibly analogous situations and analyze whether or not different rules should be applied.

Professor Murray has made a valuable contribution to the analysis of this most difficult and extremely emotional problem, but a great deal more thought must be given to the problem before we are ready to lay down legal rules.

### *McGarity: Agricultural Biotechnologies*

Professor McGarity's Article is a beautiful case study of just how difficult it is to create a viable regulatory scheme that correctly balances the benefits of scientific advances against the possible harms that could arise from making everyday use of the new technology. His subject is the use of "recombinant DNA" techniques for agricultural purposes throughout the production and distribution chain. This use presents almost the classic example of cost-benefit analysis in which the benefits are fairly obvious but the costs are only feared or suspected, not known. The assessment of risks becomes exceedingly difficult in this situation. It is difficult to evaluate the unknown!

As McGarity suggests, one of the greatest potential benefits of the use of agricultural biotechnologies is to eliminate the environmental hazards that have been created by widespread uses of chemical pesticides and fertilizers. There are potential hazards, however. McGarity critically analyzes the efforts of the United States Department of Agriculture (USDA) and Environmental Protection Agency (EPA) to establish a satisfactory regulatory scheme for use of these new technologies resulting from scientific research. He concludes that the proposed regulatory scheme is inadequate, perhaps so much so that Congress may have to enact new legislation. His analysis and suggestions are "must" reading for those in the USDA, the EPA, and Congress. In addition, all those concerned with the process of administrative regulation should also put this Article on the "must" reading list.

Each reader will have to make a judgment concerning the validity of the author's detailed suggestions for changes and additions to the present regulatory scheme for use of genetic agricultural biotechnology, so I will not attempt to do so here. I do have some overall doubts or concerns, however, that probably should be kept in mind in deciding if, how, and how much regulation should be imposed.

The author cites some specific examples of new technologies, such as pesticides and nuclear power, which have not been completely benign, and seems to suggest these are particularly bad environmentally. I have not studied the pesticide problem but I do know a great deal about nuclear power and the regulation of that industry. Choosing this technology as the environmental whipping boy,<sup>19</sup> if that was McGarity's intent, is rather misguided, Three Mile Island and Chernobyl notwithstanding. This is not the place to take part, on either side, in the "war" on nuclear power. I mean only to cite this as an example of how we often take a much too narrow and immediate impact stance in evaluating competing costs and benefits.

In the first place, the nuclear industry has been more comprehensively (not necessarily more competently) regulated than any industry in the history of the United States. We also knew more about its potential hazards from the beginning than we ever have about any major industry. Secondly, critics largely have ignored the basic issues of how much power we need in this country and the world to maintain an acceptable standard of living, and what is the lesser or least environmentally hazardous source of the necessary power. We are openly concerned about acid rain and air pollution caused by fossil fuel generated power. Seldom, however, are we informed about how much illness and how many deaths are caused by the discharge from fossil fuel power plants. We are more likely to know how many fish or snail darters die.<sup>20</sup> Additionally, we seldom see emphasized in the media how many workers are killed each year in drilling for oil or digging for coal, or transporting the product to the ultimate market place.<sup>21</sup>

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19. McGarity, *Federal Regulation of Agricultural Biotechnologies*, 20 U. MICH. J.L. REF. 1089, 1101 (1987).

20. See Plater, *In the Wake of the Snail Darter: An Environmental Law Paradigm and Its Consequences*, 19 U. MICH. J.L. REF. 805 (1986).

21. We know that a fair number are killed each year, such as in the recent death of 12 of 13 workers and two pilots as their helicopter landed on an offshore oil rig. And this was only one accident. 14 *Killed as a Helicopter Crashes Onto Oil Rig Off Louisiana Coast*, N.Y. Times, Dec. 22, 1987, at D23, col. 2.

Clearly, over a period of decades, the figure is higher than that for producing nuclear generated power.

I mean here only to suggest that when evaluating the possible environmental impact of any new technology, we squarely face and decide some basic value conflicts. We should choose the one that will do less damage overall in the long run, not the one that will do no damage. In the modern world there are not many of those activities. We have to face the basic question of what standard of living we want and what price in the form of damage, to people, plants, and animals, we are willing to pay. Approached from the opposite end, how much reduction in our present standard of living will we accept so we can live in a completely uncontaminated environment? Caves were not very safe either, particularly if we had no weapons to keep beasts at bay and fires to keep us warm and to cook our food. Producing these tools creates pollution.

Any consideration of how much and what type of regulation is to be imposed on uses of scientific advances must be approached with some basic questions in mind. Vested interests of existing industries, the effect on our economy, the impact on exports and imports, the restrictions on individual freedom of movement and job selection, the number of lives that will be made better or saved, the number whose lives will be damaged or lost, just to mention some items, must all be weighed and a judgment made on as rational a basis as possible. One additional consideration should be kept in mind when determining how restrictively we regulate a new technology. We already live "pretty high off the hog," so we can afford to be conservative in using new, *potentially* hazardous scientific developments.

Certainly McGarity is correct in arguing that the tort system is not a very desirable way of regulating environmental damages. The important goal is to prevent as many injuries and deaths as possible, not close the barn door after the loss has occurred. Even when losses do occur in spite of preventive regulation, new technologies create difficult proof of causal connection problems, as McGarity points out.<sup>22</sup> We should change the tort system to more realistically reflect the scientific "facts."

In considering what type of regulation to impose on the application of a new technology, another almost intractable problem arises; i.e., how to man the regulatory agency. Where do we find the competent experts in sufficient numbers to handle adequately the regulatory task fairly and efficiently? I have long

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22. McGarity, *supra* note 19, at 1101; see also Estep, *supra* note 3, at 278.

suspected that we defeat ourselves by placing responsibility for developing and supporting uses of new technologies in one agency and delegating to a different agency the task of regulating such uses, as we have with energy and the environment. If we are to make balancing judgments, then we cannot have two groups using two different scales and duplicating scarce scientific personnel. Even more important, and as McGarity points out, it is hard to get the best and most creative minds to work in the regulatory agencies. Other things being equal, we probably could attract better people if agency employees could participate in both technology development and regulation. Such a setup would not only force administrators to recognize the impact of one aspect on the other, but also would provide the administrators a chance to work on the frontiers of scientific research and consult with others doing closely related work. If we continue to think separation is the better solution, and McGarity thinks so, then we have to make the pay and professional status high enough to attract some of the top people in a particular area.

Leaving the competent personnel question aside, in the final analysis, I maintain that somebody, the Oval Office or Congress if nobody else, must make the final balancing judgment. It cannot be given to two separate groups. Perhaps the use of expert advisory groups made up of people in the various research institutions throughout the country, working on a per diem basis, is as good a compromise as we can find to meet the personnel problem. This, however, does not answer the problem of finding a single agency or official with authority to make the final cost-benefit judgment.

Professor McGarity makes several suggestions about permitting "public participation" in regulatory proceedings when public safety is at risk. There is much to be said for requiring notice of proposed actions and scheduled hearings. Nevertheless, I am not at all convinced this problem has been adequately addressed, although it is frequently discussed in scholarly articles.<sup>23</sup> McGarity makes no extensive case for direct participation as a party in the regulatory process; he simply assumes the validity of this approach. There are gains and losses from such participation, not the least of which losses is delay, often without any gain in agency deliberations or public safety. Distinctions probably should be drawn between various types of hearings and even subject matters.

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23. McGarity, *supra* note 19, at 1108.



The question of public participation should be addressed carefully and the answer should not be assumed. In our large and complex society, we cannot avoid commitment to a representative form of democracy rather than the old town meeting form of government. It does not seem feasible to require a popular vote of the public on every question of policy that arises to the level of official attention and possible action. By the same token, it is not realistic to say that every registered voter in the United States has a right to not only intervene but act as prosecutor in every administrative regulatory hearing. Surely it is impossible to put every decision up for popular vote or even to let every voter participate in administrative hearings. These concerns must be addressed in deciding who can participate in such hearings and in what role.

### *Judicial Nonscience*

The problems raised by the interface between scientific research and the legal system are not limited to the legislative and administrative branches of government. As suggested earlier, I think many times the judiciary, including the United States Supreme Court, handles these problems most inappropriately. Although none of the Articles directs attention specifically to judicial treatment, it is appropriate to cite at least a few examples of judicial mistreatment of scientific material. It is important when considering the general problem to recognize just how badly this third branch of the legal system often handles these questions.

In some cases, the long-range effect may not be too important because a court can change its mind, or the legislature can correct the mistake. This, however, is not only inefficient and most unfair to the specific litigant, but it also denies the general public the right to have good, not bad, law. In addition, correction of a scientific mistake is not always that easy. If the judiciary bases a constitutional decision on a mistaken scientific "fact" or assumption, the legislature cannot correct the ruling.

Adelman's Article on patent decisions actually deals with judicial treatment of scientific material. His criticism, however, is not directed to erroneous understanding of technical material by the United States Supreme Court. Rather he objects to the Court's basic policy with respect to the intrinsic worth of a patent system. This is largely a value judgment call, not a scientific knowledge one. The following analysis addresses a different problem.

Through just a few examples I mean to call attention to cases in which the courts, and particularly the Supreme Court, either misunderstand, or are simply ignorant of scientific concepts, or use scientific material to camouflage, consciously or unconsciously, the actual basis for the decision. The analysis is not directed at the results reached by the courts. It is concerned with the misuse, or even failure to use, relevant scientific knowledge.

There are several examples in the area of *biology*. Early in this century, the Supreme Court, in *Buck v. Bell*,<sup>24</sup> upheld the right of a state to sterilize a woman because “[t]hree generations of imbeciles are enough.”<sup>25</sup> In light of present knowledge of genetics, this was much too simplistic and unsophisticated an analysis. In 1927, however, almost nothing was known about inherited traits. Quite aside from the question of whether or not Carrie Buck should have been prevented from raising any more children, or even the ones she already had, the conclusion should not have been based on what little we knew about genetics and inherited traits at that time. Economic costs and unsuitable parental ability might justify the result in the case, but not the assumption that her feeble-mindedness would be passed on genetically.

Today we might, just might, be able to make a sound determination on that issue, but not in 1927. In one sense, the Court should not be criticized because they were not in a very good position to even recognize how little they knew. On the other hand, when such a serious invasion of bodily integrity is involved, the Court should have required the state to make a very good scientific case, which clearly could not have been made. The Court also would have done a better job in *Skinner v. Oklahoma ex rel. Williamson*<sup>26</sup> (sterilization of criminals) if it had addressed the scientific validity of the legislature’s assumptions about the inheritability of personality traits, as Chief Justice Stone suggested in his concurrence.<sup>27</sup>

Equally unscientific is the Court’s approach in the abortion cases.<sup>28</sup> As Justice O’Connor has pointed out,<sup>29</sup> the Court’s use of “viability” created a “slippery slope” because of constant

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24. 274 U.S. 200 (1927).

25. *Id.* at 207.

26. 316 U.S. 535 (1942).

27. *Id.* at 545.

28. *Doe v. Bolton*, 410 U.S. 179 (1973); *Roe v. Wade*, 410 U.S. 113 (1973).

29. *City of Akron v. Akron Center for Reproductive Health, Inc.*, 462 U.S. 416, 454-58 (1983) (O’Connor, J., dissenting).

changes in medical capabilities. Equally important, the pregnant woman cannot determine beforehand when her "privacy" right ends because viability cannot be determined until the fetus is delivered. At that point it is too late to decide whether or not she can safely ignore the statutory prohibition. Lastly, the trimester concept used by the Court simply misunderstands the science of pregnancy. There are no magical three or six month division lines. The process is a continuum, not sectionalized.

My *guess* is that the Court, perhaps unconsciously, actually drew the constitutional line where the fetus looked like a complete and recognizable human being, although admittedly not fully developed in some respects and also not yet a constitutional "person." If this is an accurate guess, then the Court should state it and explain their reasons for choosing this point rather than some other one earlier or later within the pregnancy period. I am not arguing the validity of the result, only the misuse or misunderstanding of science.

A classic example of lack of understanding is found in the area of *economics* (I am defining science broadly). One of the most perplexing problems the Court has faced over the years is that of state taxation of interstate commerce. The basic theory is relatively simple, but application to specific taxes often is terribly difficult. The theory is that interstate business should pay a fair share of the costs of running state governments but not pay multiple taxes because they are doing business in more than one state. One line of cases, however, simply flies in the face of economic reality and logic.

Over the years the Court has clearly condemned gross receipt taxes unless they are fairly apportioned so as to tax roughly the part of the whole transaction that is carried on in the taxing state.<sup>30</sup> Various formulas adopted by different states have been approved, but the basic requirement is fair apportionment. When it comes to sales taxes, however, the Court has used a local incidence theory.<sup>31</sup> Leaving aside the difficulties of determining where the sale takes place (e.g., where the title passes), the state in which it does take place can levy the tax because, by definition, it cannot happen in any other state and thus, abracadabra, there can be no multiple taxation. What baloney!

The sales tax is on the dollar amount that the ultimate purchaser pays. Economically speaking, this figure represents everything that went into that final value. It includes the cost of ob-

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30. See language in *Complete Auto Transit, Inc., v. Brady*, 430 U.S. 274, 279 (1977).

31. *McGoldrick v. Berwind-White Coal Mining Co.*, 309 U.S. 33, 43 (1940).

taining raw material, of processing and shipping the goods, as well as the cost of making the local sale. It should not take a trained economist to recognize that this is precisely what the gross receipt figure represents. Why must one be apportioned and the other not? Surely the difference in name should not control. Yet the rules have been on the Supreme Court books for decades.

Equally suspect is the economic analysis found in state severance taxation<sup>32</sup> and taxation of foreign commerce.<sup>33</sup> At least equally unrealistic is its handling of the economics of taxation of,<sup>34</sup> and financial aid to religion.<sup>35</sup> Lousy economics must be camouflaging the real reasons for the results reached. If some compromise with respect to the establishment clause is necessary then the Court should be willing to state that as its reason. I again am not arguing about the correctness of the result, only the use of bad economic analysis.

The *social sciences* have fared no better. The Court's struggle over the last two decades with pornography certainly is not based on any valid social behavior analysis. It seems to be based purely on a hunch, not on scientific research as to social behavior and a causal connection to obscenity.<sup>36</sup> Perhaps it is an emotional inheritance from our Puritan founders or even what psychologists and psychiatrists term "projection."

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32. See *Commonwealth Edison Co. v. Montana*, 453 U.S. 609 (1981).

33. See *Container Corp. of Am. v. Franchise Tax Bd.*, 463 U.S. 159 (1983); *Japan Line v. County of Los Angeles*, 441 U.S. 434 (1979).

34. *Walz v. Tax Comm'n*, 397 U.S. 664 (1970).

35. *Committee for Pub. Educ. & Religious Liberty v. Nyquist*, 413 U.S. 756 (1973); see also W. LOCKHART, Y. KAMISAR, J. CHOPER & S. SHIFFRIN, *CONSTITUTIONAL LAW* 1028-86 (6th ed. 1986) [hereinafter W. LOCKHART].

36. *Pope v. Illinois*, 107 S. Ct. 61 (1987); *Miller v. California*, 413 U.S. 15 (1973); *Paris Adult Theatre I v. Slaton*, 413 U.S. 49 (1973); COMMISSION ON OBSCENITY & PORNOGRAPHY, *THE REPORT OF THE COMMISSION ON OBSCENITY AND PORNOGRAPHY* 32 (1970).

Recognizing that the publication, *Penthouse*, has a built-in bias, the two stories by Nobile and Nadler on the composition, the method of operation, and the report of the recent Attorney General's Commission nevertheless do paint a devastating picture of a lack of appreciation of what goes into a scientifically valid sociological and psychological study. As they report, the only trained scientist on the Commission wrote a strong dissent to the Commission report, and was joined by the other woman on the Commission, the editor of *Woman's Day*. Nobile & Nadler, *Ed Meese Gives Bad Commission*, *PENTHOUSE*, July 1986, at 50; Nadler & Nobile, *Lynching Pornography*, *PENTHOUSE*, Aug. 1986, at 72 (articles on file with U. MICH. J.L. REF.). In a similar vein is an article by Dershowitz, *A 20th Century Inquisition*, *PENTHOUSE*, July 1986, at 107 (article on file with U. MICH. J.L. REF.). Scheer, *Inside the Meese Commission*, *PLAYBOY*, Aug. 1987, at 60 (article on file with U. MICH. J.L. REF.), if his reporting of the activities of the Commission is even remotely accurate, makes a persuasive case for the proposition that most members of the Commission lacked both knowledge and any interest in a scientifically valid approach to the obscenity problem.

Many examples of judicial assumptions of questionable scientific validity can be found in our rules governing legal proceedings such as criminal and civil trials. One aspect of the exclusionary rule illustrates the lack of scientific sophistication on the part of the Court. It found that the use of an accepted medical procedure in the form of a stomach pump was "shocking" and "brutal" but the use of another medical procedure, drawing blood samples, was "reasonable."<sup>37</sup> It referred to no evidence showing the relative safety and painfulness of the two procedures.

Actually there is no scientific basis for the underlying theory of the exclusionary rule; i.e., that illegal police actions will be deterred. Speaking off the top of my head, as apparently the Supreme Court did, and based on "common knowledge," I strongly suspect their assumption is invalid. I am not arguing the merits of the exclusionary rule, only the scientific (?) basis for the Court's assumption. Other arguments besides deterrence might be suggested,<sup>38</sup> but that is a different question.

### CONCLUSIONS

This Symposium addresses one of the major problems that the legal system *must* face in today's technological world. Arguably, the credibility of our system in the eyes of other professionals and probably even the general public is at stake. The examples given are only a few of the many that demonstrate a lack of sensitivity and knowledge about scientific research that exists in our profession. We simply are not doing an adequate job.

The Articles in this Symposium do demonstrate that some lawyers and political representatives are aware of the tremendous impact science and technology have on our society. We need much more effort, however, and many more people working on the problems of assimilating scientific discoveries. Blame must be shared by all parts of the legal system—legislators, administrators, and lawyers. Practicing lawyers and legal academics certainly must share a good deal of the blame for the shortcomings of the whole profession. If this Symposium helps sensitize us, it will have made an important contribution to

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37. Compare *Rochin v. California*, 342 U.S. 165 (1952) with *Schmerber v. California*, 384 U.S. 757 (1966).

38. See *Mapp v. Ohio*, 367 U.S. 643 (1961) (discussing other rationales, in addition to deterrence, for adopting the exclusionary rule).

achieving more sensible and more nearly fair results from our legal system. We must not settle for a merely definite result, right or wrong.

Trial and reviewing courts must insist on hearings that produce a decent, scientifically sophisticated record. Assumptions and common sense too often are inconsistent with known scientific findings and theories. Practicing lawyers must accept responsibility for informing legislators, administrators, and judicial decisionmakers of pertinent scientific material. More must be done than the creation of scientific courts, as some have suggested.<sup>39</sup>

One of the most challenging problems in making intelligent use of scientific material is, in some way, to find support for the legal-scientific research that is needed to test our assumptions against scientific knowledge. An initial problem is how to conduct this research to test various options without violating our obligation of giving equal treatment to litigants who are in essentially the same situation.<sup>40</sup>

Assuming we solve the fairness problem, the financing of such research is at least as difficult. The organized bar will have to convince the legislators of the dire need for funding. Probably most of the funding will have to come from Congress because most scientific research does not vary from state to state. Certainly it will be difficult to find the necessary scientific staff, but adequate staff cannot carry out valid work without adequate financing. We have an obligation to seek the necessary support!

One caution should be expressed. As the recent United States Supreme Court decision, *McClesky v. Kemp*,<sup>41</sup> clearly demon-

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39. My objection to a science court is two-fold. I do not believe that any single group of people can become expert enough in a sufficient number of areas of science and technology to deal fairly with the scientific issues that will arise in the great variety of cases that come to the courts for decision. Using separate expert advisors in special areas would be more realistic. In addition, most cases involve human value judgments, not just science, and skill in handling these factors probably is developed better in dealing with a greatly varying number of subject matters.

40. See W. LOCKHART, *supra* note 35, at 447-54 (citing cases). Our treatment, for example, of the question of retroactivity of decisions in criminal procedural due process cases illustrate how sticky this problem can become.

41. 107 S. Ct. 1756 (1987). In that case, a black man was convicted of killing a white police officer during the course of a robbery. He was sentenced to death by a Georgia court and sought review by the United States Supreme Court on the ground that a scientific study of Georgia death penalty cases for six years during the 1970's (the Baldus study) showed racial discrimination in imposing the death penalty when a black person killed a white victim. He asserted that the imposition of the penalty in his case, therefore, violated the eighth amendment and hence the fourteenth.

The case is a beautiful example of the relevancy of scientific research results in deciding a legal question and of the great difficulties involved in making proper use of such

strates, being aware of scientific research and being willing to analyze its relevance for a particular case is only the beginning. In the final analysis, legal decisions of all sorts involve value judgments and these usually are not answered by science. I am only suggesting here that these essential value judgments be based upon an intelligent understanding of scientific concepts. Legal rulings should at least be scientifically sound, and even this often is an extremely complex task. The great difficulty found in making value judgments, however, is no excuse for using bad science.

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material. In this case, the majority and most of the dissenting justices could not avoid analyzing the significance of the scientific research.

The members of the majority were willing to assume that the Baldus study was statistically valid, *id.* at 1766 n.7, and showed that there was a "discrepancy that appears to correlate with race." *Id.* at 1777. They held, however, that the study did not "prove" racial bias in all capital cases or in McCleskey's particular case. *Id.* at 1775. The majority was also unwilling to hold that the risk of such bias was sufficient to justify invalidating the death sentence in Georgia. *Id.* at 1778. Justice Powell, for the Court, then gave several nonscientific reasons why the majority could not invalidate the death sentence procedure in Georgia. *Id.* at 1778-81.

Justice Brennan, in dissent for four justices, found the scientific study sufficient to support McCleskey's argument. He emphasized the fairly startling figures showing a general correlation between race and imposition of the death sentence. He concluded that the "evidence shows that there is better than an even chance in Georgia that race will influence the decision to impose the death penalty." *Id.* at 1785. He also asserted that "Georgia's legacy of a race-conscious criminal justice system" supported the Baldus study's results. He was unimpressed with the other reasons given by the majority.

Both majority and dissenting justices did directly face the scientific study evidence. The majority, however, did not adequately address the intriguing question of why statistical evidence of racial bias should be used in deciding the constitutionality of selecting juries but not in the imposition of a sentence. Likewise, no real guidelines are given in any of the opinions to determine when statistical evidence is sufficiently persuasive to "prove" bias in institutional actions. The majority's position would seem to reject almost all use of statistical analysis and the dissent does not really indicate what percentage of correlation will be sufficient to prove bias. In addition, the dissent's position would seem to dictate that, at the present time, almost no blacks could be brought to trial, at least for murder, because they say the statistics establish the presence of racial bias in Georgia trials generally. The only possible solution to the dissent's dilemma would seem to be to have all blacks tried only by an all black tribunal, i.e., judge, prosecutor, and jury. Surely this is unacceptable. The only solution to the majority's dilemma is equally unpalatable, cross-examination of jurors after the verdict is rendered in an effort to determine if racial bias entered into their vote of "guilty."

In any event, and regardless of the dilemma, none of the justices seem to recognize the nature of statistical correlation evidence. Such evidence will always be in percentages, and the Court should face the issue of where to draw the line—at 25%, 51%, 75%, or 98%. The dissent's reference to "more probable than not" suggests that perhaps 50% is enough but this is at least doubtful. On the other hand, does the majority mean anything less than 100% is not sufficient proof? Even "beyond a reasonable doubt" allows some margin of error. This question will not go away by ignoring it and it won't be any easier in future cases because of the very nature of this scientific material. The Court must face this issue, uncomfortable as that may be.