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Science in Law: Reliance, Idealization & Some Calvinist Insights

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Science in Law:
Reliance, Idealization & Some Calvinist Insights

by David S. Caudill

I offer some reflections on the place of science in law today and on the way science is viewed in our legal system. I particularly want to focus on the various contemporary narratives about the proper use and role of science, in two contexts: (1) in the courtroom and (2) in the public policy debates in administrative agencies that regulate so many aspects of our lives. Many lawsuits involve or are decided on the basis of scientific knowledge wherein each side calls on scientific experts to deliver determinative science. Examples include claims against chemical companies or pharmaceutical manufacturers for producing allegedly dangerous products or litigation concerning workplace injuries arising from contact with harmful substances. In governmental agencies that protect human health, as in Environmental Protection Agency's attempts to control or reduce air or water pollution, or the Food & Drug Administration's decisions about which foods and drugs are safe, there is, on the one hand, a profound reliance on science to make decisions but, on the other hand, debate about what to do if the science is uncertain or which scientific studies to believe or whether the scientific decisions have become infected by politics.

In both the courtroom and the rule-making activities of governmental agencies, our common sense would tell us that we *should* let science decide whether a workplace chemical caused the plaintiff's cancer or whether genetically-modified food is dangerous or what level of mercury in water is safe for drinking. But if we look closely at the lawsuits involving scientific issues or at the debates surrounding agency regulations, we find scientific controversy, contradictory scientific testimony, and high levels of scientific uncertainty.

What is our reaction to that state of affairs? Does it make us doubt the utility of science? Or does our trust in science remain firm and lead us to doubt the ability of the legal and political systems

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to get things right? Those are the questions I want to address because a great deal is going on right now—from climate change to food regulation to concerns about the safety of plastic water bottles—that should cause us to reflect on science, including both its potential to guide lawmakers and its limitations as a source of stable knowledge.

Part of that reflection on science involves the so-called "science wars." Those wars were preceded by the so-called "culture wars," the name given to the debates between modernists and postmodernists in the humanities. On the one side were the children of the Enlightenment, who believed in the capacity of human reason to overcome religion and other outdated traditions and to give us secure knowledge. On the other side were postmodernists, who claimed to end all totalizing narratives and who reduced knowledge to power. However, there *is* a *softer* version of postmodernism that is not as relativistic and is quite close to the Christian critique of rationalistic modernism. This softer version is one that

> recognizes the tradition-bound nature of all thinking, [that] understands [why] a purely objective and totally accurate expression of reality is impossible, that [does not ignore] the realities of power and coercion [and] that [recognizes that] all concepts have a history, and that all truths need to be put into their social and cultural context so as to understand their scope and claims more accurately…. [1]

Even though the term *postmodern* is sometimes used pejoratively in Christian circles, I like the foregoing description of *soft* postmodernism; I also notice the rhetorical move, where the author describes the extremes of Enlightenment rationalism and postmodern nihilistic relativism and then constructs a Christian view as a mediating or middle position, a third way, which avoids the extremes.

In the science wars that followed in the wake of the culture wars, the effort to avoid extremes is also apparent. On the one side are those who believe in the superiority of scientific knowledge to provide stable truths that transcend culture and history. On the other side are those historians, philosophers, and sociologists of science who emphasize that the scientific enterprise is human, who identify the social and institutional aspects of scientific communities, and who highlight the interests at work in allegedly *dis*interested science. In the most extreme version of the latter perspective, science is represented as a social construction, as just another cultural narrative without any unique claim to objective truth about reality. In its softer version, which is less relativistic and quite close to the Christian critique of scientism, it recognizes that science is not value-free and that there are genuine scientific disputes that destabilize any pretense that science is a machine-like producer of uncontroversial facts.

The science wars, a 1980s' phenomenon, are obviously not a new topic or an earth-shaking revelation for Christian scholars. There is a rich and substantial history of neo-Calvinist reflection on the natural sciences, as well as a centuries-old conversation about conflicts between science and religion, about whether science replaced religion or whether science is a religion, and so forth. Calvin himself occupies an interesting position by having lived during the scientific revolution. I recognize that the period identified as the scientific revolution, beginning with Copernicus, who lived from 1473-1542, and ending with Newton, who lived between 1624-1727, is a purely modernist construction. I agree with Steven Shapin that this period is not uniquely revolutionary[2] —it is just a convenient marker with no more significance than the debate over when the medieval "period" ends and the modern "era" begins. But it is convenient for my purposes that Calvin was born when Copernicus was 36 years old, that Galileo was born the year Calvin died, and so forth. It is not clear whether Calvin knew of Copernicus, and even though Calvin accepted the faulty Ptolemaic system that almost everyone else accepted, we do not think that Calvin was against astronomical investigation or against scientific inquiry.[3] Calvin does say that we do not get astronomy from the Scriptures, but Calvin does not degrade science—he simply warns that too much study of the creation might lead one to forget the Creator and might even lead one to think the universe was its own creator.[4] That warning is quite prophetic; Steven Weinburg, the great physicist who is now not quite as great as a public intellectual, wrote in 2001 that

> One of the great achievements of science has been, if not to make it impossible for intelligent people to be religious, then at least to make it possible for them *not* to be religious. We should not retreat from this accomplishment.[5]

I'll return to Weinberg below because he is exemplary, both (1) with respect to his position in the science wars, as a worshiper of science, and (2) with respect to my argument that the science wars are very important nowadays in law and politics; indeed, the science wars are now firmly located within the beltway, in Washington, and were anticipated by Abraham Kuyper.

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Over a hundred years ago, Kuyper dedicated the fourth of his Stone Lectures at Princeton to the nexus between Calvinism and science.[6] Even though we need to be very careful to recognize Kuyper's own background and historical context, that is, to recognize the particular views of science against which he was arguing, the lecture is nevertheless a sophisticated anticipation of the science wars to come.

Kuyper makes four points, four observations, about Calvinism and science—and even though neo-Calvinists use the word "science" broadly to include academic inquiry in all the disciplines, including philosophy and history and even theology, note that Kuyper's examples of science are almost all from the exact or natural sciences. He first says that Calvinism fosters a "love for science," and he mentions that the microscope, the telescope, and the thermometer were Dutch inventions.[7] Calvinists believe in law and order in the cosmos, which belief offers a foundation for empirical inquiry.[8] Second, Calvinists do not place science *below* spirituality, as we have no contempt for the world, and he mentions the sixteenth-century plague in Geneva when prayer was accompanied by hygienic measures.[9] This is where Kuyper mentions common grace and the ability of non-believers to excel in scientific inquiry.[10] Third, Kuyper notes that scientific inquiry should be free from church, and state, interference.[11] And fourth, Kuyper sees no conflict between faith and science.[12] This is where Kuyper, anticipating the science wars, mentions that all science begins with faith—faith in our self-consciousness, in our senses, in our intellect, in universal laws, and so forth.[13] This begins to sound like a critique of scientism, but as Jaap Klapwijk points out,[14] Kuyper was quite "scientistic" about the exact sciences—observation for Kuyper did not depend on the subjectivity of the researcher; as a result, Kuyper does not give us much of a critique of the physical sciences.

Later on, Dooyeweerd was more likely to challenge the myth of neutrality in the natural sciences, and he anticipated, much more than Kuyper did, the personal and creative aspects of scientific inquiry. Even before Polanyi's "framework of commitment," Habermas's explication of human interests, Radnitzky's theory of steering fields, and Kuhn's paradigm theory, Dooyeweerd offered many neo-Calvinists a basis for investigating the subjective and cultural aspects of the exact sciences,[15] and they did investigate those aspects. From the late 1950s to the mid-1970s, the conferences and journal of the American Scientific Affiliation included a lively discussion of Christian perspectives on science;[16] and by the time I arrived at the Free University in 1975, the history and philosophy of science were major fields of inquiry and controversy. By 1979, with the publication of Bruno Latour's and Steve Woolgar's *Laboratory Life*,[17] the sociology of science engendered the so-called sci-

ence wars with a research program into the social, institutional, and rhetorical aspects of the scientific enterprise. The sociology of scientific knowledge was a reaction against the idealized view of the scientific enterprise, which described science *solely* in terms of theory, data-collection, conclusion, publication, and application *or* refutation.[18] As to ambition, persuasion, funding bias, or cultural values, those were not (in the idealized view) part of science; as to personal values, perception, consensus, or institutional gatekeeping, those were good for science but also not part of science itself. In contrast, the sociologists of science revealed the pragmatic nature of science, demonstrating that science was not merely influenced by but *consisted* of values, paradigms, cognitive and instrumental constraints, language and metaphors, consensus-building techniques, reputation, and variable conventions. If we view that assessment as an unfair challenge to the superiority of scientific knowledge, we are on one side of the science wars; and if we are comfortable with that assessment as a realistic account, we are on the other. Of course, this is old news—there's a great deal of literature from the 1980s and 1990s describing, clarifying, and taking controversial positions in the science wars. So why am I talking about this?

Well, to my surprise, the science wars have arrived in law. Because of the need for judges and juries and governmental administrators to rely on science, the nature and reliability of the scientific enterprise have become important topics in legal discourse. Now to be fair, the legal system's reliance on science is not new—we have had scientific experts in our courtrooms since the early nineteenth century,[19] and we have also tried to regulate toxic substances and pharmaceuticals and even food for centuries. But a couple of high-profile events in recent years have heated up the controversy over the use of science in law.

First of all, there was a series of three U.S. Supreme Court opinions in the mid- to late- 1990s that together establish a new vision of science in the courtroom.[20] Because each side in a lawsuit hires its own expert to testify, there had been concerns for decades about junk science in the courtroom and about experts who become advocates for their clients, so the U.S. Supreme Court set up some new rules to ensure the reliability of scientific testimony. I think it's fair to say that those new guidelines, and the immense, recent scholarly commentary concerning expertise in law, reflect a rather idealized or romanticized vision of the scientific enterprise.[21] Whereas *law* is represented as a field of controversy, argument, advocacy, and rhetoric, *science* is represented as completely different. Science seemingly involves stable knowledge, without bias or interest or motivation. Consequently, when two experts disagree, it is often assumed that one of them is a liar, a junk scientist, while the other is telling the truth. In this new view of science, there is not a lot of room for talking about *scientific* controversy, argument, rhetoric, consensus-building, or advocacy for one's preferred scientific theory. Indeed, if an expert concedes the limitations of his knowledge, or admits that scientists are influenced by the communities or institutions in which they work, that expert is often condemned as not delivering determinative knowledge, which is what science is *supposed* to offer to the *indeterminate* and *argumentative* field of law.[22] And there is even a trend to blame lawyers for the shortage of scientific truth in the courtroom. Some have suggested that lawyers have an ethical responsibility to ensure the accuracy of their experts because anyone can supposedly do a little research and figure out the scientific truth in a particular field.[23] Such suggestions are based on a very simplistic view of science, as if scientists do not disagree and as if there are no genuine controversies among scientists.

The second phenomenon that brought the discourse concerning science into law was the accusation that during the Bush administration, science became politicized.[24] This kind of discourse also tends to idealize science and is the reason President Obama claims that his administration will pay attention to science, not politics,[25] as if there is pure science available if we would just pay attention. But is it really possible to remove worldviews and values from the scientific enterprise in the service of law?

Now, I could at this point construct a debate and say that on one side are those who trust science completely, and on the other side are those who do *not* trust the scientific establishment, perhaps because they believe that all science is politically

motivated or perhaps because they fear scientists as a bunch of Dr. Frankenstein's with no moral sensitivity. Then I could say that the Christian or neo-Calvinist view is somewhere in between. But the debates over science in law are actually a lot more nuanced and more interesting than that, and it is probably better to organize the various narratives concerning science on a continuum—there are *various* positions available in the debate, and I'll identify five of them.

I will begin with those commentators who seem to have a near-complete faith in science as the single source of truth—I mentioned above the physicist Steven Weinberg, who wrote *Facing Up: Science and Its Cultural Adversaries* (2001). That book is a diatribe against those who view science as a cultural activity involving values, theoretical biases, and advocacy. We might also think of Michael Specter's recent book, titled *Denialism: How Irrational Thinking Hinders Scientific Progress, Harms the Planet, And Threatens Our Lives* (2009). The very title of that book, *Denialism*, suggests that we should simply listen to the objective truths that science offers us. Among legal scholars, the parallel to such a perspective can be found in the work of Michael Saks, who thinks that the reason there is too much junk science in the courtroom is that lawyers don't take the time to pay attention to scientific truth:

> Any attorney, like any intelligent citizen who takes the time to research a purported scientific subject, has the potential to reach her own conclusions about whether or not the field's beliefs rest on a foundation of data and logic that is solid, mushy, or non-existent[26]

Anyone can do it. But what Saks ignores, in order to make such an observation, is that in litigation involving scientific issues, there is often considerable uncertainty, dispute, and controversy among scientific experts—(1) there may be no scientific consensus against which to measure a legal judgment; (2) the number of studies may be limited; and (3) it is commonplace that competent, well-intentioned, and conscientious scientists utilize identical data and agree on identical criteria of interpretation, and then reach different conclusions.[27] So it's not just core data leading to a conclusion—there's more going on.

In the regulatory arena, the parallel with those who worship science is those who say that risk assessments should be value-free, without normative foundations. Values, in this view, introduce biases into an otherwise rational process—the Food & Drug Administration, for example, should act on the basis of science alone.[28] If we allow ethical, religious, or moral values in the door, then, it is said, the process becomes politicized and produces junk science.[29] It is said that the inherent uncertainty of science, unfortunately, can be exploited to derail the appropriate process of value-free risk assessment.[30] Now that view, which finds its way into the literature on regulation, sounds naïve and old-fashioned. It idealizes science and promises objective guidance that is, in reality, rarely available.

Because of the need for judges and juries and governmental administrators to rely on science, the nature and reliability of the scientific enterprise have become important topics in legal discourse.

So let's move to the next position on the continuum, the more sophisticated view that acknowledges the presence of non-scientific judgments. When we approve a product on the market because there is a "reasonable certainty of no harm," we mean that the risk is acceptable to our society; this view is a value judgment based on the best science available. This perspective concedes that scientists have interpretive disagreements, that they argue for plausible alternatives, and that they engage in vigorous debates. However, this perspective holds out hope for value-free science because it is only high levels of scientific *uncertainty* that raise the need for value judgments—once we have high-

quality science, ample evidence, and small margins of error, the need for value judgments disappears.[31]

That brings us to the next perspective, even less idealistic about the stability of science, which views *all* risk assessments as judgment calls. Even a scientist's degree of confidence is not a scientific matter, and our assessment of whether a scientific analysis is relatively certain is grounded in pragmatic decisions about what to study, which variables to consider, how accurate our measurements need to be, and how much potential error we're willing to accept. When we say something is "safe" or "injurious" or we say that the evidence is "ample" or "convincing" or "reasonably certain," those words sound scientific but are actually non-scientific judgments.[32]

Now this sounds like a really sophisticated view of the limitations of the scientific enterprise, but notice that we're talking about the limitations of science within the risk-assessment or policy-making context. That is, there is still a strong fact/value distinction, insofar as science is factual, and values only come into play as we consider the *impact* of a substance or technology on society. We begin with the inevitable scientific disagreements among technical experts; then we turn to the value conflicts as to the social and political evaluation of *impacts*.

Now we can move to another, more radical, position on the continuum, even farther away from the idealized position from which I started. I just described a seemingly sophisticated vision of the limits of science, wherein science necessarily involves non-scientific judgments; and it is the technical disagreement among scientists that leads us or causes us to make value or political judgments. This makes it sound as if we have one *thing*, namely an identifiable *uncertainty*, in science, and then we begin to argue about what to do in the face of that monolithic *uncertainty*, and we argue for precaution and about how much risk to take.

We should go back to the scientific enterprise that produced the thing we're calling uncertainty. That enterprise includes contradictory certainties and plural rationalities: scientific debates gave rise to the label "uncertainty," but in most major policy disputes—think of genetically modified foods, the danger of low-dose toxicity in plastic bottles, global warming—we find multiple and contradictory *certainties*.[33]

Moreover, in the activity of risk-assessment and policy-making, we also have contradictory certainties and plural rationalities. And here's the point: these contradictory certainties arise from culture, from cultural orientations, or worldviews. In all of the previous positions on the continuum, there was no talk of culture because in policy discourse, we only turn to culture as a last resort—we prefer to say there was scientific conflict or political conflict; but we can instead *account* for these regulatory conflicts in terms of cultural orientations.[34] Some people have a fundamental view of nature as robust and tolerant, while others see nature as ephemeral and vulnerable.[35] One's viewpoint is going to affect everything in debates over low-dose toxicity, global warming, or genetically modified foods. To the extent that politically conservative or religious people are respectively individualistic and hierarchical, they tend to be skeptical of environmental risks, while those with communitarian and egalitarian worldviews are more sensitive concerning global warming or nuclear power. But then, in a curious reversal, when it comes to synthetic biology, the engineering of new biological organisms, the conservative and religious citizens get very skeptical, while the egalitarian and communitarian citizens are suddenly less sensitive because synthetic biology can stop diseases and feed the hungry.[36] Those decisions are not made on the basis of science or risk-assessment techniques but are made on the basis of worldviews. Each side is perfectly rational in terms of its convictions about the world.

Now, this is not simply an argument that politics infects the regulatory process. I think of David Michael's *Doubt is Their Product: How Industry's Assault on Science Threatens Your Health* (2008), which explains how tobacco and pharmaceutical lobbyists exploit scientific uncertainty and claim that the science is not certain enough to regulate many products. That argument is basically that science is great but that politics gets in the way; it is another way of idealizing science as determinative. Nor am I arguing, as anthropologist Paul Rabinow does, that we need to put ethicists and lawyers and social scientists in the laboratory so that scientists will be

faced with values and regulation at the outset of their activities because Rabinow's argument presumes that science is objective and value-free until the ethicists arrive.[37]

Rather, I am arguing for the acknowledgement of multiple interpretive frames, which reflect values but which *see* facts differently.[38] People do not say, "I'm going to take a position or make an argument that serves my interests." Instead, people *see things* differently and perceive the level and acceptability of the very same risks differently—that's why I said we're not dealing with scientific uncertainty followed by value judgments; we're dealing with contradictory certainties. Our selection of facts and values is not so much conscious and voluntary as it is grounded in our cultural assumptions.

In any event, that's a fairly skeptical view of the power of science to guide policy decisions, and the only position left on my continuum is the view that scientists are untrustworthy. So, where am I going with this? I'm trying to find a framework that explains what is going on when law appropriates science, in the courtroom and in the regulatory process.

Every science has a history, every science operates on the basis of probabilities, and every science involves value-driven communities, consensus-building, and limitations in terms of instrumentation, resources, and human perception.

First, as to the courtroom, if we idealize science, and we fail to acknowledge its pragmatic features, we have oversimplified the ability of science to serve or supplement law with determinative knowledge. Consequently, we cannot make sense of what is happening in U.S. courtrooms. We either have to say that all scientists are correct because they are scientists; but we know that isn't true because scientific experts disagree in court all the time. Or we have to say that when two scientists disagree, one of them is a liar, and the other has the truth; but we know that good scientists have genuine disagreements, so we need a better picture of science to explain why scientists disagree. The answer is to have a more modest view of science that acknowledges its pragmatic features. Every science has a history, every science operates on the basis of probabilities, and every science involves value-driven communities, consensus-building, and limitations in terms of instrumentation, resources, and human perception. Furthermore, science changes—many forensic scientists who provided evidence for criminal trials, on the basis of fingerprint or hair or bite-mark identification techniques, have now been proven wrong by DNA evidence.[39] So should we now glorify DNA as the final step in our quest for knowledge? I don't think so because even DNA analysis involves human beings and probabilities and possible errors—it's great stuff but not always a truth machine.[40] It is fabulous, but we need to remember that we thought fingerprint identification was flawless until we started reversing convictions on the basis of new DNA evidence.

In the regulatory context, I don't think we want to explain or account for our current scientific disputes by saying that the scientists on one side are liars or that they have been duped by lobbyists or their own political interests. It makes more sense to identify cultural biases, which shape how evidence is gathered, interpreted, and reported. Whenever we have data, there is still room for selecting, minimizing, maximizing, magnifying, and dramatizing data on the basis of social preferences, even as we claim to be merely applying scientific expertise.[41] The very perception of risk, or reasonable certainty, is framed by values in order to make strategic arguments. Some people have a precautionary worldview, and some have a Promethean worldview, the latter of which implies that we can technologically solve all our problems and that, therefore, we need not be so cautious.[42] Both sides use science, so we cannot say, "Let's just let science decide who is right." Long before we leave the

scientific realm to enter law and politics, we have conflicting conceptual lenses. The very criteria for uncertainty, sound science, reliable evidence, and adequate research are not fixed but vary according to ideological commitments, social contexts, and interpretive frames. Therefore, any appeals to science as the final arbiter are oversimplifications.

In conclusion, when we visit courtrooms and regulatory agencies and we see how science is used, the debates are hard to explain unless we have a sense, a neo-Calvinist sensibility, that worldviews affect everything, even the exact sciences. We love and enjoy scientific progress and its benefits, but we do not idealize its potential to answer every question—science does not give us our purposes, aims, and priorities, and it comes to us with uncertainties, institutional biases, and even built-in values as to what was worth investigating, what could be funded, and what was advocated for and negotiated in scientific communities. We should neither worship nor distrust science, but rather we should recognize its limitations as the stabilizer of legal and regulatory disputes.

Endnotes

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