

Science, Intersubjective Validity, and Judicial Legitimacy

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The problems associated with discovering truth in the courtroom are well known. Eyewitness testimony is notoriously unreliable. Statistics are almost endlessly manipulable. Paid experts slant their findings or, less disreputably, perhaps, but equally effectively, adjust the questions that they ask in order to yield findings supporting the party who hired them. But in litigating challenges to the incorporation of religious beliefs packaged as science into public-school curricula,¹ my concern with the relationship between expert testimony and scientific truth has less to do with the mechanics of weighing possibly conflicting expert opinions than with the deference so often afforded to those who don the trappings of science, whether they engage in bona fide scientific research or merely peddle nonscientific truth-claims masquerading as science.

Although much of this symposium has focused, in one way or another, on whether science offers a window on the truth commensurate with the pride of place that scientific evidence receives in legal factfinding, that question may be too narrow to acknowledge the full value of scientific evidence in judicial proceedings. If scientific research offers access to truth that other forms of evidence do not, affording it extra deference makes perfect sense. But whether ultimate or objective truth even exists, and, if so, whether we as humans have epistemic access to it (through scientific inquiry or otherwise), are metaphysical puzzles that have plagued philosophers and

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theologians since at least Plato's day; and it is not clear that we are any closer to solving them than the Ancient Greeks were. Courts must, of course, set aside those thorny issues in performing their daily tasks, acting instead as though ultimate truth exists and is reasonably accessible to anyone who in good faith looks for it. Otherwise, metaphysical and epistemological anxieties would overwhelm courts' ability ever to provide definitive judgments. But the need for courts to act as though they can discover ultimate truth through ordinary legal proceedings does not resolve the deeper questions. Nor, therefore, does it justify viewing science in the courtroom as useful for getting to the truth of the matter being adjudicated.

Irrespective of the metaphysical status of ultimate truth, or of science's relation to it, a better question may be whether anything about the nature of science (whether or not it relates to the capacity to reveal truth) warrants setting scientific evidence above other categories of truth-claims as a grounding for legal judgments. As background for considering *that* question, Part I provides a more detailed statement of the concern about courts' institutional competence to deal with scientific evidence, and Part II describes courts' institutional aims and the value of publicly justified judicial rulings for achieving those aims. Part III explains why science as a discipline has special power to promote shared understanding. And Part IV seeks to defend the respect that courts show to scientific evidence in light of the public confidence in the legal system that follows from judgments' being rooted in shared understandings of the sort that science provides.

The point is, in the end, a simple one: Scientific evidence has special value in legal proceedings because science confers intersubjective validity that other categories of truth-claims often lack. It offers factfinders and concerned observers a common yardstick against which to measure the validity and explanatory power of proffered evidence. So opinions grounded in science carry their own tests for reliability and usefulness, thus inspiring special confidence in judgments based on them. And by fostering greater public trust in legal rulings, judgments premised on scientific evidence reinforce the legal system's ability to resolve disputes that might otherwise threaten a peaceful, well-ordered society.

I. THE INSTITUTIONAL-COMPETENCE PROBLEM

In defending, at least in general (if not necessarily in specific cases), the role that science plays in legal proceedings, I am not deaf to the frequently voiced complaint that juries and judges are ill suited to the task of evaluating competing scientific claims. The complaint is one about institutional competence: Factfinders are not trained as scientists, so they are unlikely to possess the substantive knowledge and analytical skills required to parse scientific claims; and far from making up for those deficiencies, the adversary system compounds the problem by driving parties to present skewed accounts and to gloss over weaknesses and inconsistencies in the methodologies employed, the data collected, and the conclusions drawn by experts testifying on their behalf. But while institutional-competence concerns are certainly important, complaints about courts' inability to understand science are not terribly informative when divorced from consideration of institutional objectives. And when courts' institutional purpose and social role are taken into account, criticisms of factfinders' supposedly dismal performance in evaluating scientific evidence may be overblown.

Consider a run-of-the-mine tort case in which the factfinder (whether judge or jury) must decide which party is providing the best account of how some injury occurred. Irrespective of what that injury is, or what the legal claims are, or what proof each party offers, it is natural to wonder whether the factfinder will have knowledge and experience of the relevant sorts, and in sufficient measure, to weigh the evidence, evaluate the competing arguments, and come to the correct conclusion—in other words, to figure out the truth of the matter. And when apparently conflicting scientific evidence is a trial's centerpiece, the anxiety deepens: If we doubt judges' and juries' ability to evaluate witnesses' credibility, for example, even though everyone enters the courtroom with at least some independent experience distinguishing truthfulness from deceit, must we not be even more skeptical of factfinders' capacity to weigh competing scientific claims, when so few among us possess even rudimentary training in that enterprise? After all, most judges and jurors are unlikely to have ever before tried to make sense of the sorts of data being put before them in a trial; they may be swayed by flash rather than substance; and even when they would otherwise possess sufficient acumen to separate scientific wheat from junk-

science chaff, their efforts may be stymied by the parties' attempts to sweep under the rug the limitations of an expert witness's research program and the qualifiers that would inevitably accompany the findings if they were presented in even the most slipshod research paper.

But if factfinders' evaluation of expert testimony is good enough to allow courts to fulfill their designated social role, then courts are sufficiently competent as factfinders to consider the evidence for purposes of deciding cases. And judicial decisions will be acceptably reliable, even if judges' and juries' evaluations of competing scientific claims might sometimes be unsophisticated enough to bring tears to the eyes of any high-school biology or physics teacher—much less to a qualified researcher working in the relevant field of study. So determining institutional competence to evaluate scientific evidence requires looking, in the first instance, not at factfinders' scientific acumen, but at courts' designated social role.

II. LEGAL JUDGMENTS AND INTERSUBJECTIVE VALIDITY

As John Locke explained, law courts are a prerequisite to social stability: Impartial judges empowered to make definitive legal rulings provide a mechanism for disputants to resolve their disagreements without having to resort to physical violence or other self-help remedies.² We set up judges and courts as higher authorities with the power to declare who wins and who loses, who receives compensation and who pays, who exacts retribution and who suffers punishment, not because we think that they will always get things exactly right, but just because deferring to a neutral arbiter helps ensure that we don't end up in blood feuds to resolve every petty grievance. But a legal system prevents interpersonal violence and quells broader social strife only if both the parties to particular controversies and the public in general are in the end willing to accept and obey legal judgments. For if not, invoking the judicial process might delay, but will not prevent, resorts to bloodshed. It thus turns out that disputes over how to assess the reliability of various categories of evidence or how to deal with factfinders' possibly inept weighing of truth-claims implicate deeper issues of political legitimacy: If a court is to

² JOHN LOCKE, *SECOND TREATISE OF GOVERNMENT* §§ 13, 19-20 (1690).

resolve disputes definitively and finally, and hence to justify invoking political authority to enforce its orders, it must persuade those subject to its rulings to trust it to decide who should bear the costs of an accident or who should receive punishment for a crime—in other words, to make conclusive determinations regarding litigants' fates.

In light of that socially important, but in a metaphysical sense fairly modest, institutional aim, courts need not be infallible expositors of truth. In most cases, it is enough that a court comes to some decision—any decision—that the parties will accept as dispositive. For courts don't just attempt to ascertain truth; they define it. Justice Jackson's famous aphorism, "We are not final because we are infallible, but we are infallible only because we are final,"³ provides a pointed reminder that a judicial ruling makes true as a legal matter the findings that it encompasses, irrespective of whether the judge, jury, or appellate tribunal got everything exactly right. Judicial fiat is not, of course, a terribly satisfying basis for dispute resolution; and hence, it alone is not a secure grounding for a legal system. But if the parties and the public have the considered conviction that courts do a pretty good job finding facts, deciding cases, and resolving disagreements most of the time—in other words, that the legal system on the whole serves us better than trying to settle the score ourselves whenever we feel wronged—then we will generally be willing to let the courts act as final arbiter. And we will usually accept even unfavorable judgments from them.

Thus, what matters for a legal system's legitimacy is, in the first instance, that losers in legal actions believe that the treatment they received from the courts was at least minimally fair and respectful of them as the prevailing parties' political equals. A losing party must be able to see that the court has listened to its arguments, weighed all the relevant evidence, and explained the ruling in a way that the party can recognize as a valid—albeit unfavorable and perhaps imperfect—exercise of judicial authority. As I have suggested elsewhere,⁴ the losers' view matters most because winners do not need to have their victories justified to them. Unless a prevailing party expects to be a repeat player in litigation, fighting the same battle against future opponents in other cases, it is unlikely to care *why* it

³ *Brown v. Allen*, 344 U.S. 443, 540 (1953) (Jackson, J., concurring).

⁴ Richard B. Katskee, *Why It Mattered to Dover that Intelligent Design Isn't Science*, 5 FIRST AMEND. L. REV. 112, 153-54 (2006).

won: Knowing *that* it won is quite satisfying enough. But to the unsuccessful litigant, quite a lot depends on believing that the arbitrator was impartial, that the hearing was fair, and that the final decision fell within at least a broad range of outcomes warranted by the evidence when evaluated using permissible forms of analysis. A litigant's views about a judgment on those dimensions may make the difference between accepting an unfavorable ruling and keeping the fight going outside the courts.

Stepping back from the parties' views of any single case to an aggregate social perspective, the procedures that a legal system employs and the judgments that it produces, when taken all together, have to be fair enough, both on average and in the most significant cases, to encourage members of the society to keep reverting to the courts as the principal mechanism for resolving disputes. Courts' legitimacy depends, in other words, not just on individual losing parties' walking away with the conviction that a courtroom was the proper venue to resolve grievances (however upset the parties might have been about the final verdict), but on the public's having faith that the legal process will afford a fair hearing and generally fair treatment to those who invoke it—and that the courts will give careful, respectful consideration even to nonparties' interests when they are implicated in lawsuits.

If courts are to provide what most of us will regard as a fair trial in those senses, and hence to instill confidence that the legal system is the right place to turn to resolve disagreements, they must base their rulings on publicly accessible facts, which they must then weigh, measure, and test using publicly accessible forms of legal reasoning. In other words, courts have to limit themselves to types of evidence and modes of analysis that are equally intelligible to everyone, at least in principle, and to employ relatively transparent procedures, so that the resulting judgments are defensible as something more than mere caprice. If a court can explain its reasons for reaching some conclusion, and those reasons are generally accepted as valid—that is to say, commonly recognized as appropriate to a judicial decision-maker given the applicable legal rules, and taking into account the relative seriousness of the case—the accuracy or truth of the judgment in a metaphysical sense may be rather beside the point. For if a court relies on commonly shared premises and modes of reasoning that litigants and the public as a whole can recognize as suitable, and if it uses those analytical tools to draw what

the parties and the public can regard as reasonable inferences from facts that are themselves intelligible to, and in some sense verifiable by, everyone, then the resulting judgment will have intersubjective validity—in other words, the basis for shared understanding of its fitness. And if a judgment is grounded in that sort of shared understanding, it cannot be written off as an exercise of raw power; it must be regarded, even by those who dislike the result, as deserving of respect, and ultimately, of obedience.

To be sure, the higher the stakes are, or the more in the public eye the controversy is, the more accuracy that both litigants and the public as a whole will demand. If a limb from my neighbor's tree falls onto my fence, we might disagree heatedly about which of us should bear the cost of the repairs and in what amount. But it does not matter very much for practical purposes whether a court hearing the dispute orders my neighbor to pay me enough to build a new, stronger fence; or awards just enough to enable me to patch the broken boards; or denies my claim altogether. Pretty much any definitive answer will do: As long as there is some mechanism to assign fault and assess compensation, I will not need to try to break even by stealing my neighbor's lawnmower—or to *get* even by poisoning his azaleas. But if, for example, the question is whether my physician should compensate me for a lifetime's lost wages because of a misdiagnosis, and whether she should in the process suffer a substantial blemish on her professional record, the stakes are higher; so a judgment bearing greater indicia of reliability is warranted. And when the stakes are at their highest—as when the question is whether a court should impose a severe criminal penalty or announce a new legal rule that would affect large numbers of people—the parties and the public reasonably demand a judgment with the highest degree of accuracy possible. The systematic failure to live up to that heightened expectation, especially in well-publicized cases, would substantially erode public confidence in the legal system as the appropriate means to resolve disputes, thus encouraging people to forsake the courts entirely and fall back on self-help remedies. If the most significant controversies are seen not to be amenable to resolution through the legal system, in other words, the fact that the courts handle mundane grievances tolerably well is hardly a source of long-term social stability.

But to say that we expect greater accuracy or certainty in the cases where the stakes are high is nothing more (and nothing less) than to acknowledge that we demand more robust

public justifications for courts' decisions. Definitiveness alone is insufficient: We insist on exceptionally clear, detailed explanations for the rulings—explanations grounded in facts and legal principles that are both widely intelligible and generally accepted as reasonable.

In demanding more careful, complete justifications in important cases, we also shrink, to some extent, the pool of potential judgments that might be considered legally warranted. For in the first instance, the losing party when the stakes are extraordinarily high will likely be unwilling to accept an adverse judgment absent strong reasons to think that the court (a) considered all the relevant evidence and arguments with particular thoroughness and care; (b) applied only proper forms of legal reasoning; and (c) drew inferences and reached conclusions that are intelligible, reasonable, and suited to the seriousness of the case. The more conscientious the court has been in rendering its decision, however, the more limited the set of possible outcomes will be. Whereas in a minor dispute, a judgment might be perfectly good if it does nothing more than give the parties bare direction in how to act toward one another so that they can get on with their business—and hence virtually any decision will do (so long as it can practicably be implemented)—in important cases, the greater need for publicly justified rulings means that only more rigorous and more rigorously fair decision-making will pass muster, with the result that more possible outcomes will be rejected as illogical, irreconcilable with the evidence, fundamentally unfair, or otherwise legally untenable.

In the end, most of us will only rarely be aware of mundane legal disputes that do not involve us; we need only believe that, at the most general level, the courts provide a reasonably efficient mechanism to resolve those everyday controversies. But when a case's outcome will affect large numbers of people (as in toxic-tort suits or suits involving corporate malfeasance injuring employees, shareholders, and customers alike), or when it implicates our most basic notions of liberty (as in criminal prosecutions where the accused faces severe penalties) or equality (as in civil-rights actions challenging official discrimination), we demand that the courts provide especially strong public justifications for their rulings. For what confers legitimacy on a legal system (thus making peaceable resort to the courts the accepted means to resolve the disputes that would otherwise have the greatest potential to create social divisions and civil unrest) is the ability of

everyone, at least in principle, to understand important judicial decisions and to regard them as worthy of respect. To be sure, intersubjective validity of that sort may not be easy to achieve, especially in the most important, most public, and most difficult cases—which are, of course, the ones where it is most needed. But ensuring intersubjective validity is far more modest an institutional aim than discovering ultimate truth. So the criticism that courts are not infallible expositors of that truth—that they sometimes get things wrong—need not be viewed as a fatal blow to a legal system's legitimacy.

III. METHODOLOGICAL NATURALISM AND INTERSUBJECTIVE VALIDITY

Just as judicial opinions become more persuasive the more that judges take care to apply rules and invoke principles that are intelligible to and generally accepted by the parties and the public, so too do factual findings provide more substantial support for judgments when the evidence supporting them can be measured against generally accepted standards. When parties and interested observers can weigh the evidence for themselves and conclude that the factfinder has drawn reasonable inferences and reached warranted conclusions, public confidence in authoritative rulings will be at its zenith. Considered on that dimension, scientific evidence deserves to be regarded as especially useful in court: Science as a discipline imposes strict limitations on what can count as a scientific truth-claim; so long as those limitations are respected, the standards that the scientific community imposes for evaluating data and the inferences drawn therefrom will also provide intersubjectively intelligible measures of the validity and strength of the particular truth-claim at issue. Put more simply, science provides accepted tests for whether and to what extent opinions deserve to be respected as scientific conclusions; and legal judgments that employ those tests thus partake of the authority that the scientific method confers on robust research results.

To start with science's ground rules—what philosophers of science call methodological naturalism, but those in the lab just call the scientific method—doing science means committing oneself to the search for natural explanations for natural phenomena. As the National Academy of Sciences has put it:

In science, explanations are restricted to those that can be inferred from the confirmable data—the results obtained through observations and experiments that can be substantiated by other scientists. Anything that can be observed or measured is amenable to scientific investigation. Explanations that cannot be based on empirical evidence are not a part of science.⁵

Science thus differs from other disciplines not in its areas of interest—which are almost infinitely varied, and which overlap with matters addressed by philosophers, historians, theologians, and scholars in many other fields—but in its modes of analysis. Only observation and inference confirmable using sense data are regarded as permissible forms of scientific inquiry. If we can't see, feel, hear, smell, or taste something, we can't study it using science (though there may be many nonscientific ways to analyze it profitably) because only if conclusions are based wholly on empirical observation can others repeat, test, and potentially falsify the results. We might hypothesize an unseen force—gravity, for example—to explain the otherwise unexplainable—why the apple falls from the tree. We cannot call gravity a scientific theory, however, until we have ascertained that our hypothesis holds up under rigorous empirical testing and retains its explanatory power in a wide array of conditions. And if the hypothesis cannot be tested and potentially falsified, it is not amenable to scientific inquiry.

Methodological naturalism is a pragmatic rule, not a deeper philosophical commitment to materialism. The reason that science as a discipline limits itself to natural explanations is that what is observable, repeatable, testable, and falsifiable provides the basis for making useful predictions. If, for example, we can explain drug-resistant illnesses in terms of evolutionary theory—natural selection acting on populations of bacteria undergoing random genetic mutations—we can predict how new antibiotics or healthcare practices might minimize the growth of drug-resistant strains.

In making the choice to seek causal explanations that allow for prediction, we formally reject nonnatural explanations—divine intervention, spirit forces, or anything

⁵ WORKING GROUP ON TEACHING EVOLUTION, NATIONAL ACADEMY OF SCIENCES, TEACHING ABOUT EVOLUTION AND THE NATURE OF SCIENCE 27 (1998); *see also* NATIONAL ACADEMY OF SCIENCES & INSTITUTE OF MEDICINE, SCIENCE, EVOLUTION, AND CREATIONISM 10 (2008) (defining science as “[t]he use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process”).

else partaking of the supernatural—as standing outside science’s ken. We do so not because those explanations are necessarily wrong, but because, by definition, supernatural actors or forces exist and function outside the laws of nature, doing whatever they please, whenever they wish, and however they choose. So the willingness to entertain the idea of nonnatural causation as part of one’s scientific research program would mean throwing in the towel on the possibility of doing science at all: Because one can never prove or disprove supernatural explanations—because, in short, “God did it” explains everything and nothing—one can never reach conclusions about when, where, how, or even whether a nonnatural cause will next occur. Each nonnatural cause—each act of divine intervention—is *sui generis*. So we can never confirm or reject a supernatural explanation, even in principle; a leap of faith is always required. And hence, unless nonnatural causes are formally excluded, one can never have the slightest confidence in any prediction; supernatural acts can always break any causal chain. Rather than being the product of natural selection acting on random genetic mutations in bacteria, perhaps drug-resistant diseases might be the work of some unseen, undiscoverable being or beings who occasionally start epidemics in order to keep the human population in check, or to test our faith with suffering (as the Catholic Church in the Middle Ages viewed infectious diseases now routinely cured with antibiotics), or to punish sinners (as some fundamentalist-Christian leaders today explain the AIDS virus and, for that matter, hurricane Katrina and September 11). Why bother attempting to develop new antibiotics or to formulate better healthcare practices when, from our limited point of view, there’s no rhyme or reason to how God, the devil, the ghost in the machine, or a merry band of cosmic pranksters will act next—unless, of course, we have had the grand plan handed to us as revealed truth?⁶

⁶ I do not mean to suggest that pure reason, empirical observation, and religious belief or other invocations of nonnatural causes are inherently irreconcilable. They may or may not be in tension, depending on one’s theological commitments. But while for many if not most people, all three cohere and are mutually reinforcing—a philosophical and theological view with a distinguished Enlightenment pedigree but roots extending much further back in Western intellectual and religious history—one still must necessarily take a leap of faith from science’s empirical observations and conclusions to the idea that a supernatural force is working behind the scenes.

As Catholic theologian John Haught explained in testifying for the plaintiffs in the *Kitzmiller* intelligent-design case, science and faith need not be at loggerheads because science has more modest aims than religion does: It restricts itself

In formally excluding from scientific inquiry those sorts of explanations for natural phenomena, while still acknowledging, of course, that they might be true, and that science might be inadequate to tell us everything about everything, science as a discipline puts a premium on continuing the search for causal explanations that can potentially serve as the basis for prediction and responsive action. If no natural explanations work, there will be time enough at the end of the day to step outside the realm of scientific inquiry and invoke nonnatural explanations. The alternative—accepting at the outset that the causal mechanisms producing observable phenomena are unknown and inherently unknowable—would be a recipe for stagnation, encouraging would-be scientists to throw up their hands in despair of ever adding to the store of human knowledge or solving any practical problem.

IV. SCIENTIFIC AUTHORITY AND LEGAL JUDGMENTS

The methodological restriction on the sorts of explanations that can count as scientific turns out to have a salutary effect for legal proceedings as well as for science itself: Limiting research to what is repeatable, falsifiable, and testable means drawing conclusions that are empirically verifiable using sense data to which everyone has epistemic access. If one maintains a commitment to methodological naturalism (and therefore refuses, for purposes of conducting research, to consider any explanations other than those that are falsifiable through empirical observation and testing), then what is left as the basis for permissible inferences is equally

to what Haught termed “how” questions (“How do systems function?”), whereas religion transcends the material to ask “why” questions (“Why are we here?”). See *Kitzmiller*, 400 F. Supp. 2d at 735.

Methodological naturalism functions as a bar to scientific exploration of the “why” questions, even though scientific discoveries very often have consequences for how we think about those bigger metaphysical issues. So while research scientists may choose to comment on what they view as the philosophical or theological implications of their work, they do so not as scientists but as educated laity. Although they may not always be punctilious about informing their audience when they are doffing their lab coats to confront questions of faith and spirituality that they regard as partially illuminated by discoveries made in their professional capacities, science as a discipline requires them to draw a careful line between conclusions within the scope of scientific inquiry and those outside it. For an example of appropriate rigor in distinguishing between scientific findings and metaphysical views arising in part from nonscientific interpretations of those findings, see KENNETH R. MILLER, *FINDING DARWIN'S GOD: A SCIENTIST'S SEARCH FOR COMMON GROUND BETWEEN GOD AND EVOLUTION* (1999).

intelligible to everyone, at least in principle: We all have roughly the same capacity to observe, measure, and test, so we each, independently, have the ability to assess the validity and strength of any inferences drawn from the data. The upshot is that science has at its core a strong form of intersubjective validity: A conclusion based on evidence derived from research properly employing the scientific method inspires confidence because everyone can evaluate it using common and relatively easily applied criteria (namely, those that a scientific discipline sets for itself to test and potentially falsify hypotheses). And hence, there is never any need to take it on faith that an opinion or assertion is reliable.

Although science is enormously useful in its own right, and has the potential to inspire great confidence in decisions or courses of action grounded in it, I certainly do not mean to suggest that all invocations of science are inherently trustworthy, or that scientific fraud never occurs. Nor are courtroom misrepresentations (whether intentional or resulting from lawyers' or experts' ignorance or lack of preparation) less harmful when made by those claiming the mantle of scientific authority than when made by anyone else. Quite the contrary. If a legal system's legitimacy turns on the ability of stakeholders and others to evaluate evidence independently and satisfy themselves that judgments are fair, careful, and warranted in light of the evidence, the operative legal rules, and permissible forms of legal reasoning, then misrepresentations that play on judges' and jurors' lack of scientific acumen will distort factfinding and cast a pall over judgments, leaving parties and observers to worry that the legal system is inadequate to resolve disputes. Obtaining acceptably reliable judgments grounded in scientific-expert testimony thus turns out to depend, after all, on ascertaining the amount of respect that an expert witness's truth-claims ought to receive. But that calculus depends on the degree to which the evidence demonstrably bears the indicia of genuine science, and thereby takes advantage of the intersubjective validity that the scientific method provides—whatever one may think of science's ability to reveal truth in a metaphysical sense.

In his classic experiments on obedience to authority, psychologist Stanley Milgram showed how dressing an actor in a lab coat and introducing him as a research scientist could cause people from all walks of life, with all levels of education, to set aside their own judgment and afford deference—indeed, blind obedience—far beyond what reason, or even simple

decency, should have permitted.⁷ Confronted with the apparent authority and imprimatur of the scientific community, Milgram's test subjects would obey instructions to deliver harmful electrical shocks to another person.⁸ Believing that they were assisting in the conduct of an experiment, rather than that they themselves were the subjects of study, they would suspend compassion and all sense of moral responsibility, delivering shock after shock, in what appeared to be increasingly dangerous voltages, just because the fellow in the lab coat said that the scientific enterprise required their continuing participation.⁹

In the courtroom, this white-coat effect leads not to blind obedience, but to blind acceptance, though the effect is every bit as real—and in high-stakes cases, potentially every bit as pernicious. Technospeak alone may be quite enough to fool even well-educated nonscientists into thinking that there must be merit to what a witness is saying, even if the testimony is, in actuality, entirely vacuous. Judges and juries may suspend their reason, judgment, and basic common sense, accepting arrant nonsense as true just because the witness who delivers it looks and sounds like a bona fide scientist. Conversely, they may reject science of the highest caliber if the witness presenting it does not wear the mantle of scientific authority well: A genuine expert who tries too hard to speak plainly, or who simply does not cut an impressive figure in the witness box, may be unfairly dismissed as a hack or a fraud. What could cast greater doubt on the reliability and integrity of legal judgments than the realization that ordinarily skeptical people, empowered to make decisions about others' fates and fortunes, may base their decisions on unreflective acceptance of charlatanism supported by showmanship, ignoring solid research backed by training and experience?

Thus, the problem of institutional competence resurfaces, albeit at a different level of abstraction: What matters is not so much whether judges and juries can independently evaluate the data put before them, but whether they can truly grasp the nature of science itself in order to ascertain whether a statement of opinion should receive the respect that intersubjectively valid scientific findings do as foundations for

⁷ See generally STANLEY MILGRAM, *OBEDIENCE TO AUTHORITY* (1974).

⁸ See *id.* at 3-4, 16-19.

⁹ See *id.* at 3-4, 16-23.

authoritative judgments. The worry, then, is that if factfinders are not equipped to distinguish good chemistry or physics or genetics from bad, how much more difficult must it be for them to look beneath the particulars of slickly presented expert opinions in order to determine not just which side boasts the more convincing findings, but whether and to what extent each proffered expert is engaging in the scientific enterprise in the first place?

But limitations on judges' and juries' ability to parse and weigh scientific evidence notwithstanding, my own view is that the institutional-competence problem is not nearly so hopeless as we often suppose—in part because it turns out that courts are better at answering the philosophically rich question, "Is it science?" than at resolving the more pedestrian question, "Is it good science?"

One reason why is that the *Daubert* test¹⁰ offers a readily administrable formula for ascertaining whether an opinion counts as scientific, though not necessarily for determining the strength of particular scientific inferences and conclusions. Although courts applying the *Daubert* criteria routinely speak in terms of distinguishing good science from junk science (a term that encompasses both poor science and pseudoscience), what they are really doing, and what, as I read *Daubert*, the Supreme Court meant for them to be doing, is distinguishing between science qua science (empirical inquiry employing the scientific method), on the one hand, and nonscience (inferences and conclusions not derived from testable, repeatable, falsifiable observations), on the other. *Daubert* adopts and employs the scientific community's self-understanding about what science is, requiring the party proffering the expert witness to demonstrate that the data and opinions offered satisfy science's ground rules.¹¹ In the process, the *Daubert* test also brings to light the specific features of the evidence that the scientific community itself would use to assess the validity, reliability, and explanatory power of any purported findings;¹² but those added benefits are in a sense only incidental to the *Daubert* inquiry.

Although most commentators treat the *Daubert* test as though it was designed to address those second-order

¹⁰ See generally *Daubert v. Merrell Dow Pharm. Inc.*, 509 U.S. 579 (1993).

¹¹ *Id.* at 590.

¹² *Id.* at 590-95.

questions, that conventional view is inconsistent with both the test's specific features and the analytical approach that the Supreme Court took in formulating it. The Court did not, after all, try to define "good science" or "good enough science" according to some qualitative measure. It built the *Daubert* standard on a definition of "scientific knowledge"—the operative term in Federal Rule of Evidence 702—that the Court drew not from background legal principles or established court practices, but from the scientific community's own definition of science as methodological naturalism.¹³ Thus, the *Daubert* factors are, as formally stated, far better suited to discovering whether expert testimony is grounded in the scientific method than to deciding how much explanatory power an expert's findings actually have. Whether an expert's procedures or conclusions can be and have been tested and whether they have known or potential error rates are, for example, straightforward tests for determining whether an opinion is falsifiable—not whether it has been falsified. Had the Supreme Court meant to focus on the strength of the evidence rather than on its classification as scientific or nonscientific, the *Daubert* test surely would have required parties to show that their experts' proffered findings have withstood actual testing and that they provide substantial explanatory power with demonstrably low error rates. That testing is possible and that error rates can be calculated are certainly prerequisites to assessing the strength of the evidence the way that practitioners in the relevant scholarly field would; but in making the *Daubert* inquiry turn on the threshold question of testability rather than on the results of actual testing, the Supreme Court effectively instructed the lower

¹³ Relying principally on an amicus brief filed by scientific organizations, the Supreme Court breathed life into Rule 702's language by explaining:

The adjective "scientific" implies a grounding in the methods and procedures of science. Similarly, the word "knowledge" connotes more than subjective belief or unsupported speculation. . . . Of course, it would be unreasonable to conclude that the subject of scientific testimony must be "known" to a certainty; arguably, there are no certainties in science. . . . But, in order to qualify as "scientific knowledge," an inference or assertion must be derived by the scientific method.

Id. at 590 ("Science is not an encyclopedic body of knowledge about the universe. Instead, it represents a *process* for proposing and refining theoretical explanations about the world that are subject to further testing and refinement." (quoting Brief for the American Association for the Advancement of Science and the National Academy of Sciences as Amici Curiae in Support of Respondent, at 7-8, *Daubert*, 509 U.S. 579 (No. 92-102), 1993 WL 13006281)).

courts to ask “Is it science?” and not “Is it good science?” Similarly, publication in peer-reviewed journals and general acceptance in the scientific community demonstrate that the evidence is sound science that can be taken seriously;¹⁴ they do not measure the strength of, or confidence in, any reported effect. Insofar as either party goes ahead and provides test results, error rates, and the like, that information will, of course, be highly relevant to the admissibility determination under Rule 702 (or else to judgments about the evidence’s weight in the merits determination, if it is admitted). But those assessments of explanatory power speak only to whether and to what degree the evidence will be helpful to the trier of fact—a distinct consideration under Rule 702—and not to whether the evidence counts as scientific knowledge in the abstract.

Courts as institutions are, as it turns out, quite well suited to conducting the “Is it science?” inquiry that *Daubert* mandates. The weaknesses ascribed to their handling of scientific evidence become relevant, if at all, only at the second-stage assessment—whether the evidence is sufficiently strong to be useful to the factfinder if admitted—or in weighing the evidence at trial. In part, courts do a decent job performing the threshold inquiry because the standards that *Daubert* imposes do not require understanding all the ins and outs of any particular scientific claim. But beyond that, adversary court proceedings allow for, and indeed encourage, litigants to get at the heart of what science is—to educate the factfinder about the scientific method—in order to show whether the evidence being offered passes muster as science. Although litigants who take the additional pains to show how the scientific community would evaluate the strength of their experts’ findings may well invite more refined analysis of the probative value of their evidence, the fact that courts may often accept those invitations should not blind us to how much intersubjective validity the threshold inquiry embodied in *Daubert* alone provides. In all events, the basic determination that some opinion is scientific is a prerequisite to any second-order tests for greater intersubjective validity that a court may choose to employ.

To illustrate the point, let me draw on my experience litigating the intelligent-design case—*Kitzmiller v. Dover Area*

¹⁴ See, e.g., SUSAN HAACK, DEFENDING SCIENCE—WITHIN REASON 107 (2007); WORKING PARTY ON EQUIPPING THE PUBLIC WITH AN UNDERSTANDING OF PEER REVIEW, PEER REVIEW AND THE ACCEPTANCE OF NEW SCIENTIFIC IDEAS 2-3, 7-10 (2004), available at <http://www.senseaboutscience.org.uk/index.php/site/project/33>.

*School District*¹⁵—as the *Kitzmiller* trial and the decision that came out of it bring into sharp relief the difference between the “Is it science?” and “Is it good science?” inquiries. *Kitzmiller* involved a battle of experts over whether intelligent design is a scientific theory or a nonscientific, religious view—though with a substantial measure of the good-versus-bad-science debate thrown in.¹⁶ The Supreme Court had long since held that the Establishment Clause prohibits teaching creationism (a religious view) in public schools, even if that view is dressed up to look like science.¹⁷ So one of the two central questions in *Kitzmiller* was whether intelligent design is simply a repackaging of creationism to look like a scientific claim.¹⁸ The Dover school district tried to recast the controversy, however, as an internecine dispute among scientists about whether intelligent design is good or bad science, without worrying overmuch about how anyone might think that supposed debate would turn out. Indeed, the school district’s expert witnesses themselves contended only that intelligent design is science in its infancy, with one characterizing it as no better than “fringe science.”¹⁹ As a litigation strategy, that approach was entirely rational. The school district did not need to make any more robust claims about intelligent design because while the Establishment Clause forbids teaching religion in public schools, it places no restriction on teaching science (no matter how poor or misguided or flaky that science might be). So the claim that intelligent design is science would, if true, have gone a long way toward insulating the school district’s actions from constitutional challenge.²⁰

¹⁵ 400 F. Supp. 2d 707 (M.D. Pa. 2005).

¹⁶ See *id.* at 716-23, 735-46.

¹⁷ *Edwards v. Aguillard*, 482 U.S. 578, 597 (1987) (striking down a statute requiring public schools to teach “creation science” if they teach evolution).

¹⁸ *Kitzmiller*, 400 F. Supp. 2d at 711-12. The other issue central to the case was whether the Dover school board had a religious objective when it added intelligent design to the school district’s biology curriculum. *Id.* at 762-63. Both questions mattered because, under the Establishment Clause, governmental action is unconstitutional if either its primary purpose or its primary effect is to advance religion. *Edwards*, 482 U.S. at 582-83 (citing *Lemon v. Kurtzman*, 403 U.S. 602, 612-13 (1971)).

¹⁹ *Kitzmiller*, 400 F. Supp. 2d at 738.

²⁰ It would not have done so absolutely, however, because a decision to teach or to refrain from teaching even genuine science would violate the Establishment Clause if the reason for the choice was school officials’ desire to tailor the science curriculum “to the principles or prohibitions of any religious sect or dogma.” *Epperson v. Arkansas*, 393 U.S. 97, 106 (1968).

In a thorough, carefully reasoned opinion that has earned praise from both the scientific and legal communities, Judge John E. Jones III of the United States District Court for the Middle District of Pennsylvania found that intelligent design does not obey science's methodological ground rules, but instead invokes divine causation: It explains the diversity of life on earth by saying, in essence, that "God did it."²¹ Hence, intelligent design is not science, good or bad, mainstream or fringe; it is, the court concluded, a religious view.

What *Kitzmiller* shows in spades is that the adversary system and the rules of evidence serve incredibly well to allow lawyers and expert witnesses to inform judges and juries about what science is and how it works, so that the factfinders, in turn, can make at least gross distinctions to screen out nonscientific beliefs dressed up to look like science.²² As Margaret Talbot explained in an account of the *Kitzmiller* trial published in the *New Yorker*:

You sometimes hear it said that a courtroom is not a proper venue for debating science. In this case, it proved to be an ideal forum. . . .

²¹ See, e.g., *Kitzmiller*, 400 F. Supp. 2d at 718-22.

²² To be sure, Judge Jones's opinion in *Kitzmiller* did not just make gross distinctions. Quite the contrary; I am told that *Kitzmiller* is now required reading in many undergraduate- and graduate-level science courses, not just because of its clear explanation of the basics of evolutionary biology, but also because of its precise exposition of the nature of science itself.

Courts need not, however, speak in every case involving scientific-expert testimony (or its pseudoscience counterpart) with the precision and detail that the *Kitzmiller* court did. As argued above (*see supra* Part II), the degree to which courts must explain and publicly justify their judgments turns, at least in part, on the importance and the publicity of the case. The stakes in *Kitzmiller* were extraordinarily high: Against a national movement to market intelligent-design creationism to public schools, to state boards of education, and to legislatures, there stood eleven parents who were not only vindicating their own right to decide what religious education their children would receive, but also acting as proxies for concerned parents and defenders of science everywhere. With so much on the line for so many, on both sides of the issue, the court's legitimacy to decide the case, and thereby to take a step toward quelling the larger culture clash over science education and religious control, depended on Judge Jones's issuing an opinion that would provide an almost unprecedented level of public justification for the ruling. *See Katskee, supra* note 4, at 158-61.

Those in the intelligent-design movement who have since chided Judge Jones for saying too much understood perfectly well what was at stake; they simply wished to avoid a definitive legal ruling that might undercut their ongoing attempts to foment social controversy. *See* DAVID K. DEWOLF ET AL., TRAIPSING INTO EVOLUTION: INTELLIGENT DESIGN AND THE KITZMILLER VS. DOVER DECISION 7-57, 74-76, 79-92 (2006); Brief of Amici Curiae Biologists and Other Scientists in Support of Defendants, *Kitzmiller*, 400 F. Supp. 2d 707, at 6, available at <http://www.discovery.org/scripts/viewDB/filesDB-download.php?command=download&id=558>; (Revised) Brief of Amicus Curiae, the Discovery Institute, *Kitzmiller*, 400 F. Supp. 2d 707 (No. 04cv2688), at 11-12, 20 n.30, available at <http://www.discovery.org/scripts/viewDB/filesDB-download.php?command=download&id=646>.

The trial . . . allowed the lawyers to act as proxies for the rest of us, and ask of scientists questions that we'd probably be too embarrassed to ask ourselves. In a courtroom, you must lay an intellectual foundation in order to earn a line of questioning—and so the lawyers stripped matters neatly back to the first principles of science.²³

What Talbot found so compelling was that, far from misleading the court about science, the parties' presentations of expert testimony in an adversary proceeding informed by the principles in *Daubert* revealed the nature and core characteristics of science and scientific truth, thus allowing the court (and everyone else) to assess whether the intelligent-design movement could legitimately claim to be a scientific enterprise.²⁴

The fact that the legal proceedings worked so well to expose intelligent design as a nonscientific, religious view resting on belief in a supernatural creator is an especially strong indicator of what courts and the adversary system can accomplish. After all, the intelligent-design movement's grand strategic plan—its *raison d'être*—is to recast religious belief as a simulacrum of science in the hope that judges will have neither the skill nor the patience to look behind the façade.²⁵ If an adversary proceeding applying *Daubert*-type criteria could prove so effective for stripping away that façade, built up over

²³ Margaret Talbot, *Darwin in the Dock: Intelligent Design Has Its Day in Court*, NEW YORKER, Dec. 5, 2005, at 66.

²⁴ I should note that there were no *Daubert* hearings in *Kitzmiller*. The court's first opportunity to evaluate the reliability of the expert testimony came during the six-week bench trial. But while neither party formally invoked *Daubert*, the *Daubert* factors were the subtext of both sides' expert cases because *Daubert* so effectively encapsulates the scientific community's own understanding of what science is.

The school district did challenge the testimony of Barbara Forrest, a philosopher and social historian who gave expert evidence for the plaintiff-parents about the history and character of the intelligent-design movement. The school district's counsel sought, unsuccessfully, to discredit Dr. Forrest in order to try to persuade the court to exclude her testimony about the movement's inherently religious aims and strategic plan. See Defendant's Brief in Support of Motion *in Limine* to Exclude the Testimony of Barbara Forrest, Ph.D., at 1, *Kitzmiller*, 400 F. Supp. 2d 707 (No. 04-CV-2688), 2005 WL 3628818. But neither party made any attempt to exclude any scientific—or putatively scientific—testimony.

²⁵ As the *Kitzmiller* court found, and as many of us have explained elsewhere, intelligent-design creationism is a repackaging of so-called creation science (itself a repackaging of straightforward biblical creationism) to try to overcome the Supreme Court's ruling in *Edwards*, which prohibited the teaching of creation science in public schools. See *Kitzmiller*, 400 F. Supp. 2d at 722; BARBARA FORREST & PAUL R. GROSS, CREATIONISM'S TROJAN HORSE: THE WEDGE OF INTELLIGENT DESIGN (2004); Matthew J. Brauer, Barbara Forrest & Steven G. Gey, *Is It Science Yet? Intelligent Design Creationism and the Constitution*, 83 WASH. U. L.Q. 1, 22-23 (2005); Katskee, *supra* note 4, at 141-50.

decades by a dedicated and well-funded cadre whose sole objective was to deceive courts, legislatures, and the public into accepting a nonscientific, religious belief as a scientific truth-claim (so that religion could then be slipped into public-school curricula), surely it is not too much to expect courts in general to uncover the far less sophisticated attempts to portray nonscientific views as science that parties might cook up on the fly and try to spoon-feed to a judge or jury in a single case.

There is also a simpler reason why the institutional-competence problem is not so serious as many suppose—one that brings me back to my initial focus on courts' institutional objective. Even if courts may not infallibly identify the best science when they are confronted with genuine disputes in which both sides properly invoke the scientific method and competing scientific truth-claims may appear to be in something close to equipoise, that limitation does not preclude courts' fulfilling their social function. If, as argued above, the point of a legal system is to resolve disagreements sufficiently fairly and reliably to ensure that people continue resorting to lawsuits rather than guns, even when they find themselves embroiled in disputes serious enough to threaten social stability, entirely correct decisions are not required in every instance. Nor, of course, can they reasonably be expected: Although ensuring perfect judgments all the time is an admirable aspirational goal, we all recognize that perfection of that sort is not possible for any human institution. Courts must do a decent job screening out pseudoscience—that is to say, nonscience posing as science—because it provides no basis for the shared understanding that leads to trust in judgments. But as long as courts achieve the far more modest aim to foster that trust, the rulings that they issue, after weighing legitimate but competing scientific claims and applying recognized modes of legal reasoning, will have sufficient intersubjective validity to make the judgments acceptable to most people most of the time. In that case, courts will be able to fulfill their basic social function to manage conflict, irrespective of whether they parse scientific claims exactly right in any particular case—much less whether they invariably and infallibly discover ultimate truth.