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McLean and *Kitzmiller*

Locating Constitutional Permissibility in the Objectivity of Science

McLean v. Arkansas and *Kitzmiller v. Dover School Board* both respectively represent a continued trend in US courts to use the Establishment Clause of the First Amendment of the Constitution as a means to restrict what can and cannot be taught in public schools. Interestingly, while the Establishment Clause was intended to explicitly identify and restrict the role of religion in government, it has increasingly been used as a means by which courts may "safe-guard" the public from impingements of religion by distinguishing not simply between religion and non-religion, but, as it was appealed to in both *McLean* and *Kitzmiller*, between religion and science.

In evaluating the decisions reached by the courts in *McLean* and *Kitzmiller* this paper will assess the role of the Establishment Clause of the First Amendment as it was appealed to in both cases as well as explore the complications that arise for courts when justices appeal to and construct criteria to assess legal questions appropriated from knowledge bases outside of legal discourse. Though both the *McLean* and *Kitzmiller* courts sought to identify objective tests and apply them in order to discern whether or not the science curriculum in question violated the Establishment Clause, the apparent objectivity of the criteria the courts adopted deserves further scrutiny. It seems apparent, as our assessment of the *McLean* and *Kitzmiller* decisions will reveal, that adopting criteria for assessment from areas outside of the law and then attempting to use such criteria to resolve legal questions may imbue appropriated frameworks from areas outside of the law as more relevant/determinable/objective tests of what is of legal consequence than they ought be endowed with.

Our investigation will focus on the findings of the *McLean* and *Kitzmiller* courts, paying particular attention to the criteria that each court constructed in order to assess whether or not teaching creation science (*McLean*) or intelligent design *(Kitzmiller*) in public school science classes violated the Establishment Clause. Our investigation will then proceed to examine the criteria for science established in the decisions as acts of boundary-work performed by justices Overton and Jones. In reading the decisions as acts of boundary-work we will proceed to examine the limitations and possible problems of justices performing boundary-work premised on criteria for what is and is not science when such criteria are borrowed from communities of science whose particular stake in maintaining "ownership" over what may or may be considered to be "science" to extents necessarily precludes them from being a purely "objective" means by which the courts may assess the claims before them. In concluding our assessment of the *McLean* and *Kitzmiller* decisions focus will shift from the problems inherent to the particular sort of boundary-work performed by justices Overton and Jones to problems inherent to judicial postures that presume that courts might become more objective in their decisions is science's standards of proof (a mixing of legal and scientific boundary-work) are appropriated.

McLean v. Arkansas

At issue in *McLean v. Arkansas* was the constitutional validity of Act 590, entitled the "Balanced Treatment for Creation Science and Evolution-Science Act" of 1981. Passed by Arkansas legislators and later signed into law by the Governor, Act 590 stipulated that wherever "evolution-science" was taught, so too would "creation-science" be taught. As was stipulated in Act 590, and as was later argued on behalf of the state:

> [P]ublic school presentation of only evolution-science without any alternative model of origins abridges the United States Constitution's protections of freedom of religious exercise and of freedom of belief and speech for students and parents, because it undermines their religious convictions and moral or philosophical values, compels their

> unconscionable professions of belief, and hinders religious training and moral training by parents.[1]

As the state of Arkansas argued in *McLean*, Act 590 was an attempt by the school board to ensure the academic freedoms and free expression of beliefs of both students and teachers. They saw the introduction/inclusion of creation-science as a way to better represent both the beliefs/philosophies of community members being served by the school district as well as a way to counter-balance the sectarian nature of evolution only science instruction (on the basis that teaching evolution-science up to this point had not allowed for the presentation of any "alternative" theories for origins within the classroom).[2]

Within the history of the creation vs. evolution debate, Act 590 marks a departure from the creationist strategies of legislating the illegality of teaching evolution science within public schools (as was argued in the *Scopes* trial). Instead of challenging evolution head-on, Act 590 was an attempt to argue for the "equal treatment" or consideration of creation science along-side evolution science within public school classrooms. As was stipulated in the "Legislative Findings of Fact" section of Act 590, "only evolution-science is presented to students in virtually all of those courses that discuss the subject of origins. Public schools generally censor creation-science and evidence contrary to evolution." For the Arkansas legislature, it seemed (at least as purported in Act 590) that *not teaching* creation-science in public schools, along side evolution-science, seemed to in effect register the government's tacit approval of evolution-science as the only acceptable "model of origins" (Section 7, e, Act 590).

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[1] Section 7, e, Act 590

[2] The purpose behind Act 590, at least according to the text of the Act, was understood as being a secularly based one. As revealed in the text of Act 590, the legislature stipulated that:

> This Legislature enacts this Act for public schools with the purpose of protecting academic freedom for students' differing values and beliefs; ensuring neutrality toward students' diverse religious convictions; ensuring freedom of religious exercise for students and their parents; guaranteeing freedom of belief and speech for students; preventing establishment of Theologically Liberal, Humanist, Nontheist, or Atheist religions; preventing discrimination against students on the basis of their personal beliefs concerning creation and evolution; and assisting students in their search for truth. This Legislature does not have the purpose of causing instruction in religious concepts or making an establishment of religion.
>
> (Section 6, Act 590)

Justice Overton's Decision

In his decision in *McLean* Justice Overton ruled that Act 590 was unconstitutional because it violated the Establishment Clause of the First Amendment. In *McLean* the constitutional validity of Act 590 was contested on three grounds:

1. That Act 590 constitutes an establishment of religion prohibited by the First Amendment to the Constitution, which is made applicable to the states by the Fourteenth Amendment.
2. The Act violates a right to academic freedom which, as the plaintiffs contend, is guaranteed to students and teachers by the Free Speech Clause of the First Amendment.
3. The Act is impermissibly vague and thereby violates the Due Process Clause of the Fourteenth Amendment.

In his decision, Justice Overton focused on the first two of the three contested grounds, namely those which concerned themselves with interpreting whether or not creation-science, as presented in Act 590, constituted a violation of the Establishment Clause of the First Amendment. In order to determine whether or not Act 590 violated the Establishment Clause, Justice Overton elected to build of a comprehensive definition of science, or rather an ontology of what can be considered to be science, so that he could discriminate science from non-science (and within the context of *McLean* identify non-science as religion, which would consequently reveal an inherent violation of the Establishment Clause).

As a basis for his finding, Overton provided a specific definition of science as a basis for finding that "creation-science" was indeed religious pedagogy and not a "legitimate" science, thus violating (in his logic) the Establishment Clause of the First Amendment. In his decision Overton defined the "essential characteristics of science" as being that it:

1. Is guided by natural law.
2. Is explanatory by reference to natural law.
3. Is testable against the empirical world.

4. Its conclusions are tentative, i.e. are not necessarily the final word.
5. Is falsifiable.

Specifically, Overton argued that "creation-science" failed to be a "science" because it failed each and every one of the "essential characteristics of science." As Overton argued:

1. Creation-science is not governed by natural law, as it appeals to a removed supernatural creator who intervenes in the actual world.
2. Creation-science is not entirely explained through natural law, because of its appeals to a supernatural creator.
3. It is not testable against the empirical world because the supernatural status of a creator necessarily (logically) removes it from being considered and "tested" by scientists in a way similar to certain claims of evolution-science.
4. Creation-science necessarily holds itself as the "final word" on creation. It, as a theory, is not open to interpellation at any point in time. The theory itself is based upon the premise that a supernatural being enacted creation. This one first-principle is not open to scrutiny, it must merely be accepted *prima facie*.
5. Creation-science is not falsifiable. Overton points out many of the claims of creation-science that are not falsifiable, but the major failure of the fasifiability test is that creation *ex-nihilo* is not in his words "science"[3] and is thus not "falsifiable."

Of key interest in Overton's ruling in *McLean* is his use of his definitive characteristics of "science" as a way for gleaning for the Court exactly what may be properly considered science. While Overton's Constitutional basis for finding Act 590 unconstitutional appeals directly to the text of the First Amendment (in that it directly references that religion cannot have a place in the government [or in our specific case public schools]), he determines exactly what may be considered "religion" (and thus what is confined by the Establishment Clause) by first determining what is "science."

[3] Not science in that it relies upon supernatural intervention, not an appeal to natural law.

Kitzmiller v. Dover School Board

Kitzmiller v. Dover School Board was the first direct challenge brought in the United States federal courts against a public school district that required the presentation of Intelligent Design[4] as an alternative explanation of the "origin of life." The case hinged upon the plaintiffs successfully arguing that Intelligent Design is a form of Creationism[5], which the Court earlier found unconstitutional to teach in public schools, and that because of this linkage the school board's policy was in clear violation of the Establishment Clause of the First Amendment.

Content of the Policy

On November 19th, 2004 the Dover Area School District issued a press release that stated starting January of 2005 teachers in the district would be required to read a prepared statement to students in ninth-grade biology classes.[6] The statement read:

> The Pennsylvania Academic Standards require students to learn about Darwin's theory of evolution and eventually to take a standardized test of which evolution is a part.
>
> Because Darwin's Theory is a theory, it is still being tested as new evidence is discovered. The Theory is not a fact. Gaps in the Theory exist for which there is no evidence. A theory is defined as a well-tested explanation that unifies a broad range of observations.
>
> Intelligent design is an explanation of the origin of life that differs from Darwin's view. The reference book, *Of Pandas and People* is available for students to see if they would like to explore this view in an effort to gain an understanding of what intelligent design actually involves.

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[4] Intelligent Design was defined by the school board simply as "an explanation of the origin of life that differs from Darwin's view."
[5] *Edwards v. Aguilar* (1987)
[6] The Dover Board of Education (school board) was the organization that passed the resolution enstating the policy.

> As is true with any theory, students are encouraged to keep an open mind. The school leaves the discussion of the origins of life to individual students and their families. As a standards-driven district, class instruction focuses upon preparing students to achieve proficiency on standards-based assessments.

The press release, and the content of it as well as the suggested change in curriculum had originally been assessed by the Dover Board of Education on October 18th, 2004. The board at that time voted 6-3 in favor of adding an addendum statement to their biology curriculum. That statement read:

> Students will be made aware of the gaps/problems in Darwin's theory and of other theories of evolution, including, but not limited to, intelligent design. Note: Origins of life is not taught.

Key to note in the *Kitzmiller* case is that though the Dover Board of Education did move to implement the reading of the first mentioned statement before ninth-grade biology instruction, the Board did not move to allocate actual class time to the teaching of Intelligent Design, nor did it reallocate any major sources of funding to pay for additional texts that advocated only Intelligent Design.

Justice Jones' Decision

On December 20th, 2005 Justice Jones found for the plaintiffs, and ruled the statement on Intelligent Design and Evolution as passed by the Dover Board of Education was unconstitutional, as it violated the Establishment Clause of the First Amendment. For Justice Jones, "the religious nature of ID [intelligent design] would be readily apparent to an objective observer, adult or child." While Intelligent Design, as defined in the statement from the Board, was contended to be "another theory of origins" that simply differed from "evolution," Justice Jones postulated in his decision that Intelligent Design was essentially a religious argument or

model for creation/origins, and thus, being *essentially* a religious argument was not a valid, constitutionally sound[7], theory of origins.

Specifically, as Justice Jones pointed out, Intelligent Design fails as an acceptable "scientific" theory because of its apparent reliance upon religious doctrine to supplement its secular claims and its essential likeness to creationism. Interestingly, the major factor considered by Justice Jones was not whether the claims of Intelligent Design had any apparent "truth value,"[8] but rather how the claims of ID (as they were contrasted with evolution [evolution used as a paradigm of what may be considered to be "scientific"]) were (presumably) derived/inferred.

For Justice Jones Intelligent Design "fails on three different levels, any one of which is sufficient to preclude a determination that ID is science." The three failures were outlined by Jones as being:

1. That ID violates the centuries-old ground rules of science by invoking and permitting supernatural causation;

2. That the argument of irreducibility, central to ID, employs the same flawed and illogical contrived dualism that doomed creation science in the 1980's; and

3. That ID's negative attacks on evolution have been refuted by the scientific community."[9]

Key to the "three failures" of Intelligent Design as delineated by Jones, is the notion of "scientific scrutiny." Intelligent Design's three failures are essentially failures because they mark the points at which Intelligent Design, as a theory, is decoupled from proper edification through scientific scrutiny. Specifically, as Jones claims:

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[7] "Constitutionally sound" in that the theory itself does not violate the Establishment Clause (e.g.: is not an attempt to bring religion or to favor religion [or one religion specifically] in into public education/curriculum).

[8] To quote Justice Jones, "After a searching review of the record and applicable caselaw, we find that while ID arguments may be true, a proposition on which the Court takes no position, ID is not science."

[9] Pg. 64

> ID's backers have sought to avoid the scientific scrutiny which we now determined that it cannot withstand by advocating that the *controversy*, but not ID itself, should be taught in science class. This tactic is at best disingenuous, and at worst a canard. The goal of the IDM[10] is not to encourage critical thought, but to foment a revolution which would supplant evolutionary theory with ID.[11]

As Jones' determined, the Board's attempt to introduce the Intelligent Design controversy was not a matter of, as they purported, making students aware of an ongoing controversy within a particular subject, but rather an attempt to use the (supposed) controversy as a means by which Intelligent Design can gain backdoor-entry into public school "science based" curriculum.

In assessing the "controversy" that Jones felt was "innate" to the Intelligent Design model/argument, Jones choose to apply the "*endorsement test*[12] as well as the *Lemon tests*[13]

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[10] IDM is Justice Jones' abbreviation of "Intelligent Design Movement."

[11] Pg. 89

[12] The *establishment test* was proposed by Justice Sandra Day O'Connor in *Lynch v. Donnelly* (1984). The test essentially aims at determining whether a particular government action amounts to an endorsement of religion (which would violate the Establishment Clause of the First Amendment). Key to the application of the test is the understanding that a government action would be invalid/unconstitutional if it "creates a perception in the mind of a reasonable observer that the government is either endorsing or disaproving of religion." To quote Justice O'Connor in *Lynch*: "The Establishment Clause prohibits government from making adherence to a religion relevant in any way to a person's standing in the political community. Government can run afoul of that prohibition...[by] endorsement or disapproval of religion. Endorsement sends a message to nonadherents that they are outsiders, not full members of the political community, and an accompanying message to adherents that they are insiders, favored members of the political community."

[13] In *Lemon v. Kurtzman* (1971) the Court's decision was partially based upon a newly constructed measure for governmental interest in cases concerning religion, formed for the first time in *Lemon*. The requirements of legislation concerning religion, as denoted in the Lemon test, consist of three prongs:

1. The government's action must have legitimate secular purpose;
2. The government's action must not have the primary effect of either advancing or inhibiting religion;
3. The government's action must not result in an "excessive government entanglement" with religion.

[sic]" as a measure of whether or not "the facts of this case ma[de] it abundantly clear that the Board's ID Policy violate[d] the Establishment Clause."[14]

After application of both the endorsement test and the Lemon test, Jones concluded that Intelligent Design failed both tests. Significantly Jones asserted that:

> [I]n making this determination, we have addressed the seminal question of whether ID is science. We have concluded that it is not, and moreover that ID cannot uncouple itself from its creationist, and thus religious, antecedents."[15]

Thus, for Jones, an application of the establishment and Lemon tests to Intelligent Design in effect go beyond simply determining that Intelligent Design lacks a secular purpose (one of the prongs of the Lemon test for example), but, and key to our interest in assessing that which is "not-religion" as being *defacto* "science," allow for us to postulate if the "secular interest" truly conforms to the restrictions of the Establishment Clause. Reading Jones' decision closely, it is the Court's finding that because Intelligent Design fails the establishment test and the Lemon test that it is not deemed "science." And, conversely, it is because evolution does not fail the establishment test and the Lemon test that it is deemed "science."

Demarcation and Boundary-Work in *McLean* and *Kitzmiller*

The law necessarily draws boundaries between what is of legal consequence and what is not. It would be, if we take into consideration the task of the courts in *McLean* and *Kitzmiller,* impossible for them to determine whether or not the science curriculum in question were unconstitutional as per the Establishment Clause if they were unable to draw a distinction

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The Lemon test is essentially based upon the Establishment Clause of the First Amendment. It any of the three prongs of the Lemon test is violated, then the government's action would be deemed unconstitutional.

[14] Jones conclusion

between what may properly be construed as a scientific theory and what inherently constitutes religious belief. In efforts to more thoroughly assess the decisions reached by justices Overton and Jones this section will aim at exploring the manner in which the judges constructed what will be referred to as the religion/science dichotomy, and in what ways the dichotomy was appealed to as an objective test that could assess the constitutionality of the two science curricula brought before the courts. The last part of this section will focus upon whether or not the religion/science dichotomy can be properly considered an entirely "objective" test and question whether there are any inherent drawbacks to the application of such a test.

Limits of the religion/science dichotomy test:
Boundary-work and Reassessments of Objectivity

In considering the decisions put forth in *McLean* and *Kitzmiller* it is readily apparent that justices Overton and Jones perform acts of boundary-work. Further, it seems as if performances of boundary-work are necessary in these cases if the courts are to evaluate whether or not the curriculum in question is unconstitutional. Conceding that boundary-work is necessary in these cases, however, is not to maintain that the particular acts of boundary-work performed by the justices best serve the ends/concerns stipulated by the courts. If we specifically look to the criteria for science adopted by justices Overton and Jones in hopes that such criteria might aptly differentiate that which is science from that which is mere religious belief the apparent limitations and even failings of the justices' boundary-work is made apparent.

The US Constitution expressly establishes a separation between church and state, a separation that necessarily prohibits religious beliefs from being inculcated through curriculum adopted by public schools. That said, the Establishment Clause does not itself provide justices with a set criteria that may be used to make determinations of what is or is not religious belief. Absent a ready-made test, justices Overton and Jones constructed sets of criteria that they held a true "scientific theory" would *necessarily* meet. Framed in this way, that which was determined by the courts to be a criteria/characteristic of "science" was held to necessarily be absent in "unscientific" theories, namely "religion." Thus the religion/science dichotomy was established

as the "objective" test for determining whether or not the proposed science curricula violated the Establishment Clause.

While both Justice Overton and Justice Jones posture in their decisions that they have objectively considered whether or not the contested theories in the science curricula are "scientific," their means of examination, the science/religion dichotomy, is not, in a truly expansive sense, "objective." As both justices acknowledge in their decisions, what (in their own minds) differentiates "scientific theory" from mere "religious belief" is the inherently objective nature of science's ontology. Science, for both justices, is deemed to be that which is subject to public rebuke (ie: it is falsifiable, revisable, and testable against the empirical world), while religious belief is that which is beyond reproach (simply accepted as the "final word" and never revisable). The work, however, that each justice performs in formulating a set of criteria that true "scientific theories" necessarily meet seems, however, to necessarily undermine the justices' claim that their test(s) serve to identify theories of the beginning of life that are "objective" accounts (and as such are constitutionally permissible). Simply put, if the only reason why theories deemed to be "scientific" in nature are not prohibited from being included in curricula in public schools is that such theories provide "objective" accounts of the beginning of life (while "religious" theories fail to be demonstrably "objective" *enough*) all that must be determined to strip such theories of their "objectivity" is the determination that their referenced "objectivity" is not fixed in their nature (which would strip such theories of the characteristic that qualifies them as permissible/acceptable to be taught in public schools under the Establishment Clause).

The mistake that justices Overton and Jones make in determining that the salient feature that marks scientific theories as appropriate is the objectivity of scientific theories/inquiry is that they locate objectivity in these theories as characteristics inborn to the theories themselves. In this sense, scientific theories are considered to be objective because it is *in their very nature to be objective.* Objectivity, however, as many sociologists of science would contend, is not a characteristic inborn to scientific theories, and precluded to all others that fail to meet the criteria

of objectivity in all possible worlds[16], it is instead that which is *ascribed* to scientific theories in the social sphere, shaped by what sociologist of science Thomas Gieryn terms as "boundary-work."[17]

Boundary-work, as conceptualized by sociologist of science Thomas Gieryn, is a term that is used to refer to instances in which boundaries, demarcations, or other divisions between fields of knowledge are created, advocated, attached, or reinforced.[18] Boundary-work has no ultimate (essential) principle that guides it. Instead it is a time and/or place dependent framework that serves to reify a particular set of beliefs/claims as parts of consistent systems of belief that reflect specific interests and/or biases.[19] In performing boundary-work, an actor differentiates and affirms the existence of a distinction between that which belongs to the set system of beliefs, and that which by definition is excluded.[20]

As per Gieryn, there exists a philosophical difficulty in discerning a "rigorous delineation" between that which is considered to be "science" and that which falls short of such a distinction.[21] Insofar as there is no, in Gieryn's framework, distinct "knowable" feature inborn to that which is considered science and that which is not for Gieryn acts of boundary-work serve themselves to inhere the "attribution of selected characteristics" to institutions (institutions including things such as a specified set of practitioners, methodologies, and knowledge base) that serve the purpose of delineating a social boundary which, in effect, picks out particular areas of knowledge/activities as necessarily outside the institution in question.[22] Thus institutions are defined in opposition to activities, pursuits, or knowledge bases that fall outside their own boundaries. In this way defined by their oppositional relationship to all those institutions (those institutions' respective beliefs, methodologies, practitioners, and knowledge base), the

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[17] Thomas F. Gieryn, "Boundary-work and the demarcation of science from non-science". American Sociological Review 48 (1983): 781-795.
[18] *Ibid.*
[19] *Ibid.*
[20] *Ibid.*
[21] This is known as the "problem of demarcation."
[22] *Ibid.*

boundaries that mark an institution as different from other institutions become grounds for, and encourage the further erection of boundaries of a means of manifesting, claims of "objectivity."[23]

That science, an institution like any other in the social sphere, claims "objectivity" as uniquely its own, laying claim to such status by way of excluding and defining itself in opposition to institutions that are "not objective" (that are "not science") does not, as per Gieyrn, bespeak of its *inherent* or *natural* "objectivity."[24] When, as they posture in their decisions, the justices appeal to the "scientific community" at large for their "expert" opinion on questions of "what is" science they are not in any real sense taking steps to uncover the "nature" or "character" of objectivity incarnate. Through the identification of and drawing of boundaries between oppositionally defined institutions (manifested in the courts' turning to scientists and asking scientists to define why science is inherently objective), the justices have taken steps to merely reaffirm and re-ascribe "objectivity" unto science without ever actually submitting its *claims* of objectivity to actual scrutiny (lack of scrutiny, notably, being a commonly identified reason why theories deemed to be "religious belief" are not "objective"). In these instances, the boundary-work of the courts identifies and picks out (that which is determined to be "credible") testimony of experts that, belonging to the community of science, are necessarily deemed to provide "objective" accounts of the nature of science and scientific inquiry (such persons have, as Gieryn contends, a "stake" in the maintaining of their respective institution's boundaries[25]) from which the courts piece together what it holds to be characteristics of theories that are *properly* objective. In performing such work, the courts, when they attempt to consider creation-science or intelligent design as "science",[26] are from the beginning of their inquiry destined to determine that any thing or theory that the general scientific community does not determine/recognize as part of the institution itself is not, for the court's purposes, properly "objective." Is this not somewhat inherently problematic?

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[23] *Ibid.*
[24] *Ibid.*
[25] *Ibid.*
[26] By judging as "science" I mean to describe courts' attempts at considering whether or not either alternative theory of the beginnings of life may be determined to be "objective" and thus not constitutionally prohibited from inclusion in the curricula of public schools as per the Establishment Clause.

Concluding Thoughts on *McLean* and *Kitzmiller*

Key to the findings in both *McLean* and *Kitzmiller* is the ability of the court to discriminate between what is religion, and what is not-religion. Though *McLean* deals explicitly with creation-science and *Kitzmiller* deals with Intelligent Design, justices Overton and Jones were both tasked with determining, and in determining developing a test by which to one may determine, what is, for the intents and purposes of the Establishment Clause of the First Amendment, "religion."

I believe it is interesting to note that both justices set up an "either-or" argument for the status of religion as it relates to science. In both *McLean* and *Kitzmiller*, the court first sets out to define science, and from that position consequently define religion as that which "fails" (quite literally as worded in both Overton's and Jones' opinions) to qualify as science. While at the end of the day the Establishment Clause is worded as a protection of the state from religion, and religion from the state, the courts based their findings not upon the presence of religion *prima facie*, but as what logically *must* be religion if it is first determined to *not* be science. While, in principle, each justice phrased his decision as a finding of the unconstitutional nature of Act 590 (*McLean*)/ the resolution of the Dover Board of Education (*Kitzmiller*) as an intrusion of religion into public schools, these intrusions are only "intrusions" insofar as religion may be defined as that which is necessarily defined in opposition to science.

Further Problems with Judicial Reliance upon "Objectivity" as Revealed in Boundary-Work:

The Problem of Justices Becoming Amateur Scientists and Appropriated Standards of Proof

In his dissent to the Supreme Court's majority opinion in *Daubert v. Merrell Dow Pharmaceuticals, Inc.* late Chief Justice William Rehnquist voiced a concern that followers of the court have long harbored.

> The various briefs filed in this case are markedly different from typical briefs, in that large parts of them do not deal with decided cases or statutory language—the sort of material we customarily interpret. Instead, they deal with definitions of scientific knowledge, scientific method, scientific validity, and peer review—in short, matters far afield from the expertise of judges[…]. The unusual subject matter should cause us to proceed with great caution in deciding more than we have to, because our reach can so easily exceed our grasp.[27]
>
> Chief Justice William Rehnquist,
> dissent to *Daubert v. Merrell Dow Pharmaceuticals*

At times it is necessary that justices turn to fields of expertise outside of the law to determine what an appropriate legal remedy should be. While in such cases these gestures are undoubtedly made in attempts to make intelligible the nature of legally salient facts that would otherwise be obfuscated, such judicial postures might, as Rehnquist goes on to warn his colleagues, turn judges into "amateur scientists" instead of triers of legal fact.

In many respects the legal disputes that have arisen over the plausible unconstitutionality of teaching creation-science and intelligent design in public schools serve as paradigm examples of the complicated work that justices sometimes must necessarily perform in the service of justice. While at times the facts of a case and/or the facts in dispute simply lie beyond the knowledge base of even the most versatile of legal scholars, to exactly what lengths jurists should extend themselves beyond the scope of the legal canon in order to serve justice seems, as a close reading of the decisions in *McLean v. Arkansas* and *Kitzmiller v. Dover School Board* has demonstrated, unclear at best.

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[27] Justice Rehnquist. Dissent in Daubert v Merrel Dow Pharmaceuticals,Inc. 1993. <http://straylight.law.cornell.edu/supct/html/92-102.ZX.html>

A Melding of Frameworks: An Opportunity for Complication

A particular complication to the boundary work performed in the legal context is that often legal boundary-work must to some degree appeal to the boundary-work of other institutions upon which it may base its demarcations. Difficulties arise, as noted numerous times in US case history, when scientific and legal concerns overlap. As Justice Blackmun noted in the plurality decision of *Daubert v. Merrell Dow* (1993) "there are important differences between truth in the courtroom and the quest for truth in the laboratory."[28] Yet in the course of assessing a legal problem that necessitates that the court delve into questions to which science purportedly has the answers it seems as if the "difference between truth in the courtroom and the quest for truth in the laboratory" must to some extents be rendered moot, and one commonly agreed upon quest undertaken. Whether such a venture is possible, however, perhaps still remains in question.

As noted by Solomon and Hackett in "Setting Boundaries between Science and Law: Lessons from Daubert v. Merrell Dow Pharmaceuticals, Inc." in an effort to sustain the appearance of objectivity and balance, judges and lawyers may at times 'treat 'science' or 'expertise' as an autonomous, objective entity which has authority independent of the institutional settings in which it is used" (pg. 147).[29] Yet such a treatment of "science" within the courts to extents fundamentally misrepresents the true nature of the relationship between science and the law institutionally speaking. As Solomon and Hackett note, the fact that "scientists are often seen as searching for objective truth" and the prevailing myth that assumes that "judges can simply dip into this body of knowledge" and take from it "evidence from the best available 'neutral' experts" have undoubtedly glossed over the true complications that arise when these two different institutions come to heads.

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[28] Justice Blackmun. Opinion in *Daubert v. Merrel Dow Pharmaceuticals, Inc.* 1993. <http://straylight.law.cornell.edu/supct/html/92-102.ZO.html>

[29] Shana Solomon and Edward Hackett. "Setting boundaries between science and law: Lessons from Daubert v Merrel Dow Pharmaceuticals, Inc" *Science, Technology, and Human Values*, 21 (1996), 131-56, e journal.

What is proof? Where is it located? By whose terms is it determined?

Simply, as Solomon and Hackett note, "standards of proof are different in law and science," a difference that at times might mitigate an answer to the same question answered differently by science than by the law. While as Solomon and Hackett note, standards of proof in science conventionally demand a "confidence interval of 95 percent, that is, '95 percent certainty' that results are not due to random variation, and much greater assurance that they are not caused by systematic errors or biases" legal are somewhat less "explicit" (pg. 149). As legal standards for "proof" range from "'a perponderance of evidence' standard (or greater than 50 percent certainty) for many civil matters, through an intermediate standard of 'clear and convincing evidence', to the highest standard of 'certainty beyond a reasonable doubt' for criminal cases" a meshing of scientific and legal boundaries, ones guided by different standards of proof, is ultimately problematic (pg. 149). While, as is often the case, it might seem that science and the law are using the same terms to refer to the same two particulars in any given case, the referent used and the reasons behind using such a referent may greatly differ and thus not pick out the same particular for the same reasons when identified by science versus the law.

Differences in underlying phenomena

As Solomon and Hackett note, more alarming than differences in standards of proof between science and law are differences in the underlying phenomena themselves" (pg. 149). While science is essentially "predicated on the *principle* of replicability" law is, as it is often asked, tasked with resolving disputes concerning "unique configurations of events, configurations that are not even in principle replicable, that are not drawn from any imaginable population of events, and for which the principle of replicability has little force" (pg. 149). Once again, as was posited in terms of the misaligned "standards of proof" between science and law, difference in the underlying phenomena of the two seems to suggest that functionally though the projects both science and the law undertake might superficially look akin, their, as Solomon and Hackett note, "underlying phenomena" mark them as fundamentally dissimilar.

Further Complications

Further complicating the somewhat necessary exchange between boundaries demarcated by science and those demarcated by law is the ultimately complex social framework that manifestly determines the lines along which both independently and dependently these two institutions draw their boundaries. While, as Fuchs and Ward note in "What is Deconstruction, and Where and When Does it Take Place? Making Facts in Science, Building Cases in Law," a traditional philosophy of science imagines facts as mirrors of reality," this mythic model has, as the authors note, "become obsolete" (pg. 485).[30] Facts do not "represent the actual fabric of physical reality," nor are they "discovered when scientists follow only the neutral and disinterested leads of Reason and Reality" (pg. 485).

Science as well as the Law are subject to continuous acts of revision that, driven by "local negotiations on what counts as evidence and fact," are to great extents "socially situated and contextual" (pg. 485). Simply, the "truths" and "facts" identified in both science and law are to great extents socially constructed. A by-product of social construction is thus that within such a framework, "strong statements are *made* strong by [the] mobilizing of diverse and heterogeneous agents," *not* by their actual correspondence or causal relation to Truth (pg. 486). In recognizing that the "fact" or "truth" value of a given statement is, in many ways, highly dependent upon the extent to which the current social and cognitive networks support their claims to being "fact" or "truth," it is possible to locate both the ability to transform mere "statements into facts" as well as strip statements of their "rightful" claim to facticity.

That, as contended by Fuchs and Ward, the apparent veracity of "facts" held up by science and law both independently and dependently is fixed in such a manner that it is in many ways subject to change if the social climate itself changes is, in many respects, troublesome. The reason, after all, that law called upon science, was to render intelligible the "facts" of a legal question that, without the aid of science, would be unintelligible. Yet, as Fuchs and Ward

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[30] Steven Fuchs & Steven Ward (1994). "What is deconstruction and where and when does it take place? Making facts in science, building cases in law." *American Sociological Review* 59:481-500.

assert, it is possible that what scientifically (and for that matter legally speaking) we regard today as ultimate and fixed "truths" or "facts" "began as a fragile and fallible statement, ridden with anomalies and uncertainties" while today "simply appear as the way the world really is and has always been" (pg. 486).

Ezra:

This is an excellent analysis of the core issues in the religion v. science debate. However, I do take issue with your discussion of the social construction of "facts" and "truths" at the conclusion of your paper. My own view on this distinction, which I believe is shared by a great many scientists, is that there is a fundamental distinction to be made, but it is not between "facts" and "truth". Rather, it is between *observations* and *inferences*. The former are what scientists do on a daily basis; they count or measure or otherwise record observable characteristics of objects and processes in the "natural world" (i.e. the world that exists outside of their own minds). These observations are the "facts" which scientists then use to formulate their explanations about how the world works. These explanations are formulated via logical inference; that is, they are based on facts, but are not reducible to them.

This distinction is perhaps best captured by examining the process of logical induction, which is the basis for all scientific inference. Induction involves the formulation of "covering statements" (to modify Hempel's terminology) that explain the logical connections between a set of diverse observations of natural phenomena. Such covering statements are what scientists usually refer to as "hypotheses" (when not yet rigorously tested) and "theories" (following rigorous empirical testing). Clearly, it is necessary to assume that the patterns that have been identified among individual observations are patterns of *similarity*, not *identity*. However, as in the case of the distinction between Platonic realism and nominalism, one must assume that the patterns that one infers in a set of similar observations are the result of a "real" underlying unity of causation, rather than purely accidental similarities.

While it is clear that the choice of what "facts" to observe and record may be (and indeed almost certainly are) the result of "social consensus", and may therefore be said to be "socially constructed", the observations themselves just as clearly are not. Therefore, if theories explaining such "facts" are then formulated using logical inference, then such theories are not themselves necessarily "socially constructed". On the contrary, they are as close to "objective" as anything we may claim for that descriptor.

If, in the name of "deconstruction" we assume *a priori* that all inferences about reality must perforce be "socially constructed", then there is no distinction to be made between "socially constructed" and some other form of knowledge. Therefore, the use of the term "socially constructed" becomes essentially unnecessary, as it cannot be distinguished from any other form of knowledge, and we are back to where we were before the "theory" of deconstruction was formulated. That is, we are back to doing the best we can with the tools at hand.

This means that, as both justices Overton and Jones clearly stated, the most appropriate people to judge what the standards of science are clearly would be scientists themselves. This does not necessarily mean that the theories propounded by scientists are *invalid* because they are necessarily "socially constructed" by the scientific community. On the contrary, as I have pointed out, "socially constructed" logical inferences are the only kind we have (or ever will have), and therefore (in the interest of parsimony) we can simply leave out the "socially constructed" qualifier and refer to what scientists, as a community, define as science. This is precisely what justices Overton and Jones did, and is why their use of "scientific consensus" was not only valid, it is quite literally the only standard that could be used in the determination of what science is (and is not).

Again, an outstanding paper. Thank you for your participation in our evolution section, and have a great break!
--Allen