

2009

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## Recommended Citation

Sisson, Edward Hawkins (2009) "A Socrates in Judicial Robes: An Address to Trial Judges Who Preside Over Cases Involving Intelligent Design," *Liberty University Law Review*: Vol. 3: Iss. 2, Article 6.

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# A SOCRATES IN JUDICIAL ROBES: AN ADDRESS TO TRIAL JUDGES WHO PRESIDE OVER CASES INVOLVING INTELLIGENT DESIGN

*Edward Hawkins Sisson*<sup>†</sup>

## I. INTRODUCTION

This Article urges trial judges, presiding over cases involving “intelligent design,” whether involving the public schools or in other contexts, to undertake the effort to consider independently, and to accept as a legitimate finding of fact, that a reasonable conclusion to be drawn when logical analysis is applied to the current data of molecular biology, is that some force or aspect, that we can best comprehend by analogy to our own concept of intelligence, must have operated in the material world.

This proposition can and should be grounded solely on data reported in textbooks accepted and used by professors in colleges and universities such as MIT, Caltech, Harvard, and other institutions widely credited as having no religious motivation in the selection of texts. The proposition invokes a practice widespread in American litigation, wherein the documented data accepted into evidence—and thereby necessarily appearing in a party’s brief—contradict the theme, the story, the narrative that the author of the brief has attempted to ground on that data. It is a mode of critical analysis as old as Socrates, who in Plato’s *Dialogs* takes nothing but the words of his interlocutors to demonstrate that these men could not reasonably ground their own conclusions on their own data. In short, this proposition asks the judge to assume the role of Socrates *vis-à-vis* the scientists, and recognize that the data reported in the textbooks, by itself, impeaches the Darwinian

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evolution story that the authors, in those very same texts, present as being grounded on that data. The proposition does not ask the judge to do anything novel; to the contrary, the proposition asks the judge to reject the novel proposition that the authors of science texts, because they are scientists, are entitled to dictate to the judge what is, and is not, a reasonable conclusion to draw from the data.

By excluding all other documents and sources, such as texts associated with one or more religions, the proposition neither relies on, nor presents, any religious doctrine or dogma. As so defined and limited in its presentation, and excluding all reference to any texts other than those ratified by acceptance in the curricula of such institutions, the proposition raises no 'establishment clause' issue that could otherwise limit teaching in the public school curriculum.

## II. ORIGIN OF THE AUTHOR'S INTEREST IN THIS SUBJECT

### A. *Educated in Science and Art, Not Religion*

The question of whether an individual who openly expresses doubt about Darwinian evolution is inspired by a pre-existing religious motivation is seen by many as a threshold question whose answer must be provided before the debate can continue. I will address that question now. In the mid-1990s, as an associate lawyer at the prominent Washington, D.C., firm Arnold & Porter—a firm known for its roots in the liberal wing of American culture, founded by Roosevelt New-Dealers and intimates of Lyndon Johnson—I came across an interesting magazine article by a partner at an equally prominent Washington law firm, Dean Overman of Winston & Strawn. In the article, Overman argued that the mathematical statistical analysis of DNA established that the "code" of DNA could not have come about solely by operation of physical and chemical principles and laws in nature. His article presented views in his book, which I then obtained, titled *A Case Against Accident and Self-Organization*.<sup>1</sup>

I had never before had any interest in any challenges to evolution as I learned it during the 1970s, in high school (St. Albans School for Boys in Washington, D.C., 1969-73) and in college (Pomona College 1973-75, majoring in philosophy and literature, and then MIT 1975-77, where I earned a bachelor of science in architecture).<sup>2</sup> I certainly had no

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1. DEAN L. OVERMAN, *A CASE AGAINST ACCIDENT AND SELF-ORGANIZATION* (1997).

2. Pomona did not offer architecture as a major, so when I decided to pursue that career I had to transfer; MIT was the number-one-rated architecture school in the country. I graduated with a 4.6 out of 5.0 possible GPA. The precise title of the degree, reflecting the

religiously-driven motivation to pay attention to challenges to evolution. I was born and raised a mainline Episcopalian; my family heritage was uniformly, and for many generations back, in the sciences and the secular world, not in religion.<sup>3</sup> From my senior year at St. Albans forward, religion had played essentially no role in my life. My plan in 1977 was to begin the MIT Master of Architecture program (to which I already had been accepted) after taking a year off. Yet, during that year I got involved as a producer in the avant-garde theater world of San Francisco, which I found far more creative and exciting than the profession of architecture. I then wrote MIT that I was not coming back and embarked on a career as a theater producer, touring across the U.S. and in Europe, as well as producing original works and festivals of foreign works in San Francisco.

### B. Legal Experience

In late 1987 I decided to switch careers and become a lawyer. In 1991 I earned a law degree *magna cum laude* from Georgetown University Law Center; after graduation I clerked for a federal judge, and also married, and soon had two children. Like many new parents, the birth of children

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trends of the 1970s, is “bachelor of science in art and design,” but my course of study was in architecture, preparatory to becoming a practicing licensed architect.

3. My father has a bachelor of science from the U.S. Naval Academy and was in the top two percent of his class of almost 1,000 midshipmen, as well as a master’s degree in political science from Stanford. Both of my grandfathers had bachelor-of-science degrees (Yale/Sheffield 1910; Naval Academy 1924), and one a graduate engineering degree as well (Yale/Sheffield 1912). One of my great-uncles had a bachelor of science (Yale/Sheffield 1905) and led a government research laboratory, affiliated with the University of Wisconsin, for more than 20 years; one of my great-great uncles not only had an MIT bachelor of science (1881), he served on the board of MIT (1911-1916), was State Geologist of Missouri and assistant State Geologist of Pennsylvania and of Arkansas, and is honored today at NC State for his leadership role in founding a scientific and technical school in North Carolina (which became NC State). Two of my four great-grandfathers had bachelor-of-science degrees (Naval Academy 1870, West Point 1886); one of them (John T. Nance) was professor of military science at UC Berkeley for many years, the other (Francis Winslow II) a member of the groundbreaking Johns Hopkins’ Chesapeake Zoological Laboratory. The other two great-grandfathers were a long-time U.S. congressman and a career Ambassador to the U.S.; both had law degrees. A great-great grandfather (Carlile Patterson) spent 20 years with what is now NOAA, the last seven of those as the agency head (1874-1881); a great-great-great grandfather (Charles Worthington) helped found the original professional medical societies of both Maryland (in 1799) and the District of Columbia (in 1818), was the first President of the DC medical society, and was a trustee of what is now George Washington University; a great-great-great-great uncle (Nicholas Worthington) was a professor of pharmacology at the medical school of that same George Washington University. One of my brothers has an MIT Ph.D. in science. My other brother has a master’s degree in engineering.

occasioned a re-involvement in church-going, and I joined a liberal Episcopal church in the Washington suburbs, whose rector was the same woman priest whom I and my wife had asked to perform our marriage ceremony in 1991. When my wife and I divorced in the early 2000s I stopped regular church attendance.

After my judicial clerkship I became an associate and then partner at a prominent international law firm, Arnold & Porter, in Washington, D.C., where my commercial practice focused on representing billionaire investors in the banking industry.

I had many pro bono clients: in the arts; aiding international pro-democracy and human rights organizations; representing racial minority individuals and urban D.C. civic organizations; and, most relevant here, science Ph.D.s. Most of the science Ph.D.s were university-level science professors, who saw merit in doubts about evolution as taught in institutions such as MIT, and who saw merit in pursuing traces of what we can best describe as “intelligent” effects in the discoveries in molecular biology since 1950.

Stanford psychologist Philip Zimbardo, in his important book, *The Lucifer Effect*, noted the vital importance of a “dissident minority.” In the arts, I had focused on aiding the avant-garde<sup>4</sup> artists who fit this description, and I recognized that my pro bono “intelligent design” scientist-clients also fit this description:

Majority decisions tend to be made without engaging the systematic thought and critical thinking skills of the individuals in the group. Given the force of the group’s normative power to shape the opinions of the followers who conform without thinking things through, they are often taken at face value. The persistent minority forces the others to process the relevant information more mindfully. Research shows that the decisions of the group as a whole are more thoughtful and creative when there is minority dissent than when it is absent.

. . . [T]he conflict between the entrenched majority view and the dissident minority perspective is an essential precondition of

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4. See THE AMERICAN HERITAGE COLLEGE DICTIONARY 98 (4th ed. 2002) (defining avant-garde as “[a] group active in the invention and application of new techniques in a given field, esp. in the arts”).

innovation and revolution that can lead to positive social change.<sup>5</sup>

I made this argument to the pro bono committee at Arnold & Porter, whose approval was necessary to *all* of my efforts in support of “intelligent design.” To the firm’s great credit, the leaders of the committee recognized the validity of this view, and approved every single one of my many proposed clients and matters. That was notwithstanding the calumny and denigration inflicted on my pro bono clients by a powerful and entrenched majority intent on suppressing them and their point of view, and notwithstanding the unpopularity of my clients and their positions with the majority of my partners.

### III. DISCUSSION

#### *A. The Involvement of Intelligence in Molecular Biology Is a Logical Conclusion Drawn from Scientific Data.*

As noted above, my commercial practice at Arnold & Porter involved litigation over failed banks and financial institutions, a practice that included Ph.D. experts in finance and banking, so I was accustomed to the role of challenging and cross-examining highly-credentialed professors. Thus, I was intrigued by what Overman, who was also a lawyer at a prominent “establishment” firm, presented as a mathematical and logical challenge to a widely-held scientific proposition. The area of interest was not the “natural selection” part of evolution—what happens to the creature as it develops in embryo, is born, and encounters the world. Instead, it was in the “information content” side—how does the creature obtain the DNA instructions that construct new body features that then encounter “natural selection” in the world? “Natural selection” was like the editing and marketing role of a book publishing firm; but who was writing the initial raw texts that were dropped unsolicited into the publishing house? It will be instructive to judges to see the path that I followed in examining the data in the textbooks, without automatically deferring to the construction placed on the data by the authors of those books.

#### 1. Examining the Textbooks

Upon looking to see whether others shared Overman’s approach to the data, I discovered that a world-renowned scientist, Professor Sir Fred

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5. PHILIP ZIMBARDO, *THE LUCIFER EFFECT* 266 (2007). In this section, Zimbardo is discussing the effects of peer pressure and in particular an experiment by Solomon Asch, which I also discuss below.

Hoyle, head of astrophysics at Cambridge University, also saw the mathematical statistical challenge to the assembly of the DNA code. His book, *The Mathematics of Evolution*,<sup>6</sup> confirmed that there was a serious and fundamental concern with the “mainstream” theory. I found other similar mathematical analyses by other Ph.D. scientists.

Searching various websites, I read some critiques attacking Hoyle, Overman, and others. None of the online critiques claimed to identify errors in their math, nor did they cite to books that did. Instead, the critiques, in their defense of Darwinian evolution, typically asserted that even Ph.D. scientists and professors such as Hoyle had mistakenly chosen the wrong subject to analyze. Perhaps some of the critiques may have had some validity in this regard. I began to think that I would have to invest substantial time in assessing whether Overman and Hoyle had applied their analysis to the wrong subjects.

But then it struck me. Where, I wanted to ask the critics, is this *your* math? As an MIT graduate, who earned A's in both semesters of physics, who mastered the General Institute Requirements of MIT in science, I knew that proponents of a theory are supposed to put forward their *own* mathematical analysis. Yet here, the proponents of the mainstream theory did not offer their *own* math. Where was it?

Why, I wondered, has this fundamental requirement of science been skipped, forgiven, excused, and overlooked? If everyone who actually does the math comes up saying the math disproves the theory, it will not do for proponents of the theory to assert that each of these persons missed the proper subject of analysis. “Where is *your* math?” I asked of the proponents.

I bought Richard Dawkins' book *The Blind Watchmaker*,<sup>7</sup> because if the math existed anywhere, it would have to be in that book. I found that Dawkins recognized the problem, but as he was leading up to what I thought would be the mathematical analysis, he diverged into a discussion of a “biomorph” computer program he had developed, that presented lots of little line drawings that looked kind of like animals. He said that his program was analogous to mutations in DNA and natural selection.<sup>8</sup> Dawkins' discussion and presentation was not math. I knew that if anyone had presented this kind of “math substitute” at MIT during the years I was

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6. FRED HOYLE, *THE MATHEMATICS OF EVOLUTION* (Diane Nesin ed., 1st Am. rev. ed., Acorn Enterprises 1999) (1987).

7. RICHARD DAWKINS, *THE BLIND WATCHMAKER* (1996).

8. *Id.* at 43-74.

there, and called it equivalent to math, they would have been laughed at and ridiculed.

I bought the leading textbook on molecular biology, *Molecular Biology of the Cell*, 4th edition (“MBC”),<sup>9</sup> and looked to determine if it had the necessary mathematical statistical analysis. It did not. I bought *Developmental Biology*, 7th edition.<sup>10</sup> It did not have the math either. I bought *Evolution* by Douglas Futuyma.<sup>11</sup> The math was not there either.

In reading the textbooks, I noticed a characteristic verbal formulation that reflects the presupposition that Darwinian evolution is the source of all aspects of the cell. The textbooks typically do not say, simply, “the cell has X feature,” as a statement of what science has presently observed in the cell. Instead, the textbooks say “the cell has evolved X feature,” transforming the statement into an assertion about the process by which the cell obtained X feature. Even so, the studies and experiments by which science discovered X feature did not show the process by which the cell obtained that feature. The assertion regarding the process is an insertion by the author that rests not on the experiment that revealed the feature, but on the attitudes and assumptions of the author.

In my opinion, as I will show below, because, long before the data of molecular biology discovered since 1950, the scientific community was preconditioned to treat Darwinian evolution as a fact, the science community has approached all this data from the perspective of how to explain it as being consistent with the pre-accepted “fact.” Like astronomers in the days of the earth-centered Ptolemaic system, the science community is adding epicycles upon epicycles as more and more data comes in, never recognizing that the data is destroying the reasonableness of the underlying fundamental “fact.”

Now, anyone who enters into this debate soon hears that “the design argument has long been rejected.” But of course, no *argument* can be rejected once and for all, for all time. Instead, it is the data that is known and used in the argument at a particular time that determines whether the argument is persuasive or not *at that time*.

Every detective show uses this principle. At the beginning of the show, the argument that Suspect A did the crime is rejected, because the data is insufficient. Then the detective finds new data—and now the argument is successful. No one would say that Subject A cannot be prosecuted because at an earlier time, the argument for his guilt was rejected. This principle

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9. BRUCE ALBERTS ET AL., *MOLECULAR BIOLOGY OF THE CELL* (4th ed. 2002).

10. SCOTT F. GILBERT, *DEVELOPMENTAL BIOLOGY* (7th ed. 2003).

11. DOUGLAS J. FUTUYMA, *EVOLUTION* (5th ed. 2005).



drives every episode of the hit TV doctor show *House M.D.*<sup>12</sup> Those who rely on the proposition that “the design argument has long been rejected” know *less* about the intellectual process of investigation and reinvestigation than the TV screenwriters of *House*. As I learned more molecular biology, I began to wonder: what other propositions and assertions, such as the missing mathematical analysis, ought to be appearing in these textbooks, clearly and prominently, but were not there?

## 2. The Odyssey of the DNA Mutations

Take, for example, the step-by-step presentation that ought to be front-and-center in any university-level molecular biology text. Every text should include the proposition that Darwinian evolution in multi-celled creatures such as ourselves, creatures made up of cells that have a nucleus, known as “eukaryotic” cells, is founded on “copying errors.” Those copying errors produce mutations in DNA that then produce new proteins that then accumulate to initiate new physical structures and forms in the body of the creature. In high school, the presentation is in the most simplified, summary form, but the promise is that at the next level, the university level, the step-by-step details will be provided. But such a step-by-step presentation of the expression of mutations in eukaryotic cells never appeared in the texts I noted above. Instead, the books describe the process in a prokaryotic cell, and then say it was similar in nuclear cells.

Should not these prominent, comprehensive textbooks, written for undergraduate science students at elite institutions, present a clear, consolidated discussion of all the steps by which a mutation in the DNA of a creature made of nuclear cells (eukaryotic, not prokaryotic bacterial-type cells) produces a new protein installed and operating productively and beneficially inside a cell?

True, the books provide the details, but the details are never summarized in a form that presents clearly to the student just what has to happen for a mutation to produce the necessary result in the cell. I had to read through almost all of *MBC* in order to find scattered through the different chapters all of the complex stages and processes by which a sequence of DNA eventually produces a novel protein in place and operating inside a healthy, “new and improved” cell.<sup>13</sup>

It is not hard to summarize the information. The problem is that the process is so complex, and involves so many different points of information input, that seeing it in summary form makes clear that the process casts

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12. See IMDB, <http://www.imdb.com/title/tt0412142> (last visited Mar. 23, 2009).

13. ALBERTS ET AL., *supra* note 9.

serious doubt on the “mutation-as-origin-of-novelty” claim altogether. It is an example of how the *data* in the book impeaches the *story* told by the authors of the book.

So here, in brief, are the eleven steps by which the hypothetical mutation in the DNA eventually produces a novel, “never-before-seen” in this cell protein, installed and operating beneficially inside the cell.

First, assume that through a copying error in the DNA of the “germ line” of a particular animal, the DNA of the creature now contains a novel sequence of nucleotides (the “letters” of the four-letter alphabet of DNA). This novel sequence appears in the DNA in every cell of the creature as it begins to develop from fertilization forward through embryo, fetus, etc. This is analogous to the original filmstrip of a movie (pre-digital).

Assume further that the creature has now, through cellular division and growth, reached a stage of development in which a particular kind of cell will now find its operations to be improved if the new sequence is used to generate a new protein. Assume further that at no prior point in the development of the creature has the new sequence been used in a way in which the appearance of the new protein in a different kind of cell would cause that cell to be so defective that it would have halted the healthy development of this animal.

Second, an exact copy of the DNA sequence that contains the mutation is made out of a related substance called RNA. This part of the process is common to nuclear and non-nuclear cells. This is analogous to a “work print” of the filmstrip original.

Third, we start to encounter complexities in nuclear cells that are not in non-nuclear cells. A molecule called the spliceosome attaches to the RNA “work print” sequence at one end and starts to make another RNA sequence, except that it edits the copy it makes. The spliceosome skips some parts of the original “work print” and attaches the bits it copies together as if the omitted sequences had never been in the DNA (it “splices” the original, hence the name of this molecule). On average, the same spliceosome, applied to the same original “work print,” produces three different “edit prints” from the same original. How can the same molecule, applied to the same “work print,” know how to produce at least three different end products? How does the same molecule know when to produce each version? This appears to be an “information input” point in which the information cannot be found in the original DNA code. Regarding our mutation, if the spliceosome “edits out” the mutation from the “work print,” the evolutionary process is terminated right there; no protein will be produced due to that mutation during that pass of the

spliceosome. So, the mutation has to survive the spliceosome process and get preserved in the “edit print.”

Fourth, assume our “edit print” is still inside the nucleus of the cell. Then there is another editing process, which only happens rarely, in which a “code letter” of the “edit print” is swapped out for a different letter. This process is called “ADAR” editing, and it is vital to the proper development of the brain in mice (and perhaps, in humans). This is another information input where the information does not appear to be found in the DNA code. The mutation has to avoid being swapped out by an ADAR edit.

Fifth, the “edit print,” which is still inside the nucleus, has to survive a quality control examination. A molecule called the exosome destroys certain RNA sequences that exhibit certain features that trigger its operation. If the mutation has the effect of producing such a feature in the “edit print,” the exosome will destroy that “edit print” and again, the evolutionary process will terminate.

Sixth, the “edit print” must exit the nucleus. The nucleus is essentially a spherical membrane that protects the DNA and the related RNA processes discussed above. Think of it as a secure government building that houses important, sensitive computers, e.g., CIA headquarters. Nothing can get in or out except through doorways. Dotted about the surface of the nucleus are “pores” that function as security check points. The nuclear pore structure includes processes that examine each “edit print” that arrives and seeks to exit into the body of the cell. The pores keep defective material from escaping the nucleus into the body of the cell, where they may cause damage. If the mutation has the effect of producing a feature in the “edit print” that the pore treats as an error, the pore will prevent that “edit print” from exiting into the body of the cell and again, the evolutionary process will terminate.

Seventh, if the mutation survives the spliceosome, the ADAR process, the exosome, and the pore, it passes into the body of the cell, where it moves about in the company of unattached solo molecules called “amino acids.” Amino acids come in different varieties like an alphabet, once again, but having more letters to choose from. Proteins are chains of amino acids, which are attached one to another in a long chain. The “edit print” is picked up by another molecule, the ribosome, which attaches to one end, similarly to the manner in which the spliceosome attached to the “work print.”

The ribosome, floating in this “alphabet soup” of amino acid “letters,” uses the “edit print” to pull amino acid after amino acid from the surrounding environment and link them together into chains. If you were to watch this process in an actual bowl of alphabet soup before you on the

dinner table, you would see the amazing process of the ribosome, in the middle of the bowl, automatically producing words as it snags one free-floating letter after another from the soup and attaches them together.

Often, the ribosome proceeds to the location in the cell where the new chain (new “word”) will be used, even before it has finished making the chain. It is as if there was, already in the soup, a partially formed sentence of words, and the ribosome proceeds to the point in the sentence where the next word will go.

A question must be asked as we consider our mutation, which is going to cause the ribosome to produce a word that has never yet been seen inside this cell. How does the ribosome know where to go, to insert that word into its sentence, a word that it has never before made? How does it know where to use a protein it has never made before, before it has ever made that protein?

Eighth, the making of the chain is not the end of the process of making the new “word” (i.e., the new protein). Amino acid chains must fold, or be folded, into complex three-dimensional shapes before they are functional and complete. The folding of the chain is not merely an automatic result determined by the sequence of amino acids. Other molecules, called “chaperones,” may be necessary to get the chain to fold up into the necessary configuration that makes it useful. How do the chaperones know how to fold a chain they have never encountered before?

Next, the ninth step is that the new protein encounters another quality control step. Molecules called ubiquitin may snag the new protein, if the mutation produces certain characteristics that trigger a reaction with the ubiquitin, and the ubiquitin will carry it to a mechanism called the proteasome, that disassembles it. If the mutation has the effect of producing a feature in the new protein that ubiquitin treats as an error, the proteasome will destroy that protein and again, the evolutionary process will terminate.

Tenth, if our new protein survives all these steps, it still has to be rotated in three dimensions and fitted into place in the cell, engaging with other previously installed proteins. How does the cell know how to manipulate a protein it has never encountered before and install it into place?

Lastly, the eleventh step is to recall that the spliceosome makes, on average, three different “edit prints” derived from each DNA sequence. If one of these other “edit prints” also picks up the mutation, and that “edit print” also survives all the above steps and ends up producing a *different* new protein in the cell, that protein must *not* have a damaging effect on the cell that counteracts the beneficial effect of the other protein whose odyssey I have just charted above. In other words, because of the ability of the

spliceosome to make different “edit prints” that incorporate the mutation, the same single mutation may result both in a beneficial new protein, and also a damaging new protein. What the mutation giveth, the mutation may also taketh away.

If scientists respond to the foregoing eleven-step summary by saying I did not get it right, my question is, where is *your* presentation? The “DNA mutation into new protein” process is taught to us as the fundamental process by which new bodies form of multi-celled, eukaryotic-celled creatures, and ultimately new species take shape. How come this vital, central process is not set forth for students plainly and compactly in these undergraduate university-level science textbooks? It cannot be a matter of space because these lengthy and complex textbooks can surely afford the space for my 1,400 word summary set forth above. Indeed, would it not whet the appetite of the students, to signal early on what this process is, so that as the student learns the details, the student understands how they fit into the larger picture?

### 3. The Odyssey of the Retro-Viruses

I then began another line of inquiry into another widely asserted mechanism by which DNA sequences are said to become incorporated into the DNA of an animal: the proposition that a virus infects the creature, makes its way through the body to and into the sperm cells (if the infected individual is male) or egg cells (if the infected individual is female), and through unique viral mechanisms inserts DNA sequences into the “germ line” DNA of a creature (i.e., the DNA in sperm or egg cells that becomes the DNA of the offspring when sperm fertilizes egg). A law journal article is not the place for the critical analysis I gave to various studies that purportedly show this process in action; I refer interested readers to my “MIT 10-250” paper on the Social Science Research Network.<sup>14</sup> All I can say here is that there is a fundamental implausibility with the proposition that sperm or egg cells whose structural integrity has been breached by a virus will remain capable of producing fertile offspring, or that individuals infected with a virus potent enough to penetrate to and into sperm or egg cells will still be healthy enough not merely to procreate, but also to out-compete the uninfected individuals in their population, so that their descendants dominate the population in the future. These insertions do not appear to have any physical cause known today.

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14. Social Science Research Network, Edward H. Sisson’s Scholarly Papers, <http://ssrn.com/author=1164768>.

4. Mutation “Clocks” That Do Not Keep the Same Time, Convenient Convergent Evolution: The Obtruding Inference of Re-Engineering, Not Just Natural Processes

Evolutionary biologists, using assumed rates of error accumulation in certain genes (DNA sequences) common to two or more existing species, have attempted to calculate back in time to the date in which the common ancestor of those creatures existed. They do this with respect to one common gene, and arrive at a date. Then they pick another gene shared by the same creatures, and calculate it back. The dates should match, if there really is a common ancestor, but they do not. Depending on which genes are used, different contemporary creatures are closer to each other, or farther apart, in terms of the dates of their last common ancestors. If sequences supposedly inserted by an endogenous retrovirus are analyzed, we get yet another contradictory tree, because the sequence that ought to appear in one contemporary creature, due to the sequence having been inserted into a common ancestor, does not appear in that creature.

Or we read about “convergent evolution” in which contemporary creatures that both have a distinctive feature do not have a common ancestor that had that feature, so each is said to have evolved the feature separately. Again and again, when new observations appear to contradict the Darwinian approach, the response is to postulate a new principle, for which the only data is the data the principle is offered to explain. It all feels like round after round of Ptolemaic astronomical epicycles.

I ask questions about the lack of mathematical analysis of DNA. I ask questions about the lack of clear descriptions of the mutation-to-protein process in animals. I ask questions about the lack of verification of the “endogenous retrovirus” DNA insertion theory. I even ask about the criss-crossing, overlapping evidence of DNA and gene sequences and body features that defy any consistent, agreed-upon tree or bush of descent from common ancestors. I ask not as a religiously motivated person, but as the seventh generation of science-trained Americans in a consistent, unbroken line beginning with my ancestor Dr. Charles Worthington from the 1780s.

The whole structure looks like a situation, if we put it in human terms, in which engineers have taken the same basic kit of materials and have reworked them in different ways. Different parts get changed at different times and produce different results. This is not a conclusion that I set out to find when I started this investigation; it is a conclusion that obtruded itself with ever-increasing force, the more and more data I learned. It appears that the only way a reasoning, intelligent, logical person can avoid seeing this conclusion is if that person starts out, long before beginning the

investigation, with the unshakable conviction that there just cannot be any intelligence, of any kind, involved in the process.

Does the DNA, filled as it is with what look like ad hoc design modifications here, there, and everywhere, look like anything anticipated in the dogmas and documents of any religion? Not to my knowledge, although I do not have any religious training other than the standard Episcopal church Sunday school of the 1960s. It looks neither perfect, nor preplanned. It does not look “front loaded” or the result of some single catastrophic “fall of man” causing degradation of a system that was preplanned and once perfect. Perhaps religiously motivated people can make something of this data. Whether they can or not must be irrelevant to the independent and logical response to this data.

Reason is barred from the classroom because of external sociological effects if a legal regime bars discussion of the logical analysis of this data on the grounds that discussion of the data may cause some students to be more likely to see validity in some religious doctrines. Opening the door to the possibility that some element, or force, or something that we can only understand by a rough analogy to our own intelligence must have operated in the material world does not mean the end of biology as a science.

It is striking to read what Dr. E.N. Reinke, Professor of Biology at Vanderbilt University, wrote in 1927, as repeatedly quoted in briefs of counsel for the defense in the Scopes “Monkey trial” case:

The theory of evolution is altogether essential to the teaching of biology and its kindred sciences. To deny the teacher of biology the use of this most fundamental generalization of his science would make his teaching as chaotic as an attempt to teach astronomy without the law of gravitation or *physics without assuming the existence of the ether*.<sup>15</sup>

One must ponder the concept, “physics without assuming the existence of the ether.”<sup>16</sup> I earned A’s in physics at MIT in both semesters and no one taught me that to do physics I must assume the existence of “the ether.” The concept of the ether has been abandoned, yet physics survives.<sup>17</sup>

If the theory of evolution is inadequate absent recognition that something analogous to intelligence must have been involved, biology will no more

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15. *Scopes v. Tennessee*, 289 S.W. 363, 369 (Tenn. 1927) (emphasis added).

16. *Id.* at 369.

17. Moreover, Einstein’s concept of “space-time” has superseded the “law of gravitation” as Professor Reinke understood it in 1927. See, e.g., Usenet, Internet FAQ Archives, <http://www.faqs.org/faqs/astronomy/faq/part4/section-5.html> (last visited Mar. 30, 2009).

end than did physics end when the concept of the ether was discarded. Indeed, nothing can more rapidly bring a scientific field to an end than the persistent clinging to a falsified view of the data out of fear that accepting a true view will unsettle the world of social institutions in which the scientists have made their careers.

*B. The Momentum of Science's Struggle in the Late 1800s to Be Free of Religion-based Assertions About the Material World Carries Through To Become Science's Struggle in the Late 1900s to Occupy Most of Religion's Sociological Role in Society*

So why is there such resistance to this interpretation of the data of molecular biology discovered since 1950? The answer, this Article suggests, is that this data was discovered by the science community some 100 years after the science community had entered into a fierce sociological competition with religious institutions over which would provide to society the basic story of the origins of man, and which would reap the substantial social rewards accruing to those who provide society with its "creation story." To defend this sociological status of the science community, a number of "rules" have developed within the science community, ostensibly in support of the pursuit of truth, but in reality in frustration of the pursuit of truth.

The great conundrum in the judicial consideration of whether teaching intelligent design is an attempt to establish religion at the expense of science is that the persons whom the judicial system is predisposed to accept and defer to as experts on the question are credentialed by a system that has a profound, vested economic and social bias in favor of denying that intelligent design has a credible scientific position.

It is as if, in the years prior to the Civil War, the only experts permitted to deliver a judicially cognizable opinion on the intellectual capabilities of persons whose genetic heritage was categorized as the Negro race were persons whose expert credentials were issued by societies run by slave owners. On the surface, it might appear plausible that slave owners, being in the most intimate day-to-day contact with the greatest number of "Negroes," would have the most detailed and comprehensive knowledge of the subject. Even so, the preservation of their own status encouraged a system that suppressed the intellectual development of the very subjects under analysis, and predisposed the "experts" in the opinion they delivered.

It is a question as old, and as difficult, as Plato's dialog the *Charmides* (c. 390 B.C.) for a judge who is not an expert in a particular field to determine whether an individual who claims to be an expert in that field is



in fact a reliable expert.<sup>18</sup> The problem is that in order to assess whether a person is an expert, the assessor, the person judging, must acquire expertise in the same subject. Yet, none of us has the time or resources to gain an expertise in every subject wherein we need the expertise of others. Our judicial system typically resolves the problem by relying on credentials: the Doctor of Philosophy, Ph.D.; the reputation of the institution that awarded the credentials; and the reputation of the editors and publishers of those who have published the writings and studies of the proposed expert.

In the context of evolution, the secular creation story of our age, perhaps uniquely among all fields of expertise, the self-interest of the credential-awarding and publishing institutions themselves bears so powerfully upon the question on which expertise is sought, as to place into substantial doubt whether a judge intent on a truly independent assessment of the data ought to rely on credentials and publications. If the judge may not properly rely on the credentials awarded by these institutions, the only alternative is for the judge to undertake the effort of learning the material and of delivering an opinion founded not on a choice between battling experts, but on the product of the judge's own intellectual efforts.

1. Status of Evolution in Science: Adopted as Fact Prior to Establishment of Systematic Programs of Peer Review

A fundamental problem with the status of evolution in science is that it attained a status of being "fact" decades before there was any system of peer review. Let us return to the time in which MIT was founded. In the United States, with the Civil War having apparently resolved the great issue of slavery (an impression that sadly was not true), there was great optimism for the future. To take advantage of these opportunities, there was a big push for public education and for the founding of German-style research universities.

At the same time, in Britain, a group of men who were convinced of the value of Darwin's theory decided to work together to advance public acceptance of it. Thomas Huxley started the "X Club" in 1864. It was a dinner group of men whose primary purpose was to promote Darwin and combat religious influence on science.<sup>19</sup> The X Club placed people in

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18. See 8 PLATO, PLATO IN TWELVE VOLUMES: CHARMIDES, at 169E – 171C (W.R.M. Lamb trans., Harvard Univ. Press 1955), available at <http://www.perseus.tufts.edu/hopper/text.jsp?doc=Perseus%3Atext%3A1999.01.0176%3Atext%3DCharm.%3Asection%3D169e> (last visited Mar. 29, 2009).

19. See generally RUTH BARTON, HUXLEY, LUBBOCK, AND HALF DOZEN OTHERS: PROFESSIONALS AND GENTLEMEN IN THE FORMATION OF THE X CLUB, 1851-1864 (1998) (discussing the formation of the X Club); Ruth Barton, 'An Influential Set of Chaps': The X-

leading positions in science institutions, many of whom played a key role in founding them. X Club member John Tyndall gave a very popular lecture tour in the United States from 1872 to 1873.<sup>20</sup>

In 1876 Huxley followed with a U.S. tour of his own. A highlight of the tour was Huxley's address at the opening exercises of Johns Hopkins University. Johns Hopkins University was the soon to be home of the Chesapeake Zoological Laboratory with which my great-grandfather Francis Winslow II would be associated. Huxley inspired the first faculty of Hopkins with these words:

[T]he future of the world lies in the hands of those who are able to carry the interpretation of nature a step further than their predecessors—so certain it is that the highest function of a university is to seek out those men, cherish them and give them the ability to serve their kind full play.<sup>21</sup>

The major institutions of science got their start in those years. MIT itself is a leading example. All of these institutions took form under the dominating influence of men, like the members of the X Club, who *already* were convinced of the *fact* of evolution. None of these institutions conducted an impartial critical examination or review of Darwin's theory; instead they took it as a fact.

As a fact, all subsequent data necessarily must be consistent with it. That is what it means to be a *fact*. A fact is *reality*. However difficult it might be to understand how data might be consistent with the *fact*, it is inevitable that it *must* be consistent. This changes the mental attitude that scientists bring to the enterprise. As new data comes in, the mental task ahead is not to evaluate whether the data disproves a "theory," but to imagine how the data is consistent with the "fact."

Scientists think it quite easy to detect the operation of this psychology in religious people. They smile condescendingly as the religious people engage in logical gyrations to explain how a "perfect creator" who created tigers to live in the Garden of Eden could have created meat eaters in paradise, or why such a creator would create animals with immune systems

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*Club and Royal Society Politics 1864-85*, 23 BRIT. J. HIST. SCI. 53 (1990) (discussing the X-Club).

20. *Prof. Tyndall's Lectures*, N.Y. TIMES, Dec. 8, 1872 (discussing the beginning of Professor Tyndall's tour); *Spectral Analysis: Prof. Tyndall's Last Lecture in New York*, N.Y. TIMES, Jan. 1, 1873 (discussing the end of Professor Tyndall's tour in New York).

21. *Huxley on Universities*, NY TIMES, Sept. 13, 1876, available at <http://query.nytimes.com/gst/abstract.html?res=990DE4D81630E53ABC4C51DFBF66838D669FDE> (last visited Jan. 29, 2010).

when in paradise there would be no disease. They laugh at efforts to imagine how this data can be consistent with the *fact* of Genesis, and sneer that the religious people ought to evaluate the data as disproving the *fact*. Scientists well know the difference in psychological approach. They simply do not think themselves to be subject to it. Yet, the scientists are subject to it.

The members of the X Club were not engaged in some sort of conscious effort to “establish materialism” in some doctrinal program. They just wanted to conduct inquiries into nature without having to pay any attention to old religious documents or to people whose claim to dominance in society rests on the assertion that the old religious documents contain truths. Those documents, to the extent they are founded on revelation and verbal traditions, are outside of the kind of activity these men wanted to pursue. Their goal was to discover, “What can we learn about the natural world, ignoring these documents and just relying on observations and analysis and logical reasoning?”

To put it succinctly, they wanted to be free of people who were trying to tell them what they had to believe in order to remain respected members of society. They wanted to be free to say “This data disproves this claim in this document.” The X Club was expressly involved in religious matters, basically in the same way as today’s National Center for Science Education: promoting the idea that the Bible is not literally true, that science and religion each have their own separate subject matter, and that religion should get out of the business of making claims about how the natural world came into being and how it works today.<sup>22</sup>

## 2. Sociological Benefits to the Science Community of Widespread Public Affirmation of Evolution as a Fact

To the public, scientists present a persona of modesty, dress casually, and speak informally. But this friendly demeanor ought not to be taken as evidence that these men are free from the desire to be prominent intellectual leaders of society. Ask them to accept having their name appear lower-down in order on a peer-reviewed publication they worked on, or to have their name omitted altogether, and you will see the teeth of ambition suddenly bared. Self-interest jumps out when grants, tenure, deanships, and conference invitations are at stake. The appearance of disinterest when presented to the public serves the basic goal of gaining public support for the whole enterprise. If the public saw how much self-interest is really involved, it would doubt the wisdom of investing so much in the

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22. See, e.g., BARTON, *supra* note 19, at 433.

institutions of science, because it would distrust the impartiality of the results.

If the data actually does disprove the claim in the old religious documents, the people who collected the data gain a tremendous social benefit. Broad public acceptance of evolution leads the public to direct its greatest deference, respect, and attention to the leaders of the science establishment, and away from leaders of religious organizations. The prestige of science and scientists is enhanced, and the prestige of religion and clergy is reduced.

Evolution was vital to the X Club and their successors because it provided a basis for rejecting the claim that the religious documents described how life came to take the form it has today. Darwinism gave them a creation story that was vital to their effort to keep free of religions, and so it has remained ever since.

This sociological effect on the scientists themselves introduces a self-interest that biases their assessment of the data. The scientists who see the data as contradicting the religious documents are the ones who attract public respect away from religious figures and towards themselves. In a sense, one can conceive of this as a battle over "market share." The public donates only a certain amount of money to the general class of "truth proclaimers" in society, and their donation is divided between two large classes: truth proclaimers from the religious tradition, and truth proclaimers from the science tradition. As to each group, those who do not proclaim a conflict necessarily have no effect in shifting "market share." If from the science tradition, they attract no religious money towards the science side. If from the religious tradition, they attract no science money to the religious side. Nor do they generate conflict stories that attract public attention; public attention that gains the interest of the media, sells magazines, or brings people to public debates. The incentive structure is all in favor of individuals who interpret the data so as to discredit one side and pull market share away from it.

Preserving the preeminence of a naturalistic, non-intelligent, non-religious explanation for the origin and subsequent diversification of life serves the sociological function of privileging the scientific establishment. It privileges the establishment as the group vested by our society with the right to pronounce fundamental truths about the physical world that affects our day-to-day lives. By so doing, it displaces and keeps in check the religious establishment, and any newly-emerging religious groups, that formerly competed effectively for that social role. In short, acceptance by the public of the truth of evolution gives to scientists a kind of power, prestige, and income. It is this dynamic that makes it uniquely

inappropriate for judges to rely on credentials awarded by the institutions whose prestige and income is so invested in one side of the question.

This sociological dynamic has been obvious ever since Huxley debated Bishop Wilberforce, and found particular expression in the Scopes Monkey Trial. The result of the scientific establishment's success in this debate has been to humiliate and drive the clergy from the podium from which truths about the world are pronounced, leaving the podium for pronouncements of truth to be controlled by scientists.

For the scientific establishment to abandon voluntarily the "Darwinian evolution" paradigm and admit the possibility of "intelligent design" would be a remarkable event. It would be an event in which a powerful social group voluntarily and seriously diminishes its own authority, permitting a historically competing group that claims to have insight into the operation of such an intelligence to gain prestige at the expense of the science community.

As a matter of sociology and human nature, it is not reasonable to expect that institutions set up 130 years ago in reliance on the "natural causes are sufficient" principle, that have trained thousands upon thousands of people whose careers are also dependent on the same principle, will ever acknowledge the refutational effect of any data that has been or will be collected. Nothing we see in the debate today is much different than it was in 1875, except for something that ought to have transformed the debate, but has not. That something is the molecular biology data collected since about 1950 and thereafter.

C. *"The Object of Life Is Not to Be on the Side of the Majority, but To Escape Finding Oneself in the Ranks of the Insane."*

The essential core of wisdom is to know what is true, and what is not true. The philosopher and Roman Emperor Marcus Aurelius is widely credited with the saying: "The object of life is not to be on the side of the majority, but to escape finding oneself in the ranks of the insane."<sup>23</sup> I have always read the word "insane" to mean two things. First, it means the intellectual error of believing *as true* things that are actually *not true*. Second, and the reverse, it means disbelieving things that one actually ought to acknowledge are true. This principle ought to animate both the judicial decisions of our courts and the educational content of our schools.

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23. *Inside the Beltway*, WASH. TIMES, Aug. 14, 2007, <http://www.washingtontimes.com/news/2007/aug/14/inside-the-beltway-81073443/>.

Aristotle, in the first words of his *Metaphysics*,<sup>24</sup> wrote that “All men by nature desire to know.”<sup>25</sup> While those words may not, in fact, be true of all men and women, it is certainly true of judges, whose professional role in life demands that they “desire to know” the facts of every case that comes before them.

A little later on in the *Metaphysics*, Aristotle adds “we suppose . . . that he who can learn things that are difficult, and not easy for man to know, is wise” and that “the wise man must not be ordered but must order, and he must not obey another, but the less wise must obey him.”<sup>26</sup> These words, too, apply particularly to judges, who are expected not only to be learned in the law, but also to have the intellectual capacity to understand true facts and distinguish them from false statements.

### 1. Judicial Independence from Popular Opinion

Judges order, rather than be ordered, but their independence and freedom to so act is a gift from the people, and must be founded on judges’ ability to “learn things that are difficult to know.” The community of credentialed individuals who make a living from their credentials, in part by serving as expert witnesses, can be expected to urge judges to confine their role to the choice of one expert over another, but this limited role is not the role the public expects. A judge, who in a proper case is asked to find the facts, may certainly undertake to become the expert herself or himself. A judge may himself or herself draft a comprehensive memorandum by which the judge presents to the review of the appellate courts and to the people themselves the content of that expertise. A judge who proves unable to learn things that are difficult to know, or who abdicates the duty of learning such things merely because self-interested private parties so urge, forfeits the substance of why the people are willing to give the judge such deference.

Judges ought to hold it as a priority to escape finding themselves in the ranks of the insane even if that places the judges outside the side of the majority.<sup>27</sup> The popular majority may often be correct in its opinions, but it may also be wrong. The art, and the courage, of the wise man and woman is to be able to disagree with the majority when it appears that the majority

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24. ARISTOTLE, *METAPHYSICS* 980a. Citations to Aristotle employ a unique system of Bekker numbers, based on page numbers used in the Prussian Academy of Sciences edition of the works of Aristotle.

25. *Id.*

26. *Id.* at 982a.

27. “Majority” means the public opinion of the day. This Article does not urge judges to defy binding judicial precedent as enunciated in majority opinions of higher courts.

has committed itself wrongly, specifically when it appears the majority, through the jagged and shifting history of human intellectual endeavor, beset as it always is by emotion, self-interest for social prestige, and the extreme reluctance to admit the humiliation of fundamental error, has committed itself wrongly.

Of course, it was easy for a Roman Emperor to pursue his independent way; his power protected him from all adverse effects of disagreeing with the majority. For private citizens, this kind of independence comes at a price that few are able to suffer.<sup>28</sup>

The cherished and protected independence of judges, as bolstered by financial and legal protections such as life tenure in the federal system, is the people's attempt to place judges within a protected zone that facilitates independent thought.

However, the judge who assumes this role in this context enters into direct competition, sometimes in direct conflict, with other people trained in different disciplines. Such a judge enters into conflict with other people such as religious leaders who want society to vest them with the authority to tell society what is true about the world, and what is not true.

Also, as this Article suggests, it puts the judge in direct competition with those in the science community itself. The current generation of scientists, having accepted and relied on the propositions declared by past generations of scientists, can become so vested psychologically in the way they have viewed the world that it is impossible for them to adopt a different view as more data comes in.

## 2. The Mechanical Universe

An excellent example of the effect of *not* questioning accepted truths is the Michelson-Morley Experiment and the "ether" that supposedly filled the universe. This is a subject of the excellent television series on physics

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28. See, e.g., Jason Linkins, *Ben Stein Dropped as University of Vermont Commencement Speaker*, HUFFINGTON POST, Feb. 3, 2009, available at [http://www.huffingtonpost.com/2009/02/03/ben-stein-dropped-as-univ\\_n\\_163586.html](http://www.huffingtonpost.com/2009/02/03/ben-stein-dropped-as-univ_n_163586.html).

Indeed, news reports announced that lawyer and entertainer Ben Stein has had his invitation to speak at the University of Vermont revoked, due to a public outcry over Stein's leading role in a documentary film that documented how persons in academia are ostracized and criticized if they reveal sympathy for "intelligent design." *Id.* The irony, of course, is that the protestors who punished Stein in this academic setting thereby confirmed, by their own actions, the validity of his documentary. Of course, Stein knew, before he took on the role in the film, that the same persecution that his film would document would likely also rain down on him. I urge the judges to have the strength and independence of character to risk a similar social criticism.

and the history of science, *The Mechanical Universe*.<sup>29</sup> Episode forty-one describes the central importance of an idea as old as Aristotle, that space is not empty, but is filled with something called the “ether” or the “luminiferous ether.”<sup>30</sup> In the 1800s, the concept of the “ether” was a central element of physics, but experiments to identify it, or to show it in action, had not been performed.<sup>31</sup> In 1887, physicists Michelson and Morley decided to show the ether in action, and designed the experiment that Professor Goodstein describes as “perhaps the most famous experiment in all the history of physics. . . . It was designed to detect the motion of the earth through luminiferous ether.”<sup>32</sup>

As Goldstein says, the experiment demonstrated that the “ether” did not actually exist. Michelson felt otherwise and for fifty years after his experiment he considered nevertheless that the ether existed. He considered his experiment was a failure because the experiment did not demonstrate its existence.<sup>33</sup>

Conviction that the ether existed, and inability to recognize that the experiment showed that it did not, persisted a long time. Physicists repeated the experiment off and on for the next fifty years in a continuing effort to demonstrate what they were convinced was true: that the ether existed.

The narrator of episode forty-one explains how the apparent non-existence of the ether affected the science community:

The consequences were shattering. The negative result was almost as disturbing for Michelson as it was for physics as a whole. He truly believed the ether existed and that he and Morley had simply failed to detect it. . . . He remained haunted by the results . . . .

Putting the idea of the ether in historical perspective, it had been important beyond measure. In 1887, its existence was as important as, in the day of Copernicus, the location of the sun. . . .

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29. See *The Mechanical Universe, Episode 41, The Michelson-Morley Experiment*, California Institute of Technology, 1985 (hosted by Caltech’s Professor Goodstein), available at <http://www.learner.org/resources/series42.html> (last visited Mar. 29, 2009).

30. *Id.*

31. *Id.*

32. *Id.* The reference refers to the substance of the video and not to the explanatory material.

33. *Id.*



To the end of his days, [Michelson] never fully accepted the implications of his famous experiment. . . . “Since the result of the original experiment was negative,” he concluded, “the problem is still demanding a solution.”

But in reality, Michelson’s experiment, if it was a failure, was the most brilliant failure in all the history of science. And the solution he sought, but refused to accept, Albert Einstein’s theory of relativity, would change forever the very meaning of space and time.<sup>34</sup>

Goodstein concludes: “Michelson of course never, for the rest of his life, believed the results of his own experiment.”<sup>35</sup>

In Episode forty-two, Professor Goodstein explains how Dutch physicist Hendrik Lorentz continued to believe in the ether despite the Michelson-Morley experiment. Lorentz believed in the ether and that the earth moved through it. He theorized that the ether caused electrons to change dimension. Thus, because Michelson’s experimental apparatus, like all things made of matter, was made of atoms that include electrons, the cumulative change of the electrons produced a change in the dimensions of the apparatus, thereby preventing the apparatus from revealing the existence of the ether. Lorentz developed mathematical equations that described the change of dimensions, called the “Lorentz transformations.” Goodstein also explains that Albert Einstein developed the same equations in connection with his theory of special relativity.<sup>36</sup>

Why, then, is Einstein famous and Lorentz obscure? Goodstein argues it is because Lorentz was merely trying to reconcile belief in the ether with the Michelson-Morley experiment, while:

Completely separately, and independently, young Albert Einstein was worried about a deep problem having to do with the nature of light and electricity, and he decided that this was the way the world had to work. And he came up with exactly the same theory, but with a far, far deeper understanding of what it meant.

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34. *The Mechanical Universe, Episode 41, The Michelson-Morley Experiment*, California Institute of Technology, 1985 (hosted by Caltech’s Professor Goodstein), available at <http://www.learner.org/resources/series42.html> (last visited Mar. 29, 2009). A copy of the video transcript is on file with the author of this Article.

35. *Id.*

36. *The Mechanical Universe, Episode 42, The Lorentz Transformation*, California Institute of Technology, 1985 (hosted by Caltech’s Professor Goodstein), available at <http://www.learner.org/resources/series42.html> (last visited Mar. 29, 2009). A copy of the video transcript is on file with the author of this Article.

So it's possible to say that Einstein made only minor contributions to the theory of relativity, just as its possible to say that Copernicus did nothing but trivial mathematical transformation of coordinates. But to say that ignores in the most profound possible way the real history of both of those subjects.<sup>37</sup>

3. Sociological Motivations to Imagine, and Then Assert as True, Mechanisms of Causation for Which There Is No Independent Data

Another example of persistent belief in a theory unsupported by direct observation was the view that now-submerged land bridges once connected the continents, which were believed to be fixed and immobile.<sup>38</sup> The parallel between what is happening in evolutionary theory to what happened in the land bridge theory is particularly apt. By the 1920s, sufficient data had accumulated to suggest that the continents might once have been joined, and so must have since drifted to their present positions.<sup>39</sup>

One class of such evidence was the distribution of certain fossils that appeared in both Africa and South America, which strongly suggested that the two continents had once been connected.<sup>40</sup> Proponents of continental drift suggested that a population occupying a single contiguous land area had been fossilized, and then the land in which they had been fossilized had separated into the two continents.

For reasons too technical to be relevant here, continental drift was seen by many scientists as violating a principle of science known as "uniformitarianism," and thus providing an opportunity for religiously-motivated persons to argue that Biblical texts provided accurate information concerning the physical formation and history of the planet. If continental drift were accepted as a reasonable scientific theory, they feared that religion would regain unwarranted dominance in geology.<sup>41</sup>

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37. *Id.*

38. See NAOMI ORESKES, PLATE TECTONICS, AN INSIDER'S HISTORY OF THE MODERN THEORY OF THE EARTH: SEVENTEEN ORIGINAL ESSAYS BY THE SCIENTISTS WHO MADE EARTH HISTORY 3-13 (2001) [hereinafter ORESKES, PLATE TECTONICS]. The land-bridge theory, also called the isthmian link theory, is set forth by Oreskes. NAOMI ORESKES, THE REJECTION OF CONTINENTAL DRIFT: THEORY AND METHOD IN AMERICAN EARTH SCIENCE 210-18 (1999) [hereinafter ORESKES, REJECTION OF CONTINENTAL DRIFT]. A world map of the theorized links can also be found in Oreskes' book. *Id.* at 215.

39. ORESKES, PLATE TECTONICS, *supra* note 38, at 7-8; see also ORESKES, REJECTION OF CONTINENTAL DRIFT, *supra* note 38, at 54-58.

40. ORESKES, REJECTION OF CONTINENTAL DRIFT, *supra* note 38, at 57, 180-81, 189-90, 192, 199, 218, 309-10 (Kenneth Caster's 1952 diagram of fossil faunal affinities).

41. *Id.* at 204-05.

As historian of science Naomi Oreskes states, “uniformitarianism was associated in many geologists’ minds with the exclusion of religious arguments from geology and the consolidation of geology as a science.”<sup>42</sup> In order to preserve uniformitarianism, exclude religious argument from geology, and still reject the continental drift theory, the scientific establishment after 1920 needed to identify a mechanism whereby the creatures that produced the fossils could have crossed the South Atlantic between Africa and South America. From 1931 to 1933, American geologists Charles Schuchert and Bailey Willis developed a theory of an isthmian link, or land bridge, which had become submerged beneath the South Atlantic. It had become submerged because of the subsidence of the land and the melting of the ice age glaciers, an east-to-west ridge running between Africa and South America. To explain other fossil data and data relating to patterns of ancient glaciations, Schuchert and Willis proposed other submerged isthmian links, connecting Africa to India, Vietnam to Australia, Australia to Antarctica, and Antarctica to South America.<sup>43</sup>

As Oreskes states, “[t]his explanation was patently ad hoc—there was no evidence of isthmian links other than the paleontological data they were designed to explain (away). Nevertheless, the idea was widely accepted, and it undercut a major line of evidence of continental drift.”<sup>44</sup>

Harvard evolutionist the late Stephen Jay Gould called the isthmian links a “*deus ex machina* . . . flung with daring abandon across 3,000 miles of ocean.”<sup>45</sup> He also noted that “[t]he only common property shared by all these land bridges was their utterly hypothetical status . . . [but] to Willis, Schuchert, and any right-thinking geologist of the 1930s, one thing legitimately seemed ten times as absurd as imaginary land bridges thousands of miles long—continental drift itself.”<sup>46</sup> Gould noted the “highly fertile imaginations” of Schuchert and Willis could refute any

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42. ORESKES, PLATE TECTONICS, *supra* note 38, at 12; *see also* ORESKES, REJECTION OF CONTINENTAL DRIFT, *supra* note 38, at 204-05.

43. ORESKES, REJECTION OF CONTINENTAL DRIFT, *supra* note 38, at 208-19, 350-51; ORESKES, PLATE TECTONICS, *supra* note 38, at 12. Schuchert, who in 1904 became professor of historical geology at Yale’s Sheffield Scientific School, was probably one of my grandfather Francis Winslow III’s professors; F. Winslow earned undergraduate and graduate degrees in mining at Sheffield in 1910 and 1912. Schuchert may also have taught my great-uncle Carlile P. Winslow, Sheffield 1905, who spent the 1920s and 1930s leading the USDA Forest Products Laboratory affiliated with the University of Wisconsin.

44. ORESKES, PLATE TECTONICS, *supra* note 38, at 12; *see also* ORESKES, REJECTION OF CONTINENTAL DRIFT, *supra* note 38, at 218.

45. STEPHEN JAY GOULD, EVER SINCE DARWIN: REFLECTIONS IN NATURAL HISTORY 164 (1979).

46. *Id.* at 165.

observations that appeared to support continental drift, and stated that the lesson to be learned from the land-bridge episode was that “. . . orthodoxy colors our vision of all data; there are no pure facts . . . .”<sup>47</sup> Or, as a common proverb puts it, “If I had not believed it, I would not have seen it.”

But after World War II, with the development of more advanced undersea research tools, science learned the topography of the ocean floor, and learned that there had never been any land-bridges.<sup>48</sup> Schuchert and Willis and their elaborate inventions vanished. Simultaneously, other scientists developed an alternative naturalistic, unintelligent, non-religious theory to explain the data: plate tectonics, of which continental drift was a part. The scientific establishment adopted this new theory.<sup>49</sup>

There are of course many precedents for the general proposition that the reigning theories of an era may be false. For example, Witness Galen’s theory of the four humors of the body, which led doctors to “bleed” patients in hopes of curing them, or Ptolemy’s theory of the earth-centric universe. Thomas Kuhn’s *The Structure of Scientific Revolutions* analyzes more examples of this sociological phenomenon.<sup>50</sup>

Kuhn identifies many sociological pressures and interests that deform the scientific process away from efficient truth-finding.<sup>51</sup> Sociologist Bernard Barber of Columbia University discusses the effect of such sociological pressures by focusing on the fact that, on occasion, the scientific establishment may resist evidence that challenges a prevailing theory.<sup>52</sup> The resistance is not the result of the application of normal critical scientific

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47. *Id.* at 166.

48. ORESKES, REJECTION OF CONTINENTAL DRIFT, *supra* note 38, at 262-63, 267 (discussing the mid-ocean ridges), 288-89, 302; ORESKES, PLATE TECTONICS, *supra* note 38, at 16-17.

49. *See generally* ORESKES, PLATE TECTONICS, *supra* note 38. This entire book is a detailed history of the acceptance of the new theory. Before leaving this discussion of Oreskes’ two books, it is worth noting her repeated recognition of the vital importance in the 1800s of the research work conducted by the U.S. Coast Survey. *See* ORESKES, REJECTION OF CONTINENTAL DRIFT, *supra* note 38, at 37-40, 128 (describing the Coast Survey as “the nation’s first scientific and technical agency”), 280 (noting that “the Coast Survey was for many years the largest employer of physical scientists and mathematicians in America”). My great-great grandfather, Carlile P. Patterson, a former naval officer, spent the last 20 years of his life with the Coast Survey (1861-1881), the last seven years as head of the agency (1874-1881). His son-in-law, my great-grandfather and former naval officer Francis Winslow II, spent several years in Nicaragua conducting geological engineering studies to evaluate proposed routes for the proposed Atlantic-Pacific canal (later built in Panama).

50. *See generally* THOMAS KUHN, THE STRUCTURE OF SCIENTIFIC REVOLUTIONS (3rd ed. 1996).

51. *Id.*

52. *See* BERNARD BARBER, SOCIAL STUDIES OF SCIENCE 97-113 (1990).

scrutiny but “due to the direct operation of cultural (e.g., received ideas) or social-structural (e.g., social-status differences) factors” that are “specifiable social-structural or cultural factors.”<sup>53</sup> Or as Professor Sir Fred Hoyle of Cambridge University put it, “[i]t is a mistake to suppose that science is an unswerving pursuit of objective truth. Partially it is, but only to the extent that the truth does not turn out to contradict what has already been taught in the educational process.”<sup>54</sup>

*D. Rules That Those Who Seek to Be Wise Would Be Wiser to Reject*

As noted above, during the approximately 140 years since the initiation of science’s efforts to be free of religious-based assertions about the material world, that effort has gradually become a movement to supplant most of religion’s role in shaping and directing society. Aiding that process have been a number of “rules,” ostensibly, and likely sincerely, to be integral to the effort to discern truths about the material world, but in real effect to be integral to the effort to establish science in the place formerly occupied by religion. These rules operate to suppress lines of intellectual inquiry that lead to the discrediting of the propositions on which majorities of scientists have established their prestige. Judges in particular ought to be conscious of the effect of these rules and to be prepared to reject them when it becomes apparent that the rules serve sociological rather than scientific goals.

1. Rule Number One to Be Rejected: “The lesson of history holds that theories are overthrown by rival theories” – Stephen Jay Gould<sup>55</sup>

In all social institutions, funding flows to those individuals who consciously or subconsciously engage in behaviors that tend to cause other people to increase funding to that organization. Individuals whose behavior tends to diminish the funding for the institution are seen by others as damaging to the institution that nourishes them all.<sup>56</sup> This is one example

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53. *Id.* at 80.

54. See HOYLE, *supra* note 6, at 104.

55. GOULD, *supra* note 45, at 167.

56. One of the leading American science journals is *Science*, a publication of the American Association for the Advancement of Science (AAAS). The very name of this organization demonstrates that its purpose is to “advance” science – and science is, today, an institution of great size and financial investment. There is, of course, an assumption that science is the impartial search for truth. But the question for this address is, “Is it really?” The AAAS has for many years lobbied the United States government to increase the amount of money paid to scientists, and touts the success of such spending, without ever reporting that money was spent on programs that never should have been funded at all.

in which the dynamic of survival of the fittest does not conduce to the impartial search for the truth, but actually conflicts with that search. In fact, if the pursuit of truth involves discrediting the claims of truth pronounced by others, without any simultaneous proclamation of a new truth to replace the old truth, the institution in fact is damaged, in the eyes of those who have been relying on it.

This leads to the first and most effective of the rules that provide special procedural protections to generally accepted theories: that the only challengers that receive a hearing are those in which the challenger also offers a *replacement* theory that would explain the event or phenomenon that the prior theory purported to explain.

It is commonplace in the science community that as soon as someone presumes to impeach the truth of an accepted theory to interrupt and say “But what is your theory?” If the challenger has no alternative theory, the challenger is brusquely cut off. If the challenger has an alternative, the discussion is immediately turned to the evaluation of the new theory. Only after the proponent of the new theory makes a credible case for the new theory will the discussion then turn, almost as an addendum, to the list of weaknesses and flaws in the prior theory—points offered as merely second-level support for the new theory that everyone is now supposed to rally around.

As Stephen Jay Gould put it, “[t]he lesson of history holds that theories are overthrown by rival theories.”<sup>57</sup> Kuhn makes the same point.<sup>58</sup> Thus, “theories are overthrown by rival theories” and not by demonstrations that the accepted theories ought never to have become accepted in the first place.

As sociologist Robert K. Merton stated almost fifty years ago, “[o]n every side, the scientist is reminded that it is his role to advance knowledge” and to “have made genuinely original contributions to the

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There is something strange about a situation in which our society vigorously argues and second-guesses the wisdom of military operations and campaigns, the wisdom of welfare programs, of education policies, of the wisdom of building certain highways—yet never second-guesses the wisdom and judgment of the leaders of the science community concerning whether every program they obtain funding for turns out to have been a wise program to fund. The science community acts like every other self-interested, money-seeking institution in always asserting the superior wisdom of its leaders over all outside critics. The only surprise about this is that the science community claims that it is more self-critical than any other institution and thereby neither needs, nor even deserves, any second-guessing. One can criticize waste in the execution of programs, but what counts is criticism of the wisdom and judgment of pursuing them at all, even if efficiently.

57. GOULD, *supra* note 45, at 167.

58. KUHN, *supra* note 50.

common stock of knowledge.”<sup>59</sup> The history of science demonstrates that because of the career dynamics of science, individuals attain prominence, prestige, and position by advocating and convincing others in the scientific establishment of the validity of new or existing theoretical explanations, data, and observations. In other words, once science has claimed to have knowledge, it never afterwards confesses ignorance. It does not abandon a reigning paradigm until a replacement paradigm is offered that science can accept.

Thus, while the scientific establishment often admits that it is in ignorance of matters for which it has never had a reigning paradigm—indeed, the purpose of science is to investigate areas of admitted ignorance—the scientific establishment will never admit ignorance of any subject for which it has adopted a reigning paradigm. Once science has asserted that it has an answer to a question, it may later announce that it has changed its answer, but it will never admit that it was wrong and that it has no answer. This principle is not compelled by any impartial principle of scientific investigation, but is instead a product of sociological concerns to preserve the prestige of science.

This is a fundamental defect in the sociology of science. Contrast this with the criminal law, the premiere field in which human society for thousands of years has adopted the role of fact-finder and truth-finder. To analogize to a criminal case, the “reigning theory” is the theory advanced by the prosecution, and the defense counsel’s job is to rebut that theory. But in law, unlike science, the defense counsel need not offer an alternate theory to explain the facts that led to the prosecution.

Central to the process of courtroom truth-determining is the role of the defense lawyer. The job of the defense lawyer is to demonstrate the defects in the case offered by the prosecution (in a criminal case) or by the plaintiff (in a civil case). The question is: has the prosecution or plaintiff satisfied the burden of proof assigned by society? The burden varies, depending on the cost to society of acting upon a wrong answer, from “beyond a reasonable doubt” to “preponderance of the evidence” and various levels in between.

The defense lawyer is not obligated to prove any alternative theory of “Who did the crime” or “what caused the injury?” In law, a practitioner can have a very successful career as defense counsel, proving that prosecution and plaintiff theories are incorrect, without having to go further and prove alternative theories to explain the events that led the prosecutors and plaintiffs to advance the flawed theories they proposed. The defense

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59. Robert K. Murton, *Priorities in Scientific Discovery*, 22 AM. SOC. REV. 635, 639 (1957).

lawyer can happily admit complete ignorance as to who is the real culprit. And the private defendants will pay vast sums of money to support these limited roles of the defense lawyers, because the cost to them of suffering the verdict of the jury, whether criminal or civil, can be so much greater than the cost of refuting these theories.<sup>60</sup>

Unfortunately, the limited role of a defense lawyer is, to the general public, somewhat emotionally unsatisfying, because it leaves unanswered the question that the public dearly wants to have answered: “Who did it?” “Who, or what, deserves the blame?” And thus, in fiction, to persuade the public to buy the novel or buy a ticket to the movie or watch the television show, the fictional defense lawyer must always find the real culprit.<sup>61</sup>

But in science, where the vast majority of funding is from the public (tax dollars), there is no financial constituency to support a career dedicated solely to disproving the theories offered by other scientists. In discrete instances, where a particular scientific theory, if acted on by the public, will impose immediate and substantial costs on a person, company, or industry, there will be opportunities for a few scientists to earn consulting fees as expert witnesses. But there is no reliable, systematic career option open to young scientists to dedicate themselves solely to exposing the flaws—indeed, to expose discrediting fundamental flaws—in the theories proposed by other scientists.

So it is understandable that a science community that is constructed on public funding will inevitably be driven, by the public’s desire to be told answers, to become an “answer declaring” system even at the expense of the “truth finding” role. The fundamental problem is that the science community has founded its funding on a public that wants the same kind of satisfaction from *the scientists whom it funds* as it wants from detective fiction and courtroom dramas.

There simply is no funding source available to science that can accept with equanimity that prior accepted theories were wrong. A science that can accept that we must acknowledge we are and have always been ignorant of the explanation for a particular event or phenomenon, despite that we used to think we knew the answer, does not exist.

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60. Indeed, the litigation practices of most of the largest American law firms, including my own former firm Arnold & Porter LLP, are primarily defense practices, defending corporations, partnerships, and trusts from thousands of suits and prosecutions directed against them every year.

61. Perry Mason is a well-known fictional defense lawyer that fits this description.



In science, no scientist sees a career advantage in proclaiming not only that the scientific establishment is ignorant of the truth, but also that he or she is equally ignorant.

There is zero funding for the pure defense counsel role in the established scientific community. Institutional, publicly-funded science is not a system where a prosecutor contends with a defense counsel, but is instead a system where a prosecutor, having surpassed the minimal level of testing provided by “peer review”—which is roughly equivalent to the “grand jury” step of obtaining an indictment—never again encounters significant, well-funded, strongly motivated opposition, unless another prosecutor obtains an “indictment” of his own and then sets-up an alternative theory.

Scientific peer review is intended to provide a form of impartial jury review, but fails to address all of the well-recognized forms of bias that may affect the process. As set forth in the leading text “Applied Social Psychology,” by Frank W. Schneider, et al,<sup>62</sup> there are four different types of “juror prejudice.” The four types are as follows: (1) interest prejudice, in which the juror has a stake in the outcome of the particular case he or she is judging; (2) specific prejudice, in which “the juror holds attitudes or beliefs that might interfere with his or her ability to be impartial”; (3) generic prejudice, in which the juror possesses “general attitudes (e.g., racist views) that would interfere with unbiased evaluation of the evidence”; and (4) normative prejudice, in which the juror is aware of “such strong community sentiment supporting a particular outcome of the case that his or her ability to decide the case impartially based on the evidence become compromised in favor of the perceived normative attitude.”<sup>63</sup> Peer review protects against only the first source of bias, interest prejudice, by ensuring that the reviewers have no personal involvement in the particular study they are evaluating, but presents no protection against the other three sources of bias.

Oreskes, in the conclusion to “Rejection of Continental Drift,” recognizes this problem:

In closing we may note a striking contrast between the two realms in our culture held most responsible for determinations of truth. In the legal realm, juries are impaneled on the basis of impartiality: anyone with prior connection to the case at hand is dismissed . . . In Science the opposite is the case: we hold those most knowledgeable about matters to be the most qualified judge. . . . [W]e are placing responsibility for making new

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62. FRANK W. SCHNEIDER, JAMIE A. GRUMAN & LARRY M. COUTTS, *APPLIED SOCIAL PSYCHOLOGY* (2005).

63. *Id.* at 274.

knowledge in the hands of those who have the most old knowledge to unmake. . . . [This] makes scientific judgments inescapably personal and historical, undermining out deepest wishes for knowledge that might somehow be transcendent.<sup>64</sup>

What this means is that not only is the burden of proof on challengers immeasurably higher in science than in law, but there are also distinct and powerful career disincentives for anyone to take on the “defense counsel” role of disproving the flawed paradigm. Why should anyone do it, when there is no reward even for success?

The scientific establishment, by demanding that those who challenge its theories must produce alternative theories, is demanding that defense counsel must in every instance produce “the real culprit” or else the jury must accept the prosecution’s case. This imposes an unfair burden of proof that, if it were applied in law, would require every defense lawyer to be as effective as Perry Mason. No wonder reigning scientific paradigms are rarely abandoned, given that every challenger is required to be a virtual Perry Mason of science.

Thus, science thrusts upon challengers the burden of offering an alternative theory before it will abandon the prevailing theory, and will not even listen to challenges that provide mathematical, logical, and evidentiary challenges to that theory unless the challenger also proposes an alternative theory.

2. Rule Number Two to Be Rejected: “Extraordinary claims require extraordinary evidence” – Carl Sagan<sup>65</sup>

If a broad majority of the scientific community has for a substantial period of time considered a particular theory or proposition to be true, they describe any alternative theory as an “extraordinary claim.” The rule then imposes a higher evidentiary standard on the new theory than would have been imposed on that theory had it been presented earlier, prior to the date on which the earlier theory obtained widespread acceptance.

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64. ORESKES, REJECTION OF CONTINENTAL DRIFT, *supra* note 38, at 317-18.

65. Christian Apologetics & Research Ministry, Apologetics: Evidence and Answers, <http://www.carm.org/apologetics/evidence-and-answers/extraordinary-claims-require-extraordinary-evidence> (last visited Mar. 30, 2009) (discussing the phrase of Carl Sagan who hosted the TV series “Cosmos”). Pierre Simon Marquis de Laplace (1749-1827), French mathematician and astronomer, is widely reputed to have said: “The weight of evidence for an extraordinary claim must be proportioned to its strangeness.” Laplace, in *A Philosophical Essay on Probabilities*, uses the term “extraordinary” to describe events with an extremely low probability, such as drawing at random the only white ball from an urn containing 999 black balls and one white. PIERRE SIMON MARQUIS DE LAPLACE, A PHILOSOPHICAL ESSAY ON

Let me offer an example from my experience at MIT, in 1977 in Introductory Astrophysics.<sup>66</sup> At the time, there was no settled consensus in the scientific community concerning how quasars came into existence; there were four or five theories, each with roughly the same level of support or opposition. Our assignment was to evaluate each of the competing theories and write a paper in which we argued for whichever theory we felt was the most likely to be the most accurate.

I no longer recall what the various alternative theories were, or which theory I supported. My point today is that at that time, our professor told us to treat each alternative theory on an equal basis. In so instructing us, the professor was asking us to apply the principle of “multiple working hypotheses” developed by Thomas Crowder Chamberlin, founder of the *Journal of Geology*, President of the University of Wisconsin from 1887-1892, founder of the Department of Geology at the University of Chicago, and professor there from 1892-1918, in his paper “The Method of Multiple Working Hypotheses.”<sup>67</sup>

I presume that in the thirty-one years that have passed since that class, one of those theories has attained general support. But if someone were to come forward now and propose that in fact, one of the now-rejected alternatives ought to be chosen instead, operation of this rule would change the basis for comparing the theories. This cannot be correct. The burden of proof comparing each theory ought to be the same. “New” evidence that tips the balance in favor of a different theory ought not to be burdened with the additional demand that it be “extraordinary” merely because we did not discover the evidence until after the passage of thirty-one years. The happenstance of the particular dates on the calendar on which human beings happened to collect different items of data and evidence cannot logically affect the weight to be given to each item. If the “incumbent” theory is still to hold sway, it ought to be because it possesses more and better evidence

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PROBABILITIES 112 (Frederick Wilson Truscott & Frederick Lincoln Emory trans., Chapman & Hall 1902) (1814). Laplace begins chapter eleven with “The majority of our opinions being founded on the probability of proofs it is indeed important to submit it to calculus.” *Id.* at 109. In other words, “where is *your* math?” In the mid-1970s, a group of individuals including Sagan and sociologist Marcello Truzzi amended Laplace’s principle to justify their demand that a higher standard of proof applied in evaluating claims seen as paranormal or fringe-science: “Extraordinary claims require extraordinary proof.” Sagan changed the final word to “evidence” when he popularized the phrase in the 1980s and later.

66. In which I earned a B.

67. ORESKES, REJECTION OF CONTINENTAL DRIFT, *supra* note 38, at 136-40; see Thomas Crowder Chamberlin, *The Method of Multiple Working Hypotheses*, *SCI. MAG.* 15, 92 (1890), reprinted in *SCI. MAG.*, May 7, 1965, at 754-59.

than any other. It ought not to be maintained because a higher standard of proof has been imposed on the alternatives and as a result, the alternatives failed to meet the burden.

This is plainly a rule designed to protect the prestige of the science community from the embarrassment of having proclaimed as true, for many years, statements that are false. The rule does not serve truth. The rule overturns Chamberlin's principle of "multiple working hypotheses" because it imposes a predetermined bias against all alternatives other than the generally-accepted theory. Chamberlin, to the contrary, called on scientists to "become the parent of a family of hypotheses, and by his parental relations to all is morally forbidden to fasten his affection unduly upon any one."<sup>68</sup> To analogize to elections, the rule that "extraordinary claims require extraordinary evidence" is akin to a rule that says that the sitting mayor of the town, if he has held office long enough, or won past elections by a large enough margin, can only be replaced in future elections if the challenger gets seventy per cent of the vote, rather than fifty-one percent of the vote. Certainly such a rule would be in the interests of all those other officials who have attached their careers to the continued success of the incumbent mayor. As time passes, it is a matter of human nature that more and more people will have attached themselves to the incumbent's continued success. Plainly, this is a rule that serves sociological, financial, and prestige goals, at the expense of putting the best "candidate" into "office."

3. Rule Number Three to Be Rejected: "Scientific merit is not established through public discourse and debate, but rather, internally, through a consensus of those with the specialized background necessary to make such judgment" – Kansas Citizens for Science<sup>69</sup>

Another rule of behavior and thinking that the science community has developed for sociological reasons is a habit of what might best be described as professional deference between persons who hold Ph.D.s in science.

A great deal of time and effort is necessary to earn a Ph.D., and such a degree typically denotes expertise in a fairly narrow field. A person who has earned a Ph.D. expects deference for her or his opinions in that field,

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68. ORESKES, REJECTION OF CONTINENTAL DRIFT, *supra* note 38, at 137.

69. Kansas Citizens for Science, Resolution Regarding the State Board Science Hearing Committee (Mar. 8, 2005) [hereinafter "KCFS Resolution"] <http://www.kcfs.org/standards05/KCFS.resolution.html>.

such that the holder of the Ph.D. will not afford respect to anyone who lacks equivalent qualifications but yet questions the Ph.D.'s opinions in that field. The holder of the Ph.D. expects others either to listen, or to ask questions merely for the purpose of clarifying inaccuracies in their own understanding of the Ph.D.'s opinions and conclusions.

But to get this deference from others, the Ph.D. must also give it to others. Thus there arises a fraternity of deference, in which the pronouncements of leading Ph.D.s in a particular field are automatically given acceptance and deference (at least, in all public situations) by all other Ph.D.s in all other fields.<sup>70</sup> This rule of professional deference operates to limit the number of "authorized critics" of any particular person's pronouncements. All other persons in the world are ruled out *a fortiori* and labeled ineligible to offer substantive criticism of the theories offered by the Ph.D. The community of all science Ph.D.'s conforms to this rule, because it serves all members of the community. Any one Ph.D. who took the position that a non-Ph.D. could provide a telling, indeed refuting, criticism of a current Ph.D.s work, would of course open up his or her own opinions to challenge by non-Ph.D.s.

This rule reinforces the earlier rule described above, the one that provides that no-one may criticize a theory without offering an alternative theory. So much time and effort is required to earn a Ph.D. that each person who commits to earn one is necessarily invested in the continuing prestige of the science establishment generally, and is personally invested in the enterprise of developing new explanations and theories, and not merely in exposing the invalidity of existing theories. Because the roster of "authorized credible critics" of a theory is limited to persons whose careers depend on rising within the scientific establishment, science ensures that unsound theories maintain the appearance of soundness in perpetuity, until a more persuasive alternative theory is advanced within the institutions of science.

This rule also operates through the popular science press into the mainstream media. The popular scientific magazines survive by providing the public with a more comprehensible summary of the leading scientific advances of the day than the public could get by reading the abstruse science journals directly. The popular science press thus has a vested

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70. My observations on the customary deference Ph.D.s accord each other are based on my general impressions of interacting with Ph.D.s: first, in the context of my experiences at Pomona College and MIT, 1973-1977; second, in the context of my career in avant-garde theater, 1979-1987, in which our non-profit boards of directors included Ph.D.s such as U.C. Berkeley's George Lakoff (Professor of cognitive linguistics); and third, in the context of my commercial and pro bono law practice at Arnold & Porter LLP, 1992-2006.

interest in praising and expressing excitement about the science community on which it reports. It is a succession of hero stories and success stories, similar to the popular business press, which survives by selling stories of business successes and business geniuses.

The editors of the popular science magazines also have a vested interest in asserting that only Ph.D.s in a particular field are qualified to critique the conclusions stated by other Ph.D.s in that field. Thus, in panel discussions or presentations, editors of popular science magazines will regularly, and with apparent modesty and deference, note that they would not dare to question the conclusions of the Ph.D. scientists on whom the magazine reports.<sup>71</sup>

Now, the editors of these magazines typically have greater science education than the general public that reads the magazines. So the necessary implication is that if the editors proclaim their own lack of ability to doubt the Ph.D.s, so too the readers must admit their own lack of ability to doubt the Ph.D.s.

I personally experienced the “non-authorized critics rule” firsthand in a very high-profile, public setting. In May 2005, I had the pleasure of participating in the Kansas State Board of Education’s “evolution” hearings.<sup>72</sup> The teaching of evolution became a high-profile issue in Kansas in 1999, when the board removed evolution from the curriculum. Later, a

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71. My observations on the customary deference that popular science magazine editors accord to Ph.D.s are based on my general impressions of attending a variety of panel discussion since 2003, or viewing videos of such discussion online. I first recognized the psychological effect of this deference while attending a panel presented by the Robert Taft Club on December 5, 2007 in Arlington, Virginia, in which the panelists included Ron Bailey, science correspondent for Reason magazine, as well as National Review’s John Derbyshire, and authors Tom Behtell and Charles Murray. Reason Magazine, Reason Staff: Ronald Bailey, <http://www.reason.com/staff/show/133.html> (last visited Apr. 16, 2009). Mr. Bailey’s deferential comments toward the Ph.D. scientists on whom he reports, in which he declaimed any qualification to second-guess these scientists in their fields of expertise, had the effect also of disqualifying anyone else in the audience and on the panel who might presume to doubt these scientists. A singularly vivid example of a publication that grounds its own credibility on the promotion of the credibility of scientists is the November 2004 issue of National Geographic, with the cover story “Was Darwin Wrong?” *Was Darwin Wrong*, NAT’L GEOGRAPHIC, Nov. 2004, available at <http://ngm.nationalgeographic.com/ngm/0411/feature1/fulltext.html>.

72. As of April 2009, the only remaining online site where the transcripts are available is maintained by an anti-intelligent design website, which frames the material with a customary derogatory slant, but which purports to present the transcripts accurately. See Transcript of Kansas State Board of Education “Evolution” Hearings (2005), available at <http://www.talkorigins.org/faqs/kansas/kangaroo.html>. A search of the internet will likely reveal sites that offer audio recordings and video excerpts.

new majority on the board voted to put evolution back into the curriculum, and now another new majority was considering including in the curriculum scientific criticisms of evolution.

The board, a body composed of representatives elected by the people of Kansas pursuant to the State Constitution, organized the hearings to take testimony for and against the scientific validity of two assertions: (1) that natural chemical processes alone are the cause of the origination of life, “chemical evolution,” and (2) that Darwinian “natural selection” alone, without any intelligent guidance or control, is the cause of the subsequent diversification of forms of life.<sup>73</sup>

The key question that the people’s elected representatives wanted to explore was whether (a) all life is the result of chance events occurring in DNA, or perhaps elsewhere, that are then “selected” in some fashion without the need of any guiding intelligence, or (b) at least some of the diversity of life, such as the more significant changes of species one into another, must have been produced by the intervention of something that we can best analogize to our own concept of intelligence.

Advocates of neo-Darwinism, punctuated equilibrium, or of similar theories under other labels, all assert that chance combinations of atoms and molecules, primarily in DNA, perhaps also with insertions of other DNA carried by viruses or other organisms, given several billion years in which to operate and to be selected, not only can but in fact have given rise to all of the diversity of life we see today.<sup>74</sup>

This is the fundamental principle common to a variety of different theories that are sometimes labeled “naturalistic evolution” but might more usefully be labeled “unintelligent evolution.” I use the phrase “unintelligent” evolution to make explicit this connotation of the term

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73. The lead witness for the “challenger” side, Dr. William Harris, in his opening remarks on May 2005, described the question as follows:

[W]e hope to show that there is a scientific controversy over two major aspects of evolutionary theory. Chemical evolution—that is the arrival of life from non-life—and macroevolution, which is the development of complex life forms from simple life forms. Those two issues, I think, are what’s on the table. What’s not on the table is what we call and many call microevolution, also part of Darwin’s theory, that species adapt to changes of environments by natural processes only in this occurrence within certain limits. The question is what are those limits. We anticipate demonstrating that there is really a scientific controversy.

See Transcript of Kansas State Board of Education “Evolution” Hearings (2005), available at <http://www.talkorigins.org/faqs/Kansas/kangaroo.html>.

74. See GILBERT, *supra* note 10, at 751, 777-79 for a helpful short summary of the changes and variants in evolutionary theory from Darwin to the early 2000s.

“evolution” as customarily understood. I do this so as to make available to public discussion an alternative possibility, that some force or operative part of our material universe that humans can conceptualize only by analogy to our own intelligence,<sup>75</sup> theoretically might generate new designs (and thus produce the diversity of life) by causing preexisting species to undergo designed changes in DNA, and thus to undergo “intelligent” evolution. The argument here is that unintelligent processes are not a complete and sufficient explanation for all the diversity of life.

The elected representatives with the Kansas Board scheduled six days of testimony. Three days were scheduled for the challengers to “unintelligent” evolution, or Darwinism, followed by three days for its defenders. No objections would be allowed to interrupt the testimony, and each person who spoke would be subject to cross-examination by counsel for the other side. Following cross-examination, the three members of the board conducting the hearings would ask questions.

Two of the individuals most responsible for the hearings, Bill Harris, Ph.D. professor of medicine at the University of Missouri/Kansas City, and John Calvert, a lawyer, offered twenty-three witnesses to testify over their three days. The witnesses were offered to challenge the scientific basis for chemical evolution and natural selection. Their witnesses included seventeen Ph.D.s: ten university science professors (including Harris), five other science Ph.D.s who had published books on evolution and intelligent

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75. Each animal we see on earth has its own mental intellectual limitations concerning the concepts it is able to develop. Not even the great apes will ever be able to form concepts such as space and time, of forces, of mathematics, of logical reasoning, or of complex designs, and form a mental picture of our world as humans do. We can take a dog or a chimpanzee to the assembly-line of an automobile factory. We can show it every step of the assembly. We can put it in the car at the end of the line and drive away, but the animal still will not comprehend the process of assembly or the mental organization of design. The assembly-line will not even form a coherent whole process in its mind.

The science establishment today devotes considerable effort to show that the human body is physically similar to the apes, both in its abilities and its limitations. It is logical to extend that argument also to the mental abilities and to operate on the prudence and conservative principle that our minds, also, are significantly limited in their ability to form the concepts necessary to a complete and accurate understanding of the world. We humans should expect that there are processes and forces operating in the natural world that are beyond the ability of our evolved minds to comprehend. Those phenomena that the less sophisticated call supernatural may all be the perceptible aspects of processes in the material world that the human brain has not evolved an ability to cohesively perceive and mentally integrate into a conceptual picture. Only a desire for social status and continued prestige urges the science community to claim, contrary to the rational conclusions of its own positions, that the human mind can with enough time and enough funding learn and conceive of everything necessary to comprehend the world.



design, and two university philosophy professors. The other six witnesses were two masters-degree holders, three high school biology teachers, and Calvert himself, who would provide a legal argument. Harris and Calvert asked me to help prepare their witnesses for cross-examination, and to prepare to cross-examine the opposition witnesses.

But when the board scheduled the hearings, an advocacy group called Kansas Citizens for Science (KCFS) promptly called for a boycott. A nonprofit whose directors include scientists and laypersons, KCFS had been prominent in opposing the board's 1999 decision to remove evolution from the curriculum.<sup>76</sup>

"Scientific merit is not established through public discourse and debate," their resolution stated, "but rather, internally, through a consensus of those with the specialized background necessary to make such judgment."<sup>77</sup>

A KCFS executive, Liz Craig, posted on the group's website that her "strategy at this point is . . . [to] portray [critics of natural selection] in the harshest light possible, as political opportunists, evangelical activists, ignoramuses, breakers of rules, unprincipled bullies, etc."<sup>78</sup> She added, "Our target is the moderates who are not that well educated about the issues, most of whom probably are theistic evolutionists."<sup>79</sup>

One of the leading institutions of science, the American Association for the Advancement of Science (AAAS), issued a press release announcing that it, too, would boycott the hearings, because "the event is likely to sow confusion rather than understanding among the public."<sup>80</sup>

Calling the hearings an "event" disparaged the hearings as serious attempts to explore the questions at hand. Also, saying the testimony would "sow confusion rather than understanding" insulted the witnesses, particularly the ten university science professors, whose universities presumably engaged them to teach science precisely because of their proven ability to sow understanding, not confusion, among their students.

The releases worked, and the boycott held. However, a highly-skilled and well-known Topeka trial lawyer, Pedro Irigonegaray, appeared and announced that he would cross-examine our witnesses and speak for "mainstream science." It appeared fairly clear, although never explicitly

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76. Kansas Citizens for Science, About Us, [http://www.kcfs.org/kcfsnews/?page\\_id=2](http://www.kcfs.org/kcfsnews/?page_id=2) (last visited Mar. 24, 2009).

77. KCFS Resolution, *supra* note 69.

78. Personal knowledge of the author as a participant in the hearings.

79. *Id.*

80. Edward W. Lempinen, AAAS "Respectfully Declines" Invitation to Controversial Evolution Hearing, AAAS, Apr. 12, 2005, <http://www.aaas.org/news/releases/2005/0412kansas.shtml>.

stated, that he was brought into the hearings by KCFS and represented KCFS's position.

I sat beside Harris and Calvert at counsel table throughout the hearings. As they began, the press filled the hearing room, an auditorium with a small stage. Reporters from many national news organizations were present. Video camera tripods lined both aisles, making it difficult to get to the stage, where the two counsel tables were located.

Calvert conducted the direct examination. Our witnesses included some of the major figures in the current challenges to chemical evolution and natural selection, such as John C. Sanford of Cornell, primary inventor of the "gene gun" for injecting cells with genetic information. Also testifying was Michael Behe, a biochemist at Lehigh University. Charles Thaxton, co-author of *The Mystery of Life's Origin*, was also a witness. Witnesses also included other science Ph.D.s and professors. In conclusion, Calvert gave a legal argument for the constitutionality of teaching the scientific evidence our witnesses had just provided.<sup>81</sup>

As a result of the boycott, my role of cross-examining the other side's witnesses was reduced to preparing to cross-examine Irigonegaray. On the fourth day of the hearings, Irigonegaray took the podium and presented what he labeled a "closing argument." This amounted to a two-hour diatribe focused on two points. First, he denied that evolution, as taught in the schools, postulates that no intelligence is necessary to account for the diversity and complexity of life. In this, he was appealing to KCFS's "target[,] the moderates who are not that well educated about the issues, most of whom are probably theistic evolutionists."<sup>82</sup> Second, he denounced the members of the board and Calvert as being motivated by political interests and for wasting taxpayer money. In this, he was applying KCFS's "strategy [to] portray them in the harshest light possible, as political opportunists" and "breakers of rules."<sup>83</sup>

As part of his presentation, Irigonegaray read a lengthy statement from a KCFS executive who was in the room at that moment. Obviously, the author could have read his own statement in person, but then he would have been subject to cross-examination.

While Irigonegaray spoke, I took notes to prepare to cross-examine him; including on the speech authored by the KCFS leader. The procedural rules clearly stated that anyone who spoke would be subject to cross-

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81. *Id.*

82. *See supra* note 72.

83. *Id.*

examination.<sup>84</sup> Indeed, Irigonegaray had used the rule to question our side's lawyer, Calvert, after Calvert's legal presentation.

But as Irigonegaray concluded his speech, he announced that he was a lawyer giving an argument, not a witness, and thus he would refuse to undergo cross-examination. That was even though he had himself taken advantage of the right of cross-examination the day before, when he questioned Calvert, who was also a lawyer giving a legal argument. Irigonegaray's tactic effectively allowed the KCFS leader to testify, by means of his speech Irigonegaray had read into the record, yet escape cross-examination.

Our witnesses stood up to public cross-examination by legal counsel. "Mainstream science" dodged it. Yet it is "mainstream science's" position on evolution, the side that refused public cross-examination by legal counsel, that has been and is being taught in our schools. As the theory that is actually being taught, plainly it ought to be subject to cross-examination by independent examiners who have the courage and independence to weather the storm of opprobrium inflicted on those who openly challenge this orthodoxy. Yet the theory is not.

One might respond to the foregoing by saying that the rules serve a proper substantive purpose, that only a Ph.D. ought to be allowed to attempt to tear apart the work of another Ph.D. and replace that work with an alternative theory.

If we separate the role of tearing down existing theories from the role of proposing and establishing new theories, we see instantly that, while it may be appropriate to expect a Ph.D. from one who proposes a new theory, there should be no such requirement for a person whose role is merely to tear down another Ph.D.'s theory.

In fact, in every lawsuit involving theories offered by Ph.D.s, non-Ph.D.s undertake to tear down those theories. The job is performed by lawyers who do not have Ph.D.s themselves, but who are intellectually capable of learning enough science and mathematics as necessary to tear down the theories offered by the other side.

The tearing down of Ph.D. theories by non-Ph.D.s is particularly prevalent in biology. Defense lawyers attack plaintiffs' civil tort theories which assert that—as to a particular individual—smoking, asbestos, diet drugs, artificial heart valves, chemicals in the drinking water, overhead electrical wires, vaccines, gases emitted from wood paneling, lead paint chips, or some other substance or force caused that person to suffer disease or injury of one kind or another. Or in a criminal case, if the prosecution

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84. Personal knowledge of the author as a participant in the hearings.

asserts that the crime was done by a means that requires a science Ph.D. to describe it, defense counsel can impeach the Ph.D.'s theory without offering an alternative scientific explanation. In both kinds of cases, defense lawyers are not required to prove alternative theories of disease or injury. Of course, they may choose to offer alternatives if they think it will help defeat the plaintiff's or prosecution's theory.

4. Rule Number Four to Be Rejected: "Social situations significantly control individual behavior" – Philip Zimbardo<sup>85</sup>

The 2001 video series *Discovering Psychology: Updated Edition*, hosted by Stanford psychologist Philip Zimbardo, includes an episode entitled "The Power of the Situation," which explores the development of social psychology during World War II.<sup>86</sup> Referring to an experiment that compared human productivity under three leadership styles—authoritarian, laissez-faire, and democratic—Zimbardo notes first that democratic was the most productive. Zimbardo then says:

But there is also another powerful lesson here. Notice that it was leadership style and the social situations it created, and not the personality of the individuals involved, that were the critical factors in the experiment. This leads us to a central theme in social psychology: that social situations significantly control individual behavior.<sup>87</sup>

Immediately following this statement, Zimbardo describes an experiment conducted by Solomon Asch in which the subject is shown a line of a given length. The subject is then shown a group of three other lines, each of a different length, one of which is the same length as the original line. It is obvious to the isolated subject and the audience which line is the same length. The other two lines are plainly not the same length as the original line. But if the same test subject is placed in a group with six other people, all of whom appear as rational and intelligent as the subject, and all six confidently choose the same *incorrect* line, seventy percent of subjects will also choose the incorrect line.<sup>88</sup>

If this psychology of conformity to the majority can operate so successfully to direct a seventy percent error rate in a data-evaluation

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85. *Discovering Psychology: Updated Edition: The Power of the Situation* (episode 19) (Annenberg Media 2001), available at <http://www.learner.org/resources/series138.html>.

86. *See id.*

87. *Id.*

88. *Id.*; see also Asch Conformity Experiments, [http://en.wikipedia.org/wiki/Asch\\_conformity\\_experiments](http://en.wikipedia.org/wiki/Asch_conformity_experiments) (last visited Mar. 23, 2009).

setting such as comparing the lengths of lines, imagine how powerfully it operates when the implications of the data are far less plainly clear. It would appear inescapable that the power of social conformity psychology would overwhelm the independent rational analysis of each individual.<sup>89</sup>

I find it remarkable that the leaders of the science establishment—who surely must know of the Solomon Asch experiment—have apparently taken no steps at all to design and institute organizational structures and systems that attempt to counteract the otherwise inescapable and overwhelming effect of social psychology on the independent logical judgment of young scientists. These young scientists receive instruction in rooms of students, each of whom by voice or body language indicates acceptance of the teacher's statements. Each student operates psychologically on the others, in the same way as the six people in Solomon Asch's room. Each student takes his or her cue from the teacher, who was himself or herself socialized in just such a room. The lesson of the Solomon Asch experiment may be to undermine in significant ways the very function of large lecture halls—and by extension, all other science learning situations in which each student knows the position of the pre-existing majority of power figures and peers on any particular question before he or she is called upon to give his or her own analysis of the same data.

Professor Hoyle addresses this dynamic in the context of evolution: the things that are “wrong” with evolutionary theory have “never had a fair hearing” because

the developing system of popular education [in Darwin's day] provided an ideal opportunity for zealots who were sure of themselves to overcome those who were not, for awkward arguments not to be discussed, and for discrepant facts to be

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89. Zimbardo discusses these implications in more detail in his book *The Lucifer Effect*. See ZIMBARDO, *supra* note 5, at 262-66. Zimbardo also discusses the 1935 Muzafer Sherif experiment, in which test subjects reported the apparent movement of a spot of light due to the “autokinetic effect.” Persons exposed to a group's judgment of the movement tended to revise their own perceptions of the light to accord with the group's stated consensus. *Id.* at 262. The implications of this phenomenon for scientists—whose primary competence is said to be the independent and impartial assessment of physical data—ought to be obvious. To pick just one of the many sub-topics in the evolution arguments, scientists' views about whether fossils do or do not demonstrate a progression of transitional forms must inescapably be affected by this phenomenon. This is a primary reason why I have never felt it productive to engage in debates over fossil similarities, the usefulness or non-usefulness of body features, or the efficiency or inefficiency of designs. All such matters are so tainted by subjectivity and the effects of the group pressures demonstrated by the Asch and Sherif experiments as to make these debates useless.

suppressed. This was because popular education created a body of students who . . . had of necessity [to earn their livings] and because it is only students from privileged backgrounds who can afford to adopt views contrary to what they are told.<sup>90</sup>

Indeed, advocates of Darwinian evolution ought to be well aware of the biasing effect of social dominance. *The Evolution of Mind* reported on a series of psychology experiments that established “the effects of social dominance on reasoning.”<sup>91</sup> In one experiment, each subject (a college student identified as the “reasoner”) was told to inspect a set of records to determine whether the supposed author of the records had reported certain facts accurately or inaccurately. Some of the subjects were told to adopt the role of a dormitory “RA” (resident assistant, a status that the subjects saw as higher than a mere student), and some were told to adopt the role of a student; some were told that the author of the records was a dormitory RA, while others were told the author of the records was a mere student. The result:

Rank was found to have a clear impact on reasoning performance but only on the social version of the task: People were more likely to look for potential violations when they believed themselves to be checking on people who were lower-ranking than themselves (65%) than when they believed themselves to be checking on people who were higher-ranking (20%) or equal-ranking (RA-RA = 20%, student-student = 15%).<sup>92</sup>

*The Evolution of Mind* reported: “[T]he human reasoning literature shows a robust deontic effect in human reasoning and a complex relationship between cheater detection [the form of false reporting used in the study] and rank discrimination in human decision making.”<sup>93</sup>

It should be obvious in the school instruction environment, where the professor holds not only the position of social dominance in the lecture hall, but also actual power over the students in the awarding of grades and recommendation letters, that the academic instructional environment is rife with psychological and sociological features that override independent reasoning.

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90. HOYLE, *supra* note 6, at 106.

91. See Denise Dellarosa Cummins, *Social Norms and Other Minds: The Evolutionary Roots of Higher Cognition*, in *THE EVOLUTION OF MIND* 30, 42 (Denise Dellarosa Cummins & Colin Allen eds., 1998).

92. *Id.* at 41-42.

93. *Id.* at 42.

And because all professors today and their professors before them, going back at least seventy years and perhaps 130 years, generation after generation, have been conditioned in the same academic structural settings, it should be obvious that on such a fundamental and socially significant question as the origin and diversification of life and of the human species, the modern scientific community is profoundly unreliable. It is unreliable regarding the rational and logical analysis of the factors that must have been necessary to produce DNA and the operations of cells and of multi-celled creatures, as the data on these subjects has come in only since the early 1950s.

Professor T.C. Chamberlin was aware of this problem. Oreskes reports: "The question, as posed by Chamberlin, was how to foster mental independence among his charges, so that the work of the next generation would 'be individual and independent, not the mere following of previous lines of thought ending in predetermined result.'"<sup>94</sup>

The effect of social dominance, stemming from Huxley and the members of the X Club who inspired the founding of modern research universities, through generation after generation of professors, to Crick and Watson (the discoverers of DNA whose own arrogant and dominant personalities and anti-"intelligent design" bias were well known), through to today, has profoundly deformed the reasoning of those minds that have directed themselves to this data. Only those few who are able, financially and emotionally, to divorce themselves from the influence of the academic scientific world (as well as the religious world) can even begin to apply independent reason to this data.

I have been fortunate these last few years to be able to watch such Annenberg television courses as *The Mechanical Universe*<sup>95</sup> and *The Western Tradition*.<sup>96</sup> And I have read, on my own, almost all of the textbook *Molecular Biology of the Cell*.<sup>97</sup> But I have done this on my own, between ages forty-three and fifty-three, long after establishing my credentials and a number of careers. I have studied these things neither as part of a class in which other students and the teacher are watching me, nor as part of an effort to earn a credential that will gain me employment within a science institution. Thus, I am able to evaluate and critique what I am told by these sources, without any Asch psychological effect.

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94. ORESKES, REJECTION OF CONTINENTAL DRIFT, *supra* note 38, at 138.

95. See *The Mechanical Universe . . . and Beyond* (Annenberg Media 1985), available at <http://www.learner.org/resources/series42.html>.

96. See *The Western Tradition* (Annenberg Media 1989), available at <http://www.learner.org/resources/series58.html>.

97. See ALBERTS ET AL., *supra* note 9.

Although these educational videos show students sitting in the lecture hall and a teacher lecturing at the front, these people have not the slightest power over me. It is the same format of instruction, but divorced from the psychological effect. If I disagree with something I hear, note contradictions between the teacher's statements, or find that some statement is not supported by any prior statements or data, I am in no danger that a crowd of students around me will form a negative opinion about me, or that the teacher will curl a lip in a sneer and make me afraid of getting a bad grade.

Judges in cases involving intelligent design ought to try to cultivate this same indifference to the emotions of others. It is inappropriate and contrary to the intellectual freedom of the reasoning logical mind for any judge to allow emotional pressure to make the judge assent to propositions that the judge would reject if the he or she were evaluating the propositions in a socially insulated environment.

The operation of the Asch effect is another reason why judges in cases involving intelligent design ought not to rely on credentials bestowed by the prominent institutions of science. Where a challenge to a particular theory is already well known and long-rejected by the science community, members of that community will not even begin to listen to an argument that new evidence revives that challenge. They know that if it becomes known in the community that they gave any credence to the challenge, they will be considered to have revealed a fundamental irrationality that renders them unreliable.

In litigation, if a lawyer reviews the data and develops an internal, sincere belief that conflicts with the presentation that he or she needs to make in court, the lawyer is expected to keep that belief private. The lawyer's obligation is not to be *actually* sincere but only to *appear* sincere. Thus, there is no danger to the lawyer's livelihood if the lawyer develops a private understanding of the data that conflicts with the understanding to be presented in court.

But in science the rule is different. Scientists are supposed to be *actually* sincere. They are supposed to develop genuine, individual opinions about the data and then express those opinions. They are not supposed to hide their opinions while expressing opinions that they do not sincerely believe. For brevity's sake, I will call this the "sincerity rule." The "sincerity rule" means that if a scientist develops a *disbelief* in a widely accepted theory, he or she must express that disbelief. But if the justification for the disbelief requires learning a body of evidence and arguments that most other scientists will not take the time to learn, or involves rejecting the opinions of the consensus of Ph.D.s in that field, the scientist who develops the



disbelief can expect a swift and widespread rejection of his position by most peers, co-workers, and superiors.

Thus, preservation of career advancement opportunities is predicated on the maintenance of belief in all widely held theories. It is vital to a scientist's career not to develop opinions that, if expressed, will end that career. This is another reason why challenges to generally accepted theories will receive, at best, no more than a condescending hearing in every forum that is dominated or controlled by the science establishment, because its members are primed and motivated in every instance to reject those challenges.

It requires a tremendous amount of intellectual energy to take a position that disagrees with the majority view. In the example of the intelligent design challenge to evolution, anyone—including a judge or scientist—who starts to see merit in the dissenters' viewpoint must wonder: "If I say that I see some merit in the position, what box will my friends say I've fallen into? Will they recoil and say, 'Oh, and what about the age of the earth, and common descent?' If I can't promptly brush those questions aside in five words, this issue is not worth the cost. I do not have the energy, time, and interest to argue with my friends about the age of the earth and common descent, on top of the main intelligent design argument that I am interested in exploring. If, by showing some receptivity to intelligent design, I am forced into debates about those other issues, forget it. I'll reject intelligent design because I can't afford the disruption in my life and friendships if I get into it."

The cumulative effect of these psychological pressures produces in the science community a psychological dynamic that I have observed in the practice of law: a mental process lawyers go through when they take a case.

Non-lawyers often wonder how a lawyer can advocate either position in a lawsuit, depending entirely on which side happened to retain that lawyer. What if the lawyer's sincere assessment of the case leads her or him to feel that the other side has the better case? The answer is that many lawyers employ a thought process that entirely avoids putting themselves into that dilemma.

Upon receiving a case, a lawyer who uses this process immediately inquires what result the client wants. Then he or she asks not "What are the facts?" but "What facts must be true so that my client wins?"

After determining what facts need to be true for the client to win, the lawyer then looks at the data and applicable law and asks, "How can I understand this data, in light of the applicable law, as evidence proving the facts that need to be true for my side to win?" The lawyer then mentally

adopts, as much as possible, an understanding of the data as evidence for the facts that need to be true to achieve the goal.

Granted, the process is not unbounded. The lawyer's assessment of what the court might accept as a proper interpretation of the data bounds what the lawyer will believe and then advocate. But the key point is that at no time does the lawyer need to step back and ask, "What is my assessment of this data, independent of my client's interests?" The lawyer's independent assessment of the data is irrelevant to the client's goals, and usually to any other interest of the lawyer, so she or he need spend no effort developing such an assessment. Thus, the lawyer never has in mind two conflicting understandings of the data; the lawyer only develops the understanding that is a reasonable interpretation of the data as evidence for the facts that gain the goal the client seeks. In experienced lawyers, this mental process goes on entirely unconsciously. If the opposing party had retained the lawyer first, the lawyer, using the same mental process, would have developed an entirely different understanding of the data.

I think scientists, who often function as advocates, consciously or unconsciously employ the same mental process. In fact, I believe this process is even more strongly at work in the scientific community than among litigators. Each scientist also has, in effect, a client: her- or himself and by extension the scientific establishment, which controls the scientist's future career. The scientific establishment, like any client, has economic and sociological interests. And as in any human organization, the people who most effectively advance the interests of the scientific establishment are the ones chosen to lead the establishment. Those who impede the achievement of those ends are rejected. Thus, there is simply no sociological incentive for a scientist to take the time to consider challenges to widely accepted propositions and to develop an individual response to those challenges, because if that response rejects the widely accepted propositions, the scientist must either suppress it (and violate the "sincerity rule") or else express it (and likely end his or her career).

These observations also explain the operation, in the science community, of a psychology that commonly operates in litigation. In litigation, opposing lawyers are primed to reject every statement by the other side, because there is no advantage to gain by considering whether the statements might be true. The lawyers are not engaged in a mutual search for truth.

This manifests itself in the *ad hominem* denigration of the other side's representatives. If the other lawyer has not actually said things that are egregious enough to condemn, the attacking lawyer will *claim* that the opponent said things that he or she did not really say. If pressed, the attacker will step back slightly and argue that what the opponent actually

said *amounts to* what the attacker claimed the opponent said. Moreover, lawyers regularly seize upon any action by the other side's lawyers that can be characterized as evidence that that lawyer is deceitful, is incompetent, is confused, or has bad motivations. The goal is to get the judge to discount the credibility of the other side's spokesperson.

Anyone who delves into the books, articles, and internet postings in the evolution debate will see instantly who employs these kinds of tactics and who does not. In comparing the writings of the science-trained advocates of intelligent design with the writings of their opponents, these tactics occur again and again on just one side of the debate: the side of the science establishment. The science establishment ridicules intelligent design advocates in an attempt to intimidate them and, by implication, anyone who sides with them. For example, the authors aligned with the scientific establishment often label skeptics of unintelligent evolution as "creationists" in an attempt to box in all doubters with young-earth Christian fundamentalists, while adding sneering comments that denigrate these doubters' intellectual integrity. This denigration arises in connection with social psychology to enforce conformity and reduce the discomfort caused by a dissenter who undermines that conformity.

Unlike in almost all other scientific debates, in this debate the science establishment appears not as an entity that wants to work with the public in seeking the truth, but as an entity that will sneer at those who fail to defer to its pronouncements of the truth.

#### IV. CONCLUSION

Serving the people as a judge requires, on one hand, an intellectual independence from the popular trends and attitudes of the day, yet on the other hand, a sensitivity to the public's discomfort with decisions that appear to reach too far outside those same trends and attitudes.

If a lawsuit arose today that required a judge to opine on whether the continents of the earth move, it would be a simple matter to rule that they do. The theory of plate tectonics is so widespread that it provides a cultural background that makes the proposition easy to declare. But if we transpose the same dispute to the year 1930, suddenly that ruling becomes much more adventurous for the judge to make. A judge who ruled in 1930 that the continents moved would have suffered the scorn and denunciations of the science community of that time, but today, such treatment would be inflicted upon any judge who ruled that the continents did *not* move.

Judges, like other educated, well-informed persons, know of the various social groups that have differing opinions concerning disputed fundamental

facts about the world. They know which positions are supported by various media institutions and political groups.<sup>98</sup> They know which positions are taken by those who control the writing of the news and the writing of history. They know who will praise them for taking a certain position, and who will condemn them. They know what they need to say in order to find themselves being invited to the most prestigious gatherings, and to find themselves being praised rather than denounced at those same gatherings. The easiest course is to agree with whatever position is espoused by the group that has the greatest social power to affect a judge's personal and professional life.

In this Article, I urge judges to take a different course. I ask judges, in effect, to be like a hypothetical judge who would have had the courage to rule in the 1930s that it is reasonable to conclude that the continents move, notwithstanding the prevailing opinion of the 1930s science community to the contrary.

To make a ruling in favor of the scientific reasonableness of intelligent design in today's intellectual climate would require an extensive amount of data admitted into evidence, and a thorough discussion of that data. It would require a substantial investment of judicial time and energy. And it would require a judge whose independent analytical judgment is impervious to either praise or condemnation by persons in the larger community—a judge as likely to spurn praise as to ignore criticism, no matter who offers it.

I respectfully urge every judge to adopt internally, psychologically, the independence popularly attributed to the Roman emperor Marcus Aurelius. Each judge should disregard the attitudes of newspapers, television pundits, and everyone who might flatter the judge with an article or invitation to a conference or dinner—or who might denigrate the judge by denying such invitations. That is the attitude to bring to any case involving the proposition of intelligent design.

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98. See SCHNEIDER ET AL., *supra* note 62, at 274, noting a type of “juror prejudice” termed “normative prejudice.” The judge may be biased by awareness of “such strong community sentiment supporting a particular outcome of the case that his or her ability to decide the case impartially based on the evidence becomes compromised in favor of the perceived normative attitude.” *Id.*

