

Original Paper

Anti-Scientific Currents in American Thought

Charles J Kowalski^{1*} & Adam J Mrdjenovich¹

¹ Health Sciences and Behavioral Sciences IRB, University of Michigan, MI, USA

* Charles J Kowalski, Health Sciences and Behavioral Sciences IRB, University of Michigan, 2800 Plymouth Road, Building 520, Suite 1169, Ann Arbor, MI, 48109-2800, USA

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Abstract

Multifarious forces have surrounded science and continue their—sometimes separate, sometimes coordinated—attempts to supplant a scientific approach to an explanation of important questions about us and the world we inhabit. We focus here on questions pertaining to biology and medicine, but no aspect of the scientific enterprise is immune from attack; and not all of the forces aligned against it are represented. The ones considered are: religion, neoliberalism, postmodernism, the “back-to-nature” movement, bioethical obstructionism, and the current POTUS, Donald Trump. We sit in amazement that at the amount of vitriol that has been leveled at science, but try to maintain civility in response. We would be irenic, not polemic; promoting true dialogue between respected scholars holding somewhat differing views. This is not as difficult as some would have you believe.

Keywords

war on science, religion, politics, neoliberalism, postmodernism, over-regulation

1. Introduction

This nation’s founding fathers such as Thomas Paine, Thomas Jefferson, and Benjamin Franklin built a country “known for secularism, the separation of church and state, science-driven technological innovations, and the exulted ideal that public policy must look to scientific evidence instead of appealing to emotion, religious dogma, or authority” (Sidky, 2018). This stance, this attitude, this ideology was not for internal use only. Thus, in 1782, Thomas Paine recognized the cosmopolitan virtues of science:

Science, the partisan of no country, but the beneficent patroness of all, has liberally opened a temple where all may meet. Her influence on the mind, like the sun on the chilled earth, has long been preparing it for higher cultivation and further improvement. The philosopher of one

country sees not an enemy in the philosopher of another, he takes his seat in the temple of science, and asks not who sits beside him.

Seen in this historical light, and noting the incredible progress this reliance on science has achieved, it is truly ironic that we find ourselves in the second decade of the 21st Century defending the virtues of science against supernaturalism, anti-intellectualism, and obscurantism, potent forces in the private and national life of the United States. These are not the only forces that are aligned against science, but some of the more prominent of the several fronts that have been opened are shown in Figure 1, below:

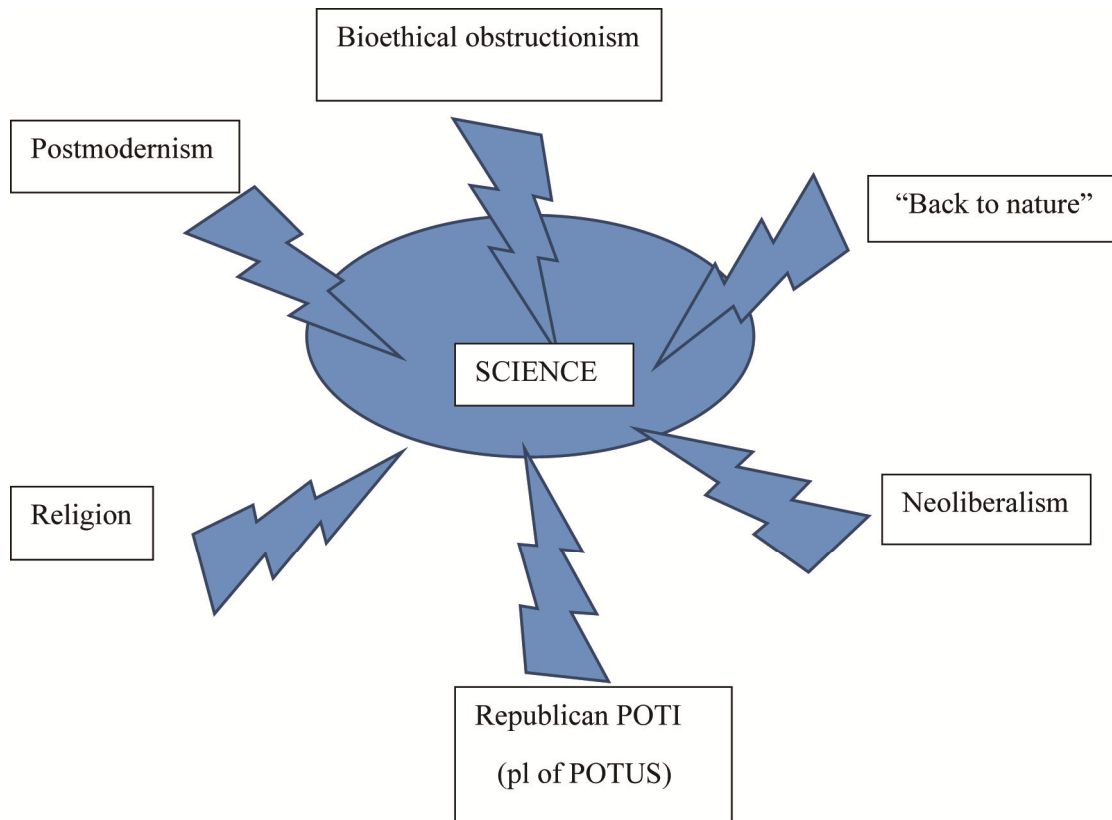


Figure 1. Several of the More Important Fronts in the War on Science

We have, above, pointed to “anti-intellectualism” as one of the forces directed against science. This stands as a force not directly aimed at *science* but, more generally, a hostility aimed at knowledge itself. The recognition of the existence and nature of this phenomenon has been often attributed to Hofstadter (1962), but American history has never known a time predating its presence. In 1955, an entire number of Vol XI of the *Journal of Social Issues* was devoted to anti-intellectualism (as was mentioned by Hofstadter, 1962, p. 6). Therein the central theme of anti-intellectualism was identified as “a distrust and dislike of those who approached problems and policies on the basis of science and reason rather than of tradition and ‘common sense’” (Sargent, 1955, p. 5). It was also pointed out that anti-intellectualism was not, even then, a new phenomenon in American history. Rather, it was thriving

among the very first generation of settlers in the American colonies in the seventeenth century (Leuchtenburg, 1955). In any event, Hofstadter (1962) serves as an important benchmark for the study of anti-intellectualism, and has inspired important work by others, most prominently Susan Jacoby and Charles Pierce. It touches all six of the forces depicted in Figure 1 (albeit in differing ways) and so is not considered separately here. Another potent presence that cannot be isolated from its application to all six of the forces of Figure 1 is *politics*. This stems from the notion of obscurantism pointed to above and its ties to traditionalism, conservatism, dogmatism. We will discuss its effects mainly in the context of neoliberalism, but it too is present in all six of the fronts shown. In particular, not shown in Figure 1 are the usual, routine “bumps along the road” that science would just normally be expected to encounter during its development. For example, progress in science is dependent upon funding, much of which comes from government. Fluctuations in funding will cause structural changes to occur within the scientific enterprise, the fluctuations reflecting changes in the ways different political factions value scientific efforts. The book *Not a Scientist* gives examples (Levitan, 2017). The subtitle says it all: *How politicians mistake, misrepresent, and utterly mangle science*. Some of the bumps will in fact have religious or neoliberal roots, but an endless variety of local quirks may influence the ways in which voters elect their representatives. Levitan is also one (of many) calling for a science-only televised debate between political candidates, especially aspiring POTI (p. 203).

We emphasize that, while the six fronts shown in Figure 1 are distinguishable, they are certainly not independent, and interactions are dependent on context. For example, business enterprises are drawn to produce the dietary supplements desired by those heading “back to nature”, but these same people will adversely affect the market for traditional, conventional medicine. Neoliberal interests will sometimes aim to sow doubt by belittling expertise; sometimes the call will be “We need more research”. Bioethical concerns may put the brakes on innovations that might prove profitable or allow the development of effective therapies. Medicine and religion share a mission of alleviating suffering; certain religions will, however, make it difficult for children to receive appropriate medical care. Both POMOs and neoliberals endorse man’s limited ability to “understand stuff”. The neoliberals turn to the market for answers and populate the political right; POMOs question *the* answer to any question and lean to the left.

We also note that the six forces have been developed to varying degrees. In particular, neoliberalism and religion have received intense study and will not receive special attention in this paper. We note here only that Lave et al. (2010) wrote an introduction to the special edition of *Social Studies of Science* devoted to the study of the impacts of neoliberalism when used to manage the scientific enterprise. Noting that there are important differences in how neoliberalism has been implemented across nations and disciplines, they identify a set of key principles and common outcomes that characterize these activities. These are: the rollback of public funding for universities; the separation of research and teaching missions, leading to rising numbers of temporary faculty; the dissolution of the scientific author; the narrowing of research agendas to focus on the needs of commercial actors; an

increasing reliance on market take-up to adjudicate intellectual disputes; and the intense fortification of intellectual property in an attempt to commercialize knowledge. Each of these features of neoliberalism is treated in detail by Mirowski (2011); and examples of how these have impacted upon biomedical research were given by Kowalski and Mrdjenovich (2017).

The history of the relationship between science and religion has recently been updated by Kowalski (2018). He makes the point that viewing the S&R relationship as a “war”, which has often been done, is not entirely accurate. While there have been notable skirmishes such as Galileo’s imprisonment and the Skopes monkey trial, these are best seen as occasional hiccups in an otherwise reasonably peaceful coexistence over time (Fergren, 2017). Things appear to be heating up in recent times, mainly due to the rise of the so-called “New Atheists”, who have actively attacked religious proponents, especially those with fundamentalist bents. We want to make the point that this is counterproductive if the aim is to promote the image of science amongst the general public (Mooney & Kirshenbaum, 2009, p. 97), but otherwise will have little to say about the religious arm in Figure 1. We next consider, in turn, the postmodern, the “back to nature”, the bioethical obstructionist, and the Republican POTI fronts in the war on science.

2. Postmodernism

What we have labeled “postmodernists” in Figure 1 have other names: “secular creationists”, “the academic left”, “poststructuralists”, “deconstructionalists”, “social constructionists”, etc. This combines a heterogeneous group of individuals into the single unit we call “postmodernists” (POMOs for short), the unifying perspective they all share is a *dislike of science*. And, it is not only a dislike for some of the uses to which science has been put, but extending to the social structures through which science is institutionalized, to the system of education by which scientists are produced, to “the” scientific attitude, but even to the *actual content* of scientific knowledge. They deny that scientific knowledge is reasonably reliable and rests on sound methodology; that nature is knowable by means of the scientific method, and, even that the true nature of nature is “knowable”. According to Sidky (2018, p. 2) they share “general features, such as a disdain for the rationalist tradition of the Enlightenment, a disregard for empirical data and logic, the idea of ‘the cultural construction of knowledge’, and subjective and intuitive approaches to knowledge. Moreover, although pontificating about science became their forte, none of these scholars were trained as professional scientists”.

A convenient starting place for our discussion is 1994 with the publication of *Higher Superstition: The academic left and its quarrels with science* by Paul Gross and Norman Levitt. This is where the tea is tossed into the harbor, Fort Sumpter, or Pearl Harbor. Here the “academic left” is defined. It is admitted that this comprises a diverse and internally contentious community (so much so that Lewontin (1996) charges that “academic left” is useless for analytic purposes), but it’s basically the subset of the academic community that “dislikes science”.

According to Gross and Levitt (1994, p. 3)

The category is comprised, in the main, of humanists and social sciences; rarely do working natural scientists (who may nevertheless associate themselves with liberal or leftist ideals) show up within its ranks. The academic left is not completely defined by the spectrum of issues that form the benchmarks for the left/right dichotomy in American and world politics, although by reference to that standard set—race, women’s rights, health care, disarmament, foreign policy—it unquestionably belongs on the left.

An interesting example of the POMO mindset was given by Moore (2000) who thought about what it would take to teach biology in such a way as to not antagonize POMO. He comes up with a number of suggestions, one of which reads:

Warn students that opinions such as the cell theory and the structure of glucose were proposed by Western white men. Challenge students to discover a new structure for glucose that is not based on ethnocentrically oppressive carbon. Provide encouragement by telling students that their new structure for glucose is as good as any other structure. Give every new structure “equal time” in your discussions of biochemistry. After all, in the world of secular creationism, any ideology is a valid “scholarly perspective”.

Sidky (2018) argued that one of the fundamental tenants of the postmodern perspective was self-contradictory: “it claimed that all truths were relative to class, gender, ethnicity, and cultural background but excluded itself from the constraints of culture, history, and context” (p. 4). He quotes Schick and Vaughn (2014, pp. 311-312):

To say everything is relative is to say that no unrestricted universal generalizations are true (an unrestricted universal generalization is a statement to the effect that something holds for all individuals, societies, or conceptual schemes). But the statement that “No unrestricted universal generalizations are true” is itself an unrestricted universal generalization. So if relativism in any of its forms is true, it’s false.

The book by Gross and Levitt (1994), which signals the start of the modern “science wars” is seen by them as a necessary response to postmodern challenges. Perhaps the famous of the subsequent battles is the so-called “Sokal hoax”, which has generated a voluminous literature characterized by the Editors of *Lingua Franca* (2000) and Sokal (2008). It is beyond the scope of this paper to retell the ensuing stories. Suffice it to say the attacks and counterattacks do nothing to soften the description of the encounters as *war*.

Reading the above descriptions of the postmodern attitude towards science, it’s easy to come away with the impression that its advocates are a bunch of know-nothings intent on discarding the scientific method as a epistemic tool and replacing it with whatever seems fashionable at the moment and fits into the current cultural worldview. Also see Sokal and Bricmont (1998) and Koertge (1998a, 1998b). Some quotes from Koertge (1998b) include:

From Andrew Ross’ dedication of *Strange Weather*: “To all the science teachers I never had. [This book] could only have been written without them” (p. 258).

From Collins and Pinch, in a section entitled “Science and the Citizen”. The idea that knowing more science would help the public make more sensible decisions “ranks among the great fallacies of our age”. (p. 258)

She notes that Mary Daly, in her *Wickedary*, promises to take the “dick” out of “dictionary”. (p. 259).

A more balanced characterization can be attempted. Consider, for example, one of the POMO brigades known as Science and Technology Studies (STS). Fuller (1993) traces the history of the beginnings of STS summarizing its current direction in (p. 9) *The Fundamental Mandate of STS*. Science should be studied as one would any other social phenomenon, which is to say, scientifically (and not by relying uncritically on authoritative testimony, anecdotal evidence, and the like).

This allows that the scientific method is useful and can/should be used on science itself so that it can be understood scientifically. Not much vitriol here. Indeed, our advocacy for irenics has a history within the POMO community. Martin (1996) defined *Irenic* (polemic’s antonym) as: “fitted or designed to promote peace; pacific, conciliatory, peaceful”, and used the approach to blunt some of the polemics found in the “science wars”. We believe that polemics only seems useful when one is convinced of some absolute truth or another and counts sarcasm and vitriol to be among the anythings that go in war. Lewontin (1996) points out that a passionate belief in an absolute truth is exactly the opposite of the relativist, comparativist, and situational understanding of values fostered by social constructivism. Thus, being true to one’s own principles should dampen POMO polemics and allow a more irenic approach. Both sides would benefit from reading Levins’ (1996) ten propositions on the demarcation problem. His 5th proposition is that science has a dual nature. On the one hand, it really does inform us about our interactions with the rest of the world, producing understanding and guiding our actions. On the other hand, science, as a product of human activity, reflects the conditions of its production, and the viewpoints of its producers or owners.

3. Back to Nature

The back-to-nature movement is not so much postmodern as anti-modern. Both rebel against the modern, but while the postmodern view is less oriented to the past as a guide, anti-modernism rejects modernist ideals and behaviors in favor of what is perceived to be a purer, closer to nature historical way of life and state of mind. This is well-illustrated by the “raw milk movement”, a fad among gourmards, which was described by Goodyear (2012) and discussed by Nichols (2017, p. 21 ff). Not only does the stuff taste better, they argue that it’s better for you: If raw vegetables are healthier and better for human beings, why not raw everything? Back to nature! Why not eat the way nature intended and go back to a purer, simpler time? There is an answer to this one—back in those simpler times people routinely died from food-borne diseases. Pasteurization may add to the cost, and someone probably profits from including this step, but most people are inclined to not risk stomach problems and do not mind paying for the privilege.

In this section we briefly discuss three problems that are linked to “back to nature”, viz., vaccination, GMOs (genetically modified organisms), and alternative medicine. Specter (2009) contains detailed discussions of each of these topics. His chapter 2 (Vaccines and the Great Denial) describes the intense controversy involving the alleged relationship between MMR immunization and autism. He notes that this is hardly the first time that the use of vaccination has been controversial. The enduring question is whether vaccination does more harm than good? George Washington faced this when deciding whether to vaccinate the Continental Army against smallpox; Benjamin Franklin regretted not immunizing his son. There is no need to repeat his discussion here: We simply quote his statement “With the sole exceptions of improved sanitation and clean drinking water, no public health measure has enhanced the lives of a greater number of people than the widespread adoption of vaccinations, not even the use of antibiotics” (p. 59).

He also considers “The Organic Fetish” (Chapter 3) and the controversy surrounding the use of Genetically Modified Organisms (GMOs). This is a natural extension of the “Green our Vaccines” attitude adopted by those skeptical of vaccine safety. In Chapter 4 (“The Era of Echinacea”) he looks at the retreat from conventional medicine to “alternative medicine”. We briefly discuss each of these three derivatives of the “back to nature” movement below.

3.1 Vaccinations

Jacoby (2018, pp. 220-221) noted that the anti-vax movement is rife with conspiracy theories tied both to the right wing’s distrust of government and the far left’s distrust of traditional medicine. Nichols (2017, p. 21) noted that low rates of participation in vaccination programs are not due to small-town mothers with little schooling. Rather, resistance is more likely due to educated suburbanites with enough schooling to believe that they have sufficient background to challenge established medical science. Thus, Otto (2011) cited a study by the CDC showing unvaccinated children tend to be white and to have middle-class, college-educated parents. “These are organic-food shoppers. They know enough about science to be skeptical, but not enough to allay their fears, and they have too little trust in science to take the risk” (p. 153). Otto (2016, p. 142) reiterated, “These people are indeed organic-food shoppers, and alternative-health-care and nutritional-supplement consumers. There are large pockets of them in affluent liberal communities, like Marin County, California, where more than 50 percent of students were unvaccinated ... In Eugene, Oregon, rated the ‘Best US City for Hippies’, there were schools with vaccination exemption rates over 60 percent”.

This vaccine angst -wherever it may be found- can have unexpected additional negative consequences. An important example is the erosion of the integrity of vaccine science. Scientists, anxious to overcome the public’s skepticism, are “censoring themselves, playing down undesirable findings and perhaps even avoiding undertaking studies that could show unwanted effects” (Moyer, 2018, SR 7). This (understandable) desire not to fuel vaccination phobia can, however, be counterproductive. For example, scientists know that pathogens evolve in response to vaccines, and thus properly conduct studies aimed at adjusting vaccine composition to maintain effectiveness. Such studies should be

published, but they do run the risk that anti-vaccinators will concentrate on the diminishing effectiveness part. A revealing example was given by Moyer (2018). She cited a 2005 study that concluded that the flu vaccine prevented fewer deaths than expected in people over 65. This prompted the development of a more effective flu vaccine for older people, but some of her colleagues still felt that publishing such findings would “hurt the cause”, and sure enough, the study inspired an article with the ridiculous title, “Flu vaccines are killing senior citizens, study warns”. This is a problem that needs to be recognized and dealt with; a problem that will exist as long as there is a passionate belief in the absolute truth that “back to nature” the way to go. We suggest that it is all-important to maintain the integrity of vaccine science. The other side will persist in cherry-picking the results that further their cause while downplaying those that don’t, but this runs afoul of the very soul of science, and must be avoided. According to Moyer (2018, SR7), “good science needs to be heard even if some people will twist its meaning”.

Levitan (2016) has a section (pp. 207-210) showing the pitfalls in reasoning that allowed the alleged link of autism to vaccination to proliferate. In particular, he named four such pitfalls: illusory correlations, belief perseverance, persuasion by association, and the logical fallacy *post hoc, ergo propter hoc*.

3.2 GMOs

Magnus (2008) notes that religious values have found their way into the GMO debate. The concept of “playing God”, and examples such as “frankenfoods” and “frankenfish” (Levitan, 2017, pp. 166-170) have dominated. Genetic engineering is seen to represent a view of the natural world that is too instrumental, a view that has commodified nature and the organisms in it. He points to agnotology (the study of ignorance-making—see Proctor and Scheibinger (2008)) as a strategy in the debate over GMOs and the contentious role played by the Precautionary Principle (PP). He explains the PP thus (pp. 255-256):

In fact, the precautionary principle is very simple. All it actually amounts to is a piece of common sense: if we are embarking on something new, we should think very carefully about whether it is safe or not, and we should not go ahead until we are convinced it is ... The Precautionary Principle states that if there are reasonable scientific grounds for believing that a new process or product may not be safe, it should not be introduced until we have convincing evidence that the risks are small and are outweighed by the benefits.

The PP may be “very simple”, but all it takes is the substitution of *proof* for *precaution* to turn the PP into a weapon to be used against science, and it is a very flexible weapon, indeed. The back-to-nature folks ask for *proof* that GMOs are safe; the tobacco industry for *proof* that second-hand smoke is harmful. David Michaels’ (2008) book chronicles a number of the more important skirmishes that have employed this tactic.

3.3 Alternative Medicine

“The ascendance of the internet and social media has raised the dissemination of unreliable medical news to new heights” (Keslar, 2018). A good example is Mike Adams’ blog www.naturalnews.com. One of its milder claims is that turmeric, vitamins, oxygen and cannabis are just some of the therapies that would be better treatments for cancer than radiation, chemotherapy or other conventional approaches. There is no gainsaying that smoking a joint sounds better than the slash, burn, poison alternatives, but there is no evidence that cannabis shrinks tumors.

He has also pointed to purported dangers of fluoride in drinking water, anti-perspirants, laundry detergent, monosodium glutamate, aspartame, toxic ingredients in vaccines (describing the use of vaccines as “medical child abuse”), and genetically modified crops (“Just Say No to GMO”).

Without so much as a hint that the buyer should beware, a huge industry has made available a wide variety of products purporting, without evidence, to improve health and vitality. Weight-loss supplements and drugs claiming to reverse age-related mental decline are two of the biggest categories for bogus products (backed by fake medical news).

The following example is representative of the genre. Krista Burton describes her encounter with crystal therapy, which focuses on activating the healing powers of one’s *chakra*—a center of spiritual power in the body, and is one of the fastest-growing alternative medical approaches. She remarks, “The meteoric rise of New Age practices may be trendy, but it’s one way that millennials are acknowledging that the current system isn’t working [So, back-to-nature!]. We’re trying out the new things that are actually old things; we’re seeing what else could make life a little more meaningful, a little more bearable”. She admits that she doesn’t really expect a crystal based *cure*—“It may not do a thing. But none of us know anything about anything, really [POMO personified]. So why not be open to the possibility of hope?” (Burton, 2018, p. 2).

The source of hope for many is religion, resulting in the “faith based healing” version of alternative medicine. This has been thoroughly debunked as in, e.g., Hickey and Lyckolm (2004) who make the following observations:

- * “Over the past three decades more than 200 children have died in the U.S. of treatable illnesses as a result of parents relying on spiritual healing rather than conventional medical treatment” (p. 265).
- * “The basic Christian Science diagnosis of disease involves the conviction that ... all forms of disease are symptomatic of an underlying condition that needs to be healed ... through prayer” (p. 266).
- * “The solicitation of medical care demonstrates weakness of faith” (p. 267).
- * “Accepting a blood transfusion disobeys God’s commandments and may lead to eternal damnation” (p. 271).

More examples of this kind, and the documentation of studies showing the therapeutic non-effectiveness of faith, prayer (including the intercessory variety), etc., are given by Stenger (2003, 2008). Here, the continuation of a war on science by religious fundamentalists is especially tragic, harming as it does, innocent children. Fueled by “absence of evidence” arguments, and a continuing

insistence that the soul is more important than the body, the beat goes on, leaving in its wake crosses on the graves of youthful victims.

4. Bioethical Obstructionism

In this section we consider how increasing the number of administrative tasks imposed upon researchers may impede scientific progress. It is suggested that should the number and extent of these activities reach obstructionist levels, scientists will view such intrusions as yet another front in the war on science.

4.1 Administrative Tasks Interfere with Science

The administrative workload placed on researchers can be seen as another instrument in the war on science. Principal investigators conducting federally sponsored research spend an average of 42% of their time on administrative tasks (e.g., the grant proposal process, subcontracts, financial management; laboratory safety and security; time, effort, progress, and outcome reports; information tracking for auditing purposes, and so on) (Rockwell, 2009). These tasks can interfere with the conduct of science in a manner that is “substantially out of proportion” to the need for safety, accountability, and transparency (National Science Foundation [NSF], 2014, p. 1). A 2005 Federal Demonstration Partnership survey revealed a perception among research faculty that the focus on science is all but lost in favor of administrative requirements and regulatory obligations that consume valuable research time and come at considerable cost to investigators and academic institutions, but have very little meaning for the assessment of scientific merit and achievement (Rockwell, 2009). More recently, the Education Advisory Board (2018) cautioned the Academy about the “downstream impact” of administrative burden in the form of weary faculty members who fail to attain tenure or leave academia altogether. Clearly, such outcomes could be a detriment to science.

This is all suggestive of a larger administrative culture and the shift toward institutional policies and practices that constrain research scientists and faculty members in various ways (also known as rampant administrative blight) (Ginsberg, 2011). As an example, it takes at least two hands to count the number of oversight units and research review committees that make up the contemporary research compliance enterprise: (1) Biosafety, (2) Conflict of Interest, (3) Controlled substances, (4) Data security, (5) Data sharing, (6) Data use agreements, (7) Export control, (8) Materials transfer (which specifies the terms under which scientists can move and share intellectual property), (9) Research integrity and misconduct, (10) Technology transfer (i.e., the commercialization, licensing, and deployment of scientific discoveries), etc. It is astounding to us that scientists—who are expected to operate and thrive in such an environment of (over) regulation—get any work done at all.

4.2 Institutional Review Boards and the War on Science

One manifestation of administrative culture is the imposition of a federal regulatory structure on researchers by way of Institutional Review Boards (IRBs). For the most part, the relationship between the scientific community and IRBs has been inharmonious, and the notion that IRBs have contributed

to administrative burden for investigators, overstepped the boundaries of their regulatory authority (Note 1), and threatened academic freedom is not new (Atran, 2011; Gunsalas et al., 2006). Schneider (2015) characterized IRBs as “censors” that lack accountability, make decisions poorly, and—as part of a system that is fundamentally misconceived—ultimately do more harm than good. IRBs have been further criticized for delaying or deterring research studies that could otherwise hasten medical and social progress, enhance human welfare, and even save lives (Klitzman, 2015). Thus, it comes as no surprise that issues of whether and how the IRB system should be overhauled have been the source of a well-documented debate, which has brought with it several proposals to limit the scope of IRB oversight (American Association of University Professors, 2006; Gunsalas et al., 2006; Kim et al., 2009).

The most recent effort to update the federal regulations that govern the conduct of human subjects research (see Schrag (2010) for a comprehensive analysis of the origins and applications of these regulations) began more than seven years ago, and resulted in the publication of a Final Rule to revise the Federal Policy for the Protection of Human Subjects known as the Common Rule (Office for Human Research Protections, 2017). The Final Rule is intended, in part, to “reduce burden, delay, and ambiguity” for scientific investigators. Essentially, it would (1) expand the categories of research that meet criteria for exemption, (2) require a single IRB-of-record for cooperative research, (3) add required elements of informed consent, and (4) eliminate continuing review for minimal risk studies. But then again, regulations are not easily modified once implemented—at least not in a way that facilitates science. Despite high hopes, enthusiasm, and pronouncements that academic institutions and administrators should fully support the regulatory changes (and that faculty members should be wary and skeptical of strategies that oppose those changes) (Shweder & Nisbett, 2017), the effective date and compliance date for the revised rule have been delayed twice, leaving institutions and researchers in a holding pattern as the former undertake the logistical challenge and expense of revamping IRB-related business processes, and the latter are expected to learn and adhere to new procedures and directives, which may or may not stick. As of this writing, the anticipated implementation date for the new rule is January 21, 2019 (Note 2). From our vantage point as researchers and IRB members at an academic institution, it remains unclear whether things will actually become less cumbersome for the scientific community as a direct consequence of the purported regulatory changes. Case in point, although the expanded exemption categories would allow benign behavioral interventions and the collection of sensitive identifiable data, the sundry conditions that apply seem to make it as difficult as ever for investigators to qualify for exemption from IRB oversight. Scientists who are expecting a newfound freedom in this regard are bound to be disappointed.

Although it is not our intention to single out the activities of hard-working, well-intentioned IRBs, there are a number of relevant trends that we find concerning in the context of the war on science. As IRB members who also happen to be researchers (or researchers who also happen to be IRB members), we find ourselves well-situated to offer the following observations.

4.3 IRB Administrators and Regulatory Staff Call the Shots

The day and age in which IRB administrators and regulatory staff conduct the greater part of the IRB application review—and manage the IRB review process with lesser attention to the contributions of IRB chairpersons, board members, and expediting reviewers—is upon us. Just as an illustration, it has been our observation that the IRB administration and staff, as well as legal and other consultants, have become increasingly vocal during convened board meetings. This has had the (not so subtle) effect of swaying board discussions and deliberations at times, particularly when individuals who are not voting members of the board have rendered contingencies for IRB approval, some of which could be rather burdensome for investigators and quite disruptive to the research process. Along these same lines, we know of institutions at which the IRB administration and staff “triage” IRB applications. The triage process as we understand it essentially involves the assignment of applications to reviewers who the staff and administration determine would be best for a given study. Yet, to the extent that applications are assigned based on criteria other than reviewer expertise, the process has the appearance of compromising the objectivity of IRB review and approval. In other words, one way in which IRB administrators and staff members might “call the shots” is through the assignment of applications to reviewer(s) who they anticipate will issue the determinations and/or conditions that the administration and staff would prefer to see (or have already decided upon). So much for the autonomy and discretion of IRB members and expediting reviewers. This imbalance of authority (for lack of a better term) is reminiscent of the phenomenon Ginsberg (2011) described in *The Fall of the Faculty* whereby administrators and staffers—sometimes without formal scientific backgrounds or experience—increasingly set the agenda at universities that were once led primarily by their faculties. This is problematic for science because universities are, of course, the place where much of science happens.

4.4 Scientific Review by Non-Scientists

When the boundaries and distinctions between IRB administrative/regulatory review and full committee (ethics) review get fuzzy to the point where the former encroaches on the latter, scientific aspects of protocols submitted for IRB approval may be evaluated by IRB staff who are not qualified by training or experience to assess the rigor and ethical implications of various study designs and plans. For us, this is not about whether IRBs should consider the science behind the studies they review. In fact, we would argue that IRBs have an obligation to assess methodological soundness as it relates to the rights and welfare of research participants (see Dawson & Yentis, 2007). Our concern has to do with *who* should conduct the scientific review. The accrediting body for IRBs has indicated that this should be an individual “with appropriate scientific or scholarly expertise and other expertise or knowledge” (AAHRPP, 2001). To us, that sounds like a member of the full committee or an expediting reviewer with a terminal academic degree and experience in his or her field, who would have the ability to conduct something akin to peer review, which is ubiquitous in the Academy (Oakes, 2002). When

members of the IRB regulatory staff begin offering methodological tips or questioning the selection of samples and measures, however, it sounds more like a war on science.

4.5 Auditing Practices

In addition to the activities of an external research review unit that conducts audits to ensure studies are carried out according to IRB-approved protocols, we know of an IRB that has implemented an internal Quality Assurance/Quality Improvement (QA/QI) initiative as an institutional practice whereby IRB applications are “re-reviewed” post-approval. When errors are discovered during that process, investigators are asked to cease all research activities covered under the IRB application at hand (even though there may be no immediate threat of harm to the research participants), and then they are required to submit an amendment to bring the study back into compliance. In other words, before they are permitted to move forward with a study for which they had prior IRB approval to conduct, investigators are expected to correct mistakes (some of which may be the IRB’s) and address additional contingencies that have been levied by the administrator—not the reviewer. Ostensibly, IRB approval does not mean approved. Our understanding is that QA/QI initiatives such as this essentially authorize the IRB administration to overturn approvals and other determinations made by IRB members and expediting reviewers. We find it especially problematic that IRB administrators should have unilateral authority to do that. Not only does this disrupt and delay the research process and contribute to more of the same administrative burden for investigators (which is often not well calibrated to risk; see Hunter, 2007, for a discussion of “proportional ethical review”), it compromises the objectivity of the IRB review process for the scientific community through a “double jeopardy” of sorts that undermines the judgment and legitimate authority of IRB members and expediting (peer) reviewers.

Among the most disconcerting things about all of this is the fact that faculty members would yield to such administrative practices and requests. Perhaps they have become habituated, or they experience a learned helplessness of sorts. Worse yet is the thought that passive obedience might actually be their only option. In all of this, there is virtually no advocacy for scientific researchers—the vast majority of whom we believe are able and willing to behave ethically and responsibly. Granted, the regulatory framework for protecting human research subjects was constructed in response to instances where investigators did *not* do “the right thing”. However, we believe the pendulum has swung much too far in the other direction.

4.6 Resolving the Administrative War on Science

We acknowledge that systems of checks and balances are both a reality of conducting federally sponsored research and an integral part of the machinery and operation of research institutions and universities. In the end, the crux of our concern for science is not about administrative authority or objectivity in the IRB review process. Instead, our concern is that some IRBs (as they sit in the firehouse waiting for the fire alarm that rarely sounds) seem not to grasp the substantial implications of their decisions for scientific research and medical and social progress. According to the NSF, it is imperative that such concerns are addressed so that researchers can “refocus their efforts on scientific

discovery and translation” (NSF, 2014, p. 1). The EAB (2018) has provided several recommendations in this regard: modify or eliminate regulations; harmonize requirements across agencies; and enhance the efficiency and effectiveness of academic institutions. Such measures would go a long way toward resolution of the war on science. To be clear: We are *not* advocating the abolition of the IRB system. Rather, we suggest that IRBs resist their current propensity for mission creep and limit their reviews to the protection of human subjects.

5. Republican POTI

Most of this section focuses on the current Republican POTUS, Donald Trump, but much of the groundwork for his anti-scientific rhetoric was prepared by two previous Republican POTI, Ronald Reagan and George W Bush. In his Introduction to *Not A Scientist*, Dave Levitan showed the ways in which Reagan used the title of the book, followed by BUT ... as a prelude to stating his opinion about the question of man’s role in the warming of our planet, or other questions that some scientific expertise could have, had they been consulted, provided useful insight. George W Bush did reach out for advice on occasion, but as noted by Al Gore (2017, p. 115) “Exxon Mobil ... has apparently been his most trusted source of information about the climate crisis. Chemical companies are his most trusted sources on whether or not particular chemicals are hazardous to the environment. The major pharmaceutical companies are his most trusted advisors on the health risks of new drugs”. And his most trusted advisor of all is Jesus Christ. Some quotes: “I’ve heard the call. I believe God wants me to run for President”, ... “I trust God speaks through me. Without that, I couldn’t do my job”, ... “God told me to strike at Al Qaeda and I struck them, and then He instructed me to strike at Saddam, which I did”. For more details about Bush’s anti-science stance, see Ch 14 (Bush League Science) of Mooney (2005). Donald Trump doubled down on Bush’s choices for advice—he cut out the middle man and simply appointed agency heads that, often, were selected because they wanted to dismantle the agency. And, he went even further, he turned to the Heritage Foundation to guide his hires to fill all of the presidential appointees that would staff the government (Mahler, 2018). Thus, he brought in trusted conservatives who

“supported a Heritage agenda that included opening offshore drilling on federal lands; opposing mandatory labeling of genetically engineered food; reducing regulations on for-profit universities; revoking an Obama executive order on green-energy mandates for federal agencies; phasing out federal subsidies for housing; and opposing marriage equality and nondiscrimination protections based on sexual orientation and gender identity” (Mahler, 2018, p. 37).

Al Gore (2017) brought his polemic against George W Bush up-to-date by including the latest anti-science moves by Donald Trump. A recent New York Times editorial surveyed the downsizing and/or elimination of a number of science-based regulatory agencies under Trump, concluding “Even allowing for justifiable budgetary reasons, in nearly every case the principal motive seemed the same:

to serve commercial interests whose profitability could be affected by health and safety rules” (p. 10). Mooney (2005) builds the case that today’s glut of politically motivated outrages against science are due to modern conservative ideology and attempts to appease key Republican interest groups.

A recent example captures the Trumpian attitude. Coral Davenport, writing in the NY Times, Sunday, June 10, 2018, noted that “Mr. Trump is the first president since 1941 not to name a science adviser, a position created during World War II to guide the Oval Office on technical matters ranging from nuclear warfare to global pandemics”. This can have immediate ramifications, as when in preparing for his meeting with Kim Jong-un of North Korea to negotiate denuclearization, Trump did so without the benefit of help from anyone trained in nuclear physics. Nor was such expertise available to him during the talks. Trump said only something to the effect that he’d “know within the first minute or two whether or not the talks would be productive”.

This is one of the many examples that could be cited to demonstrate the current POTUS’s disdain for “those so-called experts”. Thus the rise of “Idiot America”, which, as described by Pierce (2009), “The rise of Idiot America ... is essentially a war on expertise. It’s not so much antimodernism or the distrust of intellectual elites that Richard Hofstadter teased out of the national DNA, although both of those things are part of it. The rise of Idiot America today reflects—for profit, mainly, but also and more cynically, for political advantage and in the pursuit of power—the breakdown of the consensus that the pursuit of knowledge is a good” (p. 8).

The “war on expertise” theme was expounded upon by Nichols (2017). He noted that when facts conflict with our values, “almost everyone finds a way to stick with their values and reject the evidence”. And, while it is often thought that conservatives are more likely to shoot the messenger, those with more liberal views are equally at fault: When exposed to scientific research that challenged their views, both liberals and conservatives reacted by doubting the *science*, rather than themselves. The idea that neither side is blameless was even admitted by Mooney (2005, p. 7) although his title, *The Republican War on Science*, makes clear his contention that the sides are not equally blameworthy. In any case, even if this “race to the bottom” between the left and right was too close to call BT (Before Trump), the right has now assumed what can be considered an insurmountable lead.

6. Discussion

In this final section, we wish to elaborate on three points: (1) There are current problems of interest to the biomedical community that rely on our understanding of what we can expect science to accomplish; (2) That *scientism* is a confounding factor in debates surrounding the role of science in our lives; and (3) The world is a complex place, and there are many complementary, not competing, ways to approach its understanding.

6.1 Current Problems

A cursory review of the news reveals several contemporary problems which spark debates between scientists and their critics, e.g., Acid rain; Global warming; The efficacy of condoms in preventing the

spread of sexually transmitted disease; The health impact of excess dietary sugar and fat; The alleged link between abortion and breast cancer; The status of endangered species; The efficacy of abstinence-only sex education programs; and The therapeutic potential of adult stem cells.

To add to these, we refer to

www.thehastingscenter.org/phd-scientist-congress-speaks-truth-politics-human-flourishing

a link to Carolyn P. Neuhaus' interview of Rep. Bill Foster, a Democrat from Illinois who is the only PhD scientist currently serving in the U.S. Congress. Foster (who admitted to feeling lonely) identified some additional contemporary problems that are not receiving the attention they deserve: Human gene editing; The opioid epidemic; Artificial intelligence; and Social determinants of health.

The reader will have no trouble adding to this list, a list that is expected to grow over time and reflect current attitudes and concerns of individuals and groups as they attempt to make peace with mother earth.

6.2 *Scientism*

We begin with some definitions. Mikael Stenmark (2018) notes that there are at least eight current usages of “scientism”:

- 1) The view that all of the non-scientific academic disciplines can be reduced to science;
- 2) The attempt to extend the use of the methods of natural science to other academic disciplines;
- 3) The view that all, or at least some of the essential non-academic areas of human life can be reduced to science;
- 4) The view that the only reality we can know anything about is the one science has access to;
- 5) The view that we are rationally entitled to believe only what can be scientifically justified or what is scientifically knowable;
- 6) The view that the only reality that exists is the one science has access to;
- 7) The view that science is the only truly valuable realm of human life, all other realms are of negligible value; and
- 8) The view that science alone can explain morality and replace traditional ethics.

Most of these are unabashed statements to the effect that science is the *only* rational way to uncover the secrets of nature. Thus, according to Williams and Robinson (2015, p. 3), “Scientism entails a zealous metaphysical commitment and a requisite orthodoxy in method and in thought regarding the nature of the world and how understanding of the world is to be approached”. There is, here, a passionate belief in an absolute truth that melds ontology with epistemology—the only reality that exists is the one “the scientific method” has access to. Even glossing over the questionable uniqueness of method claim, the very idea of a “scientific explanation” of anything exposes the part of the dual nature of science that is a product of human activity, for human consumption. Humans explaining to humans. Williams and Robinson (2015, p. 17) conclude, “Explanation always requires a starting point that scientism cannot provide and offers a type of understanding that scientism cannot accommodate”.

In short, our contention is that the “war” between any of the factions depicted in Figure 1 and science is one between the “passionate belief in an absolute truth” espoused by any one of the factions and scientism. For example, for religion vs science, Williams and Robinson (2015, p. 18), “The conflict between science and religion is better characterized as conflict between scientism and religion”. And, for Principe (2015, p. 44), it is “more correct to speak not of a broad and ill-defined conflict between science and religion but rather of a conflict between *scientism* and religion”. It is more in line with our thesis that the “war” is between scientism and religious fundamentalists. Much of the current thunder on this front pits the so-called “New Atheists” and religious extremists (Kowalski, 2018). Thus, Principe (2015) cites “the rise of the celebrity scientist”, as an important development in the “science wars”. Both sides exhibit that “passionate belief in an absolute truth” that accounts for most—maybe not all—of the rancor. The “maybe not all” is our dodge of the charge that we are adopting a passionate belief in an absolute truth. We are also aware of the possibility that neoliberal considerations may intrude—book sales depend on the tone adopted.

6.3 Unraveling Complexity

“[A] complete elucidation of one and the same object may require diverse points of view which defy a unique description.”

Niels Bohr’s *Complementary Principle*

Imagine Figure 1 redrawn so that SCIENCE is taken from the center and joins the others as entities focusing in on the new centerpiece, THE WORLD. No longer are the entities on the periphery attacking the center; rather, they are gazing into it, trying to understand what it is they are seeing. We believe that Mary Midgley’s “one aquarium, many windows” metaphor is instructive. Consider a large aquarium with a number of windows allowing simultaneous viewing of parts of that aquarium by multiple viewers. The view from any one window does not allow complete understanding of the contents of the whole aquarium: “We cannot have a single comprehensive view of the whole aquarium—a single all-purpose, philosophic Theory of Everything ... The world is simply too rich for such reductive straight-jacketing” (Midgley, 2001, p. 19). But this does not say that we are unable to improve upon our restricted view—all we need do is recognize our limitations and admit the possibility that others may be able to help us learn. Midgley continues, “This does not mean no understanding is possible. We can relate these various aspects rationally because they all occur within the framework of our lives. We can walk around and look at the other windows and can discuss them with each other. But we cannot eliminate any of them. We have to combine a number of different ways of thinking—the view through several windows, historical, biological, mathematical, everyday and the rest—and somehow to fit them together”.

Figure 2 captures the basic idea:

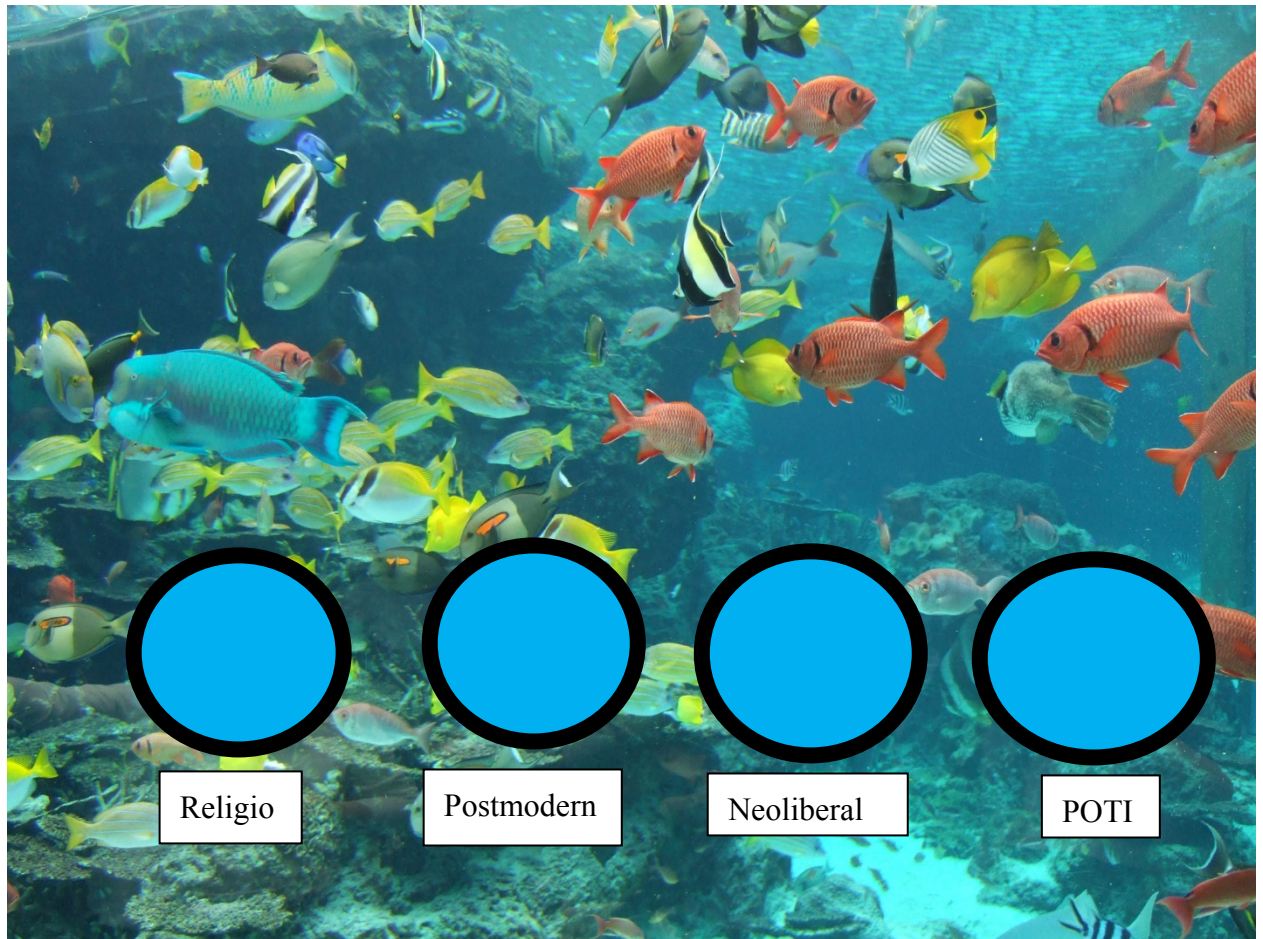


Figure 2. The World as an Aquarium. Four Possible Viewing Windows Are Shown

Windows (not shown) at the sides and on the opposite side will afford different views of the (same) aquarium. Scientism (and Religion, Neoliberals, POMOs, etc.) would restrict our view of the aquarium to just one window. If we can just *not do this*, if we can allow that more windows are desirable and, even, necessary, we might be able to change some of the lightning bolts in Figure 1 to two-way arrows that allow a dialogue between the parties. A panacea? No, but we submit it as useful first step in assembling the tools most useful in understanding the workings of the world.

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Notes

Note 1. For example, some would argue that IRBs have become meddlesome in terms of reviewing grants and contracts for consistency with information contained in IRB applications; requiring site permissions and collaboration agreements as a condition of IRB approval; placing parameters around the use of subject registries and subject pools; requiring investigators to obtain IRB approval for pilot

studies and other activities that are preparatory to research such as the psychometric evaluation of survey instruments; and enforcing laws, acts, and regulations that are not immediately under their purview (e.g., income tax reporting requirements and state lottery rules for research incentives; website terms of use; FERPA, GDPR, GINA, HIPAA, PPRA, and so on), which in many cases serves to protect institutions from liability rather than research subjects from harm.

Note 2. Prior to this date, the IRBs at our home institution implemented some of the anticipated burden-reducing provisions of the new rule as part of a flexibility initiative for non-federally-sponsored research.