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Comment

Fundamentalism and science

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The many facets of fundamentalism. There has been much talk about fundamentalism of late. While most people's thought on the topic go to the 9/11 attacks against the United States, or to the ongoing war in Iraq, fundamentalism is affecting science and its relationship to society in a way that may have dire long-term consequences. Of course, religious fundamentalism has always had a history of antagonism with science, and – before the birth of modern science – with philosophy, the age-old vehicle of the human attempt to exercise critical thinking and rationality to solve problems and pursue knowledge. "Fundamentalism" is defined by the Oxford Dictionary of the Social Sciences[1] as "A movement that asserts the primacy of religious values in social and political life and calls for a return to a 'fundamental' or pure form of religion." In its broadest sense, however, fundamentalism is a form of ideological intransigence which is not limited to religion, but includes political positions as well (for example, in the case of some extreme forms of "environmentalism").

In the United States, the main version of the modern conflict between science and religious fundamentalism is epitomized by the infamous Scopes trial that occurred in 1925 in Tennessee, when the teaching of evolution was challenged for the first time[2,3]. That battle is still being fought, for example in Dover, Pennsylvania, where at the time of this writing a court of law is considering the legitimacy of teaching "intelligent design" (a form of creationism) in public schools. Yet, even in the US, creationism is certainly not the only battleground between fundamentalism and science, and in some respects, it isn't even the most crucial. The Bush administration, for example, has systematically overruled or ignored scientific findings in areas ranging from global warming to drug safety in order to affirm their ideologically-determined set of priorities[4,5]. Europeans have their own problems with dogmatic thinking too, albeit arising from a different historical and cultural background. Just consider the sometimes irrational positions taken by green parties in Germany and England (e.g., indiscriminate, as opposed to reasoned, rejection of stem cell research, or of genetically engineered crops), or the fact that Italy has become the most restrictive European country on matters of stem cell research and in vitro fertilization, largely due to the still strong influence of the Catholic Church in Italian internal political affairs.

In this essay, however, I will not focus on specific controversies, but rather on what I consider a largely unappreciated dimension of the problem. It seems to me that much of the debates surrounding the science-society-religion cultural triangle are due to the failure of scientists and science educators – and hence of the media, elected officials and the public at large – to appreciate two crucial philosophical points. These concern the distinction between methodological and philosophical naturalism, and the distinction between "is" and "ought," i.e., between matters of facts and value judgments. While I am certainly not as naïve as to suggest that simply explaining these two points to colleagues and the public will be enough to instantly "solve" the problems posed by the so-called "culture wars," I am confident that this is a good place for discussion that should be pursued in search of a long-term reconciliation. I shall therefore explore these two philosophical issues within the context of fundamentalism (religious and not) and science, with the hope of helping to provide scientists and educators with two additional, formidable, intellectual and educational weapons. I should also warn the reader that the following treatment glosses over several subtleties of the philosophical debate that are still occupying professional philosophers. Nonetheless, I am convinced that the major points are both clear enough and highly relevant, so as to deserve a much wider presentation that has been the case so far.

Science and religion: methodological vs. philosophical naturalism. One of the basic fears of religious fundamentalists who challenge the teaching of evolution, be they "young-earth" creationists, "old-earth" creationists, or the slightly more sophisticated crowd of "intelligent design" supporters (see Scott 1997[6]

for the differences among these and other versions of creationism), springs from the idea that the teaching of evolution starts a slippery slope that inevitably ends with atheism. Leaving aside the obvious point that atheism is in fact a legitimate philosophical position that – in a pluralistic society – ought to receive the same degree of respect as any other metaphysical school of thought, slippery slope arguments are in fact logically fallacious[7], and the fallacy lies in the fact that most people (including, alas, prominent science popularizers such as Richard Dawkins) don't make the subtle but crucial distinction between methodological and philosophical naturalism (Forrest 2000[8]).

Naturalism, broadly speaking, is the idea that nature, and natural phenomena, is all there is – as opposed to the supernatural realm and phenomena. As a philosophical position, this has a long history of elaboration and debate, and it obviously characterizes any individual who considers himself an atheist. Philosophical naturalism, then, is the (strong) metaphysical position that there is, as a matter of fact, no such thing as the supernatural. Methodological naturalism, however, is a (metaphysically) more modest claim, that essentially corresponds to the position that while there *may* be a supernatural realm, it does not enter, and need not be invoked, in any discussions of scientific findings. For the methodological naturalist, scientific explanations are naturalistic by definition, or else science would not have a set of reliable theoretical and empirical methods to proceed with. This is why the most embarrassing question one can ask a proponent of intelligent design is: if I give you a million dollars to set up a scientific research program, what sort of experiments would you pursue with the grant? There is no possible answer.

The crucial point here is that a scientist is, essentially by definition, a methodological naturalist; however, she does not have any specific commitment (aside from her own metaphysical views) to philosophical naturalism. In other words, science does not necessarily entail atheism, which is the fundamentalist's fear. How can we explain this to the general public? One way to go about it is to point out that most people are in fact methodological naturalists when it comes to everyday life. Suppose your car doesn't start today: how do you react to such an annoying occurrence? Most likely you will not invoke supernatural explanations, and will not attempt to have the car exorcised. Rather, *regardless of your religious convictions*, you will bring it to a mechanic, assuming (methodologically) that there must be something physically wrong with it. Moreover, even if the mechanic will not find the answer, and will not be able to fix your car, you will still persist in the (reasonable) belief that there must have been something physically out of place, with no supernatural implications or intervention required. You will shrug your shoulders, grudgingly pay the bill to the mechanic, and go in search of a new car or another mechanic. That is exactly what scientists do, and are required to do by their profession – no more, no less.

There is, therefore, a good reason why many scientists are themselves religious[9], and it is a mistake (both in terms of public relations and from a philosophical standpoint) to present the scientific worldview as if it necessarily leads to atheism. Science can neither afford, nor does it need, a head-on confrontation with religion. The confrontation does need to occur, however, wherever religious ideology makes (unsupported, a priori) claims about the natural world, as is often the case with creationism. A few-thousand-years-old-earth, a worldwide flood, or the necessity of an intelligent designer to produce bacterial flagella are, to paraphrase philosopher Jeremy Bentham, nonsense on stilts, nonsense that needs to be vigorously fought against by scientists and science educators. However, that still leaves plenty of room for a peaceful coexistence of science and religion when one recognizes, and respects, the distinction between methodological and philosophical naturalism.

Science and society: the difference between "is" and "ought". Many controversies between scientists and ideological fundamentalists (the word here indicating a broader context than just the religious one) are rooted in a second common misconception, one that philosophers often refer to as the "naturalistic fallacy." David Hume[10], the 18th century Scottish philosopher, first described the fallacy (though he didn't name it) in his *A Treatise of Human Nature* (1739). Hume wrote about his puzzlement when encountering philosophical essays that began by considering matters of fact (what is) and somehow shifted to discussions of matters of value (what ought to be), without making the link explicit, or justifying it in any reasonable way.

The idea is of course not that there is *no* connection between facts and values, but rather to make clear that such connection is anything but automatic, and it needs to be justified. So, for example, a scientist

can be intellectually interested in pursuing fundamental research on the properties of stem cells (or of genetically engineered crops, or whatever), without this implying that the very act of carrying out such research necessarily implies certain ethical positions (i.e., the scientist in question cannot automatically be labeled a "nazi," or an anti-environmentalist in the pockets of the bioengineering industry). By the same token, however, the scientist should be aware that it is society at large that decides what level of public funding goes to science, and most especially what sort of *applications* of scientific findings are acceptable from an ethical standpoint. In other words, the scientist doesn't get to cry "anti-intellectualism" every time there is a legitimate public discussion about ethical issues in science.

A better way to conceive of the science and society relationship, instead, is that the two are connected, but in multiple and negotiable fashions. On the one hand, science should be free as much as possible to pursue fundamental research in all areas of human knowledge, both for its own sake and because of the potentially positive consequences on society. On the other hand, scientists cannot be the sole arbiters of ethical decisions about what sort of applied science is acceptable by society at large, although of course scientists do play a special dual role of both informed experts and participating citizens in any such decision. As Hume would put it, there may be a connection between what is and what ought to be, but it has to be reasonably fleshed out in every specific case.

Again, the challenge often concerns how to explain this in a way that is clear and understandable without having to mandate that everybody take a course in philosophy (though the latter isn't necessarily a bad idea). A good starting point is offered by obvious cases where the is/ought connection is clearly rejected by any sane person, scientist or not. To use one of many available examples, science has demonstrated that it is "natural" (it's a matter of fact) for the males of some species of mammals (e.g., lions) to kill the offspring that a female had with another male, before taking her as a mate. This most certainly doesn't imply that the study of behavioral ecology somehow leads to the justification of such actions for conscious beings such as humans (i.e., the "ought" simply doesn't follow). Therefore, we should fund research in potentially controversial areas because we need all the information we can get in order to make intelligent decisions, but it ought to be clear to both scientists and the public at large that ethical decisions are simply too important to be simplistically derived by the observation of what is "natural."

What to do? Toward a general program of science-philosophy literacy. Scientists and science educators, when faced with the question of irrational attacks against science, usually respond by clamoring for more science education. There certainly is a need for more, and better, science education. However, there is also increasing evidence that more science literacy is not only insufficient, but may have little or no effect if it is not accompanied by efforts at teaching critical thinking and the nature of science[11,12]. The problem is that too much pre-college (and even introductory-level college) science education focuses on factual knowledge at the expense of broad conceptual issues, especially in the biological sciences. Obviously, we do want our students (and the citizenry at large) to get some fundamental scientific facts straight; but, more importantly, we are in desperate need of people understanding the scope, power, and especially limits of the scientific enterprise. Such understanding is crucial for the functioning of modern democracies, where science plays an ever-increasing role in everybody's life.

The fact is, the teaching of critical thinking and understanding of the nature of science are more properly – or at least equally – seen as the domains of philosophy, and require engaging philosophers as well as scientists in the response to fundamentalism. Moreover, as I have tried to argue above, much of the roots of anti-intellectualism and anti-science thinking are to be found in issues of ethics and religion, again the proper domain of philosophy, and areas in which scientists usually find themselves unprepared and uneasy. We need not turn scientists into philosophers, nor can we pretend that the general public be knowledgeable of the depth of scientific and philosophical inquiry. What we can and need to do – urgently – is to promote wide, inter-disciplinary efforts at educating scientists, science educators, and the public at large about the best ways to see the science-society-religion triangle. Nothing short of the future of modern civilization depends on it.

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