Ernan McMullin on Science and Values—A Second View

with Michael Ruse, "Science and Values; My Debt to Ernan McMullin"; and Ernan McMullin, "Values in Science"

SCIENCE AND VALUES: MY DEBT TO ERNAN McMULLIN

by Michael Ruse

Abstract. Ernan McMullin's 1982 presidential address to the Philosophy of Science Association dealt with the issue of science and values, arguing that although scientists are rightfully wary of the infiltration of cultural and social values, their work is guided by "epistemic values," such as the drive for consistency and predictive fertility. McMullin argued that it is the pursuit of these epistemic values that drives nonepistemic values (like religious yearnings) from science. Using the case study of the fate of the nonepistemic value of progress in the history of evolutionary theorizing, I show that, vital though McMullin's thinking was for my own scholarship, in fact the study shows that the connections between epistemic and nonepistemic values in science are more complex than either of us supposed.

Keywords: epistemic values; evolutionary theory; logical empiricism; Ernan McMullin; metaphor; nonepistemic values; progress; realism; social constructivism

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I have been a philosopher and historian of science for 50 years. I cannot remember when I first met Ernan McMullin—I suspect it may have been in the fall of 1968 at the first meeting of the Philosophy of Science Association in Pittsburgh—but I do know that until his recent death he was very much a presence in my professional life. We were friends, and I think toward the end very good friends, but our relationship was not always comfortable. He took extreme umbrage at the testimony that I gave on behalf of the American Civil Liberties Union in the "Creationism" trial in Arkansas in 1981. There, as the expert witness on the philosophy of science, I offered a number of criteria for what constitutes science—being predictive, being falsifiable, and so forth—and concluded that whereas evolution qualifies as science,

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Creationism (aka Genesis read literally) does not.[1] I am not quite sure why Ernan was so cross. I suspect that partly his ire was simply a function of the belief that topics proper for the philosophical seminar are not proper for the courtroom. He would not have been alone in this. I suspect in his case that his ire was partly due to his belief that, whatever the rights and wrongs of Creationism, my testimony was underlain by a general hostility to religion. At the time, I think he may well have been right. I should say that in recent years we became closer on these issues, in part because I became (not more of a believer but) more understanding of the worth of religion, and in part because (and I do not say this entirely cynically) shortly after the Arkansas trial Ernan gained the Calvinist philosopher and Intelligent Design supporter Alvin Plantinga as a colleague at Notre Dame. Being exposed to how a too-literal reading of the Bible can distort one's thinking about science showed Ernan that even vulgarians such as I have our uses![2]

Much of the work that Ernan and I did led us into very different pastures. I am a historian and philosopher of biology, somewhat overly obsessed with evolutionary biology. He was a more general philosopher of science, although one with strong interests in the history and philosophy of physics, especially the period around and including Galileo. More recently our interests did come closer, because we both thought a great deal about the science-religion relationship. I do not think that Ernan McMullin was a deeply profound thinker. He certainly did not have the great insights of the men who most influenced me—Karl Popper, Carl Hempel, Ernest Nagel, Thomas Kuhn, to take some obvious examples. However, he had an unrivaled ability to pick a topic and to write a 30- or 40-page essay, laying out the different perspectives and then making some judicious remarks on the strengths and weaknesses of what he had surveyed. And it is because of this ability, it is because of one of these essays, that I owe a huge debt to Ernan McMullin for having directed me into what became an incredibly fruitful and enjoyable 20-year research program. For this reason, although a lot of what follows is about me, you should not read this piece as essentially about me, but rather as a case study in the way that ideas can be transmitted and used. It is about how older, more experienced scholars can pass on thoughts to younger, less experienced scholars, and how the thoughts get taken up and used and transformed in the process.

Values

Autobiographically, I should say that I spent the 1960s being trained in the logical empiricist philosophy of science. Following Hempel and Nagel, I learned (and accepted) that science is a body of laws (theories are "hypothetico-deductive systems") that aims for prediction and explanation, in an entirely disinterested fashion. In Popper's (1972) felicitous phrase,

science is "knowledge without a knower. Then, in the 1970s, very much inspired by Thomas Kuhn's (1962) *The Structure of Scientific Revolutions*, 1962) I turned to the history of science.[3] There I found a very different world! The philosophy—perhaps better, the anti-philosophy—of "social constructivism" was conquering all. The dominant view was that science is nothing more (or less) than an epiphenomenon on the culture of the day. The very idea of knowledge without a knower (meaning that the origin of the science, its discoverers and supporters and detractors, plays no role in the truth status of the science itself) was just ridiculous. You can no more abstract a science from the milieu in which it is formed than you can abstract a religion or a political commitment from such a milieu.

I am not like the soldier and the tinder box. I do not empty my pockets of the old coins as soon as I enter a new room filled with better. I wanted to hang on to logical empiricism, and I still do! But at the same time, particularly as I developed my own skills as a historian, I wanted to incorporate the insights of the historians, and by this I mean the enthusiasts for social constructivism. I wanted some kind of synthesis. (All a bit Hegelian, if you think about things. Well, why not?! As you will see, I also became pretty Comtean, although this was certainly not by design.) It is perhaps therefore given this need for a synthesis that as the second decade drew to an end (around 1980)—and no doubt in major part thanks to my engagement with the Creationist movement and needing an alternative of my own—I began to feel an increasing urge to formulate some overall general philosophy—epistemology and ethics—of my own. If I was not going to accept a Christian worldview (whether Creationist or more sophisticated) with a good god underpinning this view, then what was my worldview and what were its underpinnings? Because this is so very much an important part of my narrative, and because this is not a mystery story, even though basically for the moment I am going to put off to one side this urge and where it led me, let me say that (rather unsurprisingly) I embraced naturalism (Ruse 1986). I realize that "naturalism" is something of a weasel word meaning many things to many people, but my use of it now is in the context of the nature of philosophy, meaning trying to make philosophy not into a science but something that uses science whenever appropriate and that models its methods as much as possible on science. The underlying motive is that science is the best example of knowledge that we humans have and that therefore one should strive in other areas that are as science-dependent on or as close to knowledge as possible.

More on naturalism as we go along. For now, let us return to the issue at hand. How do we get a synthesis? It did not take a great genius to see that in some fashion values were going to be at the heart of any solution. By "values" I mean judgments of worth. A is better than B, so A is more valued than B. Beethoven is better than the Beatles, so Beethoven's work has more value than that of the Beatles. Helping is better than killing, so

helping has more value than killing. If there was anything that divided the two sides—logical empiricists and social constructivists—it was values. Logical empiricists insisted that the mark of science, certainly of good mature science, is that it is value free. That is the whole point of knowledge without a knower. Einstein's theory neither favors nor is prejudiced against Jews. It takes no value stance on the matter. Nor does Copernicus's theory do so with women or blacks or Muslims or gays or whatever. Science is not in the value business. Or, more precisely, as Nagel (1961) was careful to explain, science is not in the absolute objective-value business. One can have evaluation in science. Substance X is harder than substance Y. Liquid M is hotter than liquid N. But no one is saying that it is better to be harder than softer, hotter than colder. That is a matter of preference, of values.

Social constructivists, on the other hand, never met a value they did not like—or, more precisely they met many values they did not like and regretfully found many of them (along with good values) in science. If science is an epiphenomenon on culture, then just as religion and politics is all about value, so also is science. Take Darwinian theory and its attitude toward women or gays or Jews. Its value commitments here are loud and clear. Men are strong and forceful and polygamous. Women are coy and not too bright and monogamous—that is, when they like sex at all. Nineteenth-century values—and regretfully twentieth- and twenty-first-century values—are right there for all to see (Erskine 1995). Natural selection is the name of the game. Go out and reproduce and spread your seed, or in today's language, make sure those selfish genes get around. In such a world, those individuals whose sexual nature guides them to their own sex are totally without value. Their inclinations and behavior are reproductively worthless, and that is the only criterion of excellence. The struggle for existence fuels the whole Darwinian process (Kitcher 1985). Might is right and the weak to the wall. No wonder Hitler loved Darwin and thought his theory justifies the Final Solution (Weikart 2004).

The question then became that of what value or values I was going to consider. If I was to ask about the role or nonrole of values in science, then given the kind of philosopher I had become, a naturalist, I could not just do things theoretically, but had as it were to get my hands dirty by looking at actual values and how they function or do not function. You might think that this kind of approach or stance is obvious and needs no justification, but this was not quite true. I am not saying that the logical empiricists had no interest in actual science, and indeed most of them knew quite a bit about physics, but it was certainly a big part of the tradition to work from purely imaginary or fictional examples, making logical points. My own master's thesis, written in the mid-1960s, dwelt purely on such technical issues (the "paradoxes of confirmation") as whether "All swans are white" is confirmed by exemplifications of the logically equivalent "All non-white things are non-swans," meaning that this computer (it is black) tells us

something about ornithology. And then as a follow-up I discussed whether a green emerald confirms the truth of claims about emeralds that turn blue ("grue") at some point in the future.

Thanks to Kuhn, this kind of work no longer held any attraction. I (and I should say many others in my age cohort) accepted completely his directive that if you are going to do profitable philosophy of science—trying to understand the nature of science—then you must take seriously the history of science (extending this to include contemporary science). You have got to see how science actually works (Callebaut 1993). So in a way, rather than being entirely prescriptive—as, for example, Popper is when he says that genuine science is necessarily falsifiable—you have got to be at least in some way descriptive—telling it like it is. Probably no one can or should be entirely one or the other, but we who worked in the path of Kuhn took description very seriously indeed. We shall see that there was much more to the kind of naturalism I was then embracing, that this focus on description was all part and parcel of the general move to naturalism. Whatever the place of values in science, it is clear that a major part of science is trying to judge ideas—hypotheses, models, theories—against the evidence. So as a philosopher, this was what I wanted to do—look at value(s) against the evidence. Whereas a biologist judges his or her ideas against the findings about organisms, I was going to judge my ideas against the findings about science itself.

Obviously, given my background and interests and expertise, I was going to look at evolutionary biology, and having made this decision, the choice of which value was (as they say) a "no brainer." There was a huge amount of interest by historians of biology (including myself) in the question of progress (Ruse 1996). Does the path of organic history show a rise from the simple to the complex, from the blob to the sophisticated, from (as people in the nineteenth century used to say and as I adopted for the title of my major book on the subject) the monad to the man? Or is it just all a story of meandering going nowhere? That this reeks of value over and above the notion of evaluation needed no argument. The whole point was that one sees a rise in value, from the totally valueless—raw molecules reproducing—to the totally valued—ourselves!

Remember, however, the question is not whether you or I believe in progress in biology, but whether biologists—evolutionists—believe or believed in progress. And what, if anything, happened to the idea, and does this throw light on the dispute between the logical empiricists and the social constructivists? I should say that what made the concept of progress particularly appealing to one with interests like mine is that there was all sorts of controversy about progress, both among historians about whether certain figures did or did not believe in progress and among scientists about whether evolution shows progress or not. In the case of the former, there was, for instance, much debate about Charles Darwin himself (Gould 1977;

Ospovat 1981). Was he or was he not a biological progressionist? Some said he was. Some said he was not. In the case of the latter, there was a huge difference among today's best-known evolutionists. Edward O. Wilson, who was now at the very top of the rank of practicing scientists thanks to his magisterial *Sociobiology: The New Synthesis* (1975) and his follow-up Pulitzer Prize – winning *On Human Nature* (Wilson 1978), was a deeply committed progressionist. Stephen Jay Gould, Wilson's fellow department member and at the very top of the rank of science popularizers thanks to his *Natural History* column "This View of Life" (and the subsequent collections of these columns), was as equally contemptuous of all and any notions of biological progress (Gould 1988). Moreover the values were there to be seen. Wilson endorsed progress precisely because it leads to humankind, and this he considered good and a motive for action—namely, preserving our species and its status (Wilson 1984; 2002). Gould loathed progress because he thought it leads to racial evaluations, with some humans coming out on top and others coming out on the bottom. Barely disguised was Gould's feeling that Jews like himself had suffered prejudice because of such thinking (Gould 1981).

ERNAN MCMULLIN

And yet, I had my philosophical question, I had my naturalistic project, I had my subject matter, but I could not really put things together. I could talk about progress—and did—I could talk about values—and did—but it did not really cohere. I still remember the withering comments social scientist and political theorist Jon Elster hurled at me when I gave a talk at the University of Oslo. (I suspect that even had I been Aristotle, the comments would have been withering, but they still rankled.) And then, sometime in the early 1980s, I gave a version of my talk at a conference in Salzburg in Austria. I may not have been able to put things together conceptually, but I had some pretty good one-line jokes, one of the best of which was about the ways in which the English categorized the Irish in the nineteenth century and where they put their neighbors on the tree of life—showing, I am afraid, that just about everything that Steve Gould feared was indeed true. I had my audience in stitches (just as well, because the alternative would have been embarrassed silence at my political incorrectness) and then to my horror I realized that Ernan McMullin—the quintessential Irishman—was sitting in the front row! To my great relief, he was laughing with everyone else.

Later, walking back to our hotel, in his kindly avuncular way—I always thought of him more as an uncle than a father, for all that he was a Catholic priest—he went over some of my points and suggested that I might find some guidance in the presidential address that he had recently given at the recent Philosophy of Science Association Meeting. (A bit embarrassing

really, because I really should have been at that address and remembered it.) I am good at picking up tips, and as soon as I returned home, I read Ernan's address. At once, my project fell into place, and, as I said earlier, I was off on a 20-year journey of inquiry that that I think of as one of the most, if not the most, exciting trips in my intellectual life. So let us stop now and look at what Ernan McMullin (1983) had to say.

In its way, "Values in Science" is a typical McMullin production. It lays out carefully the pros and cons of the debate at issue and then sums up judiciously. The question is whether there are values involved in science—that is to say, do values influence the way science is produced and somehow get reflected in the product? As I have done, McMullin draws the distinction between valuation (values in some absolute sense) and evaluation (values in a comparative sense) and makes it clear that it is the former that concerns him. He shows agreement with the logical positivists/empiricists in wanting no absolute values of the general cultural kind in science. He writes: "The reality of emotive value (as it may be called) lies in the feeling of the subject, not primarily in a characteristic of the object. Value differences amount, then, to differences of attitude or of emotional response in specific subjects" (4). He then goes at once to state that these sorts of values have no place in science.

> It seems plausible that emotive values are alien to the work of natural science. There is no reason to think that human emotionality is a trustworthy guide to the structures of the natural world. Indeed, there is every reason, historically speaking, to view emotive values, as Bacon did, as potentially distorted "Idols," projecting in anthropomorphic fashion the pattern of human wants, desires, and emotions on a world where they have no place. When "ideology" is understood as a systematization of such values, it automatically becomes a threat to the integrity of science. The notion of value which is implicit in much recent social history of science, as well as in many analyses of the science-ideology relationship, is clearly that of emotive value. (4–5)

I take it that the reference to "recent social history of science" confirms my belief that these values would be cultural and would cover such things as religion, politics, sexual and ethnic differences, and so forth.

Having said this, however, McMullin makes it clear that he (along with the empiricists he is discussing) would allow some kind of valuation to mold their science. But it must involve values that in some sense promote the truth of science. Following Kuhn (1977), McMullin gives a list of some of the prominent values that he has in mind. "*Predictive accuracy* is the desideratum that scientists would usually list first" (15). After this: "A second criterion is *internal coherence*. The theory should hang together properly; there should be no logical inconsistencies, no unexplained coincidences." Next: "A third is *external consistency*: consistency with other theories and with the general background of expectation." Following: "A fourth feature that scientists value is *unifying power*, the ability to bring

together hitherto disparate areas of enquiry." And drawing toward the end: "A further, and quite crucial, criterion is *fertility*." Explaining: "The theory proves able to make novel predictions that were not part of the set of original explanations and, more important, the theory proves to have the imaginative resources, functioning here rather as a metaphor to enable anomalies to be overcome and new and powerful extensions to be made." McMullin adds: "One other, more problematic, candidate as a theory criterion is *simplicity*" (16).

What are we to call these values?

> Even though we cannot *definitively* establish the values appropriate to the assessment of theory, we saw just a moment ago that we can provide a tentative list of criteria that have gradually been shaped over the experience of many centuries, the values that are implicit in contemporary scientific practice. Such characteristic values I will call *epistemic*, because they are presumed to promote the truth-like character of science, its character as the most secure knowledge available to us of the world we seek to understand. And epistemic value is one we have reason to believe will, if pursued, help towards the attainment of such knowledge. (18)

Is this the end of the story? Well, not quite. Although he is drawing to the end, McMullin has some housecleaning to do. What about the stuff that sociologists of science have been emphasizing—namely, the emotive values that surround and supposedly infiltrate science? They are going to get pushed out by the epistemic!

> To the extent that nonepistemic values and other nonepistemic factors have been instrumental in the original theory-decision (and sociologists of science have rendered a great service by revealing how much more pervasive these factors are than one might have expected), they are gradually sifted by the continued application of the sort of value-judgment we have been describing here. The nonepistemic, by very different definition, will not in the long run survive this process. The process is designed to limit the effects not only of fraud and carelessness, but also of ideology, understood in its pejorative sense as distorted intrusion into the slow process of shaping our thought to the world. (p 23)

At a personal level, I should say that until now I had not reread Ernan's address in a long time, at least 20 years. In a way, I found the experience of rereading both predictable and a little puzzling. On the one hand, he did just what I expected him to do—namely, review the literature carefully and thoroughly. (Do not just read my synopsis above. There is a lot more that I have skipped.) On the other hand, as I often do with Ernan's work, I wanted him to get on with a few ideas of his own. Rightfully, he could complain that he did do just this. However, it was right at the end and a lot briefer than I remember or indeed as I think it should have been. All of the meat was in the penultimate paragraph that I have just quoted above. How are we going to tackle the clash between the logical empiricists and the social constructivists? Well, ultimately the logical empiricists are right. Good science may have epistemic values but not nonepistemic values like

religion and politics. However, the social constructivists do have a point: namely, that a lot that goes by the name of science does contain such values. The point is that over time the epistemic expels the nonepistemic, as scientists keep working to get some understanding of objective reality. To use other language—not used by McMullin here but with which he would have been very familiar—good science gets over the "context of discovery" and moves into the "context of justification," but we should realize that the context of discovery may be with us for a long time, and it is only slowly and with work that we are able to make this move.

I suspect that Ernan himself was a bit embarrassed by the paucity of his argument. He concluded by admitting that he had but offered "an outline of an argument, a sketch of work remaining to be done" (23). But as they say, it is the prepared mind that counts and my mind was certainly prepared. I seized on this paragraph and realized that I had the means to move forward. It just all made so much sense. And although McMullin was not giving examples in support of his position, it was easy to see how they could be found. Take something like cultural anthropology. In the nineteenth century, as it started to develop as a science, it was often, if not primarily, done by people working part-time, as a diversion from their day jobs. In the British case, a huge amount was done in places like India by soldiers or teachers or missionaries who, instead of drinking themselves into oblivion each night, would take the time and effort to learn native languages and look at native artifacts and read native books and talk to learned native religious or educational leaders. But the stuff they produced was almost always done through the filter of Western superiority and reflected such biases. Natives were either unspoiled geniuses or lesser beings, depending on whether one had read Rousseau; they were either heathens or religiously advanced, depending on whether one favored Christianity; they were either screaming perverts or true spirits of freedom, depending on one's own sexual needs and practices.

But, over the years, things changed, and these prejudices started to fade and vanish. Why? Not because cultural anthropologists are particularly nice and pure people, but because, as they developed their thinking, the epistemic values started to come into play. You cannot have a whole set of views about natives being some kind of inferior subspecies simply because modern genetics negates it. You want to be consistent? Then change your mind on this and related topics. You cannot (as was held by Herbert Spencer) have some view about the innate superiority of English as a language, because our understanding of linguistics negates it. You want to relate anthropological views about deities in one part of the world with those in another part of the world? Again, you had better stop reading in the assumptions of racial superiority and try to be more consistent and predictive and so on and so forth.

Progress

So back to progress and evolutionary biology. In a way, it seemed almost as if the job would be done before I had started. If you travel through time to the eighteenth century and to the early years of evolutionary thinking, then progress is rife. What would you expect, given that evolutionary ideas came almost directly from earlier thinking about the Great Chain of Being, with the absolutely simple at the bottom and God at the top and humans somewhere up the ladder or chain, not at the top but higher than any of the other animals or plants (Lovejoy 1936)? If you turn to the early evolutionists like Erasmus Darwin, progress is the backbone (to use a metaphor) through and through.

> Imperious man, who rules the bestial crowd,
> Of language, reason, and reflection proud,
> With brow erect who scorns this earthy sod,
> And styles himself the image of his God;
> Arose from rudiments of form and sense,
> An embryon point, or microscopic ens!
> (Darwin 1803, 1, ll. 295–314)

This vision was all bound up with the cultural idea of progress: "This idea [that the organic world had a natural origin] is analogous to the improving excellence observable in every part of the creation; . . . such as in the progressive increase of the wisdom and happiness of its inhabitants" (Darwin 1794, 509).

Fast forward now to the end of the twentieth century and look at the publications in leading evolution journals, like *Evolution* and *American Naturalist*. Not a hint of progress of any kind, anywhere. It just is not there. There is lots of discussion about population genetics and about factors causing change, and as the years go by there are different emphases, but progress is just not one of them. Moreover, if you turn to more specialized journals like the fairly new *Paleobiology* or the somewhat older *Systematic Zoology* (as it was then known), places where progress might well appear—after all, they deal with things like the history of life and not just processes—again your search for progress will leave you disappointed. Moreover the clues are there. A journal like *Paleobiology*, founded with the express intention of getting paleontology fully accepted in the modern evolutionary family, is obsessive in its stress on things like coherence and consistency, and trying to be predictive and fertile. Epistemic values really are the Holy Grail (Sepkoski 2012).

And finally, making the case complete, if you dig back into the history of evolutionary thinking, between the extremes of the eighteenth and late twentieth centuries, you see that it was indeed the quest for epistemic values that brought about the expulsion of progress. First there was Charles Darwin's mechanism of natural selection—the survival of the fittest.[4] It is not, as critics often claim, a tautology—those that survive are those that

survive. However, it is relativistic. It does say that evolution is a function of some organisms having features—adaptations—not possessed by (or not as well possessed by) others, their competitors, and that over time this leads to change. What it does not say is that the same features will always be the features of the winners, the fittest. Obviously eyes generally are good things, but in the dark they may well be burdens—getting irritated and so forth—and hence selection will act to remove them. It is well known that animals that live in caves have often lost the sense of sight, possessed both by their ancestors and their daylight-living, present relatives. Even humans are subject to this relativism. The natural assumption is that big brains are good things, but the fact is that they are very costly. In nature, you need ongoing supplies of big chunks of protein—otherwise known as dead animals—to keep them fueled. If this is available and you have the ability to get it, then all well and good. If you do not, then perhaps other strategies are better. In the immortal words of the late paleontologist Jack Sepkoski: "I see intelligence as just one of a variety of adaptations among tetrapods for survival. Running fast in a herd while being as dumb as shit, I think, is a very good adaptation for survival" (Ruse 1996, 486).

No necessary progress here. And this is underlined by the second big event in the history of evolutionary theory—the second big event that like the first, the coming of selection, made evolutionary thinking significantly more epistemically powerful (in the sense of getting one a closer understanding of reality). I refer to the development of an adequate theory of heredity, genetics, and to its incorporation into, its synthesis with, selection-based thinking about the past. Around 1900, the work of the Austro-Hungarian monk Gregor Mendel was rediscovered, and serious theoretical and experimental work on the factors of transmission and change was then possible, culminating in the development of the "classical theory of the gene," by Thomas Hunt Morgan and his associates at Columbia University in the second decade of the twentieth century. Then a few years later, the mathematically gifted trio of Ronald Fisher and J. B. S. Haldane in Britain and Sewall Wright in the United States formulated the basic theory of "population genetics," the theoretical core of modern evolutionary thinking, known now as (in the United States) the "synthetic theory of evolution" or (in Britain) "neo-Darwinism" (Provine 1971). From our perspective, the crucial point is that the new variations that are the building blocks of evolution, the "mutations," are random. This is not in the sense that they are uncaused—much is known about the causes—but in the sense that they did not develop in response to a need. An animal might need a red coat for camouflage, but it is as likely to get a variation in the direction of yellow or green. Such an animal might then adopt a new strategy, such as moving to a location where green is an asset, but the point is that there is no built-in direction and certainly no direction toward some absolute excellence. There is no progress.

Two Hypotheses

So it seems that Ernan McMullin's picture of theory change or development is beautifully illustrated by the history of evolutionary thinking over the past three centuries. And yet, there are nagging worries! I have noted already that Edward O. Wilson, by anyone's standards one of the leading evolutionary biologists of the second half of the twentieth century, is absolutely committed to progress. It is the connecting thread of his magisterial *Sociobiology: The New Synthesis* and for the problem he poses: "Four groups occupy pinnacles high above the others: the colonial invertebrates, the social insects, the nonhuman mammals, and man. Each has basic qualities of social life unique to itself." However, there is a paradox. Although "the sequence just given proceeds from unquestionably more primitive and older forms of life to more advanced and recent ones, the key properties of social existence, including cohesiveness, altruism, and cooperativeness, decline." Yet do not despair. "Man has intensified [the] vertebrate traits while adding unique qualities of his own. In so doing he has achieved an extraordinary degree of cooperation with little or no sacrifice of personal survival and reproduction. Exactly how he alone has been able to cross to this fourth pinnacle, reversing the downward trend of social evolution in general, is the culminating mystery of all biology" (Wilson 1975, 379). There is progress and we have won!

Wilson is not alone in this fondness for progress. Cross the Atlantic and listen to another well-known evolutionist, Richard Dawkins. In his great popular overview of modern evolutionary thinking, *The Blind Watchmaker* (1986), Dawkins refers to Harry Jerison's (1973) notion of an Encephalization Quotient (EQ), this being a kind of universal animal IQ, that works from brain size and subtracts the gray matter simply needed to get the body functioning: Whales necessarily have bigger brains than shrews, because they have bigger bodies. What counts is what is left when you take off the body-functioning portion. Thus measured, humans come way out on top, leading Dawkins (1986, 189) to reflect: "The fact that humans have an EQ of 7 and hippos an EQ of 0.3 may not literally mean that humans are 23 times as clever as hippos!" But, he concludes, it does tell us "something."

I was led to wonder if this sort of thinking might be a bit more significant than one might suppose. After all, if you do start searching, you find more and more instances of progress cropping up in very unlikely places. For all of the naysayers whose theory will not let them believe the evidence of their own eyes, we can cite the work that, on the McMullin history of evolutionary thinking, would surely be the last place to expect progressive thinking: Darwin's *Origin of Species*! Remember the famous last paragraph:

> It is interesting to contemplate an entangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these

elaborately constructed forms, so different from each other, and dependent on each other in so complex a manner, have all been produced by laws acting around us. These laws, taken in the largest sense, being Growth with Reproduction; Inheritance which is almost implied by reproduction; Variability from the indirect and direct action of the external conditions of life, and from use and disuse; a Ratio of Increase so high as to lead to a Struggle for Life, and as a consequence to Natural Selection, entailing Divergence of Character and the Extinction of less-improved forms. Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows. There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved. (Darwin 1859, 489–90)

A significant clue to what is truly going on here seemed to be the (already-mentioned) attitude of Stephen Jay Gould. He was violently against the notion of biological progress and, moreover, he made few bones about the fact that his opposition was very much fueled by value considerations. As noted earlier, he thought that progress leads—has led—to the belittling of certain groups of people—blacks, Native Americans, Jews, and more. Could it therefore be that McMullin is quite wrong and that nonepistemic values are just as alive and well in today's evolutionary biology as they ever were? It is just that these nonepistemic values have changed! While it is true that there are some like Wilson and Dawkins who continue to endorse biological progress—and incidentally both are quite open about their beliefs in social progress (and in Dawkins's case particularly technological progress)—the majority of today's evolutionists join with Gould in thinking that biological progress is a socially and morally bad thing.

Interestingly, Gould was in favor of social progress, but he thought that it was to be achieved by denying the morally obnoxious biological progress.[5] However, perhaps a more common pattern might be simply that today's evolutionists join with the bulk of educated people generally in being very dubious about the possibility of general cultural progress and as dubious about whether, if even attainable, it is a good thing. In an age of nuclear weaponry, of global warming, of obesity in a fraction of the world's population and starvation in a much bigger fraction of the population, and much more of this ilk, who would dare to speak of progress? And this is to ignore the dreadful history of the twentieth century and how modern means of communication—the radio and television for a start—have made possible propaganda and the deadening of human sensibilities and moral fiber. Even if we could (for example) produce a lot more energy, would it necessarily be a good thing? Surely anyone who takes seriously the opinions expressed in such influential organs of opinion as the *New York Times* and *Le Monde* and the *Frankfurter Allgemeine Zeitung* realizes that eighteenth-century hopes for and beliefs in progress of any kind are simply nonsensical

and somewhat pernicious. And as goes social and cultural progress, so goes biological progress.

I am a naturalist, remember? I want to make my philosophizing as science-like as possible. I now had two hypotheses: one that said epistemic values had expelled nonepistemic values (McMullin's hypothesis) and one that said nonepistemic values persisted but had changed (Ruse's hypothesis). So I went to work, going carefully through the history of evolutionary thinking from the beginning to the end, working empirically like a scientist, trying to see if the facts bore on the truth of one or the other hypothesis. I certainly soon found facts that seemed to show that there had to be something amiss with the McMullin hypothesis. And also facts that seemed supportive of my hypothesis. A prize catch was the anatomist E. Ray Lankester, a prominent evolutionist around the turn of the century (from the nineteenth to the twentieth). He was very much against biological progress, and I discovered—not without some difficulty because the family was still suppressing the evidence—that he had a very uncomfortable personal life. He was unable to have proper relationships with women of his own social class and could only find outlets with prostitutes. (He would dash off to Paris to satisfy his needs.) He thought it was a function of his upbringing in all-male, educational establishments (school and then university), and he hated himself for it. Moreover he made no bones, when speaking to confidants, that this was a major reason why he doubted biological progress.[6]

Nevertheless, something was not quite right. For a start, I dug up huge amounts of material favoring biological progress—material that stretched right from the time of Darwin to the present and that included the biggest names in the field, including Ronald Fisher and Sewall Wright, Theodosius Dobzhansky and other prominent evolutionists of his day (Ernst Mayr, George Gaylord Simpson, and G. Ledyard Stebbins), and others in Britain (notably Julian Huxley). This was certainly a score against me, as also was the fact that people who wrote about the idea of social and cultural progress often made the point that scientists tend to be atypical—rather like politicians at election time (Wagar 1972). They believe in such progress! Their occupation—science—is an area where (whatever people like Thomas Kuhn may say) they think they see real progress in ideas. Newton is better than Aristotle, Einstein is better than Newton, and in the future we expect to see someone better than Einstein. Mendel is better than Darwin (who was hopelessly confused about heredity), Watson and Crick are better than Mendel, and so the story continues. Another score against me. And third, starting with Darwin, those who continue to believe in biological progress tend to search for mechanisms that are epistemically sound—in other words, not just reflections of nonepistemic values. Darwin, and following him right down through Julian Huxley to Richard Dawkins, believed in what we today call biological "arms

races." Lines of organisms compete against each other, and the respective adaptations get better and better—the prey gets faster and so also does the predator—and eventually this comes out in the form of the very best adaptations of all: those adaptations possessed by humans (Darwin 1861; Dawkins and Krebs 1979; Huxley 1912).

Dawkins has always made brilliant use of metaphor—selfish gene, blind watchmaker, mount improbable—and metaphor is much involved in the thinking about progress. In *The Blind Watchmaker*, the metaphor of bigger and bigger on-board computers (aka brains) plays a vital role, as it has elsewhere.

> Computer evolution in human technology is enormously rapid and unmistakably progressive. It comes about through at least partly a kind of hardware/software coevolution. Advances in hardware are in step with advances in software. There is also software/software coevolution. Advances in software make possible not only improvements in short-term computational efficiency—although they certainly do that—they also make possible further advances in the evolution of the software. So the first point is just the sheer adaptedness of the advances of software make for efficient computing. The second point is the progressive thing. The advances of software open the door—again I wouldn't mind using the word "floodgates" in some instances—open the floodgates to further advances in software. (Ruse 1996, 469. This is from an oral presentation given by Dawkins in Melbu, Norway, in 1989.)

Evolution is cumulative, for it has "the power to build new progress on the shoulders of earlier generations of progress." And brains, especially the biggest and best brains, are right there at the heart, or (perhaps we should say) end: "I was trying to suggest by my analogy with software/software coevolution, in brain evolution that these may have been advances that will come under the heading of the evolution of evolvability in [the] evolution of intelligence."

A Third Hypothesis

Another strike against me and, given that this is the third, I seem to be on my way back to the bench. However, there were some things that were starting to worry me, and I realized that they fit well with neither hypothesis, McMullin or Ruse. Most particularly, although I was finding lots of post-*Origin* discussions of biological progress increasingly rare—with some notable exceptions like Wilson (who was in the powerful position of being able to publish what and where he pleased)—I was not finding the material in what one might call the professional publications like *Evolution* and *American Naturalist*. They came rather in presidential addresses or books "for the general reader," or relatedly in displays in museums of natural history. People believed in biological progress, but at one level they were hiding it.

The crucial explanatory insight came to me when I went to the American Philosophical Society's library in Philadelphia. It has a very large holding of papers (including flimsies of many letters) by Simpson, Dobzhansky's paleontological ally. It became very clear on reading through them that Simpson (and remember we are talking now about the 1940s and 50s, the time after the population geneticists had done their fundamental work and when the empiricists like Simpson were developing the synthetic theory) was very concerned about the status of his science as a science. Collapsing down what took me some time to ferret out, before the *Origin* was published the status of evolutionary thinking was little more than that of a *pseudo* science like phrenology (the "science" of brain bumps). Significantly, one of the best known pre-Darwinian evolutionists was Robert Chambers, the Scottish publisher, who set out to write a book on phrenology and then halfway through his book (*Vestiges of the Natural History of Creation*, 1844) changed his topic to evolution! It was clear that a major part of this status (and incidentally, a major part of the attraction of the topic) was its intimate connection with social progress, reflected into biological progress. Charles Darwin set out to upgrade his area of study, but in the end really only managed to get evolution to the status of a kind of *popular* science—for the general lecture hall and the museums and the like. It is well known that although evolution found ready acceptance, natural selection was much less favorably received—and not much else was put in its place. The stuff being produced just was not very causal at all. Significantly, Darwin's great supporter, Thomas Henry Huxley (grandfather of Julian), never lectured to his students on evolution or selection. He kept all of that for popular lectures and writings. It was not until the population geneticists had done their work, and the causal underpinnings were in place (the 1930s), that serious professional work could gather speed. But if you are going to have a *professional* science—with all of the trimmings like university departments and journals and students and grants—then you have got to present yourself as a serious, professional scholar. This means you have got to eliminate all sorts of nonepistemic chat about progress and the like, especially biological progress seen as a reflection of social progress. Science is supposed to tell it like it is, not like you would like it to be. Science does not reflect the nonepistemic values of the scientist.[7]

So what I discovered was that evolutionary biology expelled its nonepistemic values, progress specifically, in order to promote its status as a professional science. So what one might say is that science pushes epistemic values and rids itself of general cultural nonepistemic values, because scientists embrace the nonepistemic values of status within their profession! I do not think this means that scientists are insincere in their promotion of epistemic values—that, after all is what they do for a living—but that the reason for working only within the epistemic arena is not as simple and straightforward as it might all seem. This also explains

why discussions of biological progress, clearly reflecting thoughts of social and cultural progress, persist. So long as one is not working in the professional level, they are not objectionable. Whoever said that scientists should not have any social concerns? Simpson was the master at this, writing two sets of books—one set for the professional with no talk of any progress and the other for the general reader with all sorts of talk about progress of all kinds![8]

Realism

And fully to complete the story (and eventually to bring it back to McMullin) I should say that, speaking now as philosophical naturalist in another sense—not so much trying to use the methodology of science but more relying on science for one's premises—I think that the epistemic values are rooted in our evolutionary past and that the reason why we accept them is because those of our would-be ancestors who did accept them tended to survive and reproduce better than those of our would-be ancestors who did not. I think also that the way scientists work within these epistemic constraints is very much a matter of trying to make sense of the empirical world (I am certainly not at all downgrading the importance of empirical inquiry) through the use of metaphor—force, work, attraction, struggle for existence, natural selection, genetic code, continental drift, Oedipus complex. I would say also that these metaphors do bring culture right into science. In the case of evolutionary thinking, I just do not see how one could pretend that Darwinism could exist without the socioeconomic thinking of the eighteenth century—people like Adam Smith with their divisions of labor and so forth. The point is that I do not see that using the metaphors, even though the originators may have drenched them in values, necessarily commits the scientist to such values. Edward O. Wilson (1980a, b; 1983a, b), for example, uses the metaphor of a division of labor repeatedly in his work on the leaf-cutter ants of the Amazon, trying to show that the many castes are a function of an efficient use of resources—better to divide the foragers and the gardeners into two groups with special adaptations than to have just generalists—but there is no reason to think that he endorses the division of labor as a good thing, in the sense of good for humans. He might well think that such a system is psychologically deadening and it is better to give people several tasks, even at the risk of losing some overall efficiency. What selection promotes for the ants is not necessarily what is best for humans.[9]

Where does McMullin come into all of this? Well known is the fact—perhaps bolstered by his alter ego as a Catholic priest—that he was a scientific realist. He thought that there is a human-independent world that science is trying to map. Falling trees really do make a noise in the forest when no one is around. He only makes passing reference to this philosophy

in "Science and Values," but I am sure he thought of it as underlying his address. For myself, I do not think that anything I have said in the past few paragraphs denies such realism, but I am not sure that it confirms it either. Particularly given the way that I allow all kinds of values in and around science, and even more the way in which (in a fairly constructivist fashion) I insist on the importance of culture as an influence and determinant on science, I cannot see that supposing that there is a real, independent world out there is a necessary premise or consequence of my thinking. But perhaps this is a function of naturalism. Like pragmatism, a close relative, it is a powerful way to do philosophy, but it comes at the cost of failing to answer—perhaps even failing to ask—certain fundamental metaphysical questions or problems. Which leaves me wondering whether ultimately he and I were working in different worlds. But that is another story for another person. It is enough that I can tell my story and how great is my debt to a man I was proud to call my friend, Ernan McMullin.

Notes

1. My testimony and the full ruling can be found in Ruse (1988). Judge William Overton characterized science thus:

(1) it is guided by natural law;
(2) it has to be explanatory by reference to nature law;
(3) it is testable against the empirical world;
(4) its conclusions are tentative, that is, are not necessarily the final word; and
(5) its is falsifiable. (Ruse and other science witnesses)

2. Not all supporters of Intelligent Design Theory accept the major claims of the Creationists: six days of creation, 6,000-year age of Earth, a literal (originally sinless) Adam and Eve, and a universal flood. I do not think, for instance, that Plantinga is a Young Earth Creationist, but both positions are based on fairly literal readings of the Bible, and they do share many of the same moral concerns, such as an opposition to abortion and to full homosexual rights.

3. My first book, *The Philosophy of Biology* (Ruse 1973), was very much in the logical empiricist school. My second book, *The Darwinian Revolution: Science Red in Tooth and Claw* (Ruse 1979), was deeply influenced by the historiography of science of the day.

4. The phrase "survival of the fittest," as an alternative to natural selection, was coined by Herbert Spencer. It does not appear in the first edition of *Origin of Species* (1859) but only in later editions (Darwin 1861). The use of the term was urged on Darwin by the codiscoverer of natural selection, Alfred Russel Wallace.

5. I knew Gould well and interviewed him at length for my book on progress (Ruse 1996). He believed very strongly in the possibility of social and cultural progress and thought it silly to deny that this has occurred.

6. I discuss this in Ruse (1996). A somewhat more guarded discussion occurs in Lester (1995).

7. A somewhat less than sympathetic reviewer of my *Monad to Man*, as I remember Michael Ghiselin, pointed out that my three stages of science—pseudo, popular, and professional—mirror August Comte's three stages of knowledge—theological, metaphysical, and positivist. I had certainly not had this in mind when I wrote my book, and I confess that I was somewhat less than pleased when the analogy was drawn! However, on reflection, I think the reviewer had a point and console myself by thinking that perhaps the coincidence is no coincidence but truly points to a real division and succession.

8. Compare *Tempo and Mode in Evolution* (Simpson 1944), written for the professional audience; *The Meaning of Evolution* (Simpson 1949), written for a popular audience; and *Major*

Features of Evolution (Simpson 1953), written for the professional audience. The first and third have no hint of progress talk, whereas the second is full of it.

9. I discuss all of this in some detail in *Mystery of Mysteries: Is Evolution a Social Construction*? (1999).

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