Critique of “Proposed Revisions to Science Standards Draft 1

E. O. Wiley
Professor of Ecology and Evolutionary Biology
Senior Curator, Biodiversity Research Center and natural History Museum
University of Kansas
Lawrence, KS 66045
ewiley@ku.edu

I do not recognized the kind of science portrayed in the revisions of the Science Standards of the kind of sciene I practice, and I have been a scientist for more than 30 years. The general thrust of the revisions seems to be the idea that science as practiced by the vast majority of scientists is some kind of religion. Since it is some kind of religion, then why not introduce other religious beliefs? So, the first question to tackle is this very basic question. Reference to “the revisers” is reference to whomever revised the original Standards draft.

The revisers make much of the idea of methodological naturalism. They do not mention metaphysical naturalism. In fact, they confuse the two. They are quite correct when they assert that hypotheses about the natural processes of evolution are formulated under the general approach of methodological materialism. They are quite wrong when they claim that this leads to anything scientifically or constitutionally problematic. It might be problematic if what science was advocating was metaphysical materialism, but a commitment to methodological materialism is not a commitment to metaphysical naturalism, as any good philosopher can tell you. In fact, everyone who problem-solves uses methodological naturalism. When we are faced with a puzzle or wish to accomplish some task, we switch to the mode methodological naturalism and seek natural explanations or solutions. Scientists do this. Bankers do this. Farmers do this. In fact, just about everyone does this. Image if I went to my auto mechanic and he said:

“Well, it might be the brakes or it might be an evil spirit.”

Should I give equal weight to the “evil spirit” hypothesis? After all, someone probably believes it, this mechanic for one. Of course not, I would probably just take my car and drive down the street to the next mechanic. I bet the next mechanic simply says “it’s the brakes” and doesn’t mention the evil spirit. I bet he is not an atheist. He has made a commitment to methodological naturalism but no such commitment to metaphysical naturalism. In short: a commitment to material naturalism is true of all science, but it does not require scientists to commit to or espouse metaphysical naturalism (aka, atheism). In my experience, there are two kinds of folks who want me to believe that methodological materialism is the same as metaphysical materialism. First, there are the atheists, since they want me to be an atheist. Second are the fundamentalists, since they want me to be a fundamentalist. Since I am neither, my response is: read some philosophy and get the differences straight.

Specific Comments

Page 4

"In a recent paper the kind of materialistic reductionism required by methodological naturalism has been charged with actually being detrimental to the conduct of science."

First, that is not what the paper says, even the quote in the footnotes. First Van Regenmortel does not state that reductionism has been detrimental, only that it has reached it limits. The specific quote is: "As the value of methodological reductionism has been particularly evident in molecular biology..." How can one think that methodological reductionism is detrimental to the conduct of science and make this statement? He also says, continuing the sentence: "…it might seem odd that, in recent years, biologists have become increasingly critical of the idea that biological systems can be fully explained using physics and chemistry." Van Regenmortel subscribes to what many of us feel: biological processes are characterized by hierarchical levels of organization that has emergent properties, These emergent properties cannot be accounted for by studying their parts because it is the interaction of these parts that creates the new level of complexity. So, where did the "detrimental influence" come in? Well, it has inhibited research because it overestimates complexity. OK, I am sure that scientists make all kinds of mistakes, and inhibit scientific progress in doing so. **But, what is the point relative to methodological naturalism, which is not mentioned by Van Regenmortel. Fact is, Van Regenmortel used this same methodological naturalism to chide reductionists that they had "reduced too much" and thus missed the boat by concluding that their over-reduced systems were too complex.**

Pages 4-5. If memory serves me right, I think that Michael Ruse concluded that organisms were not designed by a higher power.

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"The nature of determinants and rules for the organization of design elements constitutes one of the major unsolved problems in the scientific account of organismal form"

This is a quote from Muller and Newman. From the sentence above the quote, we get the impression that they are somehow involved with intelligent design, or at least some kind of design. I was suspicious as I have had a look at the book. Just to make sure, I called Stuart Newman. "Design element" is a metaphor for "organized part of" and does not in any way refer to intelligent design. In fact, Stuart tells me that his quote has been picked up and abused by Ohio creationists, that he is a committed evolutionary biologist and that he thinks Darwin only got it partly right, as many of us also think.

If methodological naturalism is irrefutable, then how was it possible to refute the "junk DNA hypothesis." Did an intelligent design person refute the hypothesis? Nope, it was another methodological naturalist, in fact, it was several of them. Not an intelligent design guy in the bunch so far as I know.

Popular article on line:

Pearson, Helen (2004) "'Junk' DNA reveals vital role (*http://www.nature.com/nsu/040503/040503-9.html*)", *Nature*.

Primary Literature:
Bejerano, et al., 2004. Ultraconserved elements in the human genome. *Science*, Vol 304, Issue 5675, 1321-1325

But, let us be cautious, the experiments of Nobrego et al. (2003) seems to demonstrate that at least some of that DNA is, in fact, junk.

Nobrega, et al.. 2004. Megabase deletions of gene deserts result in viable mice", *Nature*, 431: 988-993.

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"Methodological naturalism effectively converts evolution to an irrefutable ideology that is not secular or neutral. Naturalism, the fundamental tenet of non-theistic religious and belief systems like secular Humanism, athesism, agnosticism and scientism."

Here, I think is the motivation for the entire revision. A couple of technical points are in order. First, there are two kinds of Naturalism, only one of which leads to such nasty things as atheism and scientism: the commitment to metaphysical naturalism. Second, the revisers show their lack of philosophical acumen by not recognizing such an important distinction. (After all, what do philosophers have to do but make fine distinctions, which, I might add, sometimes turn out to be useful.) Finally, let me state a few other things that are rendered into an irrefutable ideology by this reasoning:

Gravity
The heliocentric solar system
The wave/particle theory of light
Relativity
Atomic chemistry

So, why pick on evolution?

Change that states: "Although science proposes theories that explain changes, the actual causes of many changes are currently unknown (e.g., the origin of the universe, the origin of fundamental laws, the origin of life and the genetic code, the origin of the major body plans during the Cambrian explosion, etc.)"

What does this "the actual causes" mean?

Certainly, we know the actual causes of the origin of all the fundamental laws. They are man-made hypotheses meant to explain natural phenomena we observe using the principles of, in the reviser's words, methodological naturalism. Perhaps this is the problem: not understanding the difference between processes and theories about processes? Let me state it simply: No scientist I know or have read ever proposed a theory about a nonprocess. We propose theories only after we accept the process as a real

process operating in nature. Of course, sometime we are dead wrong, but if we are, some other methodological naturalist will discover our mistake and correct it.

I know that intelligent design advocates really think the Cambrian "explosion" is a big deal. It is not, and they would know this if they actually examined the recent literature.

Examples from the primary literature:

Fortey R.A., Briggs D.E.G., Wills M.A. 1997. The Cambrian evolutionary explosion recalibrated. *Bioessays* 19 (5), pp 429-434.

Wray G.A., Levinton J.S., Shapiro L.H. 1997. Molecular evidence for deep pre-Cambrian divergencies amoung metazoan phyla. *Science* 214, pp568-573.

Seilacher A., Bose P., Pfluger. 1998. Triploblastic Animals more than 1 billion years ago: trace fossil evidence from India. *Science* 282, pp 80-83.

Xiao S., Zhang Y., Knoll A. H. 1998. Three dimensional preservation of algae and animal embryos in a Neoproterozoic phosphorite. *Nature* 391, pp 553-558.

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Teacher notes: Sorry, but Biological evolution does not theorize. Human theorize. Biological evolution is a process, not a human invention. Ok, maybe it is not a process, maybe what we thought was a process does not exist. But whether true or false, processes do not theorize, people do. What processes do, if they are true, is generate patterns in nature. (False processes, of course, do nothing: for example, the so-called process that disease was caused by putrid air.) We discover the processes by discovering the patterns and regularities. We then theorize about the process, attempting to capture part of it in our theory and we check this by seeing if the theory covers both known and new patterns and regularities. The statement should read:

Some theories about the evolutionary process postulate that evolution is gradual and occurs slowly over many generations … Of course not ALL evolutionary theories postulate this pattern.

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Number 4. I have a much better one and one that students can actually work. I will supply it if you ask.

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I find the additional wording curious and misleading. All science has the expectation that older theories will be supplanted by newer theories. Experimentation does not guarantee that any theory will stand the test of time, in fact, quite the opposite. There are "historical theories" that have lasted longer than theories built on experiment. All scientists "develop tentative competing theories and then seek clues that will "rule in one

while ruling others out." All experiments are plagued by "unknown variables," that is why we need statistics. "Experimental" science, like "historical" science also seeks "an inference to the best explanation." I fail to see the fundamental difference here.

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Indicator 6. The implication that experimental scientists "directly observe" phenomena while historical scientists do not is, in fact, bogus. For example, no chemist has directly observed a chemical reaction. Rather, they observe the effect of, and results of, a chemical reaction. Likewise, no physicist directly observes the collision of subatomic particles in an accelerator. They observe the effect of such collision on sensors. No astromomer directly observes the sun, all the photons are several minutes old. So, what experimental scientists observe are the effects and byproducts of natural processes, not the phenomena themselves (we will not even get into cognation). On this level, they are no different than "historical scientists" who observe the effects of other kinds of "past events." The difference it only that some sciences observe things that happened in the very recent past while other observe things that happened in the more distant past. But, from the standpoint of the observer, all of it happened in the past. Otherwise there would be nothing to observe. Consider this statement.

"Explanations about the cause of past events are inherently more subjective because they rely to a large extent on imagination and inference to supply missing evidence."

Really? Have the revisers even examined the literature? I am not speaking of derivative literature (secondary literature) of the sort that is represented by Ernst Mayr's article in Scientific American. There is no imagination or subjectivity in the hypothesis "humans and sharks share a common ancestor as evidenced by the presence in both organisms of gnathostome jaws" and there is no missing evidence in the statement either. How does this differ from that hypothesis "neon and argon are noble elements because they have their outer orbitals filled with electrons"? Well, one could suppose that since we cannot see the electrons but can see the jaws, that the latter statement actually is based more on imagination than the former.

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Additional Specificity1c. Yes, this is correct and it is one of the reasons that biology can never be reduced to chemistry and physics. However, the order is governed by biological laws. Unless the order results in a viable and functional organism that can reproduce, there is not life. This should be mentioned if this content is retained.

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Additional Spec. 1a. The Revisers use the NABT statement as a citation for the following: “Biological evolution postulates an unpredictable and unguided natural process that has no discernable direction or goal. Actually, the NABT statement is:

> “The diversity of life on earth is the outcome of biological evolution—an unpredictable and natural process of descent with modification that is affected by natural selection, mutation, genetic drift, migration and other natural biological and geological forces.”

Thus it is factually untrue that the NABT statement contains any wording concerning guidance, direction, or goal. This is disingenuous, at the least, on the part of the Revisers.

Spec.2f. **The fact that changes in gene frequency is confused with genetic drift and the fact that genetic drift is included in the concept of natural selection are factually wrong and calls into question the competency of the Revisers.** Genetic drift is change in gene frequency without natural selection. Changes in allele frequency can be due to drift or selection.

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Spec. 3a. The problem with beginning the statement with the word “advantageous” is that what is advantageous cannot be predicted in advance (unless, of course, someone is guiding the process!). Beneficial is the appropriate term, if you wish to use it.

Spec. 3b. Statement in bold. Fatuyma doesn’t say this, although the reference with a specific page number implies that he does. The closest thing is on this cited page in Figure 10.8: “this figure reflects the widespread belief that the vast majority of mutations are deleterious or nearly neutral (i.e. with nearly zero effect) and that only a very small proportion are beneficial.” Note also that the proportion of lethal mutation is about equal with the proportion of beneficial mutations in the figure. So far as I know, “fatal” is not a term used for classes of mutations.

Spec. 4c. Mayr does not talk about “biological systems which appear irreducible complex.” The citation implies that he does so. Indeed, the citation is positively misleading as it links Mayr to this statement, as if he said something of the kind, which he did not. This is dishonest.

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Spec. 5d. I find this entire statement ludicrous. Let us examine the parts.

i. Discrepancies in molecular evidence challenge different hypotheses of relationship, not the “view” that all living organisms are related through common ancestry. Much of this discrepancy can be ascribed to different methods of analysis, so to the known phenomenon that the descent of particular gene sequences is not “in step” with the descent of organisms due to differing rates of evolution. Some are due to adoption of different models of

how the genes are evolving. I don't know of any citations in the scientific literature (contra creationist literature) that comes to the conclusion that such discrepancies serve as falsifiers for the reality of the evolutionary process itself.

ii. First, I don't know of any particular evolutionary theory that postulates a gradual and steady increase in complexity. (I do know of one that explains increasing in complexity as a natural entropic phenomenon.) Second, at least some evolutionary theories postulate stasis. Third, whether the "Cambrian explosion" was even an explosion is subject to debate among evolutionary biologists and none of them has abandoned the evolutionary paradigm regardless of which side of the issue they embrace.

iii. What studies show this? All animals? I think not. In fact, the more recent the common ancestor, the more similar the development. Of course, not all evolutionary novelties are added onto the end of the ontogeny of animals (or plants), and this creates considerable diversity at different stages in the ontogenetic sequences, but this tiresome claim, based on Haeckel fudging his drawings (which he did) is simply false.

Primary literature relating to iii:

Richardson, M. K., Hanken, J., Selwood, L., Wright, G. M., Richards, R. J., Pieau, C., and Raynaud, A. 1997b) Haeckel, embryos, and evolution. *Science* 280: 983 -984.

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Spec. 6.b. Comments.

i. I do believe there is plenty of geologic evidence for a "chemically hospitable pre-biotic atmosphere. I am no geologist, however, so you should check with one.

ii. I am not sure what is meant by "the lack of adequate natural explanations for the genetic code" simply because "adequate" is observer dependent. Certainly it can be said that biologists and biochemists have not succeeded in making life from nonlife, so in that sense we certainly do not know all the steps. However, there is a large body of research regarding all of these points that suggests that biologists and biochemists are making good progress.

iii. The earliest life recorded is a prokaryotic organism fro Greenland circa 3.5 billion years before present (byp). The first eukaryote was, I think, about 2 byp. Now, that is 1.5 billion years between prokaryotes and eukaryotes, not exactly sudden. I suppose that one might argue that since that 3.5 byp creature was found near the time that earth first became habitable (I don't know if this claim is true and have not checked it), that life appeared suddenly. This could mean that the origin of life from the "prebiotic soup" is easily accomplished rather than a "difficulty."

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Spec. 3. Is this a threat?

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I am not going to go through all these points in detail. The thrust is: evolution is not experimental and “repeatable” and therefore it is entirely unreliable. This is just an ax that the Revisers have been grinding from the beginning and discussing these points in detail is not warranted.

I have not reviewed the glossary terms.

General Impressions.

The revisers paint a distorted of science in general and do not seem to know enough about evolution to understand that genetic drift is different from natural selection. They imply that we can know nothing substantial about the history of life. They misuse literature implying that scientists say one thing when they say another. The quotes used are frequently misleading and inaccurate.

Throughout the revisions there is the feeling that something is missing in science. Of course, that something is Intelligent Design.