

Distorting for Darwinism: *NSTA Reports! Reviews ASA's Teaching Science*

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In September 1993, ASA mailed its most recently revised version of *Teaching Science in a Climate of Controversy* to over 3,000 high school biology teachers in California. The creation/evolution pseudo-controversy has continued to flare up there, and has been highly visible most recently in the 22,000-student Vista School District. *Teaching Science* is designed to help teachers on the front lines eliminate both creationism and evolutionism from their classrooms by teaching evolution as science. The book suggests ways to correct deficiencies in existing biology texts by providing teachers with examples of unsolved problems and unanswered questions. In addition, the 1993 version includes a ready-to-use critical thinking skills exercise to give students hands-on experience in distinguishing inference from evidence.

The National Science Teachers Association (NSTA) is an "organization of science education professionals and has as its purpose the stimulation, improvement, and coordination of science teaching and learning." NSTA publishes *NSTA Reports!* six times a year to bring science education news and information to its nearly 50,000 members. The October/November 1993 edition contained a review of *Teaching Science* written by Russell Aiuto, director of research and development of NSTA's *Scope, Sequence, and Coordination of Secondary School Science* (SS&C) project.¹ Headlined "Book Claims Fairness, Tries to Dismantle Evolution," Aiuto's review is a unfortunate example of the tactics some advocates of Darwinism use to defend their ideology: *ad hominem* rhetoric, erroneous statements, and misrepresentation of scientific evidence.

The first tactic is illustrated by the headline, reinforced by *NSTA Reports!* Editor Ann Wild's pronouncement in her introduction that "high school biology teachers are the latest targets in the effort to discredit the teaching of the scientific theory of evolution." She then asserts that "Russell Aiuto takes a careful look at the book and at the clever and subtle tactics of those whom he terms 'neocreation-

ists.'" Aiuto, calling the authors of *Teaching Science* "opponents of evolution" who present a "high level of argument," one that is "seductive, seemingly innocent, and ostensibly rational," claims that the book says that we can "save our children from godless Darwinism and finally insinuate creationism into the curriculum." *Teaching Science* is also characterized as "very clever nonsense," and "positively smarmy," while both the book and its sponsoring organization (ASA) are "insidious."

The second tactic is illustrated by a rhetorical maneuver so classic that it could be used as an exam question in critical thinking. Consider the following:

But wait! This book "urges teachers to insist on strictly scientific definitions and to emphasize the differences between evidence and inference." Hmmm. What one finds are some "classroom exercises" toward the back of the book which "help" students understand that fossils provide "evolutionary inference," and not "evidence." Perhaps the photograph in a recent issue of *Education Week* of a citizen of Vista, California, holding up a fossil and declaring that it looked old because God made it look old is an example of the distinction between inference and evidence (p. 3).

Most readers will recognize the "red herring" maneuver of the switch to a photo in *Education Week* that has nothing whatsoever to do with *Teaching Science* or ASA. What readers may not be aware of is that Aiuto's statement that our classroom exercises "'help' students understand that fossils provide evolutionary 'inference,' and not 'evidence,'" is totally false. Compare Aiuto's statement with the direct quotation from the relevant section in *Teaching Science*:

Distinguish clearly between evidence and inference. On The Hard Facts Wall, the fossils and their ages constitute evidence of life's history. The lines connecting the taxa, implying common ancestry, are examples of inference (p. 61).

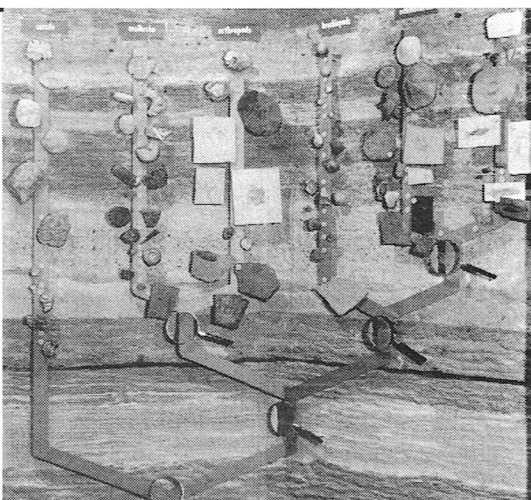
The book thus clearly states that the fossils constitute evidence, whereas it is the lines connecting the fossils

to points of hypothetical common ancestry that are inference. The reason for this is that there are no fossils beneath the magnifying glasses at the points of common ancestry.

To illustrate the review's distortion of science, it will be necessary first to describe the Hard Facts Wall critical thinking skills exercise which appears in the 1993 edition of *Teaching Science*. The primary purpose of the critical thinking skills exercise is to teach students the difference between evidence and inference through a hands-on laboratory exercise. Students are given small cards with names, sketches, and dates of fossils on them. Their assignment is to plot these cards on a geologic time scale graph by date, in the appropriate categories. Their results should look like the diagram below at left, titled "Empirical Presentation of Evidence" (p. 59, *Teaching Science*). The students then compare their work to the diagram below at right, titled "Evidence as Presented by the California Academy of Sciences" (p. 58, *Teaching Science*).

It should be noted that the California Academy of Sciences' presentation is a diagrammatic representation of the Hard Facts Wall, part of their museum exhibit "Life Through Time: The Evidence For Evolution." (See photo above.) Dots in the diagram represent the museum's fossils. The museum places

The Hard Facts Wall, a display in the exhibit "Life Through Time: The Evidence for Evolution," California Academy of Sciences, Golden Gate Park, San Francisco. This particular display does not include a time scale; relative time is represented by horizontal sedimentary layers forming a backdrop against which the fossils are mounted. Individual fossils in each vertical column are identified by numbers keyed to a wall chart at left, giving the species name, the general location where the specimen was found, and its geological age. In some other displays in the Life Through Time exhibit, magnifying glasses are mounted over tiny fossils; on The Hard Facts Wall, the magnifying glasses have no fossils beneath them. (The bent shape of the backdrop, neutral tones of the fossils and background, and glass pane in front of the display make it difficult to get a good photograph. This attempt was made in 1991.)



its fossil dates on a key chart to the left of the fossil display case. The oldest date for each category is shown in the diagrams below so that the reader can follow the errors made in the museum display.

At least two errors appear in the museum presentation. First, younger fossils have been placed below older fossils in the geologic strata, violating the law of superposition. The second error is the connecting of the lines between the categories — where there are *no common ancestors under the magnifying glasses*. Connecting the lines without fossil ancestors shown is not evidence. *It is an inference, with no evidence in the display justifying that inference.* (It should be noted that magnifying glasses are used in other displays throughout the exhibit to magnify small fossils, rather than magnifying empty space, as in this display.)

The empirical presentation (on the left, below) of the "Hard Facts" tells us some useful things about evolution. It tells us there has been "Life Through

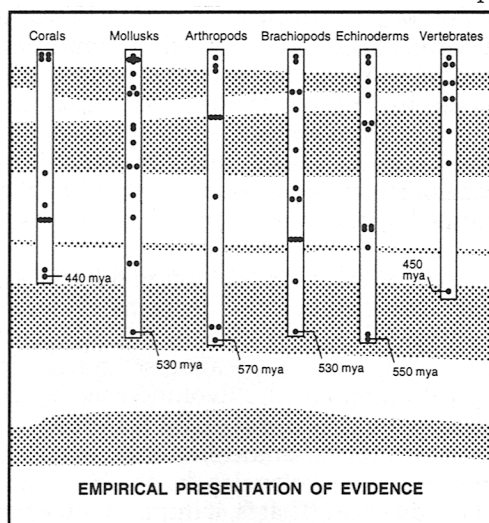


Figure 1

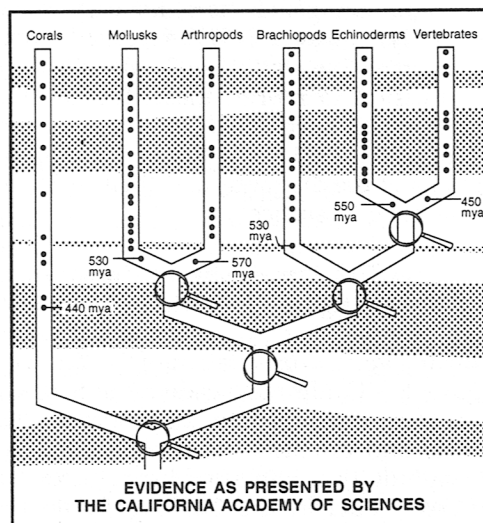


Figure 2

Time," and, if evolution is defined as "change through time," it provides strong evidence that change has taken place. It also presents a pattern of initial appearance of major taxa at variance with the Darwinian picture presented by the museum. *Teaching Science* suggests that new mechanisms of evolution need to be explored to explain the actual pattern, as opposed to the museum's hypothetical pattern. Our next generation of scientists should be challenged by such unanswered questions and unsolved problems.

An effective use of the critical-thinking skills exercise in *Teaching Science* is for the teacher to give the students the museum diagram to "correct their work." While some students begin to change the relative position of their fossil cards (by moving the corals below the mollusks, for example), most students immediately see that it is the museum diagram, not their empirical plot, that is in error. Thus, in addition to learning the crucial distinction between evidence and inference, the students discover for themselves that in science, it is evidence, not authority, that counts. In subsequent discussion, the students may also learn that pre-existing belief or ideology can override scientific objectivity, resulting in distortion of evidence and a faulty description of nature.

It is therefore ironic, as well as disturbing, that Aiuto insists on turning a scientific exercise into ideology by producing diagrammatic figures (patterned loosely after the *Teaching Science* figures) labeled "creationists and neocreationists" and what "evolutionists believe." It is not surprising, however, that this ideological overlay results in further distortions of evidence and misrepresentations of the scientific method. We would have liked to present the two sets of diagrams together here, for easy reference. Unfortunately, however, *NSTA Reports!* Editor Ann Wild has denied *Perspectives on Science and Christian Faith* permission to reprint these figures. Accordingly, unless you have access to a copy of the October/November 1993 *NSTA Reports!*, the following descriptions of the diagrams and their major differences will have to suffice.

The first *NSTA Reports!* figure differs from the *Teaching Science* figure "Empirical Presentation of Evidence" (Figure 1, p. 129) dramatically. Instead of having the vertical orientation of the *Teaching Science* figure, the California Academy of Sciences exhibit, and the geologic record, the diagram is turned on its side and oriented horizontally, and is presented without a scale of any kind. The six bars of plotted fossil data in the *Teaching Science* figure,

which graph the lifespan of the taxa in the fossil record, are "represented" in the *NSTA Reports!* diagram by lines of widely varying length, each of which begin at different points on the left with a single "separate point" of origin. (The taxon name is also listed to the left of the "point" of origin.)

Using measurement, the only scale available, to evaluate the first *NSTA Reports!* diagram, it quickly becomes clear that the diagram's proportions are not consistent with the museum's index of fossil record data. Approximate measurements of the lines in this diagram are: corals, $\frac{1}{2}$ "; mollusks, $\frac{3}{4}$ "; arthropods, $1\frac{1}{2}$ "; brachiopods, $\frac{3}{4}$ "; echinoderms, $1\frac{1}{8}$ "; and vertebrates, $\frac{5}{8}$ ". Note that the arthropods' (570 mya) line is $\frac{3}{4}$ of an inch longer than the mollusks' (530 mya) line, but the mollusks' line is only $\frac{1}{4}$ of an inch longer than the corals' (440 mya) line. A inaccurate picture of the relative length of the life history and relative appearance dates of the taxa is thus perpetuated.

Perhaps even more serious is the inaccurate picture presented by the widely varying positions of the "separate points" of origin of the invertebrate animal phyla. It is a fact of paleontology that the mollusks, arthropods, brachiopods, and echinoderms (as well as virtually all of the other invertebrate animal phyla) appear during the five-to-ten million year Cambrian explosion, now termed "The Big Bang of Animal Evolution" (*Science*, September 3, 1993). Thus, not only was *Teaching Science's* factual plot of the museum's data misrepresented, but *NSTA Reports!* readers were left with a false impression of the actual status of the fossil record, where these phyla appear simultaneously (geologically speaking).

In addition, the ideological label of "creationists and neocreationists" is applied to this diagram, which claims to be a representation of what in *Teaching Science* had been a factual and empirical presentation — a simple plot — of the museum's data. The full caption states that, "Creationists and neocreationists would have students learn that life was formed at separate points."

The second *NSTA Reports!* figure differs from the *Teaching Science* figure "Evidence as Presented by the California Academy of Sciences," (Figure 2, p. 129) in that it, like its "creationist" companion, is ideologically captioned "Evolutionists believe...." Beginning with a single dot on the far left, it presents a series of unlabeled branching lines, which end in six lines with the taxon labels on the right-hand side of the diagram. That is, it duplicates the branch-

ing pattern in Figure 2, shown as simple lines and turned on its side. Like the first *NSTA Reports!* diagram, it too lacks any detail, evidence, scale, or further data. The second *NSTA Reports!* diagram also preserves all the errors of the museum model: placement of the corals before the other taxa, placement of the echinoderms after the invertebrates, et cetera.² Therefore, like their "creationist" model, *NSTA Reports!*'s model of what "evolutionists believe" presents readers with outdated ideological constructs from the nineteenth century, rather than accurate and current information on the actual pattern of animal evolution in the fossil record.

Furthermore, Aiuto's *NSTA Reports!* models may be what some "creationists" and "evolutionists believe," but beliefs are not what count in science. In science, it is evidence that counts. That evidence must be presented accurately, without manipulation by ideological inference. This communication, as well as my letter to *NSTA Reports!*, originally ended with the hope that NSTA would join ASA in our efforts to have evolution taught *as science*. That hope has been dimmed by subsequent actions on the part of *NSTA Reports!*.

Update

In the Letters column of the February/March 1994 *NSTA Reports!*, Editor Ann Wild excerpted letters from W.R. Hearn and from me, saying that she declined to publish a 5-page official response from the ASA Committee for Integrity in Science Education. The two letters protested major distortions of fact in Aiuto's review as well as his *ad hominem* remarks about the ASA authors' intentions. Quotations demonstrating *Teaching Science*'s negative assessment of creationism were deleted from Hearn's letter.³ In an accompanying response, Aiuto said he failed to find in the letters or the book "any evidence that the entire effort by the ASA is anything other than an attempt to introduce creationism into public schools."⁴ The following quotation shows Aiuto's tone and his confusion of a postulated relationship with empirical evidence for such a relationship:

I was wrong, I will admit, to call these gentlemen "neocreationists." They are simply creationists, good and proper. The argument that the diagrams of postulated phyletic relationships are "inference" and not "evidence" is a patent attempt to introduce doubt about the empirical evidence for evolution. It is not meant to promote discussion about evolutionary mechanisms; it is an attempt to discredit the very idea of evolution....Sorry, gentlemen. I cannot retract my opinion that you guys are up to no good.

No evidence is offered in either Aiuto's original review or in his subsequent response for his allegations. He seems blind to the errors of fact we have substantiated. While this is disturbing in itself, there appears to be an even more serious problem involved than his distortions of our facts and motives. I refer to the problem of blocking access to information that would not only refute Aiuto's allegations, but allow biology teachers access to current scientific evidence in this forum. Consider the following:

1. The main (if not only) point of Aiuto's "review" and response was that the "insidious" ASA was attempting "to discredit evolution" and "to introduce creationism into the public schools." Direct quotations which would clearly refute this charge were deleted from Hearn's letter (see footnote 3).

2. *NSTA Reports!* has refused to print the portion of my letter which included both the figures from *Teaching Science* and from *NSTA Reports!* so that science teachers could compare the documents side by side. *NSTA Reports!* readers were consequently denied access to the actual evidence of the fossil record and were only allowed to see the ideological (and incorrect) distortion of it.

3. *NSTA Reports!* has denied *Perspectives on Science and Christian Faith* permission to reprint their figures on the grounds that the *NSTA Reports!* "figures simply reiterated the content of figures originally published in *Teaching Science*." After this refusal, *Perspectives* Managing Editor Patricia Ames faxed a March 25 letter to *NSTA Reports!* Editor Ann Wild asking her to reconsider her position. Key paragraphs of this letter stated:

I understand that you believe that the NSTA figures simply reiterate the *Teaching Science* ones, but there are others who strongly disagree....Your refusal to allow us to publish the figures alongside one another deprives science teachers of the opportunity to judge for themselves whether the figures are the same or different. Please note that Aiuto "in the spirit of open-mindedness advocated by Hearn...encourages readers to examine the documents in question." How are they to do this if your publication, having refused to publish the comparison yourself, then prohibits us from reproducing the documents?

I therefore urge you to re-evaluate your position in the spirit of authentic scientific inquiry and openness which is so essential to the scientific (and publishing) professions and their ethics.

Due to publication deadlines, a reply to this letter was requested by March 30. As of final press time in mid-April, no reply of any sort had been received.

4. Aiuto's statement in his response "In the spirit of open-mindedness advocated by Hearn, I do indeed encourage *NSTA Reports!* readers to examine the documents in question," is questionable for another reason. In the published letters and response, *NSTA Reports!* failed to include information on how to order the *Teaching Science* book or even to list ASA's location in Ipswich, MA. Instead, prominently inserted within Aiuto's response was complete information on how to contact the National Center for Science Education (NCSE) for information on the creation/evolution controversy (800/290-6006). Eugenie Scott, Executive Director of NCSE, has opposed *Teaching Science* and efforts by ASA to have evolution taught *as science*.⁵

ASA's desire to have evolution taught *as science* rather than ideology is expressed in the resolution adopted by its Executive Council on December 7, 1991.⁶ In addition to calling for the "forceful presentation of well-established scientific data and conclusions," the resolution urges (1) careful definition and consistent use of the terms "evolution" and "theory of evolution;" (2) clear distinction between evidence and inference; and (3) candid discussion of unsolved problems and open questions.

Aiuto and *NSTA Reports!* apparently insist on teaching evolution as rigid ideology. Their refusal even to permit discussion of this issue does not bode well for the future of science education. ☹

Notes

¹The SS&C Project is NSTA's science education reform movement, patterned after the American Association Advancement of Science (AAAS) Project 2061. SS&C, funded by grants from the National Science Foundation and the U.S. Department of Education, is currently being pilot-tested in five states.

²There is no fossil evidence that corals arose before the other taxa in the figures. Impressions of jellyfish provide evidence that the phylum Cnidaria, to which the corals also belong, appeared before the other taxa.

³The following excerpt from Hearn's letter was deleted from publication in *NSTA Reports!* (February/March 1994).

Consider Aiuto's claim that quotes from scientists in *Teaching Science* are taken out of context, "twisted into statements that ostensibly support a creationist view." Here is what the ASA book actually says about creationist views:

Early in 1982 a federal court ruling struck down an Arkansas balanced treatment act. Litigation over a Louisiana law worked its way up to the U.S. Supreme Court, where in 1987 "scientific creationism" was declared to be a religious view that should not be taught as science (p. 12).

The Court ruled that "scientific creationism" is a religious view, not a legitimate part of science (photo caption, p. 13).

It has been well established (1) that the fossil record shows a succession of life forms, and (2) that mutation and natural selection provide a plausible mechanism for the formation of new species (sometimes called micro-evolution). Other lines of evi-

dence to be considered include the geographic distribution of plants and animals; similarities in embryonic development patterns; the genetic makeup of populations; and now structural similarities in the genetic material itself. From the cumulated evidence biologists have inferred a general macro-evolutionary principle: "the genetic relatedness of all living things."

Many aspects of evolution are currently being studied by scientists who hold varying degrees of belief or disbelief in God. No matter how those investigations turn out, most scientists agree that a "creation science" based on an earth only a few thousand years old provides no theoretical basis sound enough to serve as a reasonable alternative (p. 13).

⁴See note 3.

⁵Scott has praised California's 1990 Science Framework, which promotes teaching evolution as non-science. See J. Wiester, "Teaching Evolution As Non-Science: Examples From California's 1990 Science Framework" (*PSCF* Volume 43, Number 3, September 1991, p. 190). For example:

Nothing in science or in any other field of knowledge shall be taught dogmatically (p. xi). The character of science is shown to be open to inquiry and controversy and free of dogmatism... (p. 8). The evolutionary and fossil histories of a few representative groups should be presented in life science curricula in detail... (p. 135)

Contrast these statements with the following restriction placed on the presentation of evidence from the fossil record.

The evolution of life should be presented to students *not* as a disconnected series but as a pattern of changing diversity united by evolutionary relationships and distinguished by changes in the environment and adaptations to those changes (p. 132). [emphasis mine]

Scott has also stated that the *Teaching Science* book should not be used in classrooms, "because it teaches science from a sectarian religious perspective" (*Times Advocate/Escondido*, September 18, 1993, "Christian Biology Teachers Issue Evolution Booklet").

⁶The full background and text of "A Voice for Evolution As Science" is contained in the 1993 printing of *Teaching Science* (see also *PSCF*, December 1992, p. 252).

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