A CRITIQUE OF THE BSCS BIOLOGY BOOKS

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Introduction

In January 1959 The American Institute of Biological Sciences set up a committee called the Biological Sciences Curriculum Study. Supported by the National Science Foundation, the committee, commonly called the BSCS, undertook a study of biological teaching from kindergarten to college. It was decided to provide an entirely new type of curriculum starting with the key level, high school.

When study was started under the direction of a steering committee, it soon became evident that ideas of suitable approaches varied so widely it would be impossible to prepare a single text that would please all, Accordingly it was decided to prepare three texts with different methods of approach. To prevent ranking the texts it was decided to call the texts by colors, so they came to be called the Green Version, the Yellow Version, and the Blue Version. The Yellow Version, given the title Biological Science: An Inquiry Into Life, was published by Harcourt, Brace and World, Inc. Rand McNally and Company published the Green Version which was given the title, High School Biology. The Blue Version, Biological Science: Molecules to Man, was published by Houghton Mifflin and Company.

The Themes of the Books

All the texts and the accompanying laboratory work are built around nine themes which are proposed as unifying themes. They are as follows

- **"1.** Change of living things through time: evolution
- 2. Diversity of type and unity of pattern in living things
- 3. The genetic continuity of life
- 4. The complementarily of organism and environment
- 5. The biological roots of behavior
- **6.** The complementarily of structure and function
- **7.** Regulation and homeostasis: preservation of life in the face of change
- **8.** Science as an enquiry
- **9.** The history of biological conceptions"

According to Schwab the first five of these themes are concerned with content, the sixth and seventh are intermediate, and the last two are concerned with the structure of the BSCS materials. Let us note what this author has to say about evolution in the first five themes or the content of the courses:

Theme 1: "It is no longer possible to give a complete or even a coherent account of all living things without the story of evolution." ²

Theme 2: "As we have indicated before this theme is, in part, a special aspect of the theme of evolution." ³

Theme 3: "This theme, too, is part of the theme of evolution" 4

Theme 4: "This theme, too, is part of the theme of evolution especially where it concerns the environment of the whole organism." 5

Theme 5x "In brief, the BSCS texts emphasize behavior as arising not only from the experience of the individual but also from the 'experience' of its forebears, the stored experience arising from variation and selection in evolution." 6

The slant of the content of the texts is unmistakable. Theme 6 is equally evolutionary in its approach. Again we quote:

"Long before the mechanism of evolution was understood, the well-organized character of life units was recognized and the functions of their parts investigated. With the development of the theory of evolution, the conception of function underwent important changes. We no longer thought of the organism as a *perfect* organization but instead recognized the possibility of the vestigial, the novel, and the incompletely relevant part. This did not mean, however, that the conception of function became obsolete. On the contrary, within the limits required by our knowledge of evolutionary processes, we still sought evidence through which to understand each part in terms of its contribution to the whole."

The theory of evolution is not explicitly mentioned in the discussion of the seventh theme. The last two themes are concerned with the ways in which the content of the courses is presented to the student. Theme 8 suggests that science is an enquiry. The authors oppose the use of authoritative statements:

"We have remarked that teaching science merely as authoritative facts and dogma has had an extremely bad effect on American attitudes toward science and scientists." *

The authors state that authoritative science teaches the student to distrust science since he learns later that some of the "facts" he was taught in high school were errors. Accordingly BSCS proposes to teach the student that science is an enquiry that never is finished. To emphasize the uncertainties the texts freely use many such expressions as these: "we now believe" or "according to the best information now available." This is good as far as it goes, but note how the writers practice the authoritative slant which they condemn. Although the authors decry the use of authoritative statements, we find the texts have authoritative statements intermingled with clearly qualified statements. The following quotations from the Yellow Version, chosen at random illustrate this:

Properly qualified statement: "Certainly we have no direct or indirect fossil evidence that the earliest living things were associations of organic molecules living in a hot thin soup."

Qualified but suggestive statement: "Although the evidence is still inconclusive, it suggests that for more than a billion years, the dominant and perhaps only forms of life on earth were microscopic organisms such as algae, bacteria, and molds."

Authoritative statement: "Yet any certain knowledge of these ancient events is scanty. This is because fossils of early organisms are exceedingly rare. The cause of this is twofold. First, most of the early animals and plants were small and had soft bodies. They decayed and left no traces. Second, the sedimentary rocks that formed during these early times have generally been altered so much by heat and pressure that fossils in them would have been destroyed." (Italics added)

Authoritative: "These rocks contain the fossils that tell the story of evolution." (Italics added)

Authoritative: "Tremendous events had occurred before the Cambrian period, however. This we know because already in the Cambrian we find a rich variety of complex animals and plants." (Italics added)

Reading further we find this mixed quotation: "This apparent explosion of life at the beginning of the Cambrian is in a sense discouraging. It means we find it difficult to learn much about the evolution that took place before the beginning of the Cambrian." ¹⁰ (Italics added)

In reality the BSCS books contain many authoritative statements, but there are enough qualifying statements to give the impression of objective integrity. Thus the student may easily be taken in by the infusion of unfounded authoritative statements.

The Presentation of Evolution as a Theory to the Student

Concerning the importance of evolution as a theory Schwab has this to say:

"It is no longer possible to give a complete or even a coherent account of living things without the story of evolution."

Furthermore Schwab explains to the teachers how evolution is presented to the student:

"Because of its pervasive and comprehensive character, evolution is treated in three different ways in the BSCS materials. There are specific chapters on *evolution as the history of living things*. There are specific chapters on *evolution as a process*. And third, evolution *either* as a history *or* as a process is *interwoven* in all the other chapters where it has a place: in the treatment of cell chemistry, ecology, taxonomy, and so on." ¹² (Italics added)

Even though evolution permeates the entire course, the authors carefully refrain from explicitly labeling evolution as a "fact" in the texts but tell the students it is a "theory." Let us see how this is done.

Green Version: "Both the revolution in astronomical thinking and the revolution in biological thinking were difficult. But both were complete. No one who has read attentively thus far in this book can fail to gain the idea that living things-individuals, populations, species, communities—are constantly changing. From the first chapters the idea of biological change through time has been constantly before us-where not directly mentioned it has been implied." ¹³

"Overnight nearly all (but not quite all) the biologists of the world were convinced that this theory—the *theory of organic evolution—is* true." ¹⁴

Yellow Version: "Of all the theories you may study in biology, evolution occupies a unique place. It is the most inclusive of the great unifying principles of biology. It is so much a part of the foundation of biology that the science can hardly be understood without it.............

"Evolution is a scientific theory. It [the theory] has been developed to account for an existing body of data." 15

In the *Biology Teachers' Handbook* is found a very interesting comment regarding application of the term *theory* to evolution. I quote:

"A special word is necessary concerning our habit of referring to 'the *theory* of evolution.' This usage is often taken to mean that evolution is but an envisaged possibility, something uncertain and unproved. This interpretation, in turn, is due to a mistaken idea about the meaning of 'theory' and its place in science. This mistaken idea treats science as a process of verification.

In that process of verification, it is mistakenly supposed that materials go through three stages or degrees of certainty: a first stage, of complete doubt, called hypothesis; a second stage, of uncertainty, called a theory; a third stage, or certainty, called a fact or principle. This sense of 'theory' no longer holds in science, if it ever did. Modern science is not merely a process of verification of isolated items but a process of organization as well. In this twofold process, 'theory' refers, not to the uncertain, the unverified, but rather to the coherent and organized . . . Evolution is a theory in this sense, yes-a body of interrelated facts. As new facts about evolution are discovered, the organization may be changed in order to include them, but this would not mean that the present organization of facts now known is unsound." 1

It would seem that the laws of some states prohibiting the teaching of evolution as a fact but permitting its being presented as a theory are rather pointless when that interpretation of "theory" is used.

Confusion of Terms

Not only is the use of the term "theory" confused in general, but there is failure to delineate between *limited change*, which is easily observed or demonstrated in the laboratory, and *total evolution* which is nothing but hypothesis. Schwab states the two phases this way:

"Evolution, then, forms the warp and woof of modern biology in two different ways. First, evolution appears as the *history* of organisms, the sequence of unique events in past time from which the biological present has had its origin. . . . This history may well be the key to understanding the biological future . . . Second, evolution appears in organisms as a *present* phenomenon. We have not only inferred the course of evolution in the past from such evidences as *all* historians use, but we have also seen it occur in the living present." ¹⁷ (Italics added)

On examining the texts it can be seen that the writers use "present evolution" (limited change) as evidence to support "historical evolution" (molecules to man). The Green Version, for example uses Darwin's finches, various breeds of chickens, the peppered moth, the two color phases of screech owls and of foxes, various kinds of Cucurbita, and the colors of hares and rabbits as examples of limited change or "present evolution" to illustrate the presumed basis of "historical evolution" (molecules to man). There is no suggestion that the gaps between orders, classes, and phyla are not crossed either in the fossil record or in nature today.^{18, 19, 20, 21}

But that is the very place an objective text should point out those qualifying limitations.

Although some weaknesses in the theory are mentioned, many other weaknesses are not pointed out. Perhaps the following quotation gives the reason:

"Every law has its exceptions or its uncertainties, and every theory is subject to question. Sometimes these exceptions and uncertainties must be *minimized*, else the student might become *disconcerted*, *confused* and *hindered* in achieving an understanding of what we know as science. Later these limitations should be examined as the student's understanding progresses," (Italics added)

The Use of Genetics to Support Evolution

The BSCS texts place great emphasis on genetics as providing the explanation of how evolution supposedly takes place. Mutation is considered the source of change with selection providing direction, Again the authors fail to point out some pertinent facts. Note what Dr. Walter E. Lammerts (professional geneticist) has to say about these omissions in the Yellow Version:

"I am amazed that they use the Hardy-Weinberg principle as part of their proof of evolution. This expression of stability of a breeding population is used very cleverly to prepare the student for the idea of change. Then change is equated with evolution and the mind is all prepared to accept almost any proposition no matter how impossible such as the conversion of fins into legs. What amazes me is that they fail to say that since most mutations are harmful under natural conditions, the Hardy-Weinberg stability principle is accentuated by selection against the accumulation of mutations! But since this selection can only operate against the homozygous mutant, the feed back into the next generation by the heterozygote continues. Since obviously mutations are in the great minority to start with they are soon eliminated! They fail to state that no population studies have yet demonstrated a take over by the mutant gene." (Personal communication)

Materialistic Philosophy

One does not find any statement that there is no God in the BSCS books, but the material is so handled that the student easily concludes that God is not necessary. At that point atheism is the next step.

In the Yellow Version, chapter 4 (29 pp.) is devoted to a study of vitalism versus mechanism as a means of explaining life phenomena. The two terms are defined as follows:

"There have been two main philosophies to account for the relation of life and matter. One is *vitalism*, a philosophy that assumes that life is made possible by some force that is neither

chemical nor physical. The other is mechanism, a philosophy that assumes that life can be explained entirely in chemical and physical terms."

Following discussion of Aristotle and Descartes, and the work of Priestley and Wohler, the student is lead to this conclusion:

"This is not to say that scientists proved there is no vital force, They showed that it was un-necessary to invoke a vital force to explain the data of the physiology of cells and organisms. Vitalism was not discarded: it became unnecessary in explaining biological activities." ²⁴ (Italics added)

The purely mechanistic philosophy is very ingenuously taught without saying so in definite terms. In the teachers' manual we find these statements regarding this material:

"The basic idea of this chapter is the firm establishment of the fact that biological function is explicable in terms of the laws of chemistry and physics—the same laws, essentially, that apply to nonliving materials of the earth. , . . While not disproving the theory of vitalism, the conclusion is inescapable that physiological problems are approachable by the methods of chemistry and physics—that, in fact, they cannot be understood without resort to chemistry and physics," ²⁵

By means of suggestive questions the student is lead to believe that the mechanistic philosophy is *the* logical one and leaves the false impression that the mechanistic approach can be verified by experimental means. According to the BSCS writers the mechanistic method is all-sufficient. There is no compromise–no recognition that both factors can be involved in explaining vital functions.

Again, as in so many situations, the discussion is not complete. Much is made of the discovery that enzymes could digest foods in a test tube. No vital force was present, they say, but they

fail to mention that in the living organism living cells produce the enzyme, the enzymes do not digest the protein of the stomach or intestinal wall until death takes place, and also parasites found in the digestive tract are not digested though they are protein. They do not suggest that both chemical and vital factors can be involved.

The theme of mechanism is taken up again in chapter thirty-six dealing with the origin of life. Note what is said about this in the teachers' manual:

"The basic issue is how science can account mechanistically for the origin of life." 26

Similarity of the Texts

According to BSCS officials about seventy per cent of the material in the three books is the same. That becomes evident on studying the books. The approaches are different. The Green Version stresses ecology, the Blue Version gives more emphasis to molecular biology, while the Yellow Version gives more attention to the cellular level. In the main the same subjects are discussed but where one text devotes an entire chapter or section to one subject another may reduce the quantity to a few pages. For example the Blue Version devotes five chapters to theories of the origin of life and Oparin's Hypothesis of the origin of life and the evolution of the cell. The Green Version devotes only about two pages to Oparin's Hypothesis. The Yellow Version emphasizes the historical phase of evolutionary philosophy giving more attention to fossil evidence.

Conclusion

It seems clear that all three of these books are dedicated to the promulgation of total organic evolution to the exclusion of objectivity in biology, if need be, in order to eliminate any belief in fiat creation.

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