But the world is not at peace. Unhappily for science and for free thought generally, events have forced us to observe that, in today's world, the person whose political views are derived from Karl Marx is in practice indistinguishable from one who believes in advancing the military aims of imperialist Russia. If the Marxists were simply another political party, willing to abide by the election returns, like the Republicans or the Prohibitionists, it would be different. The whole country, scientific or not, ought to protest the denial of privileges to anyone because he happened to be, say, a Dixiecrat or a Socialist. But adherence to a party that takes orders from an admittedly belligerent foreign power is not just a "particular political view;" it may be, and sometimes is, membership in the army of a self-confessed enemy of scientific and civil freedom. The Russian Empire is at present fighting a bitter, though as yet undeclared and limited, war against the non-Russian world. This war has already included siege operations in Germany, combat in Korea, and conquest and looting in Hungary. Hardly anyone doubts that it would become a declared and unlimited war the day Russia's rulers decided that the odds for a quick victory had risen high enough. It is a lamentable fact that good scientists have secretly given aid to Russia in this war. I believe most of them did it because of a sincere conviction that Marx was right and that victory for those who fight in his name would be a good thing; I cannot believe that they uphold the military ambitions of the Politburo or that they favor its methods of slavery and terrorism. But by their actions they have approved these methods and furthered these ambitions. It would be foolish for the citizens of a nation under attack by the Politburo to subsidize individuals sympathetic with such attacks, and who, as some have done, may even help Russia overtly against their own country.

Suppose, as an analogy, that in 1941 Fritz Kuhn, former Nazi leader in America, had applied for a grant of money from the government for scientific training. Does anyone contend that Kuhn's political views—he was a member of the National Socialist German Worker's Party—would be irrelevant in the matter, and not a just cause for denying him the funds?

From a broader point of view, it is obvious that war brings more serious dangers to science and to civil liberty than those resulting from political discrimination in passing out government money. Drafting a civilian to be shot at, or even telling him how he may or may not earn his living, is a far worse threat to freedom than withholding aid out of public funds from people sympathetic with the enemy. There is a difference in kind here, as well as in degree; whereas the one is only failing to confer a special privilege—which is necessarily quite limited anyway—the other is universal use of coercion. History is full of examples of arbitrary powers assumed by governments in wartime and never given up afterwards. Let those who love freedom, in science as well as in ordinary life, resist wartime attacks on liberty whose purpose is not to damage the enemy but to strengthen the government. They will have plenty to do, and they will be striking far more telling blows for the freedom of science than when they advocate public support of pro-Russian scientists.

When a workable peace is established, and men may earn their livings and criticize authority as they please, and episodes like the Lysenko-Michurin persecution are impossible, it will be of no consequence whether a scientist believes in Karl Marx, Adolf Hitler, or Calvin Coolidge. In the meantime, unhappily, we fight a defensive war for scientific and other freedoms. The most tragic phase of this war is that we must distrust, defy, and murder the human beings who fight under the other flag, for no other purpose than to keep them from murdering those who fight under our own. While this dark savagery continues, science will suffer. I do not believe it will suffer any worse because we citizens do not tax ourselves to keep and train the enemy's soldiers.

FREDERICK ROMBERG

La Coste and Romberg
3810 Speedway
Austin, Texas

Perfection None Must Hope to Find

I HAVE read with great interest the two recent communications to SCIENCE regarding my review of Dr. Pauli's new textbook, *The World of Life.* The letters of Drs. Breland and Laubenfels have confirmed my fear that I have been unfair in reviewing Dr. Pauli's book. It was my responsibility, I believe, to judge the book at least partly in terms of its ability to meet the needs of the average or typical college course currently being offered. Instead I evaluated it in terms of an ideal college biology course, which exists nowhere, to my knowledge, but in my mind. Nevertheless, I am glad that my review has raised, to use Dr. Breland's words, "several fundamental issues relative to the teaching of general biology and the subject matter that should be included in a textbook for such a course." With the permission of the editors of SCIENCE, I should like to say a few words on these issues.

When I think of a general biology course at the college level, I think of a one-year course given to all liberal arts and sciences students regardless of their choice of career. Its goal would be to help raise the college student to such a level that he may clearly see our present general position in biology, as well as the horizons where the answers are not readily forthcoming and where, indeed, the questions are not simple or very easy to formulate.

In a general course I do not think we need to cover all the roads that have been traveled in the biological sciences and examine all the theories, all the observations, all the catalogues of data and systems of fact, all the experiments and their results. The college student, who may have no further direct contact with the study of life than the course I am

describing, deserves at least to know what the outstanding problems are in biology. He ought to be able to answer the question: What are the aims of biology today? Are they the same as they were in the days of Vesalius and Harvey, when to complete the description of the parts of an organism must have been very exciting indeed? Are they the same today as in the days of Linnaeus, when to develop some sound system of cataloguing the variety of living things was a necessary project for the further development of the science?

I surmise that, wherever description and cataloguing have become part and parcel of the college biology course, biology has come to be known as a dull subject for young minds. It is worth speculating whether this very lack of interest has led teachers into the current trend of trying to make biology more appealing, more palatable, more enjoyable to a student body that has become increasingly insistent upon "entertainment," when its interest cannot be aroused any other way. The teacher who is concerned with "selling" biology has probably lost sight of the fact that what stimulates and excites the mind is not a description of the vast body of knowledge we have managed to accumulate (no matter how well organized nor how entertainingly presented), but rather an exposition of what we are trying to understand and how we are trying to do it. The most exciting part of any science is that of its frontiers; it would be a shame to leave the student unaware that such frontiers exist.

When we consider the problems that exist at the frontiers of biology, we find that they are being formulated in terms of autocatalysis, growth and morphogenesis as expressions of chemical and physical events, and the physicochemical nature of mutations. Let us grant at the outset that we know little about these "frontier" subjects. We may even agree that a detailed study of current findings belongs in advanced courses. Nevertheless, *the primary task is still the understanding of why the problems of biologists are being formulated in such terms.* The development of such an understanding is the proper object of a general biology course. It may be asked at this point: Can the college student be made aware of the significance of modern biological theories and concepts? I, for one, would say "Yes," and many of my colleagues with whom I have discussed the matter have also answered affirmatively.

We feel that a discussion of why such a question as the relation of genes to metabolic processes is of paramount importance in modern biology can be accomplished without becoming obscured by a welter of technical detail. But to proceed from a *feeling* about the matter to an actual development of a course that would fulfill the aims I have been describing is a difficult business. It would first require a long, serious, and thorough study of the content of biology, of its few fundamental theories and principles, and of the phenomena that biologists want to be able to explain and how they are being investigated. Then an equally long study of the possible techniques of exposition would be necessary. It may turn out that at the end of such a study it would be recommended that a course in general biology should not be taken until courses in general physics and chemistry are completed. If that should be the case, so be it. We would be wise, then, to alter the curriculum in line with these recommendations, rather than to adopt the alternative of avoiding so-called advanced and controversial and erudite subjects, even if they happen to be at the heart of modern biological thinking.

By the criteria for a general college biology course that I have attempted to outline, all college biology texts I have seen are very disappointing. These texts differ very little from one another basically, and one book can be said, as in the case of *The World of Life,* only to possess the virtues of a finer style of writing or a more attractive format or a better organization of material than another.

What we need in biology today are books like those of Alfred North Whitehead's *An Introduction to Mathematics* and Einstein and Infeld's *The Evolution of Physics.* Admittedly such books represent a tremendous effort of synthesis, condensation, and lucid presentation by outstanding scientists who always kept the general aims of their sciences in mind. But should we not expect an equally tremendous effort on behalf of biology?

ARNOLD W. RAVIN

Department of Zoology
Columbia University

A Return to Medievalism in Science Teaching

> Subject to rules and regulations of the Board of Regents, a pupil may be excused from such study of health and hygiene as conflicts with the religion of his parents or guardian. Such conflict must be certified by a proper representative of their religions as defined by section two of the religious corporations law.

BELIEVE it or not, this is now the law of New York State (Section 324, Chapter 135, subdivision 5, passed 1950). What are the implications of this law for science teaching? One religious group has lost no time. Representatives of this sect, in accordance with the law, have petitioned for the exemption of children from instruction in the units on disease prevention and control, and in three other areas having to do with allied subjects in the curriculum. The Commissioner of Education has granted this petition. A directive has been issued to all superintendents and principals to the effect that

> These children will then be excused from this instruction wherever in the secondary school curriculum those units of study are offered to partially fulfill the health requirement [quoted from letter of Commissioner of Education to superintendents and principals, Aug. 11, 1950].

Thus, children of this particular faith must be ex-