Letters

Plants and Animals: Vive la Différence

At last someone has said it out loud! ". . . I have come increasingly to wonder if the unity that undoubtedly exists on the biochemical and cellular levels actually exists to anything like the same extent when the higher plants and animals are reached" (Gairdner B. Moment, in a book review, 10 Sept., p. 1225). May this modest seed of doubt burgeon into a long overdue general recognition that a plant is something other than a rudimentary version of an animal.

After years of dissatisfaction with the way general biology textbooks deal with plants, I have come to the conclusion that a basic and profound distortion arises from the fact that these books are organized largely around the problems that animals must meet in their lives as organisms. Having marshalled their thoughts on this basis, the authors then achieve "integration" by considering how plants meet each of the same problems. But the question is never raised of how important these particular problems are to the plants, or whether plants may have other and different necessities of their own. The fact is that in their lives *as whole organisms* plants face major problems that are of no great consequence for animals, just as animals have large problems that do not amount to much in the lives of plants. Obvious examples of these are the maintenance of water balance in plants (important enough for animals but of an entirely different significance and order of magnitude) and digestion and excretion in animals (although people are still looking for complex waste products in plants, apparently on the assumption that since animals have them, plants must have them, too).

I have no quarrel with the current textbook treatment of molecular and cellular aspects of biology, and most authors properly make much of photosynthesis and the difference between "food-making" and "food-getting." But they fail to show how this difference is reflected in the entire structure, organization, and physiology of the two kinds of organisms and their ways of getting along in the world. This is a great oversight, because the long course of evolutionary history shows in the most fascinating way an increasingly clear and multifaceted divergence as the inhabitants of the animal kingdom have become progressively more deeply committed to going out and getting their food and those of the plant kingdom more committed to sitting tight and synthesizing, although some of the Protista inconveniently confuse things by still failing to take a stand on the matter.

By all means let us recognize the amazing unity of life where it exists, as well as the different levels of organization within the world of life. But let us not raise up a generation of biologists who know all about molecules and cells and perhaps even communities, but who know so little about the lives of whole individual organisms that they do not comprehend the ways in which plants are fundamentally different from animals.

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Public Understanding

. . . It is regrettable that the contributions of outstanding members of such groups as the St. Louis Committee for Nuclear Information, the Scientists' Committee for Public Information, the Scientists' Institute for Public Information (Edward L. Tatum, René Dubos, Barry Commoner, and others who have repeatedly offered the "holistic point of view that the citizen needs") were not recognized in Sherburne's plea (editorial, 23 July, p. 381) for an information movement involving direct communication between scientists and public—a new social phenomenon, according to Margaret Mead. The experience of these groups could serve well as pilot projects of the type Sherburne advocates for the National Science Foundation.

While concurring with Sherburne's plea for expansion of the present NSF programs, I would urge that these be directed at the crucial issues: where science leaves off and social judgments take over in the establishment of "permissible" levels of chemical or radioisotopic contamination of the environment; where the responsibility lies in these science-society interactions; the role of the scientist-adviser in governmental agencies; and other such questions. This orientation would be in contrast to the bland isn't-science-wonderful and look-what-it-can-do presentations that typify some of these programs. . . .

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U.S. Research Abroad

The report by John Walsh (10 Sept., p. 1211) on the current status of government support of behavioral science research, and particularly on the Camelot incident, neglects to mention one of the principal shortcomings of Camelot and of much other research on foreign economic development and related problems—the tendency for the United States (either the sponsoring agency or the research agency or both) to act alone in defining the purposes of the research, designing the techniques, carrying out the research, and interpreting the results. Appropriate as this may be in other scientific studies it does not seem likely to produce the best research on problems outside our own country; and certainly it makes for ruffling of political sensitivities, as Camelot so well demonstrates. Other nations and their governments have as much inherent interest in research into their own societies as we have. They are likely to be better acquainted with their own cultures; and more and more they have scientists who can participate in empirical research on their own problems. Moreover, if research indicates a need for change within the foreign country, whether a change of values, of legislation, of procedures, of investment priorities, or of some other kind, it is the government and the nationals of that country who must be persuaded of the desirability of the change before it will take place.

It would seem to me that better research designs would be formulated, better information collected, and more use made of that information if all field research abroad, and probably much of the secondary research as well, were conducted in full partnership with the governments, institutions, or nationals of the countries that are the subject of the research. This should extend to defining the purposes, designing the methodology, collecting and analyzing the data, and interpreting the results. The further we move in this direction, the fewer fiascos like Camelot we will have, and the more valid and productive our research will be. Finally, the more partnership efforts of this sort we undertake, the more widely will other nations come to adopt scientific and engineering approaches to economic and social problems.

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Photocopying and the Journals

Parker's interesting observation (17 Sept., p. 1325) on the high percentage of foreign, compared with domestic, subscriptions to his journal does not entirely support the inference that "Americans do not, by and large, read publications," or sustain the suggestion that American scientists should "spend more time reading and less writing." In many, if not most, scientific disciplines, there are far more scientists outside the United States than there are inside the United States. Even so, it is possible that uninhibited and widespread photocopying by a significant minority of American scientists is already showing its effect on domestic subscriptions to scientific journals and on reprint sales. It is also just possible that our overseas colleagues recognize more clearly that the tempting rationale "Why buy it when we can photocopy it and nobody will know?" could wipe out many scientific journals and could make the publication of many books impossible. Is the time ripe for organized American science to formulate a code of ethics for all scientists to live by with respect to photocopying of scholarly publications?

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Indian Ocean Expedition

McElheny's article "Effects of the Indian Ocean expedition" (27 Aug., p. 957) omitted two matters of interest concerning this impressive exercise in international collaboration.

First, with respect to the scientific justifications for the expedition, some mention should be made of the Indian Ocean as a model of the world ocean. It is generally accepted that the major circulation of the surface layers of the ocean is essentially wind-driven. Thus, a picture of systems of currents related to the prevailing winds, the location of boundaries, and the rotation of the earth has arisen—western boundary currents such as the Kuroshio and Gulf Stream, eastern boundary currents such as the California, Peru, and Benguela Currents, and the zonal currents of the West Wind drift and the equatorial current system (including the recently discovered equatorial undercurrents of the Atlantic and Pacific). The Indian Ocean is like the other oceans in having meridional boundaries and in being located on a rotating planet. It differs, however, in the seasonal reversal of the surface winds, the so-called monsoon system, and physical oceanographers recognized the importance of examining a system where their wind-driven models could be tested by observing conditions under opposite regimes of surface wind stress. This feature of the Indian Ocean was a powerful attraction to physical oceanographers, and several important results of their work can already be identified. They have found, for example, that an equatorial undercurrent is present despite the absence of a westward wind stress along the equator, but the current differs in several ways from those of other oceans; that a major but temporary western boundary current, the Somali Current, is developed along the Somali Coast during the southwest monsoon, with surface speeds in excess of 6 knots; that at the same season intense upwelling develops off northern Somalia, with the lowest surface temperatures occurring anywhere in the world in such proximity to the equator.

Second, with respect to the origin and operation of the expedition, mention should be made of the Scientific Committee on Oceanic Research (SCOR), and greater recognition given to the roles of UNESCO and of the Intergovernmental Oceanographic