

The Program Director for Environmental Biology, NSF, attended the December 8 meeting. At the suggestion of the chairman, he has prepared this synopsis of a longer document for the information of the NSF staff and others who have reason or wish to discuss the Ecological Society's concept. Word of the developing plan has reached the press (e.g. *Science*, January 19, 1968, page 287), and has been brought (without written documentation) before the Executive Committee, NAS/NRC Division of Biology and Agriculture, and before Committee I (Research) of the National Science Board. It must be emphasized that in no sense is this interim report a proposal before the National Science Foundation.

OUTLINE OF THE PLAN

1. *Need.*—A national institute of ecology is needed, (1) to conduct those kinds of ecological research that cannot be conducted by independent investigators working in single universities and laboratories, but require substantial field facilities and concerted multidisciplinary team effort; (2) to help coordinate the nation's ecological research by providing centralized information-storage-and-retrieval facilities on which ecologists and public agencies can draw; (3) to coordinate and strengthen those activities of ecologists that (in Rep. Daddario's words) "involve ecology in relation to public affairs as well as the education of ecologists and the infusion of ecology into general education at all levels"; (4) to perform advisory services for agencies of government and industry that express in some meaningful and constructive way "an ecological view" of action programs affecting environment. Of these needs, (1) and (2) are immediate and obvious, and can be fulfilled *only* by a national institute and a professional staff; (3) and (4) are thought of as no less urgent, and *may* be fulfilled by a national institute, if only because of its strong research programs and high visibility; but a single national *research* institute is not the only mechanism, or necessarily the best mechanism for fulfilling them. These matters need continued discussion, in which the Society's Public Affairs Committee will undoubtedly take a leading role.

2. *Need for research on ecosystems.*—Ecosystems, being partly conceptual, are elastic units; for some purposes, mainly literary, "spaceship Earth" or all of North America are ecosystems. Working ecologists rarely concern themselves with such large units. Very small ecosystems, such as old fields, small lakes, or those that can be synthesized in the laboratory, need much more research, but most of it can continue to be independent and the facilities required are conventional. However informative, the results of such studies cannot be extrapolated to larger patches of nature, containing more biological and environmental diversity, without loss of rigor or predictability. Ecosystems that require substantial field facilities and new modes of concerted team research are those of intermediate scale, of the order of drainage basins, "airsheds", and biomes such as grassland and tundra. Such systems are geographically dispersed, and their geographical variability is intrinsic to their scientific interest. As they cannot be brought into any laboratory, laboratories must be brought to them.

New technologies, mainly geophysical, geochemical, and statistical, have only recently enabled ecologists to study terrestrial systems of such magnitude. (In aquatic ecology, especially oceanography, the ecosystem concepts and the technologies have been available for a longer time.) The necessary intellectual resources obtained by interdisciplinary collaboration, are rapidly being developed. Any kind of team research needs careful attention to its organization if high quality and scientific initiative are to be preserved. It is this kind of organization, as much as the day-to-day conduct of the research, that a national institute of ecology is intended to provide.

In all systems defined and studied on this comparatively large scale, man's activities are environmental parameters that range from important to dominant. Man-dominated systems, like other systems, do not produce energy, but only transform it. If attention is concentrated on the output of ecosystems, the ecological term is "productivity." When the focus is on internal transformations and frictions, one appropriate word is "pollution." "A pollutant is a resource out of place." It follows that understanding of the metabolism of ecosystems—both positive and negative aspects—is the chief practical benefit, as well as the chief intellectual satisfaction, of ecology.

Examples of projects on large-scale ecosystems, all genuinely multidisciplinary, are the Yale-Dartmouth-U.S. Forest Service project at Hubbard Brook, New Hampshire, the OTS tropical-forest project in Costa Rica, and the IBP-sponsored program on Analysis of Ecosystems, which plans intensive and comprehensive study of six major biomes.