

A copy of the questionnaire and its covering letter are attached, with a preliminary tabulation of the first 123 responses (out of the total of 168 inquiries). Though it is preliminary and though it is only an opinion survey, the results give a very different impression of the state of ecology as a subject in our universities. They indicate that the production rate is nearer to 3,000 than to 100 PhD. ecologists (and perhaps as many as 10,000 undergraduates) if one counts ecologists in the ways they themselves do. They also indicate that the numbers could be at least doubled, perhaps tripled, with no major reorganizations on campuses, if facilities, stipends, and administrative support were available.

Here I want to stress that these 168 campuses are *all in the United States*. Canadian universities were deliberately omitted, but I can assure you that ecology as a profession does not forget them. In any list of, say, 50 really distinguished ecologists in North America, about half will turn out to be Canadians, most of whom had their training in Canada. Several extremely strong Canadian universities draw not only many students but many faculty members from the U.S.

To summarize what I have said so far, ecology is represented by many more professional people than is sometimes thought, a relatively large body of recruits is being trained right now, and the teachers of ecology on our campuses believe that the number of recruits could be expanded by an average of $2\frac{1}{2}$ times with no substantial organization changes. In addition, there is now clear evidence that intellectual talent can rather readily be recruited when ecological projects of scope and imagination require mobilization of such talent. In other words, ecology seems to us to be in a reasonably healthy state, and ready to respond to society's needs for understanding environments in depth and detail.

To say this, however, is not to say that nothing more needs to be done. A number of new organizations and institutional relations must be developed, and a great deal of hard ecological research must be done, before we can say, as Mr. Daddario would like us to say, that ecology has an adequately strong voice in public affairs or that ecological ideas are sufficiently diffused to decision makers at all levels. In speaking briefly to some of these new plans and institutional relations, I should make it clear that I am speaking mainly as an academic ecologist, not primarily as a representative of the National Science Foundation.

I should say first that ecological research, though very good, will not be truly excellent or adequately supported until substantially increased support is available for graduate students. "My field needs more money", as I am sure I am the first to say before Congressmen, but as the "project grant system" continues and expands support to match the increasing quality of projects in science, it is on graduate research training that I place my top priorities. Present ways of providing this training through the universities are not completely satisfactory, and ecological students are tending to get the short end of such support as is available.

The time has long since passed when the "ecologically oriented" graduate student was the cheapest kind to have, because all you had to do was give him a bicycle and bench in the museum, and great results would flow from his intensive study of the "biology" of two closely related sets of museum specimens. Three kinds of new technologies have been developed in the last few years, in geophysics (such as multispectral remote sensing), geochemistry (such as isotopic tracing), and computer science, that have transformed field ecology just as biochemistry has transformed laboratory biology. One result is that ecological graduate students are the most expensive rather than the least expensive kind. Not only does their training demand very expensive instruments, but the geographic dispersedness of the subject makes it in many cases essential to send them repeatedly and for long periods to the tropics, the arctic, and many other places beyond the reach of a bicycle. Hence, for adequate research training at the graduate level sharply increased support, much of it in the form of research traineeships, is essential. There is little reason to believe that NIH will consider this kind of biology sufficiently health-related to extend its magnificent training programs to include the whole of ecology.

As to the need for ecological research, I should make it clear that no thoughtful ecologist takes the position that society can do nothing about using its environment until 25 years' more research results have accumulated and "we really know what it is we are doing." Society can not wait that long, and will not. Ecology knows a great deal right now that is not being applied intelligently, and many of the answers decision makers seek are already available if mechanisms can be found for communicating them. In fact, if the basic ideas of ecology were as completely internalized by educated persons as are the basic ideas of economics (like "the market" and "benefit-cost ratios"), much of the