The record is not all black. Ecological knowledge has been put to work in many cases with great success, and the pay-off has been important. Better fundamental knowledge of biological systems to serve as the basis on which applied findings may be derived is a second source of return from the IBP investment.

—Knowledge of freshwater systems is being put to work in fish pond developments, especially in our Middle West and South, which produce as much as a ton per acre of fish. And in rice-growing areas fish are raised with paddy, or rotated soybeans and rice.

—Aquiculture is being extended to salt and brackish waters in the cultivation, the farming, of oysters and shrimp.

—Reservoirs and lakes are being stocked with carefully selected organisms to fill out a productive food chain.

—Forest and range units are becoming more productive of a wide variety of goods and services because their management is firmly based on knowledge of plant and animal ecology.

—Systematic, long-term research into the central Pacific as a complete environment system has led to the discovery of such things as the equatorial undercurrent, factors explaining distribution and abundance of tuna, and prediction of skipjack catch on the basis of seasonal warming and location of water masses.

—The program of our Soil Conservation Service, designed in the 1930's to help correct the mistakes of our past soil and water mismanagement has matured into a land capability system that helps allocate each acre to its highest sustainable use.

—Comparative agrobiology and agroclimatology are guiding land-use developments around the world, or at least have the capacity to do so.

—Identification and study of planktonic eggs and larvae in the California ocean current system have led to discovery and development of Pacific hake resources to support an expanding fishing enterprise off the State of Washington.

—Many massive health programs are founded on detailed ecological knowledge of vector roles and their niches in the biological-environmental systems of nature. Disease problems in every part of the world, from rain forest to desert to tundra and high mountains, have caused medical researchers to look closely at the natural and agricultural communities in which people live.

I would like very much to be able to indicate how each thousand or million dollars invested in the International Biological Program would return two, ten, or fifty times the investment in forestalling ecological catastrophes or in making lucrative resources development applications possible. I cannot do this, however; and in a larger, more important sense, I do not believe it is realistic to attempt to.

Why? In the first place, we are talking about the kinds of investment—in research and understanding of the world—in which we have great confidence because we have had beneficial experience in the past. We know, for example, that agricultural research has paid off handsomely over the past century and especially in recent decades. Yet we cannot, with confidence, equate the ocst of a particular project with its dollar benefits. Some preliminary and still very crude evaluations that we are doing in our Department on fishery research and development efforts, by the way, do suggest surprisingly high returns. In any event, we look mainly at the net cost and net benefits of the total effort. We seldom convert our investment in medicine and health into dollars resulting from one man's working days saved.

We expect pay-offs from our space developments, spin-offs, but we do not keep our books on a double-entry system any more than we apply such accounting to national security. We do not even say that to clean our air and water of pollution will yield benefits of certain amounts in relation to expenditures.

In the second place, the IBP does not deal exclusively with marketable products. We are talking about life and health, and survival. We are talking about an environment worthy of man and one in which he is comfortable and in which he can take pleasure.

At no time has pre-existing biological and environmental knowledge been adequate. We simply do not know our world well enough. It seems that we know more about the sub-atomic particles than we do micro-organisms. We have more knowledge about the functioning and forces among heavenly bodies than we do about the elements of a tropical rain forest. Despite the myriad species of plants and animals that have been discovered, described in Latin and catalogued, we