

old values, we are not Luddites. The computers are here to stay, bringing great benefits and difficulties for man. Man has not yet proved that he is able to handle the complex problems of our world. And, as our article emphasizes, we are concerned with man's frailty. But man has strength and vigor. Our age has produced a "revolution of expectations" as well as a scientific-technological revolution. Knowledge has been gained of the influence of technology on the moral order, and of the power of social forces in determining directions in which men and societies move. In this context we, and others, are searching for means by which computers can best be used to supplement human capability without the destruction of those abilities and values which we see as critical for man. Is it not possible that man can learn, that he can make changes in the areas which must be changed, while not losing those values which must not be changed?

DAVID L. JOHNSON
University of Washington, Seattle
ARTHUR L. KOBLER
4731 12th Ave., N.E.
Seattle, Washington

Turtle Grass in the Deep Sea

A deep-sea photograph, recently reproduced in *Science* [138, 495 (1962)], shows two "leaves" lying on the floor of the Puerto Rico Trench. These "leaves" are almost certainly the blades of *Thalassia testudinum* König, the common turtle grass of the tropical western Atlantic. This photograph is of more than passing interest because the life of the deep sea is dependent on organic material from land or the shallow seas that border islands and continents. As *Thalassia* is abundant in warm shallow marine waters, it must play a part in supplying the fauna of the deep sea with food. While the blades in the photograph looked rather clean, more often the blades are covered with attached algae, Foraminifera, Bryozoa, and other small sessile organisms.

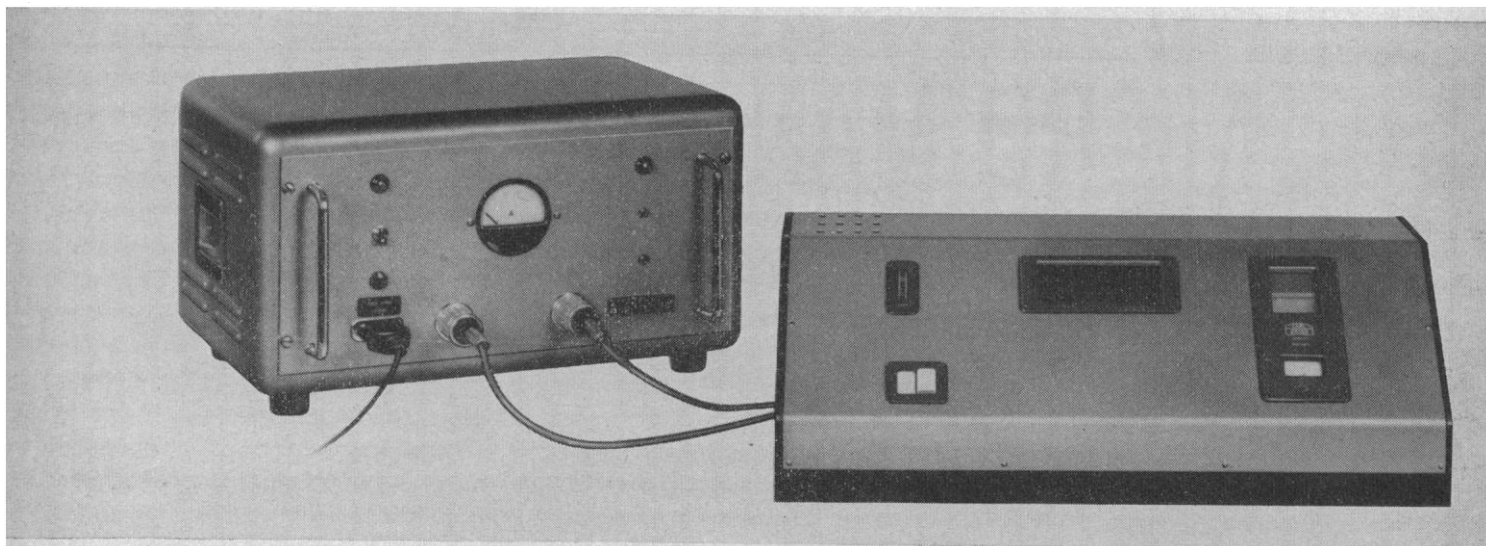
The amount of *Thalassia* torn loose from the meadows in normal times is low. However, stormy weather or a hurricane can break off many blades, or even uproot entire plants in some situations.

An attempt was made by Thomas

and his associates in 1961 to calculate the amount of *Thalassia* torn from the bottom of a bay of known size by hurricane winds. This calculation was based on the average quantity of grass washed ashore from a known area (Biscayne Bay, Florida). However, there was no way to estimate the amount of grass carried out to sea by the storm.

Fortunately, some observations were made on the abundance of displaced plant material. Harvey R. Bullis, Jr., of the U.S. Fish and Wildlife Service, directed an exploratory fishing cruise along the western edge of the Bahama Bank approximately 6 to 8 weeks after hurricane Donna had passed over the area. Shrimp-trawl hauls made by the merchant vessel *Silver Bay* in 100 to 300 fathoms brought up large masses of rotting vegetation, much of which, according to Bullis, appeared to be *Thalassia*.

Inasmuch as the continental slope in tropical areas is often found to be teeming with life, it appears that *Thalassia* must be of some importance in maintaining these populations. In addition, it supplies a suitable habitat for



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countless numbers of animals in shallow water and provides attachment for vast quantities of algae.

This may seem much ado over two blades of grass, yet it is easy to overlook the contribution of organic material to the deep sea by a shallow-water plant. The influence of hurricanes should not be disregarded, either, for the amount of material washed ashore is probably equaled by the amount carried out and sunk in deep water offshore.

Since *Thalassia*, and a few related sea grasses, in some localities occupy large tracts of shallow-water sea bottom, it seems quite probable that a certain percentage of the energy requirement of West Indian deep sea organisms is met every year by masses of detached sea-grass blades. The amount would vary considerably, depending on weather conditions, but even in relatively calm years it is probably large enough to be of considerable importance.

DONALD R. MOORE
*Institute of Marine Science,
University of Miami,
Coral Gables, Florida*

Tax Credit for Support of Research

Charles J. Flora [*Science* 138, 1185 (1962)] has clearly stated the real tragedy of current federal support in the sciences. The National Science Foundation and the National Institutes of Health are to my knowledge the best run of any federal agencies, and the best designed to prevent abuses. However, the system seems to subvert its own purpose, as Flora shows.

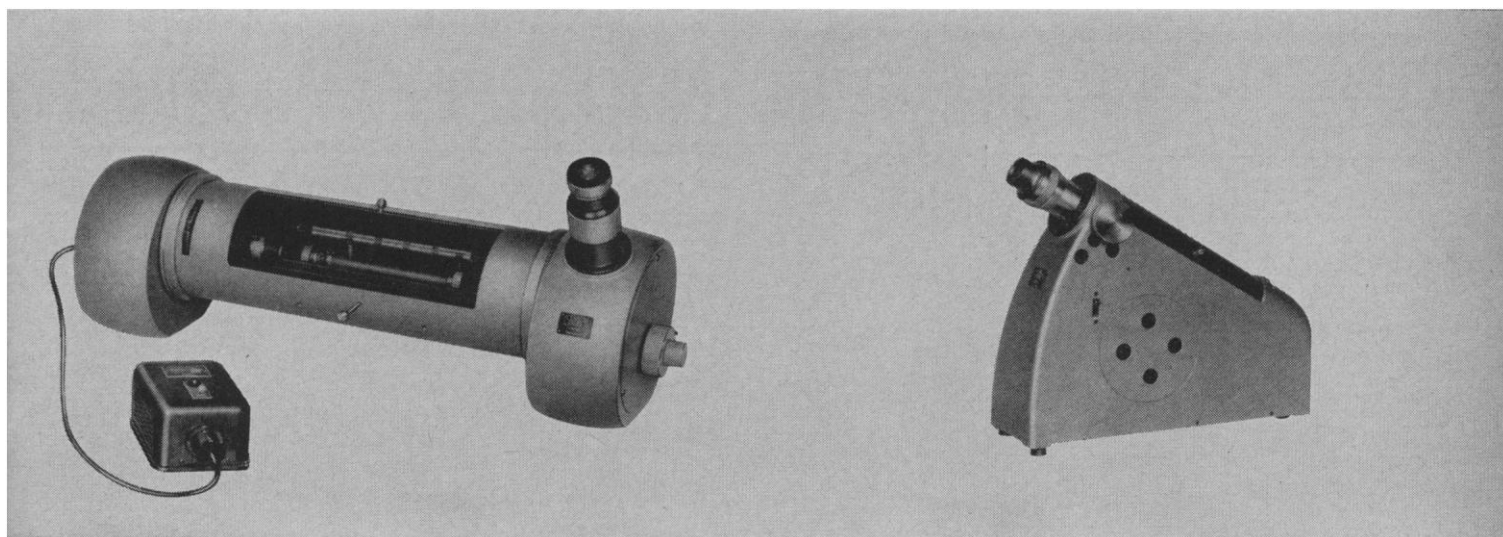
Except for projects such as Mohole, oceanographic expeditions, accelerators, and conferences, I think the remedy lies in less direct federal support. One such arrangement would allow direct federal tax credit (up to some predetermined fraction of the individual's tax liability) for contributions to a college or university that are earmarked for research. Such a system would have many advantages over the present one. (i) It would diffuse the funds more widely, thus making them more generally available to scientific personnel in small colleges. (ii) The contributed dollar would have its full value at the institution and would not decrease by 50 percent or more in going

through the federal bureaucracy. (iii) College research committees would disburse only the amounts actually needed by an investigator at a given time, as opposed to the current system of awards based on necessarily liberal estimates of possible future need. (iv) The highly trained scientists now involved in bureaucratic activities, review panels, proposal writing, report writing, and so on would be able to return to their scientific pursuits.

I think the end result would be a great saving in public funds, a vast increase in the amount and quality of research accomplished, and an increase in the number of people actually engaged in research.

The additional advantage of providing support for those rare individuals who are so far ahead of other workers in their fields that the "expert" panels can't understand, and will not support, them would be fortuitous, but might provide our nation with that most potent of weapons—original thought and research.

JACK BENNETT
*Department of Biological Sciences,
Northern Illinois University, DeKalb*



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