buried in marine sediments before it can be recycled by organisms. Intermittent stagnation of one or more of the ocean basins by whatever means would, of course, produce an immediate deficit in the available budget of marine nutrients. Such stagnation might conceivably have occurred as a result of rapid diastrophic or climatic episodes [see, for example, A. G. Fischer, in *Problems in Palaeoclimatology*, A. E. M. Nairn, Ed., Interscience (Wiley), New York, 1965], but the climatic oscillations of the Pleistocene did not bring about noteworthy mass extinctions of major terrestrial or marine communities (mass extinctions of large herbivorous mammals occurred mainly after the last major retreat of the Pleistocene glaciers). Perhaps the environmental changes of the Pleistocene were too slow, not sufficiently protracted, and of too limited range.

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Severe-Weather Forecasting

John Walsh's article "Tornadoes: Weather Bureau office in Kansas City is nerve center for severe weather warning network" (News and Comment, 4 June, p. 1306) presents an excellent, concise summary of the U.S. Weather Bureau's activities in forecasting severe local storms. The article is concerned with the contributions of a specific agency in this area and does not purport to include a survey of the work of other units. However, mention is made in general terms of improvement in knowledge of thunderstorms during World War II and the demand for better severe-storm forecasting, which is attributed to the rise in commercial air traffic.

Therefore I believe that a few comments concerning the implementation of techniques and units for severe-weather forecasts are appropriate. Before World War II meteorologists generally agreed that forecasts of time and place of tornado occurrences were beyond the state of the art. During 1948, Ernest J. Fawbush and Robert C. Miller of the Air Weather Service detachment at Tinker Air Force Base, Oklahoma, developed available techniques into a reliable system for forecasting severe local storms. In 1949 the Air Weather Service invited U.S. Weather Bureau regional directors at Oklahoma City, Kansas City, and Fort Worth to visit Tinker AFB. As a result of their meeting with Fawbush and Miller, arrangements were made for the direct transmission of the Air Weather Service's severe-weather forecasts affecting Arkansas, Kansas, Missouri, Oklahoma, and northern Texas to the U.S. Weather Bureau offices at Oklahoma City and Kansas City. These forecasts were monitored by the U.S. Weather Bureau for use in warning the civilian population when the situation warranted such action.

In 1950 the Gulf Coast states were added to the area of responsibility, and in 1951 the Air Force Severe Weather Warning Center (SWWC) was established with responsibility to provide forecast coverage for the entire continental United States between the Appalachians and the Rockies. The awareness by certain civilians and the newspapers of the existence of these forecasts prompted a demand for similar forecast services to the general public. Accordingly, in March 1952 the U.S. Weather Bureau established a specialized forecast unit, known as the Severe Local Storms Unit, in Washington, D.C. This unit moved to Kansas City in 1954. The U.S. Weather Bureau Severe Local Storms Unit and the Air Force Severe Weather Warning Center were collocated in 1956 at Kansas City.

As a result of their pioneering investigations and development of techniques for forecasting tornadoes and other destructive local storms, Fawbush and Miller were presented the Meisinger Award of the American Meteorological Society in 1956.

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"Wasted" Water

I am impressed with the sober thoughts of D. B. Luten (Letters, 9 July, p. 133) on some of the burgeoning plans to conserve our natural resources. At all levels of government and among the public in the United States there appears to be a hard-core belief in BIG projects to provide water in greater quantities to specific places for specific purposes. The NAWAPA proposal referred to by Luten is one such project, but there are others of equal importance because of their implications. It seems that everyone is

on the bandwagon for BIG canals and BIG dams, and the wagon is going at a rapid rate, greased by the idea that water flowing downstream is unused water—that it's water wasted because it dumps into an ocean. Nothing could be further from the truth.

In this light there is a need to comment on the Texas Basins Project —a proposed canal to divert waters from the large rivers which normally flow into the bays along the Upper Texas Coast. Such waters would flow through the canal to meet irrigation and other needs in the Lower Rio Grande Valley.

It is well documented that most of the Texas bays serve either as nursery grounds, spawning areas, or permanent habitats for most of the commercially important marine organisms and for most of the fish of importance to sport fishermen along the Texas coast. Most of these bays serve in this capacity because they are estuaries, and they are estuaries because of the inflow of fresh water at various times during each year. This close balance between fresh and marine waters and marine organisms is essential, but it is on the brink of being destroyed in Texas and perhaps elsewhere.

The ecology of the Texas bays has already been changed by the effects of large inland dams, by channelization within and between bay systems, by increased upstream water usage, and by pollution, to name a few. And it is a matter of record that the freshwater flow into bay systems extending from Galveston to Corpus Christi is already deficient for maintaining the status quo. Coupled with this reality the Texas Basins Project can only spell disaster in its present state of planning.

Water that flows downstream is not unused. The bays of Texas are what they are *because* of water inflow, not in spite of it.

It is time for a new bandwagon.

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Malaria Control and Economics

I am very late in commenting on Brain's article "Science and antiscience" (9 April, p. 192) because I am one of the field workers in remote areas who is trying to help the people of Ethiopia eliminate malaria through the use of insecticides and antimalaria drugs.

It is difficult to understand what prompted Brain's statement that antimalaria workers " . . . do not think about the effects of their actions on population growth in relation to food supplies." No worker on the Manhattan Project could have done more soul-searching than many of us engaged in this endeavor.

In late 1958 the people in the potentially rich agricultural highlands of Ethiopia suffered from a malaria epidemic which, by conservative estimates, caused 3 million cases and 150,000 deaths in 2 months. A less disastrous recurrence in 1964 resulted in 2000 to 3000 deaths. Efforts now under way are aimed at eliminating this threat to the rural population of Ethiopia. Considerable extensions of arable land now uninhabitable because of malaria will increase the country's agricultural productivity. Importantly, a number of high government officials and international specialists cooperating with them are not unaware of the demographic factors involved in complexities of national planning.

Fifteen years ago George MacDonald, director of the Ross Institute of the London School of Tropical Medicine and Hygiene, wrote concerning the economic importance of malaria in Africa:

> The policy of all countries which are governed in the interest of the inhabitants is the elimination of all avoidable infectious diseases, and there is no example known to the writer where it has been considered necessary to appraise the economic effects as a preliminary. The bare fact that illness and death are harmful to the social organism is universally accepted both by the humanitarian and the economist. Efforts are made to control disease even though the actual statistical loss is small, as is for instance—that due to pulmonary tuberculosis in England and Wales where it causes an annual mortality of 0.432 per 1000 but is considered to be a material blemish on the community. . . .

As a practical and practicing biologist I expect to continue my exploitation of scientific findings toward elimination of malaria as an individual and collective catastrophe hindering an enlightened social and economic evolution. May my fellow biologists and social and political scientists similarly dedicate themselves to the development and exploitation of tools in their respective fields!

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