Letters

Air Pollutants Study

As a meteorologist who had no connection with either the National Center for Atmospheric Research (NCAR) or the National Science Foundation, I would like to suggest that, in the matter of the proposed NCAR Fate of Air Pollutants Study (News and Comment, 5 Oct. 1973, p. 36; Letters, 28 Dec. 1973, p. 1295), the aspect that was really "poorly thought out" was the effect of its being "scrapped."

An inexcusable delay will now be suffered in the starting of a study that must and will be carried out. Even though there is, at this time, an apparent lack of appreciation that the fate of air pollutants can have an important bearing on the physical processes that affect our weather, visibility, and climate (especially what we leave as a heritage to our grandchildren), pressures from health-effects researchers will soon demand such a study. For instance, the life cycle of secondary and tertiary fine particulates, some of the more insidious air pollutants, must be more fully understood if they are to be properly combated.

It will take a long time to again assemble the talent, experience, and capabilities represented in the NCAR atmospheric chemistry group. They were uniquely suited for the task they had outlined for themselves, and their scattering to less-than-critical masses is a great loss to atmospheric science and a discredit to NCAR.

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Unemployed Biologists

The letter from T. H. Curry concerning unemployment among biologists (28 Dec. 1973, p. 1295) calls attention to the "startlingly high rate of unemployment (6 percent) among biologists." This value gives a wrong impression because it represents incidence of unemployment (the percentage unemployed at some time during the year) rather than the prevalence of unemployment (the percent unemployed at any particular moment during the year). Unemployment rates reported by the government are prevalence values. An incidence value cannot be changed to a prevalence value unless the average duration of unemployment is known. The prevalence of unemployment among biologists is probably about 1.5 percent.

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Underground Coal Gasification

We read Philip H. Abelson's editorial "Underground gasification of coal" (28 Dec. 1973, p. 1297) with keen interest. As Abelson suggests, in situ coal gasification is finally coming into its own after a century of studies. Recent developments in the United States are promising, in contrast to earlier work (*1*). Both the U.S. Bureau of Mines (*2*) and the Gulf Research and Development Corporation (*3*) have published results of field experiments that basically represent extensions of older gasification technology.

The Lawrence Livermore Laboratory has developed a new method (*4*) of in situ coal gasification that would be applicable to deep, thick Western coal deposits, those cited as the most attractive in Abelson's editorial. This method could also be applied to steeply dipping thinner coal beds, which are difficult to mine with current technology. The concept is to employ chemical explosives emplaced in an array of drilled holes to fracture thick (15 to 30 meters) coal beds at depths of from 150 to 900 meters. The resulting permeable bed would then be ignited and gasified with steam and oxygen, with a horizontal reaction zone moving vertically downward (or upward) through the fractured region. The main difference between our proposed concept and previous methods is that the flow paths in the coal would be clearly defined, which would prevent short circuiting of the inlet and product gases and the burning of product gas underground. We began our feasibility studies about 2 years ago, and our preliminary results (*5*) are encouraging; we hope to obtain funding to proceed with the development of a technology that offers the possibility of low-cost energy (*6*) and relatively minimal environmental consequences.

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Mangroves, Isopods, and the Ecosystem

Andrew Rhem and Harold J. Humm call attention (12 Oct. 1973, p. 173) to the activities of the wood-boring isopod *Sphaeroma terebrans* Bate (*S. destructor* Richardson) centered in the Ten Thousand Islands region of southwestern Florida. *Sphaeroma* bores into the prop roots of the red mangrove (*Rhizophora mangle* L.) causing the eventual destruction of the trees along the perimeters of islands and shorelines. The authors judge this to be an "ecocatastrophe of serious magnitude" but stop short of suggesting that an eradication program may be necessary.

The observed activities of *Sphaeroma* and the prognosis by Rehm and Humm are not dissimilar from the recent activity of the coral-eating starfish (*Alicanthaster planci*) in the Pacific and the

calls of alarm which induced an expensive and ill-fated international eradication program. These and other examples strongly reflect upon the almost complete absence of knowledge concerning the behavior of large ecological systems. What may be quite devastating to a component of a system may in fact perpetuate the survival of the whole system over a longer time span.

The contemporary physical environment of the regional ecosystem of southwestern Florida is characterized by increased upland water drainage and concomitant changes in the hydroperiod and the salinity regime in the downstream estuaries and bays (for example, shorter periods of lower salinities and longer periods of higher salinities). The general reduction in the ratio of land surface to water surface caused by *Sphaeroma* in the Ten Thousand Islands region may eventually prove to be compensatory by reestablishing old salinity regimes and tidal-flushing patterns. Not to be discounted is the possible short-term importance of mangrove-derived allochthonous materials shunted into estuarine food webs by *Sphaeroma.*

To the extent that we continue to ignore ecosystem phenomena in a long-term context, we continue to perpetuate the vacuum of knowledge concerning macroscale biology and the self-adapting mechanisms of ecosystems. Man could do well to study how natural systems continually adapt to changing environments for long-term survival.

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The title and tone of the report by Rehm and Humm, "*Sphaeroma terebrans*: a threat to the mangroves of southwestern Florida," betray a botanical and terrestrial bias. As a longtime admirer of marine crustacea in general and isopods in particular, I applaud rather than deplore the destruction of the mangroves by *Sphaeroma,* so beautifully illustrated in the cover photograph, and propose an alternative title, such as, "Mangrove roots of southwestern Florida: a new resource for *Sphaeroma terebrans*, a new hope for the marine ecosystem." This hitherto rare (*1*) and underprivileged isopod seems to be making a comeback (or an initial breakthrough) to its rightful place as a conspicuous and important member of the intertidal fauna; in the process, it may well be contributing to the abatement of terrestrial intrusion into the Gulf of Mexico occasioned by mangroves.

I am pleased, for the sake of isopods and the marine community, that the isopod-weakened mangroves may be undercut by wave action and that storms may cause groups of weakened trees to topple into the water. This will provide more food for the isopods and their marine compatriots, and return to the marine ecosystem stretches of habitat which rightly belong there. This extravagant use of resources by *Sphaeroma* may eventually lead the isopods to an energy crisis, but in that eventuality, we can hope that other marine crustacea, better adapted to a marine climax community, will complete the mopping-up operation.

There are, however, other grounds for alarm. The authors state that in the Florida Keys, where *Sphaeroma* is absent, ". . . expansion and land-building activities of red mangroves . . . are continuing." I protest the authors' use of the term "normal" to describe a situation which, instead, represents "extensive" depredations of the marine habitat by mangroves. Their "infestations" of the coastline constitute an "extremely severe" terrestrial invasion which may well develop into a "eco-catastrophe of serious magnitude."

All biases aside, I am concerned about the possible consequences of this kind of reporting. What if the state of Florida should propose a massive effort to control by pesticides this fascinating and apparently completely natural ecological event taking place in an arena that is of no evident economic significance except to land developers? When enlightened self-interest does not dictate policy—as it may in the realm of agriculture—and when there is no clear evidence that man has already (perhaps unwittingly) intervened, so as to require further intervention to redress a prior wrong, I advocate ecological nonalignment. Those organisms that cannot survive the direct depredations of man may well belong to an endangered species list; but if the mangrove cannot survive the isopod in southwestern Florida, I see no a priori justification for helping one at the expense of the other.

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