Letters

Lake Tahoe and Soil Pollution

Although Abelson's editorial (20 May, p. 1015) which mentioned banning fertilizers on garden plots as a possible necessity in the future to prevent the pollution of Lake Tahoe and the subsequent letters by Garman (12 Aug.) and Deevey (7 Oct.) present an interesting academic exercise, I feel that the authors have missed the essential arguments concerning commercial fertilizers and pollution. Fertilizers are applied to the soil and it is the behavior of these chemicals both on or in the soil that will determine any subsequent transport which could lead to water pollution. Under normal conditions small amounts of some nutrients are transported. For example, fall applications of nitrogen fertilizers in the temperate climates will probably lead to an increased leaching of nitrogen as both nitrate (and nitrite) nitrogen are mobile and will move in some manner associated with the percolating water. Under normal growth conditions, microbial mineralization and nitrification will convert some of the organic and ammonium forms of nitrogen in the upper layers of the soil to the nitrate form. Phosphorus compounds are relatively immobile within the soil (movement is generally of the order of centimeters); thus Deevey's statements about phosphorus are really of little concern except where soil erosion takes place.

The argument between Deevey and Garman concerns amounts; this is my basic concern as well. Garman says that the addition of 2000 tons of nitrogen to Lake Tahoe would be insignificant; Deevey says that this amount would be both detectable and significant. All of North America is involved because nitrate nitrogen is mobile within the soil and the real problem involves the long range effects of slowly increasing the nitrogen content of our groundwater supplies throughout the continent. Commercial fertilizers are not the only source; septic tank seepage, runoff and seepage from feedlots and barnyards, manure spread on the soil and natural sources may all contribute. In areas of groundwater recharge, these supplies maintain the base flow of many streams and rivers as well as contribute directly to lakes. Groundwater may be stored for periods of days to hundreds of years, thus adding to the complexity of the problem. It is difficult to predict the relative effect on the nitrogen content of streams and lakes of an increased nitrogen content from our groundwater supplies as compared to municipal and industrial sources; however, this aspect should not be overlooked in the overall eutrophication of our inland water supplies.

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Clearer Views for Astronomy: Another View

My article "The training of an astronomer" (17 June, p. 1597) has evoked comments and criticisms by C. B. Stephenson and Philip C. Steffey (Letters, 26 Aug.) which suggest serious misunderstandings by both astronomers as to just what I have proposed. I hope the following remarks will clarify my position, which differs so sharply from the Whitford Committee recommendations.

My reasoning is based on the answers to three questions: (i) Who are the best of the younger astronomers? (ii) Where were they trained? (iii) Was there something special or unique about that training? The list of Warner prize winners, now 13 in number, represent the best of the postwar, younger astronomers. One prize winner is chosen each year by senior astronomers, after long and careful deliberation. Four of these 13 awards have gone to overseas-trained astronomers or astronomers trained in the United States, but not in conventional departments of astronomy. This fact is both remarkable and significant, but even more remarkable is the fact that six of the remaining nine awards were for astronomers trained at Berkeley-Lick and two more were for graduates from Caltech-Mount Wilson and Palomar. The training at these two schools has been both special and unique. It has obviously been successful in the production of top excellence; we should have more of it. I therefore suggested "the California solution," namely: "A moderate-size telescope (or two or more) is operated by a university at a good mountaintop site by a permanent staff of research astronomers. The graduate student finishes his required courses . . . and then travels to the observatory for a year's research for his thesis." Steffey states (incorrectly): "Irwin advocates establishing new astronomical observatories in favorable climates . . . for the *exclusive purpose of graduate student training*." (italics mine). Steffey also states that my "case is generally sound, though premature." On the contrary, I believe it is long overdue.

Stephenson refers to my advocacy of "near-lunar observing conditions" and "the virtues of wilderness life." Mount Hamilton has no craters or maria, just as the moon has no grass or trees, clouds or precipitation, highways or modern homes. The same remarks hold true for Mount Wilson, Palomar, Mount Locke, and Kitt Peak. I think it something of an advantage —and the record backs me up on this —for a graduate student, in his final year of training, to be isolated from the predigested world of the textbook and to have as close and as lengthy a contact as possible with the rough-and-tumble world of frontier research. The problem of isolation is a serious one for a permanent observatory staff, and a mountaintop observatory with offices and shops in a relatively nearby metropolitan area is, and has been, a highly successful compromise. A graduate student who spends a good percentage of his final year in Santa Cruz or Pasadena or Tucson will find it infinitely preferable to the frustrations of observational research at Cloud-bound U.

Stephenson refers, correctly, to the comparable output of the Yerkes 40-inch (102-centimeter) in a cloudy