Letters

The Bias toward Research

Few topics can be relied upon to appear so regularly in the Letters pages of *Science* as the neglect of teaching skills in the selection of university faculty. In the latest communication (22 Jan., p. 358), F. T. Worrell lucidly defines the requisites for scholarship which should be demanded of academic personnel and logically argues that an academic scientist may be a scholar without engaging in bench research. I would heartily endorse his thesis that, in theory, a scientist who assiduously studies the literature so as to synthesize the latest scientific thoughts for his students may be superior as a scholar to the bench worker who grinds out unimaginative data. This argument, however, overlooks the operant conditioning of a scientist. In the training of a Ph.D. in science, the main emphasis is on the research thesis. In addition, research training breeds skepticism toward reviews and other secondhand sources as well as a great regard for original research reports. Finally, young scientists are exposed to national professional societies in which research achievement is the *sine qua non* of status and prestige. Why should an individual conditioned to this environment *not* pursue a productive research career?

Three possibilities come to mind. First, he may be the victim of an academic situation where the teaching load is so heavy as to preclude scholarship, either of the bench-research variety or of the literature-synthesis variety. Whatever excellence such an individual may develop in teaching skills, continued exposure to such an environment will suffocate scholarship and reduce him to a reciter of textbooks. A second possibility: he may lack the drive to overcome the frustrations of bench research. The experiments that fail because preconceived hypotheses are wrong or more variables are encountered than the experimental design anticipated, or the experiment completed the day the report appears that someone else has done the same job better, can overwhelm those of faint heart. I doubt whether individuals defeated by these discouragements will show any more persistent dedication to the equally frustrating task of disentangling and synthesizing the many tenuous and contradictory reports that constitute original scientific literature. They will more likely be found in the group described by Worrell "at the faculty club playing bridge." A third category is the group who, once out on their own and removed from the guidance of their mentors, prove incapable of designing successful research. If an individual lacks the intellectual talents to produce creative research in spite of diligent effort, his competence to carry on the type of synthesis Worrell endorses would also appear open to question.

If there is merit in Worrell's argument, we should create a new training environment for academic teachers in which status and prestige are strictly governed by demonstrated ability to carry on the scholarly review of scientific literature which Worrell defends. As he emphatically says, however, this is quite contrary to the present mores of the academic community. That being the case, wisdom dictates that to find the competent products of our current scientific training programs, one must look for the accomplished researcher; it is after this initial screening that we should endeavor to select those who are ready to dedicate themselves to some inspired teaching as well. Worrell's charge that the selection process often stops at the initial screening stage and never proceeds to evaluate teaching abilities may have a distressing element of truth in it; I would emphatically endorse his plea that careful attention should be given to teaching skills in those assigned to academic classrooms. To assure ourselves of competent scholars, however, we must continue to check their bibliographies.

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Desalination and Agriculture

The excellent editorial on desalination of water (18 Dec. 1964, p. 1533) should do much to place in proper perspective the issue of "reclaimed" versus "natural" water supplies. The popular notion that a reduction of desalination costs would turn the arid west into a Garden of Eden must be challenged. If reclaimed salt water were available at no cost at sea level, the pumpage and transportation cost (about 10 cents per 1000 gallons per 100 miles) would prohibit widespread distribution for agricultural purposes. Agriculture now pays only about 1 cent per 1000 gallons for irrigation water.

We must realize that feed, food, and fiber for future generations will have to be produced in areas of our country (and the world) where soil moisture is renewed annually by natural precipitation. Future developments in desalination methods may reduce such water costs so that they will not be prohibitive for human and industrial uses, but certainly they will remain prohibitive for agricultural uses except for very specialized crops.

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Solar Astronomy Neglected

In the report of the Whitford Committee, *Ground-Based Astronomy, a Ten-Year Program* (National Academy of Sciences, Washington, D.C.), a distinguished group of stellar and radio astronomers has recommended a vigorous program in stellar and radio astronomy (*Science*, 13 Nov. 1964, p. 899; 25 Dec. 1964, p. 1641). We wish to point out that there is a third important branch of astronomy, not represented in the committee and barely mentioned in the report, namely, solar astronomy. Despite the obvious importance of the study of the sun, our nearest and best known star, the 105-page report devotes only one paragraph to problems of the advancement of solar astronomy.

We believe that all fields of astronomy are exciting and important and deserve national attention. This is particularly true of solar astronomy, because of the profound practical influences of the sun, as well as its exciting scientific aspects. Not enough is known