Letters

On-the-Job Training Offer Rebuffed

A year ago, 1250 scientists, who were concerned with the inability of disadvantaged persons to improve their condition, offered to accept one unskilled, untrained person in their laboratories for up to 2 years of personal, on-the-job training. The offer included a promise to help the trainee find permanent employment. The scientists requested the federal government to provide trainee wages of up to $5000 per year. From the sample size, we estimate that there may be as many as 25,000 scientists who would be willing to participate in the program.

Details were discussed with members of Congress, some of whom then helped us to review the offer with members of of the White House staff and the Department of Labor. It developed that an administrative mechanism to accept the offer was lacking and, therefore, we wrote directly to the President and to members of the Cabinet for aid in authorizing acceptance. Several (Spiro Agnew, Robert Finch, David Kennedy, Daniel P. Moynihan) wrote letters of approval. However, a final reply has just been received by the undersigned from Chester E. Finn, Jr., staff assistant to the President:

> . . . In the end, much as it is to be regretted, I must tell you that present budgetary constraints are such that I doubt the feasibility of federal support of this program at this time. I don't mean to discourage you from bringing it up again in another year, or to deny our very real enthusiasm for the ideas you suggest, but only to try to be realistic . . . I would hope that you would report to them (your colleagues) that, while we do indeed accept your offer to volunteer time and service, the federal budget cannot at this time make the resources available that would seem necessary to carry out your program.

We conclude that there is little hope that positive action will be taken on this generous offer of personal services by so many scientists. However, we have summarized our experiences for the benefit of others who may feel that opportunities for persuasion still exist.

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Fresh Water for Agriculture

Clawson *et al.* ("Desalted seawater for agriculture: Is it economic?," 6 June, p. 1141) apparently have fallen into the same pitfall of which they accuse the Kaiser and Oak Ridge studies concerning seawater desalting in the Middle East. That is, their a priori point of view has biased their approach to the question. By analogy, their point seems to be that lack of need in some areas (the "overdeveloped" countries) combined with the local lack of technological capability in other areas ("undeveloped" countries) disproves the economic feasibility of large-scale desalinization in an area that has both the need and the technology. In their rather extensive review of potential costs and frequently neglected problems in this technology, they have failed to note that the Israelis are among the most advanced in the world in their approach to water resources management and desalinization technology. This is the reason that all plans for Middle East freshwater development include a major role for Israel.

A more serious error, however, is the application of American and Egyptian experience to placing a dollar value on water to Israel. The answer to if "not economical in Southern California . . . then where is large-scale desalting of seawater economic?" is simply anywhere where no alternative source is available as it is to Southern California. The economy of California is certainly not yet limited in fresh water, and, if it were, agricultural products could easily be imported should it become necessary. The Egyptian tomato fiasco is even less relevant to the determination of the value of water to mechanized, efficient agriculture.

In the nontechnical area of discussion, deprecation of plans "to develop . . . a wholly new order of magnitude in farm efficiency" on social and economic grounds is valid when applied to some areas of the world, but probably not to Israel or whatever fraction of the Middle East to which the Israeli example may eventually extend. Israel has evolved the social and administrative structure appropriate to "agro-industrial complexes" in the Kibbutz and Moshav organizations, and has done it at least partly with foreign capital without becoming colonized.

Problems certainly exist, and research should continue, but the potential advantages of large-scale desalting to the Middle East appear to warrant the active engineering development that only occurs when the end result is an operational prototype; scale, cost, and risk require participation by major powers.

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Your readers must be puzzled by the vigorous attack of Clawson, Landsberg, and Alexander on nuclear desalting schemes that have never been discussed in the pages of *Science*. A paper is therefore being prepared for *Science* which describes the Oak Ridge work. I hope readers will withhold their judgment as to the feasibility of using desalted water for agriculture until after this article is published.

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The article by Clawson, Landsberg, and Alexander is among the very few I have seen that gives adequate attention to the ability of agriculture to pay for water, and the technological competence necessary for efficient use. Calculations for various segments of agriculture show that gross return per acre should exceed $1000 before it becomes possible to compete with domestic users for water. Some economists believe that field irrigation in eastern Colorado would cease when the cost of water at the farmer's head gate exceeds $6 per acre-foot. The only segment of agriculture that could possibly afford

the cost of desalinization would be protected horticulture. The gross return per acre per year for commercial greenhouse carnation production in Colorado exceeds $100,000 with a capital investment of about $200,000, and a total yearly consumptive water utilization in excess of 6 acre-feet per year. There are Colorado producers paying more than $200 per acre-foot for domestic water, yet the resource is the cheapest raw material in ornamental production—as long as its quality is satisfactory. . . .

It would seem to me that we should explore methods of sweet water production other than straightforward seawater desalting. In certain situations, intensive horticultural production might afford a means of improving a country's foreign exchange—in Israel, for example. Where greenhouse production is feasible, why not recover the pure water transpired by plants? This requires, essentially, cheap power to remove latent heat. In certain circumstances, there is the possibility of using moderately saline or alkaline water in production. Unfortunately, the professionalism required in economic greenhouse production in this society is not any less than the professionalism required of an engineer to build, maintain, and operate a nuclear power facility. As soon as engineers realize that the "green thumb," "home lawn" variety of plant growing is not applicable to intensive agriculture, the better these schemes may be evaluated.

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Esoteric Measurements

I would like to echo the objections of H. R. Catchpole (Letters, 4 July). He suggests that with a minimum of editing many articles could increase their potential readership by several-fold, and gave as an example the use of a binomial species designation with no mention of the common English name. My concern is similar.

Why must the simplicity of the metric system be cluttered up with pica-, giga-, and nano-? The English system has two disadvantages: the arbitrary ratios of the units and the arbitrary naming of the units. In most sciences, the *measurements* used avoid the first disadvantage ("parsecs" is an exception); the names of units seem to be getting more complex by the day. As a case in point (*1*), two time periods are mentioned in one paragraph (on page 14). One of the periods is 4.5 eons; the other is 3.8×10^9 years. If an eon is 10^9 years, then I know how these intervals are related. My trusty almanac does not list "eon" in the index, and my dictionary, published in 1947, says that an eon is an indefinitely long period of time, or comprises two or more *eras*.

The editors of *Science* could require that, if esoteric measurements are used, then when first used, they be defined in terms of fundamental units.

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Reference

1. H. Alfvén and G. Arrhenius, *Science* **165**, 11 (1969).

Unreliable Results

In the course of my work I have discovered that the Beckman No. 39183 single-probe electrode for *p*H meters does not give reliable results when used to measure the *p*H of tris buffers. A 0.10*M* tris chloride buffer which had been prepared to *p*H 8.7 was recorded as *p*H 9.3 when this particular electrode was employed. In answer to an inquiry, Beckman Instruments, Inc., has informed me that there is a reaction between tris buffers and the linen fiber used in their No. 39183 electrode.

In view of the great popularity of tris buffers and Beckman electrodes, I believe this information should be made available to the entire scientific community.

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Slippery Polymers

The letter from Douglas Scott ("Slippery water in fire hoses," 27 June) describes yet another intriguing application of the turbulent frictional drag-reducing properties of the class of long, linear-chain polymers of high molecular weight such as carboxymethyl cellulose, polyvinylpyrrolidone, and polyethylene oxide. In high dilution (10 to 100 parts per million), they make petroleum and even ships' hulls slippery.

In our laboratory we have found these polymers make iodinated radiopaque media which are used for clinical vascular contrast injection studies so slippery that they require 20 percent less pressure for the same rate of delivery through small-bore heart catheters (slippery "dye" for medical "hoses").

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Phenomena of Psychic Research

Hudson Hoagland's editorial (14 Feb., p. 625) pointed out clearly the liability to deception, both unconscious and otherwise, of UFO observers and professional spirit mediums. His part in the investigation of the famous Margery spiritualist fraud 45 years ago is something for which modern psychologists should feel a sense of personal gratitude. All too often such time-consuming public service is not properly remembered and admired.

In order to place the foregoing in proper perspective, however, it is appropriate to say that the spirit mediums of past generations bear to present-day parapsychology a relationship analogous to that between the alchemists of the Middle Ages and the emerging science of chemistry in the 17th century. The cupidity, deceit, ignorance, and lack of discipline for which alchemy became legendary did not create, nor could it destroy, the underlying phenomenological reality which later became the object of scientific study.

Modern descendants of the early psychical investigators have brought to the criticism of extrasensory perception and psychokinesis experiments as much mathematical, psychological, and physical sophistication as we possess today, and still these phenomena continue to occur in a quasi-spontaneous fashion under good laboratory conditions with close attention to the rules of evidence which Dr. Hoagland mentions as essential to science. It would be interesting to be able to foresee when the scientists of the 21st century will say that this field had its Robert Boyle.

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