Letters

Basic Research in France

I read in *Science* [**128**, 227(1958)] D. M. Gates' article on "Basic research in Europe." Now I am not a scientist; I can say that your analysis of research in France is quite right and is (alas!) a good account of reality.

One sentence must be, in my opinion, corrected; you say, "France is an agricultural country of peasant proprietorship" (p. 231).

This idea is deeply embedded in people's minds, even in France. It was true before World War I; it was not quite true at the end of World War II; it's not true today.

Although the proportion of farmers in the total population is higher than in Germany or in the United States, the evolution is rather swift, and in a few years the proportion will be nearly the same.

In my opinion, the low rank of French basic research in Europe is mainly explained by psychological reasons (individualism, fear of the modern mass world, and so on) rather than by industrial underdevelopment or the predominance of the peasant class.

My purpose here is to root out in a small way this legend that France produces only cognac, champagne, Montmartre girls, women's dresses, and licentious magazines.

ANDRÉ PAULY

Versailles, France

Food Preservation

I have been perplexed by the suggestion in the editorial of 12 February [*Science* **131**, 383 (1960)] that "the Atomic Energy Commission should move to recover the Army fumble," which, it is alleged, occurred last October when the Army suspended its program on food sterilization by irradiation.

Science is an influential publication. I cannot be content to let this subject rest in the pages of *Science* on an editorial expression which, it seems to me, fails to embody adequate consideration of facts.

First, in order to avoid repetition in the matter of background, I wish to call attention to a statement I made in September 1955 on food sterilization methods [*Food Technol.* **9**, 588 (1955)]. The essence of that statement was the conclusion "that heat will continue indefinitely to be the most effective and most suitable lethal agent for use in the sterilization of food." I still stand on that statement, although now I would extend it.

The argument has been advanced in certain quarters that sterilization by irradiation has one clear-cut advantage over sterilization by heat, an advantage which justifies all the effort that would be required to "perfect" the irradiation process. This advantage is that, whereas foods sterilized by heat deteriorate while in storage, irradiated foods do not deteriorate.

In my statement, cited above, I wrote, "It appears unrealistic to expect that, among all the methods of preserving food, irradiation alone has the power to render the food incapable of quality deterioration in storage." I should like now to expand that statement by adding, "unless the composition of the food is changed radically and permanently by the process to such an extent that the unstable fractions are completely denatured or are converted into substances that are stable but are not natural to the food."

It is only logical to conclude that any treatment of food which so changes the food as to impart to it a degree of stability such as it possesses in no other form, must essentially effect an embalming of the food. By "embalming" is meant the imparting of chemical properties that are completely abnormal to the food, which, in all of its other known forms, needs to be protected against deteriorative changes by special means. The point is that if a substance possesses the stability that is claimed for irradiated food, the substance is no longer normal food. It might be added that, logically, one would suspect that this property of stability, if it exists, is directly associated with the undesirable organoleptic properties that are imparted to the food by irradiation and that if the undesirable properties are eliminated, the associated desirable property of stability would also be eliminated. Thus, of course, the only advantage of major importance that is still claimed for irradiation sterilization over heat sterilization would be eliminated.

Statistics on the matter are not available, but it is estimated that expenditures amounting to between $2 and $3 million have been made in developments aimed at bringing high-temperature, short-time sterilization into a commercially feasible and practicable form. Since 1927 I have been a participant in the work represented by a portion of those expenditures, and I can say that there has never been an effort put forth to advance heat sterilization which, even in a very small measure, resembled in concentration the effort, suspended last October, to develop irradiation sterilization. Nevertheless, the application of high-temperature, short-time sterilization is much further advanced than the application of ionizing radiation of food on any level.

In view of the greater promise offered by heat sterilization, I should like to offer a countersuggestion to that offered in the editorial. It is that the glamor of electronics be set aside, at least temporarily, in favor of an honest-to-goodness effort to bring advanced technology of heat sterilization to the point of practical application. Let one-third of the amount of $14 million that was put into the unavailing effort to develop techniques of irradiation sterilization be allocated to a sincere investigation of the science and technology of high-temperature, short-time sterilization. With such an investigation, embodying a study of all potential types of heat application, including the techniques of dielectric, inductive, and infrared heating as well as direct and indirect methods of heating with fluid media and, perhaps, also the techniques of ultrasonics, the prospects are that, at the very least, such remarkable advances would be made that there would be no question about the wisdom of carrying the job to completion.

C. OLIN BALL

Rutgers University,
New Brunswick, New Jersey

Teaching and Research

F. J. Allen's comment [*Science* **131**, 944 (1960)] that almost all scholars neglect their teaching for their research, and that we must come clean and admit it, cannot be allowed to stand. Surely the situation is this: no scholar who is not engaged in a struggle on the recalcitrant boundaries of his subject can generate the passion that first-rate teaching demands. Conversely, no scholar who is not both explaining the bases of his subject to students and concomitantly absorbing their fresh viewpoints can always keep his balance. The job of the scholar is not teaching *or* research. It is teaching-*cum*-research. In the best situations, it is a single activity—and that does not mean that one teaches only what one is momentarily engaged in investigating. Probably many of us neglect all or part of our jobs. But we do so, at least in part, because days are too short for us to perform this tremendous and joyful task in full accordance with our visions of it.

PAUL BOHANNAN

Department of Anthropology,
Northwestern University,
Evanston, Illinois