contributing increasingly large proportions of Sr^{90} to the diet, and this factor should be considered in future computations. Whether or not omission of this factor does in fact imply that I underestimated the dose by a factor of 0.5, as suggested by Commoner, I cannot say at this time.

It is my opinion that "about 5 percent" is a reasonable estimate of the maximum increase in bone marrow dose to be expected. "About 5 percent" could mean that the actual levels would be as much as 10 percent, but in my opinion, it is more likely that the true values will prove to be somewhat lower than 5 percent. This is because the method I used to compute future doses does not allow for the effect of foliar deposition or the possibility that Sr^{90} in soil will become less available to plants over a period of many years.

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Teaching and Research

The point that Jesse D. Rising raises [*Science* **130**, 66 (10 July 1959)]—that "many potentially excellent teachers may be doing less than their best teaching in an effort to satisfy the university administration by doing research"—was answered forcefully by an experienced teacher in these words:

"In the life of a university department the interests of research and of teaching are competitors. . . . The activities themselves are in necessary conflict in any department which thus seeks to serve two masters. The activities compete for room space, for the working time of staff members, including mechanicians and secretaries, for funds, and for the control of faculty appointments. . . .

"In my experience the demands of teaching and of research have been in continual conflict for nearly forty years, and I cannot remember that either function ever helped the other. Many a demonstration would have been better prepared and many a student better served if the urgency of some situation in the research laboratory (and the fascination of it) had not pulled in that direction. On the other hand, the continuous concentration that a research dilemma can demand was often broken up by the class bell. I would have done better at either one of these activities if I had kept out of the other, and I suspect that there are hundreds of scientific men who could give the same testimony. This is not a situation that we can take any satisfaction in but is just one of the facts of academic life. . . .

"It does seem that it is high time to

swing the protective tariff back from the researchers to the teacher as teacher. . . ."

These quotations come from a speech by Paul Kirkpatrick of Stanford University, delivered at a meeting of the American Physical Society in New York last January. They state in better words than many of us can muster the opinion prevailing among many teachers of undergraduate college physics and are worthy of more publicity than they have been given.

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Liesegang Phenomenon

In a recent report [*Science* **129**, 1365 (1959)], Van Oss and Hirsch-Ayalon claim that the Hirsch effect constitutes the proper explanation of the Liesegang phenomenon. This claim is based on the assumption that the Liesegang rings act as membranes which prevent further diffusion of the reacting substances. These authors also cite experimental evidence (see their references 9 and 21) in support of their conclusion that the rings remain impermeable to the diffusing outer (presumably more concentrated) reactant until the other (inner) reactant is exhausted in the vicinity of the ring.

Although it is generally agreed that the medium is exhausted of this reactant in the vicinity of the ring, the evidence for the impermeability of the ring is by no means conclusive. The Liesegang phenomenon is equally well explained [see, for example, Wagner, *J. Colloid Sci.* **5**, 85 (1950)] if a critical ion-product concentration, such as a supersaturation product, is required as a necessary condition for ring formation. In that case the clear spaces between the rings merely result from the lowering of the inner electrolyte concentration by adsorption on the last ring or by counterdiffusion. As a result, the outer electrolyte must then diffuse for some distance until the critical concentration is again reached.

Another argument against accepting the Hirsch effect as the *only* explanation of Liesegang rings under all conditions is found in the experiments by Morse [*J. Phys. Chem.* **34**, 1554 (1930)] in which rings of rather widely spaced crystals were formed in water without any colloidal material present. It seems a little farfetched to suppose that these rings act as membranes.

Van Oss and Hirsch also state that Ostwald's supersaturation theory is refuted by Hatchek's experiments. The arguments against this view have already been presented in some detail [K. H. Stern, *Chem. Revs.* **54**, 79 (1953)]. Basically they amount to this: that supersaturation can exist in the presence of crystals, particularly if these are well dispersed; and that under these conditions rings still form because the rate of crystal growth is less than the diffusion velocity of the reactants. When the rings consist of very small crystals, closely spaced, the Hirsch effect may very well operate.

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As the title of our report, "*An* explanation of the Liesegang phenomenon," implies, we did not claim to advance an explanation that excludes all other explanations. It is indeed quite probable that in certain cases diffusion, supersaturation, or even gel-protection effects play their role. Still, as we pointed out, Liesegang bands have been known to occur under circumstances where these effects were lacking. Now, although it remains difficult to ascertain which effect predominates in the formation of any particular set of Liesegang bands, the Hirsch effect can in a general way satisfactorily account for all the circumstances under which Liesegang bands are formed, needing no assumptions on diffusion, supersaturation, or gel protection. The Hirsch effect, an experimentally established and