# Comments and Communications

## Cult or Science?

THERE may be a "growing tendency toward statism, with its enslavement of body and mind to the whims of the relatively few men whose aim is to force conformity . . . ," as Metcalf says (SCIENCE, **113**, 696 [1951]), but the New York state law referred to by Goldstein and Pollet (*ibid.*, 249) is no protection against this tendency. Does Metcalf think that the bacterial theory of the origin of many diseases is a state philosophy, one of the "whims of the relatively few men," as his letter implies?

I know of no scientist who will deny that "there is today no avenue of scientific investigation in which the intellectually honest scientist will assert that the theories on which current investigations are conducted have been 'established beyond doubt'." The qualifying phrase "with enormously high probabilities" Metcalf omitted from his quotation. If any person, scientist or not, has any evidence or serious argument to present against any of the accepted scientific theories currently being taught, any science teacher worthy of the name will gladly give him a hearing. However, the Christian Science Church does not challenge currently accepted scientific theory as a scientist would who had reason to believe a current theory is in need of revision. Their objection to certain instruction is the fact that it "conflicts with the religion" of the parents of the students, not that they have evidence controverting the theories taught.

Science teachers are not trying to "abrogate the right of the individual citizen to refuse acceptance of a scientific theory." On the contrary, the law that Metcalf defends abrogates a student's right to choose between alternative theories by denying him a chance to hear the alternatives to the dogmas of his parents' church. Teachers, generally, are willing to have a student or individual citizen refuse to accept a scientific theory if he has reason for so doing, or even if he has no reason, only a contrary religious belief; but they are not willing to have religious groups prevent students from having a chance to judge whether the theory is acceptable.

Science teachers have confidence that most of their students, when presented with the known facts and suggested theories for their explanation, will accept the theory most in accord with the facts. Apparently the Christian Science Church does not have a similar confidence in students, or does not want them to accept the theory with most evidence in its favor.

What "ample reason" is there to believe that any specific one of the currently accepted scientific theories that are objected to by the Christian Science Church, or other group, will be outmoded tomorrow? If Mr. Metcalf has such reason, it is his duty to bring this reason to the attention of fellow-scientists in the usual way by publication and discussion at scientific meetings, so that his point of view may get a hearing. Then, if his reason is sound, his view will prevail, and all students will get the benefit of the improved theory.

GEORGE A. FINK

*Dayton, Ohio*

## (Potentiometric) Measurements in (Some) Colloidal Systems

THE article by Jenny *et al.* (*1*) evoked two replies (*2, 3*) which clarified several issues involved but at the same time obscured an important consideration—namely, the explanation of the so-called suspension effect which may render meaningless potentiometric measurements such as pH determinations in many colloidal systems.

Jenny *et al.* (*1*) studied suspensions of an ion exchange resin in KCl solutions and tried apparently, to prove three points: (*a*) that Donnan equilibrium does not exist; (*b*) that potentials of concentration cells whose junction occurs in a resin suspension can be calculated if transference numbers in the suspension are known; and (*c*) that a saturated KCl salt bridge cannot be used in these systems to eliminate junction potentials.

Point (*a*) has been duly criticized by Marshall (*2*), and little needs to be added. Point (*b*) is evident from thermodynamic considerations (*4*), and the necessary transference numbers can either be measured in the same system, as has been done by Jenney *et al.*, or they can be calculated under idealized conditions, if the properties of the membrane are known from Donnan equilibria according to the Meyer-Sievers-Teorell theory (*5, 6*), as pointed out by Marshall (*2*) and by Erikson (*3*).

Point (*c*), the effect of the salt bridge, has, however, been dismissed by Marshall as not likely to amount to more than a trivial correction, and by Erikson as only "comparatively small (insignificant according to the Meyer-Sievers-Teorell theory)." It is this point that I should like to try to clarify.

Both Marshall and Erikson seem to treat the dispersion of resin in KCl solution as a single phase, whereas in reality it is composed of small but discrete regions of resin and solution. (The thickness of the ion atmosphere or ion swarm is of the order of 50 A in the most dilute solutions and hence negligible in comparison.) Furthermore, the resin is a hard, nondeformable solid.

The Donnan condition of restriction of an ion to given spatial area can apply only to the resin region (and not to the solution region). It is also apparent that it is not easy to determine directly either the concentrations or the potentials within the resin.

Under some circumstances it may, nevertheless, be permissible to discuss the properties of the suspension as a whole; for example, its electric resistance over large enough regions will be a well-defined quantity.