tion. Some members of the research community think that action taken with respect to these is sometimes arbitrary, partisan, ill-considered, and lacking in authority. All these objections, whether well founded or not, could be eliminated for the most part if reviews were open—that is, if the reviewer's name were publicly attached to his review. In the first place, the reviewer would then be more careful in making a review, so that if need be he could publicly defend it. Second, the too frequent utilization of a particular reviewer in a field would become obvious and thus the establishment of "high priests" would be reduced. Third, reviewers would find it less practical to "borrow" ideas for their own use from research proposals and submitted papers. Fourth, a more responsible attitude on the part of reviewers would eliminate a lot of "hash" research and papers. . . . It seems to me that open reviews would enhance the integrity of our research programs.

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Wild-Animal Conservation

There is pending before the current Congress a resolution, Senate Concurrent Resolution No. 60, which may be of interest to readers of *Science*. The resolution states that "the Secretary of the Interior, in consultation with the Secretary of State, should take all necessary steps to convene an international conference within one year after the adoption of this concurrent resolution for the purpose of initiating cooperative action to further conservation of wild animals on a worldwide basis."

This resolution is being sponsored by Senator Yarborough and has been referred to the Committee on Commerce.

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Explaining Insect Behavior

In his article "Microscopic brains" (13 Mar., p. 1138), V. G. Dethier appears to me to commit a clear violation of Lloyd Morgan's basic canon on the interpretation of animal behavior. His argument, although ostensibly founded on objective experimental evidence, transcends the data and builds up to a plea for anthropomorphism at its most primitive level. This is the level of thinking that places an imaginary human mind inside the bodies of other animal species, regardless of their phyletic separation from man. Dethier's final paragraph leaves the reader with a disturbing feeling that somewhere, peering through the shape-shattering compound eyes, there is a tiny homunculus trapped within each housefly.

In effect, Dethier offers us a choice of two interpretations: either we accept an anthropomorphic view of insect behavior, or we consider the insect as a miniature computer with attached servos. I submit that neither view is acceptable. Just as we study man, his structure and behavior, according to his species-specific characteristics and adaptations, we must investigate the insect, or any other organism, on its own terms and in the light of its evolutionary history.

Words such as "motivation," "drive," and "emotion" have defied precise definition by psychologists for many years. If we agree on definitions broad enough to include some of the behavioral manifestations of insects, we can then use a single word for two behaviors. What is gained? The two behaviors are not necessarily qualitatively the same, and it becomes easy to fall into the semantic trap of confusing the label with the entity.

Dethier writes:

> Motivation is a specific state of endogenous activity in the brain which, under the modifying influence of internal conditions and sensory input, leads to behavior resulting in sensory feedback or change in internal milieu, which then causes a change (reduction, inhibition, or another) in the initial endogenous activity.

Simplified, his statement reads that motivation is an endogenous nervous activity which leads to a behavior that changes the motivation. Aside from the highly suspect assumption that motivation is indeed an endogenous activity in the brain, this definition is not restrictive, as Dethier seems to think. On the contrary, it is circular, and its diameter is so broad as to encompass any behavior of any organism.

Dethier acknowledges the intrinsic differences between insects and vertebrates. His reference to Vowles supports the idea of a qualitative difference in behavior between insect and vertebrates. But then he ignores these arguments and, in some cases, his own data, and hypothesizes that such dichotomous ideas are founded on "a fear of anthropomorphism." He says that insects may be capable of motivated behavior as he defines it, and, therefore, "one need not propose a dichotomy of function." In regard to learning, the mechanisms involved in the two groups are quite different, but if we follow Dethier's reasoning, we would say that these phenomena fall within a definition of learning as a modification of behavior through experience. Therefore, "one need not propose a dichotomy of function." In fact, however, there are many different kinds of learning with different physiological and psychological bases, such as simple habituation, classical conditioning, trial-and-error, and insight learning.

I suggest that Dethier refer to the many comparative studies on learning that have been done, particularly those of T. C. Schneirla. The evidence points clearly to a "dichotomy of function."

Insects and man represent the products of two very different lines of evolution. Their common ancestors, if any, have been extinct for at least a half billion years. Consider the biological divergence of the two groups. An insect has an exoskeleton, an open circulatory system, a ganglionated nervous system, compound eyes, an endocrine system as far from homologous to the vertebrate type as can be conceived—in all, is as different from the vertebrate structure as it is possible for a terrestrial, protoplasmic life form to be. From the evidence, some of it cited by Dethier, there is every reason to believe that the two groups diverge widely in physiological and behavioral mechanisms as well. Yet Dethier proposes that we use terms and concepts rooted in human psychology to describe and, indeed, explain insect behavior.

I should hope that it is about time for animal behavior as a science to outgrow such primitive attitudes and semantic confusions. A backward step in this growth is illustrated by the statement in the recent *AAAS Bulletin* (vol. 9, no. 1, p. 2) that "Dethier said he thinks that . . . insects can learn and probably have emotions as well." The newspapers will have a field day with this one.

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