Comments and Communications

Concerning a Dog's Word Comprehension

It is difficult to be sure of the extent that animals are able to generalize the meaning of those words to which they do definitely react. Data in this connection are as apt to come from spontaneous occurrences as from outright experiment.

To us the word *table* means something with a top, any kind of top, with four legs most frequently, any kind of legs, that is any size, any shape, and is used for a variety of purposes. Can a dog know *table* in that sense? Is a table anything but a special object with which the dog has special associations?

A woman who owns a large male English setter named Topper had given him a bone periodically. This always had occurred in the kitchen. Accompanying the act she always had said "Table, Topper," whereupon Topper had promptly carried the bone under the kitchen table. The woman, of course, had merely wanted to keep the rest of her kitchen floor clean. The table is a good-sized kitchen table.

Now one day there was a party in the living room. There were candy wrappers. Topper saw them and went to work on them. The woman immediately said: "Table Topper." She meant that he should take the papers into the kitchen under the table and chew them there. Instead, the dog seemed confused a moment, looked around, then deliberately walked to a small decorative coffee table, squeezed himself under it with difficulty, head far out in front, rump far out behind, and there confidently chewed. Plainly *table* in that dog's mind stood for something general, with at least two quite different examples. I invited the woman and her dog to my laboratory. I gave him a bone. At the woman's command he instantly went under a laboratory table. We tested him with all kinds of tables. The dog always went under the nearest table, never under the nearest chair or into a corner or a niche. Some weeks later the woman called me. She and the dog had been out in the large field back of their house, and the dog had dug up a buried bone. Almost idly, the woman had said: "Table, Topper." She had thought there was no table but she was wrong. At the end of the field, definitely out of sight, was an old picnic table that had been left there the previous summer. Topper knew about that table, and there he patiently carried the bone and munched.

To me it appears that the "Table, Topper" has become a stimulus for an action that includes the understanding of *table* as a fairly extended concept. In the last situation the dog has even laboriously searched out a table that he remembers and that the woman has forgotten. That is, this dog seems to understand the word with something approaching the spread of implications that it has for us.

GUSTAV ECKSTEIN

Department of Physiology,
University of Cincinnati

Interference with the Ultramicro Ascorbic Acid Method of Lowry, Lopez and Bessey

The ultramicro method of Lowry, *et al.* (*J. biol. Chem.*, 1945, **160**, 609) for the determination of ascorbic acid was used without special difficulty for nearly a year. Interference was subsequently encountered and since it may have been observed in other laboratories using this method, our experience with it and the means of avoiding it are herewith described. Interference was first encountered when an orange-red precipitate formed immediately after the addition of the dinitro-phenyl hydrazine reagent. This became progressively worse and occurred with blank, standard, and sample tubes alike. The precipitate dissolved only slightly upon addition of sulfuric acid and could not be completely removed by centrifugation. When it was possible to obtain a reading with the spectrophotometer on the reaction mixture, the values were high.

In an intensive effort to determine the cause of this precipitate, each of the reagents, including the distilled water, was systematically tested; the deep freeze storage unit was inspected for leaks of refrigerant; and other possible causative factors were sought. Finally, the cut-off ends of rubber sleeve stoppers, recommended by Lowry, *et al.* for sealing the micro tubes, were tested by extraction with 5% trichloroacetic acid, the protein precipitant used in the method. When this extract was added to the dinitro-phenyl hydrazine reagent, the characteristic precipitate formed immediately and consisted of the same needle-like crystals previously observed in the complete method.

A possible explanation for the failure of this interfering precipitate to develop when the method was first employed may be found in the fact that the rubber stoppers arrived with a protective coating. It was not entirely removed by the simple soap and water washing procedure. Perhaps the coating later wore off sufficiently to permit the liberation of some compound capable of reacting with the trichloroacetic acid and the dinitro-phenyl hydrazine reagent to produce the precipitate observed. Soaking the stoppers overnight in a 1N solution of sodium hydroxide in 80% alcohol, followed by thorough rinsing with distilled water, merely hastened the development of the precipitate.

The method is now successfully carried out by sealing each micro tube with a tiny oxygen-gas flame which closes it quickly without heating the tube contents or harming the ascorbic acid. Doubtless other satisfactory means of sealing these tubes can be found, but they should be tested first for possible interference with the reaction.

The chemical composition and properties of the precipitate are under investigation by one of us (R.R.S.)