Water Droplets: Rayleigh's Work

It is at least of historical significance that investigations, similar to R. Gunn's (*1*), of water droplets were reported by Lord Rayleigh (*2*) nearly a century ago. Rayleigh's work indicates that the electrical nature of droplet interaction was accepted at the time he first reported his work. His reports describe experiments aimed at discerning the manner in which electricity acts on the droplets, and the influence of soap film and dust contamination. The use of external vibration to regularize the droplet formation—which Gunn does with his "synchrodropper" and others with other devices (*3*)—and of either a rotating chopper or a periodic spark aided observation of the interaction. The sketches of the interacting droplets presented in Rayleigh's second paper are strikingly similar to the cover photograph of the issue of *Science* in which Gunn's article appears.

That Rayleigh was aware of the implications of these studies is indicated by the concluding comment of his first paper: ". . . we may thus anticipate an explanation of the remarkable but hitherto mysterious connection between rain and electrical manifestations."

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References

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3. J. M. Schneider and C. D. Hendricks, *Rev. Sci. Instr.* **35**, 1349 (1964); W. R. Atkinson and A. H. Miller, *ibid.* **36**, 846 (1965).

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Transfer of Learned Response by RNA Injection: Failure of Attempts to Replicate

There have been several recent reports of behavioral effects of injections of RNA extracted from the brains of trained rats (*1*, *2*). In one of these, Babich, Jacobson, Bubash, and Jacobson (*1*) trained rats to approach a food cup when a click was presented, and found that, after RNA from the brains of rats so trained was injected into the body cavity of untrained rats, the latter showed a significant tendency to approach the food cup when the click was presented.

We have failed to replicate the results of Babich *et al.* in two successive attempts. In both attempts the strain and age of the subjects and the behavior procedures were apparently identical to those reported by Babich *et al.*, except that (i) our Grason-Stadler-Skinner box had its food cup in the center of one wall rather than in one corner, (ii) food powder was not sprinkled over the grid floor, (iii) our brain sample included the most rostral portions of the brain except for the olfactory bulbs, whereas Babich *et al.* had discarded the "frontal areas" (*3*), and (iv) the extraction as well as the behavior procedure was run "blind" and the subjects were renumbered between the 8- and 22-hour trials in a manner unknown to the observers until completion of testing.

In our first experiment we had four experimental and five control rats (*4*). The tests of behavior procedures were the same as those reported by Babich *et al.* except as noted above. The biochemical procedures described by Babich *et al.* were followed except that the brain was ground with glass beads (0.1 mm in diameter) instead of sand, and all centrifuging was at 20,000 rev/min (50,000*g*) for 20 minutes. However, we found that this procedure left traces of phenol which interfered with determination of the amount of RNA in each sample from the optical density at 260 mμ. Subsequent analysis of one additional sample prepared at this time, but not injected, indicated that it did contain RNA. Approaches totaled 2, 3, 5, and 7, respectively, for the experimental rats (trained RNA) and 2, 3, 5, 6, and 7 for the control rats (untrained RNA). There was no intertrial trend for either group.

In the second experiment six experimental and seven control rats were used. The behavior procedures were identical to those described above, except that an additional trial 2 hours after injection was given. The biochemical procedures were modified to eliminate phenol contamination and increase the yield of RNA. The phenol phase from the first extraction was reextracted with 2.6 ml of water and centrifuged. The aqueous phases from both extractions were combined, and the RNA was precipitated with cold ethanol. The centrifuge tubes containing the RNA pellet were rinsed with 5 ml of 70-percent ethanol and drained. The RNA was dissolved in 1.5 ml of saline, and the remaining phenol was removed by two successive extractions with 3.5 ml of ethyl ether at 0°C. The ether was discarded, and traces of ether were removed from the samples with a stream of nitrogen. Each of the samples then showed a spectrum with a peak around 257 mμ. The mean RNA yield was 0.43 mg. Approaches on the last five trials totaled 1, 1, 2, 4, 6, and 10, respectively, for the experimental rats and 0, 4, 5, 6, 7, 8, and 11 for the control rats. As in the first experiment, the groups did not differ significantly on any particular trial (including the first one), nor was there any relation between amount of RNA injected and responses for either group. Again, there was no intertrial trend for either group.

The greater number of responses made by our control groups in both experiments (median = 5.5) than by the control groups in Babich *et al.*'s study (median = 1) is somewhat puzzling. Subsequent to completion of our experiments we received a more detailed account of their behavioral-test procedure (*5*), but it did not reveal any differences between our procedure and theirs.

In summary, we failed twice to reproduce the results of Babich *et al.* Presumably this failure was due to some (unknown) procedural differences other than the seemingly trivial ones mentioned above.

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References and Notes

1. F. R. Babich, A. L. Jacobson, S. Bubash, A. Jacobson, *Science* **149**, 656 (1965).
2. E. J. Fjerdingstad, Th. Nissen, H. H. Røigaard-Petersen, *Scand. J. Psychol.* **6**, 1 (1965).
3. Inclusion of this region of the brain in our study is unlikely to have been relevant to the difference between our results and those of Babich *et al.* (*1*), since in a subsequent similar study which replicated their earlier findings, they also included this region (*5*).
4. A fifth experimental rat died after three trials in which it had made one response. It had become rather sickly by the end of the habituation procedure.
5. A. L. Jacobson, personal communication, October 1965.
6. We thank the Department of Psychology and of Nutrition and Food Science, Massachusetts Institute of Technology, for lending us equipment; R. Lange for serving as co-observer in the first experiment and Mr. W. Zachmann in the second; and E. Khairallah for suggesting the ether-extraction procedure. Supported by NIH grant HD01907 and NSF grant GB-4104.

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