

subsequent events (intromission, ejaculation, adult copulation) were not influenced. Consequently, it is not possible to claim that pinealectomy advanced puberty, at least in the behavioral sense, in these animals.

Body weights obtained before each behavioral test showed no difference between pinealectomized and sham-operated males at any time during the experiment. Testicular weights for the two groups were not significantly different when animals were killed at 141 days of age. Histological examination of testes of animals in each group revealed no structural abnormality, and spermatogenesis appeared well advanced in all instances.

Pinealectomy may indirectly accentuate mounting and hasten pelvic thrusting by somehow allowing a temporary increase in secretion of androgens by the maturing testes of light-deprived males. Alternately, it is possible that pinealectomy affects these responses by acting directly on the preoptic and anterior hypothalamic structures necessary for normal copulation in male rats (9). Whatever the mechanism for its action, the pineal gland apparently influences only the early ontogeny of the male sex response and not the subsequent appearance of behavior patterns needed for reproduction.

MICHAEL J. BAUM

Allan Memorial Institute,
McGill University,
Montreal, Quebec, Canada

References and Notes

1. J. I. Kitay and M. D. Altschule, *The Pineal Gland* (Harvard Univ. Press, Cambridge, Mass., 1954).
2. Y. Izawa, *Amer. J. Physiol.* **77**, 126 (1926); H. Simonnet, L. Thiéblot, T. Melik, *Ann. Endocrinol.* **12**, 202 (1951); J. I. Kitay, *Endocrinology* **54**, 114 (1954).
3. R. J. Wurtman and J. Axelrod, in *Structure and Function of the Epiphysis Cerebri*, J. A. Kappers and J. P. Schädé, Eds. (Elsevier, New York, 1965), p. 520.
4. R. J. Wurtman, J. Axelrod, E. Chu, *Science* **141**, 277 (1963).
5. J. I. Kitay, in *Neuroendocrinology*, L. Martini and W. F. Ganong, Eds. (Academic Press, New York, 1967), vol. 2, p. 641.
6. R. J. Reiter, J. C. Hoffman, P. H. Rubin, *Science* **160**, 420 (1968).
7. S. Levine and R. Mullins, Jr., *ibid.* **144**, 185 (1964).
8. K. Larsson, *J. Comp. Physiol. Psychol.* **63**, 223 (1967).
9. L. Heimer and K. Larsson, *Brain Res.* **3**, 248 (1966).
10. Female sex hormones were supplied by Ciba Co. Ltd. M.J.B. holds a postgraduate studentship from the National Research Council of Canada. Supported in part by grants to R. B. Malmo from the National Research Council and Defense Research Board of Canada, and National Institute of Mental Health (USPHS). I thank R. B. Malmo and R. J. Wurtman for criticizing the manuscript.

22 July 1968

1 NOVEMBER 1968

Organic Particles in the Ocean

To develop his model of the Precambrian environment and the development of life (1), Weyl assumed that particulate organic matter suspended in the Precambrian Sea sank and that some of it was concentrated on the permanent pycnocline. However, there is information from (other) studies which make this assumption doubtful.

The distribution of particulate organic matter in the sea does not appear to be influenced by density discontinuities (2). Instead, the distribution of this material seems to be controlled by circulation of water masses (3). Also, I have many unpublished data of concentrations of particulate organic carbon suspended in temperate and tropical areas over the shelf, slope, and basins of the Pacific and Atlantic oceans. Some of these were collected specifically to study the influence of the density structure of the sea on the distribution of organic particles. None of the data indicates that concentrations of particulate organic carbon are larger in, rather than above or below, seasonal and permanent pycnoclines. These results can be explained either if particles are not concentrated on pycnoclines, or if they are concentrated and are rapidly decomposed. The second explanation is unlikely because a decrease in concentration of dissolved oxygen at the pycnocline relative to the surrounding water should then occur and never is apparent. Thus the bulk density of the particulate organic matter in present seas must be different from that formed in the Precambrian Seas or one of Weyl's basic assumptions is incorrect.

LOUIS A. HOBSON

Biology Department,
Woods Hole Oceanographic Institution,
Woods Hole, Massachusetts 02543

References

1. P. K. Weyl, *Science* **161**, 157 (1968).
2. J. Krey, *Kiel. Meeresforsch.* **20**, 18 (1964); D. W. Menzel, *Deep-Sea Res.* **14**, 229 (1967); N. W. Rakestraw, *J. Marine Res.* **17**, 429 (1958); G. A. Riley, D. Van Hemert, P. J. Wangersky, *Limnol. Oceanogr.* **10**, 354 (1965).
3. G. Dal Pont and B. Newell, *Austral. J. Mar. Freshwater Res.* **14**, 155 (1963); E. Hagmeier, *Kiel. Meeresforsch.* **20**, 12 (1964); L. A. Hobson, *Limnol. Oceanogr.* **12**, 642 (1967).

22 July 1968

The observations on particulate organic matter in the ocean of the Present era show that this matter is produced at the sea surface, where the concentration, although patchy, is a maximum,

and that the concentration drops off with depth because of consumption by organisms. In the prebiotic, reducing ocean, there would have been no loss by feeding or oxidation, and hence the vertical distribution of the particulate organic matter would have been different. The paper by Menzel (1) gives a detailed vertical section of the concentration of particulate organic matter between South America and the Galápagos Islands; unfortunately data on the density-gradient layer is not included. Data for the months of interest (2) show that the mixed layer only extends to about 10 to 15 m, while the high concentrations of particulate organic matter in Menzel's data extend to, or below, 20 m, and in two instances show a peak in the upper part of the density-gradient layer in spite of consumption.

Whether organic aggregates will be concentrated by a density-gradient layer depends on their size and density. No data on the density distribution of organic aggregates is known to me. What one would really like to know is the size and density distribution of abiotically formed aggregates, whose size distribution has not been altered by possible passage through an organism. Concentration in the density-gradient layer will result if a significant fraction of the aggregates falls in the density range of the layer. The concentration of small aggregates that are denser than the range found in the density-gradient layer will also result from the reduced vertical turbulence in the layer. At the present time, this effect is masked by grazing, by the patchiness of production (1), and by possible consolidation as the aggregates pass through organisms.

My hypothesis would be refuted if experiments show that inorganic processes in a reducing sea do not produce organic aggregates whose rate of sinking would be significantly affected by the density-gradient layer. The vertical distribution of particulate organic matter at the present time must also be influenced by the density distribution in the water, although, as pointed out by Hobson, other factors seem to dominate.

PETER K. WEYL

Main Sciences Research Center,
New York State University,
Stony Brook 11790

References

1. D. W. Menzel, *Deep-Sea Res.* **14**, 1279 (1967).
2. K. Wyrski, *Deut. Hydrograph. Z. Suppl. Ser. A* **8**, No. 6, 46 (1964).