# Symposium on Neurosecretion at Naples, Italy

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VARIOUS ASPECTS of the problem of neurosecretion were discussed at a symposium held May 11 through 16, 1953, at the Naples Zoological Station. Twenty-eight papers and a number of demonstrations were presented by investigators from Denmark, England, France, Germany, Italy, Japan, Saarland, Sweden, and the United States. There were, in addition, "observers" from different countries who wished to acquaint themselves with recent results in the fast-developing field of neurosecretion.[1]

Surveys on the historical development of the concept of neurosecretion in the vertebrates (E. Scharrer, USA), and the invertebrates in general (B. Scharrer, USA), the crustaceans in particular (Welsh, USA), and the physiology of the hypothalamic neurosecretory system in the vertebrates (Bargmann, Germany) served as introductions to papers on the morphology and physiology of neurosecretory cells in invertebrates and vertebrates. Abstracts of these communications will appear in the *Pubblicazioni della Stazione Zoologica* with references to papers published in extenso in various journals. This report briefly notes only results of general interest as they evolved from the discussions.

Neurosecretory cells represent a distinct cell type. They do not appear haphazardly in the nervous system, but form definite groups which are always found in a location that is characteristic of a given type of animal. Their products may be stained by several techniques, of which the chrome hematoxylin phloxin method of Gomori is, as Bargmann showed, the most selective. Of particular interest were the observations demonstrating the transport of the neurosecretory material along the axons of the cells that elaborate it. The original experiment of Hild, who showed in the frog that the neurosecretory material accumulates proximal to the site of an interruption in the neurosecretory pathway, was repeated by B. Scharrer in the insect *Leucophaea,* by Stutinsky (France) in the eel and the rat, by Mazzi (Italy) in the newt, by Benoit and Assenmacher (France) in the duck, by Zetler and Hild (Germany) and Scharrer and Wittenstein (USA) in the dog, always with the same result. The demonstration by E. Thomsen (Denmark) of the accumulation of neurosecretory granules proximal to the site of a ligation of a nerve carrying the material in the fly, *Calliphora,* was particularly elegant. Finally, Carlisle (England) reported the actual observation of movement of neurosecretory material in living nerve fibers of crustaceans by means of phase-contrast microscopy. Bounhiol, Arvy, and Gabe (France) were able to correlate different phases of the proximo-distal transport of the neurosecretory material in the silkworm with a sequence of events in postembryonic development.

The development and maturation of neurosecretory systems constitutes a field still to be explored. Only one communication (Wingstrand, Sweden) dealt with this aspect, in the chick embryo. Strictly speaking, the neurohypophysis is not an endocrine organ; the hormones extractable from it are produced by neurosecretory cells in the hypothalamus and are merely stored in the posterior lobe (Zetler and Hild). The comparative anatomy of the neurohypophysis is, therefore, of renewed interest (Hanström, Sweden). Similarly, the corpora cardiaca of the insects serve as storage organs for the neurosecretory substance derived from the brain (B. Scharrer). In this case there is cytological (Arvy and Gabe; M. Thomsen, Denmark) as well as experimental (Wigglesworth, England) evidence to indicate an additional secretory activity and a concomitant endocrine function of the tissue of the corpora cardiaca in its own right. The role of the sinus gland and related structures (Knowles, England) of the crustaceans is in many respects analogous to that of the neurohypophysis and the corpora cardiaca. Bliss (USA) and Enami (Japan) showed that fiber bundles from a number of neurosecretory cell groups of the crustacean central nervous system end in the sinus gland, in which the neurosecretory substance is stored. Removal of the neurohypophysis (Stutinsky) or of the sinus gland (Bliss, Enami) leads to essentially the same result, i.e., as new nerve terminals regenerate from the cut ends of the nerves, neurosecretory material is again seen to accumulate at the nerve endings. Interesting observations of the appearance of neurosecretory systems under different experimental conditions were reported by Azzali (Italy) in bats, Mazzi in amphibians, Possompès (France), and Grandori (Italy) in *Diptera,* Dupont-Raabe (France) in phasmids, etc.

Throughout the symposium a highly satisfactory correlation was achieved between the results obtained by morphological and by physiological methods; physiological data alone (Koller, Saarland) seem insufficient to establish a neurosecretory process. Equally important was the good agreement of observations made in invertebrates and vertebrates; the general conclusions were, therefore, not based on isolated

[1] For reviews see: E. Scharrer and B. Scharrer, *Biol. Revs.,* **12**, 185–216 (1937); *Research Pubs. Assoc. Research Nervous Mental Disease,* **20**, 170–194 (1940); *Physical Revs.,* **25**, 171–181 (1945); In W. von Möllendorff and W. Bargmann, Eds., *Handbuch d. mikrosk. Anat. d. Menschen.* VI/5, Heidelberg: Springer (in press); In G. Pincus, Ed., *Recent Progress in Hormone Research,* IX, New York: Academic Press (in press).

cases, but concerned fundamental phenomena common to all animals in which neurosecretion has been studied.

Stahl and Seite (France), DeLerma (Italy), Enami, and M. Thomsen described various aspects of the cytology and cytochemistry of neurosecretory cells in different animals. The view, advanced some years ago, that neurosecretory material is formed in the cell at the expense of basophil constituents has not been refuted by newer observations, but has not been definitely proved. Comparatively little use has as yet been made of methods permitting the observation of living neurosecretory cells. Passano (USA) and Carlisle demonstrated the suitability of phase microscopy, E. Thomsen that of darkfield illumination. The physical and chemical properties of the substances produced by neurosecretory cells are under investigation in various laboratories, but the results do not yet permit generally applicable conclusions.

The question was often raised: In which way is the study of neurosecretion likely to proceed? One of the major problems concerns the mechanism by which the hypothalamus controls the adenohypophysis. Benoit and Assenmacher presented evidence obtained in birds that neurosecretion may play a role, but this was contested by Zuckerman (England) on the basis of observations in mammals. In various animals there are additional groups of secretory neurons the investigation of which may lead to the discovery of new hormones. Indeed, Waterman (USA) and Enami added the lateral white body ("rudimentary eye") of the xiphosuran *Tachypleus* to the neurosecretory organs whose functions are still to be explored.

The success of the symposium was due to the cooperation and hospitality of the Stazione Zoologica, now again a center of biological research in Europe, and the financial assistance rendered to individual participants by government agencies and private foundations of the countries represented at the symposium.

The next meeting on neurosecretion will be held at the University of Lund, Sweden, at the invitation of Professor Bertil Hanström.

# Friends of Pleistocene Glacial Geology Field Meeting, Ayer Quadrangle, Massachusetts

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THE ANNUAL FIELD MEETING of the Friends of Pleistocene Glacial Geology was held on Saturday and Sunday, May 23 and 24, in the Ayer, Massachusetts, quadrangle and adjacent areas. About 75 geologists were present. The meeting was under the leadership of L. W. Currier, assisted by J. H. Hartshorn and others of the staff of the Massachusetts cooperative geologic program, of the U.S. Geological Survey.

The recently published surficial geology map of Ayer quadrangle, by R. H. Jahns, was used as a background for the meeting. This map is on a scale of 2 inches to a mile and shows, in great detail, the various glacial and Recent landforms of the area, and bedrock exposures. A special feature is a smaller colored map (scale 1:48,000) that shows numerous outwash sequences in relative chronological order, and that illustrates a new method of field mapping and geologic cartography in New England, as devised by Jahns. The principal object of the field trip was to study the outwash sequences and the basis for separation of the outwash features into the various sequences. The first day was spent in the eastern half of Ayer quadrangle. The second day was spent in the northeastern quarter of Hudson quadrangle and the northwestern quarter of Maynard quadrangle, both mapped recently by W. R. Hansen and the maps now in preparation for publication.

Identifiable end moraines are conspicuously absent in southern New England except on Cape Cod, around Buzzards Bay, and in the coastal part of southern Rhode Island and southeastern Connecticut. The late Pleistocene (Wisconsin) deglaciation appears to have been characterized by the stagnation and disintegration of the frontal zone of the ice sheet, leaving blocks and essentially motionless tongues of ice in the valleys. Meltwater deposited impressively great quantities of outwash materials around and within the blocks as kame terraces, kame plains, and ice-channel fillings, and along the valleys as pitted outwash plains. The whole assemblage might be broadly considered as making up long valley trains in which ice-content forms are particularly abundant. Locally deltaic deposits (deltas and kame deltas) and lake bottom deposits were formed in small lakes of relatively short duration, where valley outlets were blocked by ice, glacial deposits, or bedrock; subsequent melting of ice barriers within valleys and lowering of other barriers by erosion permitted draining of these ponded areas through various and successive outlet channels.

For the most part present swamp areas were the sites of remnant ice blocks that persisted while outwash gravel and sand were being deposited around and on them, or in channels across them. Some swamps, generally the smaller ones, however, occupy depressions in glacial deposits. Till covers the upland areas and