such committees and their method of formation ought to be locally determined in order to meet special conditions in each country, but it is strongly urged that they be broad in scientific disciplines and in representation from both private and public agencies. These committees should operate in a manner best suited to the interests and possibilities of each country and should be aimed at encouraging research and spreading information, utilizing UNESCO as a clearinghouse in this field. (ii) Creation of a preliminary project to explore the feasibility of an abstracting service on arid-zone literature. A periodical, patterned after existing successful abstracting journals, would include, as soon after original publication as possible, abstracts of technical, economic, and social literature related to arid-zone problems and research. Consideration should be given to the desired business and production organization, the volume of material to be included, the subject-matter divisions, the availability of abstractors, the cost of publication, the required subscription price, and so forth. A target date for the report on this feasibility study should be 1 year from the adoption of this recommendation by some agency capable of committing funds. (iii) Encouragement of the formation of research organizations, comprehensive in discipline and concerned with the best use of specific limited resources. Such organizations should be encouraged in all arid lands through adequate and broadly based financial support and through organized community interest.

Also see recommendations 2, 3, 4, 5, 10, 13, 18, and 21.

Comments on these recommendations will be welcomed. They should be addressed to John A. Behnke, AAAS.

The Grand Theme of Stephen Polyak

Stephen Polyak, who died in his home in Chicago on 9 March, was one of the great neuroanatomists of our time, destined to outlive the brief span of his 65 years in monumental contributions to the knowledge of the visual pathways, particularly the retina. To the excellent appreciation by his colleague anatomists in the *Journal of Comparative Neurology,* some words by a physiologist can only add the perspective created by distance of approach to his research and emphasize its general significance.

Polyak contributed important papers to the histology of the brain, its afferent pathways as well as the cochleo-vestibular end organs, and was one of the foremost experts on the microscopic anatomy of the central nervous system. Like the greatest of his teachers, Ramón y Cajal, he became fascinated by the histology of the retina. But, whereas Cajal began with the retina, describing it in his autobiography as the oldest of his laboratory loves, and then proceeded to investigate the same types of cells in other parts of the central nervous system, Polyak's research went in the opposite direction, from the central nervous system down to its projections in the retina. Captivated by this, the noblest of our sense organs, he wrote: "The study of the retina, begun almost by accident, stimulated me to experiment with different methods and material, including human eyes, and led to my systematic reading of the literature pertaining to the anatomy of the eye and the physiology of vision. This, in turn, caused me to do more research and to conduct further experiments, until, submerged as I was in this work, I almost lost count of the years that seemed to be passing by like months, while the notes and the figures were accumulating into an ever-increasing pile. . . . Indeed, from a casual problem my program developed, in the course of a few years, into a grand theme—big enough to fill a lengthy life." It filled 30 years of his life, a period of increasing technical perfection, happy creation, and penetrating scholarship. It took him back again to the central projections of the visual pathways and culminated shortly before his death in a book of some 1600 pages on *The Vertebrate Visual System,* now being posthumously edited by H. Klüver of the University of Chicago.

Polyak, a Jugoslavian by birth, survived innumerable vicissitudes of World War I—imprisonment, fighting, disease—to find himself, a young physician interested in neurology, being taken care of by the Rockefeller Foundation as a research fellow studying in London with G. Elliot Smith (1924–25). In 1925 he worked in Madrid under Ramón y Cajal. His association with the University of Chicago began in 1926 in collaboration with C. Judson Herrick and K. S. Lashley. In the meantime his position at Zagreb was given to a colleague and so he returned to the United States, this time as assistant professor of neuroanatomy in response to an invitation by the University of California. In 1930 he went to the University of Chicago, serving in turn as assistant professor of neurology, associate professor of neurology (1932–37), and finally as professor of anatomy until his death. It is to the everlasting credit of this institution that it supported for a quarter-century not only Polyak's research but also the scholarly publications in which he synthesized the whole literature on the visual and other afferent pathways. The posthumous work, completed in a race with death, will contain approximately 10,000 references.

Attitude no less than achievement serves to characterize a scientist, and by both criteria Polyak ranked high. In the words quoted here he emerges, true to life, as a lone worker rather than as partner of a team or leader of research groups, a man intent on devoting his life to what he felt to be a "grand theme." Everything related to this theme had to be considered and penetrated. He became an unrivaled master of the Ehrlich technique and the Golgi silver chromate stain, an expert on the history of physiological optics, and a competent judge of present-day neurophysiological modes of approach to the subject of vision.

His book of 1941, *The Retina,* was immediately hailed as a classic. It gave the first complete description of the primate retina and was based on thorough research. Several new discoveries related to the synaptic organization of the retina, especially the amacrine and bipolar cells and the centrifugal pathways within the retina, were announced. He described the midget bipolars and, in this connection, the different mono- and polysynaptic organizations of cone and rod pathways and showed that the two types of receptor also have paths in common, as has since been amply borne out by physiological studies. For generations to come his work will be the leading source of reference for those interested in the way in which the retina collects and elaborates information for delivery to the higher centers.

The solitary worker may receive few honors—and Polyak had few if any—but may nevertheless by his attitude and achievements create values that the scientific world does well to remember.

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