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THE SPECIES COMPLEX IN BIOLOGY AND EDUCATION[1]

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THIS afternoon I propose to discuss a certain mental trait which looms conspicuously in the background whenever I reflect upon the history of biology or upon academic procedures as I have observed them these many years. It is the innate propensity of active minds to form species, *i.e.*, successively to make distinctions, to point out similarities and then to assemble the things that are alike into their kinds. It applies to everything from chemical elements to college fraternities. Since the Latin word "species" is synonymous with the English word "kind" even to the point of being adequately indefinite I shall employ it in a wide and general sense which, indeed, accords with its earlier usage.

This mental trait is not a simple one. It is made up of a strong emotional factor, an inborn urge to put things in order and, alas, keep them there; of the intellectual faculty of discernment and discrimination which perceives distinctions and similarities; and of the constructive imagination which makes it possible to assemble in the mind things that are widely separated in space and time. For convenience I presume to call this trait the species-forming complex or, for short, the "species complex."

I shall first point to a few characteristic effects, good and bad, of the operation of the species complex in general; then to some of its accomplishments in the field of biology; and finally, shall venture to suggest that the recognition of the characteristics of this trait in human beings is desirable as we face the problems of the day inside and outside of the university.

The species complex often manifests itself in the

[1] Address at the Graduate Convocation of Brown University, June 17, 1939.

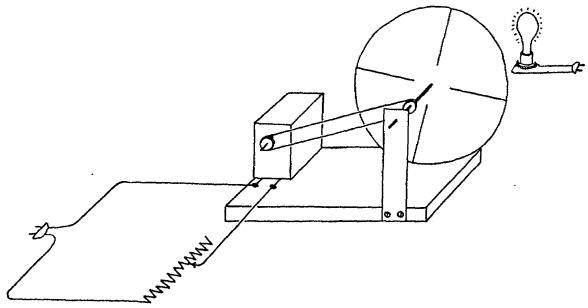

FIG. 1. A simple stroboscope.

number of rotations of the disk in a given period of time, which, when multiplied by the number of slits, will give the corresponding number of ciliary beats.

Organisms which will not move about much or side-view preparations of ciliated epithelium are best suited for demonstration purposes. Rotifers like Philodina and various attached Infusorians are excellent material, although with proper handling even an active form like Paramecium can be used.

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A NEW MATERIAL FOR MOUNTING NERVE TISSUE SECTIONS IN PARAFFIN FOR SILVER STAINING OR RESTAINING

EGG albumin solution used to affix nerve tissue sectioned in paraffin to slides has not proven completely satisfactory. Sections so mounted are easily lost when the slides are passed through the various solutions. The histological picture obtained in those sections successfully carried through is not absolutely clear. While attempting to remove the haziness from such material, it soon became evident that the proteins of the albumin are responsible for the gray background. Some other mounting media were therefore considered. One which would have no reducing properties and which would, at the same time, hold the sections in place was desired. Because of the inertness of starch, a paste of this substance was tried. The following form of paste gave the most satisfactory results: 1 gm starch thoroughly mixed with 10 cc of cold water was added to 20 cc of boiling distilled water and constantly stirred until the suspension, which is opalescent, is uniform and free from lumps. Two drops of hydrochloric acid were then added, and the solution was boiled for an additional three to five minutes. After cooling, a small crystal of thymol was added as a preservative. The result is a clear thin paste which is used very much the same as the albumin fixative. The paraffin sections which are placed on the slide covered with the hydrolyzed starch suspension are allowed to dry for two to three days in an oven at 45° C.

This fixing material was used on sections from various sized blocks of tissue which had been impregnated with silver according to Bielschowsky's or Cajal's method. These blocks were sectioned and mounted serially. Out of 500 sections of one series, only one section was lost in the solutions. In all cases, the resulting pictures were clear. No precipitate was evident.

In another series of tests, fresh formalin fixed tissue was sectioned in paraffin and impregnated after being fixed to the slide. In this way a quite even staining reaction was obtained. The inevitable gradations which occur in mass staining were avoided. In addition, the time necessary for impregnation was reduced to less than half. These sections were mounted and dried, passed through xylol into water, through the graded alcohols, and washed for about fifteen minutes and then allowed to remain in pyridine over night. Next, the tissues were washed in distilled water for about ten minutes and put into a solution of 5 per cent. silver nitrate for three hours in the dark. They were then transferred into a solution of ammoniacal silver nitrate, *i.e.,* 200 cc of 5 per cent. silver nitrate solution plus 5 cc of 10 per cent. sodium hydroxide. Add ammonia, drop by drop, until the precipitate dissolves. The sections are allowed to remain in this solution for half an hour, then rapidly washed in distilled water, placed in a 10 per cent. formalin solution for about 5 minutes. After this, they are washed again and may be toned in gold and left in hypo for two minutes, then dehydrated, cleared and covered in the usual way.

This method stains the cells as well as neurofibrillae. Further work is being done in applying this method to other routine neurological techniques, such as Bodian's, modified Bielschowsky's and Ranson-pyridine methods.

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BOOKS RECEIVED

COLEMAN, LAURENCE V. *The Museum in America.* Vol. I, pp. viii + 218. Vol. II, pp. xiii + 221–428. Vol. III, pp. xviii + 431–730. Illustrated. American Association of Museums, Smithsonian Institution, Washington. Three volumes, $7.50.

HOLBROOK, STEWART H. *Iron Brew; a Century of American Ore and Steel.* Pp. viii + 352. Macmillan. $2.50.

KUDO, RICHARD R. *Protozoology.* Second edition. Pp. xi + 689. 291 figures. Charles C Thomas. $6.50.

NEURATH, OTTO. *Modern Man in the Making.* Pp. 159. Illustrated. Knopf. $2.95.

NORDENMARK, N. V. E. *Pehr Wilhelm Wargentin.* Pp. v + 464. Illustrated. Kungl. Svenska Vetenskapsakademien. Almqvist & Wiksells, Uppsala.

PORTER, ANNIE. *The Larval Trematoda Found in Certain South African Mollusca.* Publication No. XLII, Vol. VIII of the South African Institute for Medical Research. Pp. 492. 83 plates. 1 figure. The Institute, Johannesburg.

STEVENS, BLAMEY. *The Psychology of Physics.* Pp. xvi + 282. 59 figures. Sherratt & Hughes, Manchester, England. 7s. 6d.