

TABLE 1  
LATENT PERIODS OF SPAWNING REACTIONS OF FEMALE  
OYSTERS

Female	Male	Temp. °C.	Lat. per. mins.
<i>O. virginica</i> × <i>O. virginica</i>		23	9
“	“	23	20
“	“	23	21
“	“	23	24
<i>O. virginica</i> × <i>O. gigas</i>		22	15
“	“	22.5	17
“	“	23	26
<i>O. gigas</i> × <i>O. gigas</i>		27.5	15
<i>O. gigas</i> × <i>O. virginica</i>		27	9.5
“	“	27	8.0

for stimulation. This may indicate that the sexual products of both species possess similar active principles which induce the spawning reactions.

Eggs of both species were easily fertilized by either sperm, the ensuing development resulting in apparently normal straight hinge larvae. Comparison with controls showed no increased mortality among the hybrids.

P. S. GALTISOFF  
R. O. SMITH

U. S. BUREAU OF FISHERIES

### THE STRUCTURE OF CHROMOSOMES OF *ZEA MAYS* AS REVEALED BY THE FEULGEN REACTION

DURING the progress of a series of studies on the microchemistry of the nucleolus, the Feulgen reaction for thymonucleic acid<sup>1</sup> was applied to root-tips of *Zea mays* fixed according to Zirkle<sup>2</sup> in a solution of sulfuric acid 2 cc, formalin 10 cc, distilled water 90 cc, with a pH of < 1.0.

Staining with haematoxylin after the above fixative, Zirkle found the chromatin reticulum and periphery of the later spireme and of the chromosomes stained blue, while the nucleoli and “core” of the spireme and of the chromosomes remained colorless. He also describes a physical connection between the nucleolus and the spireme.

Feulgen staining bears out the haematoxylin demonstrated morphology to a startling degree. In the resting cell and early prophase, chromatin granules, chromatin reticulum and spireme are stained a solid, intense reddish-violet; as mitosis progresses and the diameter of the spireme increases, a minute canal appears within the spireme and extends its full length. The appearance of this canal or “core” is accom-

<sup>1</sup> R. Feulgen, “Die Nuclealfärbung.” Handbuch der biologischen Arbeitsmethoden, 213: 1055–1073. 1926.

<sup>2</sup> C. Zirkle, “Nucleolus in Root Tip Mitosis in *Zea Mays*.” Botanical Gazette, 86: 402–418. 1928.

panied by a decrease in the size of the nucleolus; as the spireme increases in cross-section, there is a corresponding increase in the size of its “core” and a decrease in the amount of nucleolar material visible.

The late prophasic chromosomes have the appearance of tubules of almost uniform bore; the nucleolus may disappear entirely or vestiges may remain to follow the chromosomes to the equatorial plate and again to the poles.

Using monochromatic and polarized light at the highest magnifications available, the writer was unable to observe a physical connection between the nucleolus and the spireme, or to ascertain definitely the existence of nucleolar or other material within the latter. Neither was he able to find mitotic stages which revealed the behavior of the chromosomal “core” during the splitting of the chromosomes at the equatorial plate and during reconstruction, although at the equatorial plate the chromosomes show distinctly their “tubular” structure.

The external diameters of the spiremes and chromosomes, after this fixation, are, taking measured averages, no greater than the external diameters of the spiremes and chromosomes of similarly situated cells, in the same phases, following other fixations. The outlines of the cells are smooth, the surfaces of the spiremes and chromosomes show no undue irregularity; in short, there is no evidence of an artifact greater than that resulting from the fixing of the cells by other methods.

While “tubulated” chromosomes have been described many times previously, they were almost invariably demonstrated by the cruder stains whose action is dependent upon mordanting, length of time of staining and destaining, and various other purely physical factors. Their description after a method which stains chromatin with chemical selectivity may aid in an interpretation of their true structure.

GILBERT M. BLUNT

ZOOLOGICAL LABORATORY  
STATE COLLEGE OF WASHINGTON

### BOOKS RECEIVED

- BRUN-BLANQUET, J. *Plant Sociology*. Pp. xviii + 439. 178 figures. McGraw-Hill. \$4.50.  
FOX, H. MUNRO. *Biology*. Pp. xiv + 344. 151 figures. Cambridge University Press, Macmillan.  
HARDY, ARTHUR C. and FRED H. PERRIN. *The Principles of Optics*. Pp. xiii + 632. 319 figures. McGraw-Hill. \$6.00.  
METCALF, Z. P. *An Introduction to Zoology*. Pp. xix + 425. 184 figures. Charles C. Thomas. \$3.50.  
SHAW, SIR NAPIER. *Commission Internationale de la Haute Atmosphere. Comptes Rendus des Jours Internationaux, 1924*. Pp. 161. Illustrated. Royal Meteorological Society, London.  
SÖRENSEN, JON. *The Saga of Fridtjof Nansen*. Pp. 372. Illustrated. Norton. \$4.50.  
*Training Teachers in Supervised Farm Practice Methods*. Pp. vii + 125. Federal Board for Vocational Education.

THE WISTAR INSTITUTE  
BIBLIOGRAPHIC SERVICE  
ISSUES  
AUTHORS' ABSTRACTS

of all papers appearing in the journals listed below prior to publication of the articles in full. By this advance information biologists may familiarize themselves with *contemporary research* in a minimum of time.

**Advance Abstract Sheets** are issued twice a month, each sheet containing ten or more authors' abstracts. Subscription rate is \$3.00 per year.

**Bibliographic Service Cards**, following the Advance Abstract Sheets, also are issued twice a month. In addition to the authors' abstracts, the cards provide subject headings and complete bibliographic reference. The cards are convenient for filing and library records. Price, \$5.00 per year.

At regular intervals the authors' abstracts are assembled and published in book form with complete authors' and analytical subject indices. Price, \$5.00 per volume. Liberal discount to subscribers to the Bibliographic Service Cards.

JOURNAL OF MORPHOLOGY  
THE JOURNAL OF COMPARATIVE NEUROLOGY  
THE AMERICAN JOURNAL OF ANATOMY  
THE ANATOMICAL RECORD  
THE JOURNAL OF EXPERIMENTAL ZOOLOGY  
AMERICAN ANATOMICAL MEMOIRS  
AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY  
JOURNAL OF CELLULAR AND COMPARATIVE PHYSIOLOGY  
FOLIA ANATOMICA JAPONICA (Tokyo, Japan)  
PHYSIOLOGICAL ZOOLOGY (Chicago, Illinois)  
STAIN TECHNOLOGY (Geneva, New York)  
ECOLOGICAL MONOGRAPHS (Durham, North Carolina)

The Wistar Institute of Anatomy and Biology  
Philadelphia, Pa., U. S. A.

Second Edition: Revised and Enlarged

**THE RAT: DATA AND REFERENCE TABLES**

Memoir No. 6: 458 pages. Bibliography: 2206 titles  
HENRY H. DONALDSON

Published by THE WISTAR INSTITUTE  
Philadelphia, Pa., U. S. A. Price, \$5.00

The Rat: A bibliography, 1924-1929.

L. E. DRAKE and W. T. HERON

1353 titles—with subject index.

Price—50 cents

Orders may be sent to

The Wistar Institute, 36th Street & Woodland Ave.,  
Philadelphia, Penna.

Neat	A I T C H T U E S S	No Gas Storage
Novel		No Nuisance
Efficient		No Danger
H <sub>2</sub> S		Write
for the Laboratory		for Details

Phila. Special Chemicals Co.  
1833 Chestnut Street, Phila., Pa.

The New Book by  
**THOMAS HUNT MORGAN**

Professor of Biology, California Institute of Technology; Past President of The American Association for the Advancement of Science and of The National Academy of Sciences.

THE SCIENTIFIC BASIS  
OF EVOLUTION

Assembling the known facts concerning evolution and the process of heredity, this book repudiates all doctrines resting on metaphysical assumptions: Emergent Evolution, Holism, Organicism, Vitalism. An important book for geneticists, experimental biologists, and workers in allied fields who are interested in scientific method from the mechanistic point of view. *A Scientific Book Club Selection.* 41 illus. \$3.50.

Just Published

The First Authoritative Account of  
**INDUSTRIAL PSYCHOLOGY**

By MORRIS S. VITELES  
University of Pennsylvania

The first complete study of methods employed, principles involved, and results accomplished by industrial psychology. The author has had many years of experience both in the laboratory and in industry itself. 652 pages. Over 100 illus. \$5.50.

EXPERIMENTAL ANALYSIS  
OF DEVELOPMENT

By BERNHARD DURKEN  
University of Breslau

A survey of experimental embryology. The main theme of the book is the "mechanics of development," which Professor Durken discusses in relation to the whole body of biological science. 120 illus. \$4.75.

The Saga of FRIDTJOF NANSEN  
By JON SORENSEN

All private sources were opened for this complete biography of the great Norwegian scientist—a book of importance to geographers and oceanographers, and of great interest to all scientific men. *Fully illustrated.* \$4.50. *Send for copies on approval.*



W. W. NORTON & CO., INC.  
70 Fifth Avenue, New York.