Normal and Malignant Cells: Dr. Warren H. Lewis 545

Scientific Events:
The British National Physical Laboratory; Educational Geologic Trips in Pennsylvania; Grants for Research of the American Academy of Arts and Sciences; Awards of Latin American Fellowships 553

Scientific Notes and News 555

Discussion:

Scientific Books:
Inequalities: Professor G. A. Bliss. Biology for Everyman: Professor T. D. A. Cockerell 565

Scientific Apparatus and Laboratory Methods:
An Apparatus for Demonstrating the Oersted Effect: Dr. Iba M. Freeman. Apparatus for the Measurement of Bodily Activity: Dr. T. W. Rich-

ARDS. A Sensitive A-C Vacuum Tube Relay: Dr. Emory L. Ellis 567

Special Articles:
The Graphic Representation of Ionic Equilibria in Blood Serum: Dr. J. F. McClendon. Sexual Phases in Prosobranch Mollusks of the Genus Crepidula: Professor W. B. Cole. Protective Vaccination of Horses with Modified Equine Encephalomyelitis Virus: Dr. Erich Traub and Dr. Carl Ten Broeck 569

Science News 8

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. McKeen Cattell and published every Friday by

THE SCIENCE PRESS
New York City: Grand Central Terminal Lancaster, Pa. Garrison, N. Y.
Annual Subscription, $6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

NORMAL AND MALIGNANT CELLS

By Dr. Warren H. Lewis
Department of Embryology, Carnegie Institution of Washington, Baltimore, MD.

This evening I propose to discuss the proposition that malignant cells are permanently altered cells. They are new types or species of cells that arise in the body from normal, usually adult, cells which have been altered by environmental influences or agents of one sort or another. The alterations appear to be irreversible in the body and in vitro under the ordinary conditions in which the cells live and multiply. It is conceivable that just as normal cells can be converted into malignant cells by an extraordinary environment, so perhaps malignant cells of one type may be changed into other types (of malignant cells) or reconverted into normal cells by a different environment. The pathologists speak of tumors changing. This may be explained either by an alteration of the malignant cell

or by the gradual overgrowth of one special type among two or more types that were originally present. After malignant cells are once established they multiply independently of the special environment or agents which produced them, as is amply illustrated by the growth of metastases, by serial transplantations from animal to animal and by serial in vitro cultures. They can multiply indefinitely in vivo and in vitro. Many are cytologically different, that is visibly different from normal cells of the type from which they arose.

Speculations on the origin of malignant tumors or neoplasms have extended over a long period of years. Advocates, led astray by their own pet theories, have fought for this and that idea. In my student days there came to Baltimore pleaders for the protozoan origin of cancer, and following this a distinguished protozoologist worked out the life history of the

1 Presidential address, read before the American Association of Anatomists, at the St. Louis meeting, April 19, 1935.