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NORMAL AND MALIGNANT CELLS¹

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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.

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