CURRENT SCIENCE — 50 YEARS AGO

SCHWANN'S CELL-THEORY*

THE BASIS OF ONE HUNDRED YEARS INVESTIGATION OF VITAL PROCESSES

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THE cell-theory, which Theodore Schwann gave us one hundred years ago, has been followed by such a wealth of confirmation that we are justified to-day in rating it as the most fundamental concept in the whole science of modern biology. Botanist, zoologist, physiologist and pathologist study the cell in their search for the vital phenomena which take place there during health and disease.

The cell-theory has brought us, over the course of time, to some tremendous implications, involving the mechanism, the chemistry and the physiology of reproduction; further studies on the origin and evolution of species, and on those forces—both internal and external—which affect the rise and fall of racial stocks. Since evolution is essentially a change in the hereditary endowment of succeeding generations, the units of heredity are the only ones that are likely to prove useful as units of evolution.

Dobzhansky says:—

"By far the greatest achievement of genetics to date is the establishment of the fact that the hereditary materials transmitted from parents to offspring are composed of discrete particles known as genes," "Genes have their physical above in the microscopical cellular elements known as chromosomes."

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In 1661, Malpighi wrote Borelli two letters describing the air sacs in the lungs with their capillaries, and in 1670 his *Anatomy of Plants* was published containing a description of cells more accurate and significant than Hooke's. He found, according to Huxley, that the walls of the cells could be separated and he regarded them as independent entities, although they were units which coalesced to make up the plant as a whole. He called them "utriculi" or "sacculi", mentioning them repeatedly in his descriptions of the different parts of plants and illustrating them in pictures. Malpighi was the first real histologist, both of plants and animals, corpuscles of the kidney and spleen being named after him today, but it is evident he regarded cells as of small importance.

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From Rich's translation we learn the following:

"I must repeat here that which I have stated above regarding the organic texture of plants: we have seen that plants are composed entirely of cells, or of organs which are obviously derived from cells; we have seen that these cells are merely contiguous and adherent to each other by cohesion, but that they do not form a tissue exactly continuous. The organic being has appeared to us, therefore, to be composed of an infinite number of microscopic parts, which are related only in proximity. Now the observations on animals which we have just described obviously confirm this view.

"In the organs of vertebrates, the globular corpuscles are so small that it is impossible to know whether they are solid or vesicular bodies; but in molluscs that is very easy to determine. When one examines microscopically the tissue of the liver, the testis or the salivary glands of Helix or Limax, one sees that these secretory organs are composed, like those of vertebrates, of little globular bodies assembled in a confused manner; but here these little bodies are not so excessively small. They are indeed quite large (for microscopic objects) and one can see in the clearest manner that they are vesicular bodies or true cells, the walls of which contain other very minute corpuscles."

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During the year 1838, Schwann, in the course of conversation with Schleiden was informed of the

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latter's theories of cell-formation in plants. It struck Schwann that there were many points of resemblance between animal and vegetable cells. Two circumstances contributed to the rapid and brilliant result of Schwann's subsequent observations. He made the greatest use of the nucleus in demonstrating the animal cell while emphasizing that it was the most characteristic and least variable of its constituents. Schwann, following the work of the botanists, devoted special attention to the development of animal tissues, discovering that the embryo, at its earliest stage, consisted of a number of quite similar cells. He then traced the metamorphoses or transformations which the cells underwent, until they developed into fully formed tissues of the adult animal.

He showed that while a portion of the cells retain their original spherical shape, others become cylindrical in form, and yet others develop into long threads, or star-shaped bodies, which send out numerous radiating processes from various parts of their surface. He observed that bones, cartilage, teeth, and various tissues become surrounded by firm cell walls of varying thicknesses, and finally, he explained the appearance of a number of the most typical tissues by showing that groups of cells become fused together, analogous to the development of the cell structure in plants. Schwann also studied metabolism and gave it its Greek derivation.

His materialistic view of living matter made him a scientific missionary of the first rank; his errors in observation and his conclusions in regard to the nucleus make his work seem incomplete as compared with modern cytology, but it must be remembered that he knew nothing of mitotic division and the whole science of genetics with its cytological implications was in the distant future.

Schwann led off in the great attack in which the Protoplasmic Theory was later worked out by Mohl, Cohn, Kolliker, Bischoff, Max Schultze and the physiologist, Brucke.

NEWS

DEPARTMENT OF ELECTRONICS, STATE CORPORATIONS TO SET UP RESEARCH AND DEVELOPMENT CENTRES

The Department of Electronics (DoE) has for first time decided to set up Research and Development (R & D) centres in collaboration with State Electronics Development Corporations. The Department will have 50 per cent stake in these centres. Four such centres will be created initially.

The total cost of setting up the four centres will be Rs. 200 million with an operating cost of Rs. 30 million per centre per annum. The share of the Centre in the equity capital will be Rs. 100 million the balance coming from the State Electronics Development Corporations.

According to official sources, these centres will closely interact with industry and develop technologies with specific applications. The disciplines to be taken up include mining electronics, railway communications, use of electronics in VHF (very high frequency) communication and computer peripherals.

The centres will have a laboratory with the facilities of a model workshop and pilot production. As the centres are expected to interact with the industry, they will be working on technologies required by the users and earn a royalty on successful implementation of these technologies. (*Standard India*, Vol. 2, October 1988, p. 288. Published by Bureau of Indian Standards, Manak Bhavan, New Delhi 110 020.)