Charles Leblond 1910–2007

In modern cell biology, it is understood that virtually all cells in the body continuously synthesize a multitude of proteins, and the pathways of synthesis and secretion of these proteins are well established. The continuous turnover of cells in many tissues is also an accepted idea, and embryonic and adult stem cells are of central importance, both for the cellular economy and in malignant transformation.

None of these phenomena were appreciated at the beginning of the career of Charles Philippe (CP) Leblond, and his extraordinary contributions to these fields have fundamentally changed our concepts of cell biology.

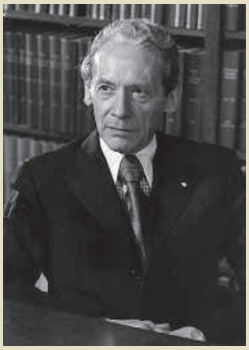
CP Leblond was born in Lille, France in 1910, and received his M.D. from the University of Paris in 1934. His medical thesis localized ascorbic acid to steroid-secreting cells and this study led him, with a Rockefeller postdoctoral fellowship in hand, to the Department of Anatomy at Yale University in 1935. It was there that he met his wife Gertrude Sternschus, to whom he was married for 64 years.

In 1937, Leblond joined the Laboratoire de Synthese Atomique in Paris, which was involved in preparing radioactive elements. Here, under the guidance of Antoine Lacassagne, he showed that radio-iodine-128 injected into a rat promptly accumulated in the thyroid gland. To localize the label within the thyroid tissue, Leblond set out to use autoradiography, the novel technique devised by Lacassagne in 1924. Unfortunately, this first attempt failed as the very short half-life of the isotope left too little radioactivity to be detected by the photographic emulsion.

After the battle of France in 1940, Leblond moved to McGill University, where he became a full-time faculty member of the Department of Anatomy — a post he held for over six decades. During the years 1957–1974, he was chairman of the department, and under his tenure it became one of the top research facilities in cell biology and microscopy.

At McGill, Leblond repeated his autoradiographic experiment with the longer half-life radio-iodine-131 isotope. With this new tool to hand, he was finally able to localize the iodine to specific thyroid follicles. Leblond then continued, together with Leonard Belanger, to search for ways to increase the resolution of autoradiography. They were advised by physicist Pierre Demers to dip glass slides directly into emulsion from Eastman-Kodak lantern slides. With thinner emulsion coats and appropriate isotopes such as tritium, this resulted in a hundredfold improvement in resolution and led to an explosion of the use of autoradiography in cell biology.

The first dramatic results of this technique were achieved in Leblond's laboratory with the use of ^{3}H-thymidine, which allowed him to make the fundamental observation about the constant and rapid dynamic turnover of cells of the gastrointestinal and male reproductive systems. The small intestinal cells in rats were reported to be replaced every two days, a concept originally dismissed by critics as "too silly for words". To support cell renewal, these tissues were shown to contain a population of stem cells, which divided to produce differentiated cells, as well as to maintain their own number. As noted in a seminal publication by Leblond to describe the renewal of spermatogonia in the testis, "the reappearance at each cycle of a new dormant cell which acts as the stem cell of spermatocytes … is described as the 'Stem Cell Renewal Theory'". This concept was similar to that proposed independently by Till and McCulloch in 1963 to define the haemopoietic stem cell.



Leblond also provided seminal insights into the secretory pathway, in parallel with the work of Caro and Palade. Much of our current knowledge on the morphological features of this pathway and especially the role of the Golgi apparatus is due to the use of radio-labelled amino acids as precursors to newly synthesized proteins, and the incorporation of radiolabelled sugars into *N*- and *O*-linked glycoprotein side chains. Using this approach, Leblond was the first to indicate that the synthesis of the carbohydrate side chains of *N*-linked glycoproteins is initiated in the endoplasmic reticulum and completed in the Golgi apparatus. At the same time, autoradiography allowed Leblond to follow the migration of glycoproteins from the Golgi apparatus to secretion granules, lysosomes and the cell membrane. In neurons, experiments with Bernard Droz using pulse chase with autoradiography on tissue sections were the very first to visualize axonal flow.

Leblond was known and fondly remembered by generations of medical students as a superb teacher, and he trained a long list of Ph.D. students, many of whom went on to distinguished academic careers in their own right.

Throughout his tenure as chairman, Leblond paid special attention to fostering a collegial and social atmosphere, and all members of the department were frequently welcomed in his home by his wife and four children. A romantic with a passion for the classics, Leblond's infectious enthusiasm for research was reflected by his glee in examining histologic sections with his beloved light microscope, which he perpetually kept beside his office desk. With whimsical humour, he adopted the colour purple, that of the periodic acid Schiff stain whose use he had pioneered, as his personal trademark, and adopted its use in his clothing, furnishings and even in the name of his country home – Val Mauve.

Professor Leblond continued his active research long after he stepped down as chair, first as a Fogarty Scholar at NIH, and then for three more decades at McGill, where he continued his work on collagen formation in odontoblasts, as well as on basement-membrane formation, while maintaining his longstanding interests in morphological aspects of adult stem cell development of the GI tract. He continued to attend all weekly departmental seminars well into his 90's, inevitably addressing incisive questions.

In recognition of his achievements, Charles Leblond received many honorary degrees and awards including the Wilson medal from the American Society of Cell Biology and the International Gairdner award. He was appointed a Companion of the Order of Canada and was a Fellow of the Royal Societies of London and Canada.

Professor Leblond will be remembered as one of the pioneers of cell biology and anatomical science, and in particular as the scientist who introduced the dimension of time to the visualization of cellular turnover and protein synthesis by microscopy.

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