Robert R. Bensley

Henry T. Ricketts, M.D., Chicago*

More than forty years ago Dr. Robert R. Bensley, then Professor of Anatomy at the University of Chicago, provided one of the important links in the discovery of insulin by showing that the islands of Langerhans comprise an organ system distinct in both structure and function from the acinar cells of the pancreas. By students of diabetes, this, and his demonstration of the differential staining properties of the alpha and beta cells, will be regarded as outstanding among his many contributions.

Dr. Bensley was born on a farm south of Hamilton, Ontario, in 1867. His father was English and his mother Irish. After a few years in a country school he pursued his education in Hamilton and then at the University of Toronto, where an earlier interest in languages gave way to science. In his third year at college, at the age of twenty, he suffered a severe gunshot wound of a leg, resulting in thrombophlebitis, septicemia, gangrene and eventual amputation. This illness cost him a full year, but it will surprise no one to learn that the year was not all wasted. His father bought him a microtome and Bensley spent his time learning histologic technics and experimenting with the staining of sections, including wood chips, with "diamond" dyes.

In 1892 he graduated from the medical school of the University of Toronto, having taught histology while still a student. The same year he married Carriella May and, while continuing his teaching at the University, began the practice of medicine. He also found time for investigation, and during this period worked out the microchemical reaction for mass iron, subsequently known as the McCallum reaction. "It's no good," he says of it today.

Among Dr. Bensley's early research interests was the histology of the gastrointestinal tract. A paper on this subject, published in 1896, established the identity of the neck chief cells of the gastric mucosa, and another, in 1902, carried the demonstration that the glands of Brunner in the duodenum are derived from the pyloric glands of the stomach.

In 1901 he accepted a post in the Department of Anatomy at the University of Chicago. It was soon after this that he became interested in the pancreas as a result of publications from Starling's laboratory purporting to show that the islets, instead of having an identity of their own, are part and parcel of the acinar system and that the cells of both are mutually interconvertible. Some of the observations cited by the British workers in support of their theory consisted of the counting of islets in small sections of pancreas before and after stimulation with secretin, a substance known to increase acinar activity. It was reported that this procedure caused a definitive increase in the number of islets, and these diminished when the pancreas was at rest.

*Professor of Medicine, University of Chicago, School of Medicine, Chicago, Illinois.

It was Bensley's opinion that such evidence was inadequate, that quantitative estimates of islet tissue based upon the examination of tiny fragments of pancreas were inaccurate, and that, moreover, the morphology of the islets and the arrangement of their blood supply, far from suggesting any exocrine function, argued strongly in favor of endocrine activity.

In order to determine not who was right but what was true, to use Bensley's own aphorism, new tools were needed, and these he supplied. He devised a method of supravital staining with janus green and other dyes which permitted him to do three things. First, it allowed him to stain all the islets in the entire pancreas of the guinea pig and hence to enumerate them accurately rather than relying upon estimations and calculations derived from small bits of tissue. Thus he was enabled to show conclusively that agents such as secretin and starvation, which do affect the acinar cells, have no influence on the number of islets. Second, it permitted the demonstration that the islets, while derived from the duct system and often more or less loosely connected with it, have no egress into it through any hollow structures, and hence can have no excretory function. Third, by the development of specific granule stains he was able to show that the alpha and beta cells retain their identity through various phases of acinar activity, with no evidence of transition into or out of the cells of the acini. Bensley's granule stains have since been widely used in investigating the physiology and pathology of the islet cells themselves.

By these classical studies, published in the *American Journal of Anatomy* in 1911, Bensley firmly established the islet system as an independent entity whose structure and relationships seemed designed for internal secretion. By so doing, he promoted in large measure the understanding of the islets that was to lead eventually to the work of Banting and Best.

While the cytology of the islets continued to interest Dr. Bensley and his later students, particularly Lazarow, Woerner and Sylvia Holton, Bensley's curiosity ranged over many other fields. In 1910 he placed the existence of the Golgi apparatus on a solid footing. In 1912, with B. C. H. Harvey, he published the results of investigations on the mechanism of hydrochloric acid secretion in the stomach, and three years later demonstrated histologically the intracellular precursor of the secretion of the thyroid.

As the years passed he devoted himself increasingly to the fundamentals of cytology and histochemistry. The minute structure of the cell intrigued him, and to this problem he brought, in his own person, the diverse talents of the chemist, pathologist, physician and connoisseur of nature. To these were added the qualities of imagination tempered by objectivity and perserverance supported by enthusiasm. Small wonder, then, that in 1934, after nearly thirty years of study and effort, and one year after his official retirement, he finally succeeded in separating the mitochondria of liver cells in pure form and subjecting them to chemical analysis. Since that time he and his students, using new technics, some of his own invention, have done much to elucidate the structure and chemical composition of cytoplasm.

In 1952, Dr. Bensley was presented with the Banting Medal of the American Diabetes Association. He was also elected to honorary membership in the Association.

Hard by the University that he has graced for many years (Bensley, a life-long hunter and fisherman, might say within rifle shot, which about describes it), he lives in a modest dwelling with his daughter, Caroline May. His easy chair in the living room is surrounded by a clutter of papers and scientific journals, a testimony, if any were needed, to the persisting activity of his mind and the breadth of his interests. Those who knew him in earlier years would today miss none of the forthrightness of opinion, the directness of expression, the retentiveness of memory or the pungency of his humor that have always marked his relationships with his colleagues and his numerous students. Nor has he lost the ability to evaluate fairly, neither with boasting nor false humility, his own contributions. His physical ills he still bears, at the age of eighty-seven, with the philosophy and objectivity of a scientist. His rich life, past and present, is the kind any man would like to have lived for his own.