EDWARD LAWRIE TATUM
(1909–1975)

In a long career of biochemical research, Edward Lawrie Tatum devoted relatively little effort to the direct analysis of deoxynucleic acid (DNA). Nevertheless, his contributions to the founding of biochemical genetics and of bacterial genetics were instrumental in the transformation of modern biology, to its present preoccupation with the flow of information through nucleic acids and the protein structure of the cell.

He was most effective in collaborative investigations, in which he played the role of microbiologist and biochemist, intersecting with challenges of profound genetic interest. In these studies, he was instrumental in the development of microorganisms such as *Neurospora* and *Escherichia coli* as tools for fundamental genetic investigations. In 1958 he shared the Nobel Prize in Physiology and Medicine with G. W. Beadle and J. Lederberg, having been a principal partner in these separate, major lines of research.

Tatum was born December 14, 1909, at Boulder, Colorado, the first son of Arthur L. and Mabel Webb Tatum. At that time, Arthur Tatum was just beginning a career in academic pharmacology that

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would take him, by 1925, to the University of Wisconsin, where Edward received both his undergraduate and graduate education. His Ph.D. thesis, under the supervision of W. H. Peterson and Marvin Johnson, dealt with the nutritional requirements of propionic-acid bacteria. This work was the first to show that thiamine, long known as a vitamin for man and for yeasts, was also a growth factor for a bacterium. It was to introduce Tatum to a preoccupation with comparative nutrition and biochemistry that illuminated the remainder of his career.

While Tatum was completing his research training as a postdoctoral fellow at the University of Utrecht, in the laboratory of F. Kögl, which was notable for the characterization of biotin as a vitamin, he received word that G. W. Beadle was recruiting a biochemist to join him at Stanford University. The research, founded on the recent collaboration of Beadle and B. Ephrussi, was a chemical characterization of the precursors of the eye pigments of the fruit fly, *Drosophila*. For many years, genetic mutants with variant eye color had been well-known markers for studies of the transmission of the genes on the chromosomes. This research was an effort to probe gene action in more proximate biochemical terms. In the event, Tatum joined Beadle at Stanford as a biochemical research associate in the fall of 1937, and set about the arduous task of isolating crystallizable quantities of the pigment-precursors from *Drosophila* mutants — a task of no little tedium and technical difficulty. The work was simplified by the discovery of a (contaminant) bacterial strain that also produced a similar substance, and culminated in the isolation of pure crystalline samples with biological activity. The material was subsequently identified as kynurenine-sucrose. However, before they could complete their arduous work, they were anticipated by A. Butenandt, who discovered that kynurenine was active by a routine survey of compounds metabolically related to tryptophane.

The whole experience led Beadle and Tatum to reexamine their basic research strategies. In the course of some lectures on comparative biochemistry, Tatum reviewed what was known about the nutrition of fungi, including the work of Nils Fries, a former colleague in Kögl's laboratory. By this time, a number of ascomycetes had been cultivated on defined media of simple composition. Beadle recalled the work that had already been done by B. O. Dodge and Carl Lindegren on the genetics of the ascomycete *Neurospora*, and suggested that this or a related organism might be the ideal material for their research. Besides being conveniently grown, a fungus might yield mutants blocked in the synthesis of an already

well-characterized vitamin — and this would relieve the geneticists of the double burden of having to probe the chemistry of difficult new products whose biosynthesis was scarcely understood.

Once having procured the necessary cultures, in March, 1941, the first task was to verify the nutritional requirements of *Neurospora*. Fortunately, these are quite simple, and within a few days, Tatum was able to establish that biotin was the only required growth factor. Over the period of the next three months, cultures were irradiated, strains isolated and tested for their ability to grow on the basic medium. By early July, 1941, strain 299 had turned up as a nutritionally demanding mutant, and again in extraordinarily simple experiments was shown to have a specific requirement for pyridoxine. These procedures have become the basis for some of the most fundamental analytical techniques in experimental biology, and also for industrial processes of enormous economic import.

The findings were also the basis of elaboration of theories of gene action, the direction upon which Beadle focused in later work, and for the dissection of biosynthetic pathways, Tatum's more natural province.

Tatum was appointed as assistant professor at Stanford in 1941, not without some opposition to the concept that a chemist had a place in a department of biology! He remained at Stanford until 1945, but lacking substantial encouragement at that time, he accepted an invitation (and promotion) from Yale University to establish a program in biochemical microbiology within the department of botany. Before he moved east, however, he had already begun studies on biochemical mutation in bacteria, which gave nutritional mutants similar to those found in *Neurospora*.

This work came to the attention of Professor F. J. Ryan at Columbia University, and in turn to his apprentice (also medical student) Joshua Lederberg. At that time, the idea that bacteria lacked sexual processes was essentially unquestioned. Hence it was not clear how one could go further in genetic analysis of these mutants. Lederberg wrote to Tatum suggesting an experimental protocol to challenge the asexuality of bacteria, and applied for the opportunity of a fellowship to work with him at Yale in this pursuit. Doubtless having already formulated some similar objectives, Tatum agreed to accommodate Lederberg in his laboratory, on the occasion of a break in the medical school curriculum, from March through August, 1946. That cooperation resulted in the discovery of genetic recombination in *Escherichia coli*, strain K-12, and the opening up of genetic analysis by crossing in bacteria generally.

Tatum's own research interests were generally focused more upon the use of biochemical mutants to analyze synthetic pathways, and he did the pioneering work for such important end metabolites as tryptophane, biotin, and several amino acids. Despite the manifest advantages of bacteria for many of these lines of investigation, he continued to prefer *Neurospora*. This fungus was, after all, a eukaryote and appeared to offer many advantages for simple models of morphogenesis.

In 1948, a new administration at Stanford and its department of biology invited him to return in a secure and esteemed position. From this time, his attention was increasingly devoted to organizational and administrative matters. For example, he played a significant part in the integration of the Stanford medical school with the main university campus, and in the establishment of a new department of biochemistry, which symbolized the new prestige of this discipline. However, in part owing to the complications of his personal affairs, he left Stanford for a professorship at Rockefeller University in New York in 1957, before these developments became operational.

At Rockefeller, Tatum continued to nurture the scientific development of a number of remarkable young investigators, while his own attentions were increasingly devoted to the advancement of research at an institutional and national level. His work for the National Science Foundation was particularly notable for the emphasis that it put on the development of scientific talent, for the human resources of science rather than the bureaucratized framework of projects and programs.

Dr. Tatum was elected a member of the American Philosophical Society in 1957. He was a member of the Committee on the Lewis Prize and the Class II Committee on Membership. He served very effectively on the Committee on Research from 1968 until his death, and was vice-president 1968–1971.

The last decade of his life was marred by increasingly poor health, substantially self-inflicted by excessive smoking, and by the loss of his second wife, Viola Cantor Tatum, rather younger than Edward, and beloved by all their associates at Rockefeller.

Edward Tatum died at New York on November 5, 1975. He was eulogized at the Rockefeller University some few weeks later. None of the speakers failed to note his outstanding attribute, the generosity and affection with which he nurtured young scientists, and the help that he gave them — often at the expense of his own work — to embark on their own careers. Implicit in this was a model of the human relationships among scientists that is all too often overlooked and transgressed in the competitive frame of an increasingly

bureaucratized and crowded profession. The way in which Tatum's memory is cherished reminds us that there are many, mutually compatible ways to achieve and sustain recognition among the immortals of scientific history.

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