9. Computed from data on the average calcium content of various foods given by *Nutritional Data*, published by the H. J. Heinz Co., and from data on the relative quantities of the various foods in the national diets, from the *1955 Year Book of Food and Agricultural Statistics* of the Food and Agriculture Organization of the United Nations, Rome, 1956.
10. M. Eisenbud, *Hearings of the Joint Committee on Atomic Energy, May 27–June 7, 1957* (Government Printing Office, Washington, D.C.), pp. 554–575.
11. F. J. Bryant *et al.*, *Harwell A.E.R.E. HP/R2056* (1956); D. V. Booker *et al.*, Harwell *A.E.R.E. HP/R2182* (1957).
12. W. F. Libby, *Proc. Natl. Acad. Sci. U.S.* **42**, 365 (1956).
13. Y. Hiyama, *Japan. Sci. Monthly* **10**, 1 (1957).
14. C. L. Comar *et al.*, *Proc. Soc. Exptl. Biol. Med.* **95**, 386 (1957).
15. H. Spencer, D. Laszlo, M. Brothers, *J. Clin. Invest.* **36**, 680 (1957).
16. W. H. Langham and E. C. Anderson, *Science* **126**, 205 (1957).
17. H. H. Mitchell *et al.*, *J. Biol. Chem.* **158**, 625 (1945).
18. C. L. Comar, I. B. Whitney, F. W. Lengemann, *Proc. Soc. Exptl. Biol. Med.* **88**, 232 (1955).
19. W. F. Libby, *Proc. Natl. Acad. Sci. U.S.* **42**, 365 (1956).
20. W. R. Collins, Jr., and N. A. Hallden, *U.S. Atomic Energy Comm. Rept. NYO—4889* (1957).
21. L. W. Machta, *Hearings of the Joint Committee on Atomic Energy, May 27–June 7, 1957* (Government Printing Office, Washington, D.C.), pp. 141–157.
22. W. F. Libby, address before the American Physical Society meetings, 26 Apr. 1957, Washington, D.C.

# Frederick George Novy, Pioneer Bacteriologist

On 8 August death ended the long and brilliant career of F. G. Novy (1864–1957). He was one of the early pioneers in bacteriology in this country, having presented the first laboratory instruction in this field in the United States for medical students. This course was given shortly after Dr. Novy and Victor Vaughn returned from a period of study in Koch's laboratory, in 1888.

Novy's research began with chemical studies on cocaine derivatives, which were made as part of his doctoral program in chemistry at the University of Michigan. He then transferred to the Medical School, earned the M.D. degree, and continued on under Vaughn in physiological chemistry. With Vaughn he spent some time studying toxic products of bacteria, "ptomaines." In so doing the two men pioneered in the mass production of pathogenic bacteria. Novy's subsequent studies were more significant and included the differentiation of the relapsing fever spirochetes, study of anaerobes (including the discovery of *Clostridium novyii*), and an investigation of the spirochetes and trypanosomes of birds. A controversy with Shaudinn, who, with Hoffmann, discovered the cause of syphilis, resulted from the latter study. Shaudinn, just before the discovery of the cause of syphilis, suggested a theory, "alternation of generation," to account for the finding of spirochetes or trypanosomes in the blood of birds, depending on when the blood was taken. Novy challenged this observation and correctly so. On the other hand, he quickly accepted the report of Shaudinn and Hoffmann on the etiology of syphilis and congratulated them. Shaudinn accepted the congratulations by letter but remained miffed at Novy's reluctance to accept his "more important" finding of the "alternation of generation" in birds!

In 1909 Novy discovered a virus infecting rats. After some 10 years of work this virus was apparently lost but was then recovered, in 1951, from specimens that had been sealed since 1914–1918. Novy (at this time, age 87) published the results of his earlier studies for the first time, since the virus was again available. The Novy rat virus was the 14th animal virus to be discovered. The course of events in this work illustrates Novy's policy of not rushing into print.

His research also included studies on anaphylotoxin, forerunners of our current concepts of histamine and other substances with marked physiological actions in sensitization reactions. From this work developed another group of observations, on the "primary toxicity of serum," in which he followed the treatment of normal serum with colloidal substances and microorganisms. From current studies one might anticipate that these early observations on primary toxicity of serum will someday have a bearing on the cause of the signs and symptoms of disease and death in infections.

Finally, Novy spent the last years of his active research career on the metabolism of microorganisms, particularly the tubercle bacillus. The techniques developed for the study of the gas exchange and oxygen requirements of microorganisms during growth have since given way to the now widely used Warburg procedures. However, Novy was a pioneer in the field of gas exchange during microbial metabolism.

Many honors came to Dr. Novy in recognition of his professional accomplishments as an investigator and teacher. He received honorary LL.D. degrees from the University of Cincinnati, in 1920, and the University of Michigan, in 1936. He was named Chevalier, Legion d'Honneur (France) in 1924, was awarded the Order of the White Lion (Czechoslovakia) and a Testimonial of the Michigan Legislature, in 1931, and received the award of the 250,000th microscope from Bausch and Lomb Optical Company at the meeting of the American Association for the Advancement of Science in Rochester, New York, in 1936.

Dr. Novy was a charter member of the Society of American Bacteriologists and was the fifth president of the society, in 1904. At the time of his death he was an emeritus member of the National Academy of Sciences.

There remains in the minds of those who were fortunate enough to attend Dr. Novy's classes a vivid memory of a man who, above all, was a clear thinker. He was stern yet kind, strict but tolerant, a demanding taskmaster with a keen sense of humor. His influence will continue to shape the decisions of his students and, in turn, of their students for years to come.

W. J. NUNGESTER
*University of Michigan Medical School, Ann Arbor*