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JAMES FLACK NORRIS

1871—1940

A Biographical Memoir by

JOHN D. ROBERTS

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JAMES FLACK NORRIS was born in Baltimore, Maryland, January 20, 1871. He was the fifth of nine children, having two brothers and two sisters older than himself. He therefore had early opportunity to learn the art of getting along with people. His father was a Methodist minister, a popular revivalist, and a forceful orator in the pulpit. The future chemist used to accompany his father to camp meetings, where it was his custom during the sermon to rest, perhaps to doze, on a bench behind the pulpit, out of sight of the audience, and then later to stand beside his father and lead the singing. He received his elementary education in the schools of Baltimore and Washington, D.C. As a boy he collected stamps, but the pastime grew wearisome and he exchanged the collection for a printing press. This supplied means for the exercise of a more synthetic ingenuity, and for two years he published a monthly literary newspaper for which he wrote the articles and made the woodcuts himself.

Norris received the A.B. degree from Johns Hopkins in 1892, graduating Phi Beta Kappa, and remained at the university for graduate work. He was Fellow in Chemistry, 1894–1895,

* The bulk of this memoir was compiled from an article by Professor Tenney L. Davis, a colleague of James Flack Norris at the Massachusetts Institute of Technology, which was published in *Industrial and Engineering Chemistry*, 14:325–26 (1936). The present author has edited and extended this material to bring it more into the usual format of the Memoirs.

and received the Ph.D. degree in 1895. At Hopkins he was a member of the "Tramp Club," whose members were initiated by being taken for a walk of twenty-five miles, and of the "House of Commons," a debating society in which his classmate, Newton D. Baker, was especially active and articulate. Norris was strongly attracted by Professor Ira Remsen and for three years' running attended his lectures on organic chemistry and on the history of chemistry. For his doctor's thesis, Remsen set him to work on complex compounds of selenium and tellurium. The lure of organic chemistry was strong, however, and the investigation evolved into a study of the double salts of selenium dichloride and tetrachloride with the aliphatic amines and thence into a study of the perbromides and periodides of aliphatic amines, especially tertiary amines, in connection with which the interesting observation was made that the amine hydrobromides form perbromides by taking on a single atom of bromine.

At the opening of the academic year in the fall of 1895 the new Ph.D. joined the staff of the chemistry department of the Massachusetts Institute of Technology. With him came Henry Fay, also a Hopkins 1895 Ph.D. The two were close friends; they went to the opera together and to parties at the homes of President Walker and of various professors. Their appearance and manners caused them to be envied by the younger members of the staff as models of what the man-about-town ought to be. The debonair Norris soon became known widely as "Sunny Jim."

Norris remained at MIT until 1904, when he took on the duties of the first professor of chemistry at Simmons College, a newly organized college for women that was at the time just opening in Boston. Here he outfitted the laboratories, organized courses in chemistry, and had general supervision of all instruction in science. He stayed at Simmons until 1915 except for a year of sabbatical leave. In 1915–1916 he was at Vanderbilt University in Tennessee, then in the war, and back again to

MIT, where he became professor of organic chemistry and director of the Research Laboratory of Organic Chemistry after its organization in 1926. He also gave courses at Harvard, Radcliffe, Clark, and Bowdoin. From Bowdoin he received the honorary Sc.D. in 1929. During his first period at MIT he gave, among other courses, one in the history of chemistry, having caught the contagion of that subject from Remsen. He also taught advanced organic and inorganic chemistry, qualitative analysis, physical chemistry, food analysis—in fact, chemistry of all sorts except quantitative analysis.

Norris's sabbatical leave from Simmons was during the academic year 1910–1911. Feeling the need for more physical chemistry, he went to Karlsruhe, in Germany, where he worked in the laboratory of Haber. Working there at that time were a number of chemists who later became well known, including Allemand, Robinson, Carter, and Askenasy. Norris wrote his textbooks in North Bridgton on Long Lake, Maine, during the summers of his period at Simmons. They were written without the assistance of reference books, except tables of physical constants, for the author believed that nothing ought to be included in the general texts that a chemist does not remember because he finds it useful.

At North Bridgton, Professor Norris worked in a cabin among the trees, apart from the dwelling house, where he had his study, a carpenter shop, a darkroom, and a laboratory. Here, with no reagents except those he could buy at the country grocery store and with no apparatus except a thermometer, a graduate, and a horn-pan balance, he contrived a number of experiments that are included in his inorganic laboratory manual. He also experimented with photography and devised a means of simultaneously developing and fixing the negative in a single bath. Others had the same idea, and chemicals for this purpose were put on the market shortly afterward by Lumière in France.

Professor Norris was an associate member of the Naval Con-

sulting Board in 1916. In 1917–1918 he was in charge of chemical research on agents of offense and war gas investigations of the U.S. Bureau of Mines. He entered the Army as Lieutenant Colonel in the Chemical Warfare Service. In 1918 he was in charge of the U.S. Chemical Warfare Service in England and in 1919 of the investigation of the manufacture of war gases in German chemical plants. After the war he served ten years as vice chairman and chairman (1924–1925) of the Division of Chemistry and Chemical Technology of the National Research Council and as a member of the Executive Board of the Council.

He was president of the American Chemical Society for two years, 1925 and 1926, during which time he did much to improve and clarify the finances of the Society. He was vice president of the International Union of Pure and Applied Chemistry from 1925 to 1928. He was made an honorary member of the Rumanian Chemical Society, had lunch with Queen Marie, and brought home a box of cigarettes, marked with the royal monogram, from each of which he secured enjoyment and satisfaction. He was also an honorary member of the Royal Institute of Chemistry of Great Britain.

The American Institute of Chemists gave him its gold medal in 1937 for "outstanding service as a teacher and as an investigator." Norris was elected to membership in the National Academy of Sciences in 1934. He was chairman of Section C (chemistry) of the American Association for the Advancement of Science in 1930.

A fitting tribute to his memory has been the James Flack Norris Award of the Northeastern Section of the American Chemical Society. The award originally recognized outstanding teaching in chemistry, but more recently has been for research in physical organic chemistry.

Although Norris was serious when occasion demanded it, profoundly interested in his work, and dignified to a degree, he was "Jimmie" to a host of friends who found him a gay com-

panion when there was no work at hand and the cheerful member of many an informal group. He was married in Washington, D.C., February 4, 1902, to Anne Bent, daughter of Lowell Augustus Chamberlin, Captain, U.S. Army; they had no children. James Flack Norris died in Cambridge, Massachusetts, on August 4, 1940.

The scientific work of James Flack Norris, insofar as may be judged by his seventy-odd scientific papers, was broadly interesting and important, but hardly had the impact of the work of some of his contemporaries in America, such as Gomberg, Stieglitz, and Nef, because he sometimes reached the wrong conclusions. Thus, at almost the beginning of his MIT career, Norris became engaged in, and lost, rather a vitriolic argument with Gomberg about the nature of triphenylmethyl. Norris held that Gomberg's analytical data were incorrect and that the "unsaturated hydrocarbon" formed from triphenylchloromethane and zinc in benzene was formed with loss of hydrogen chloride. He believed the correct structure to be $(C_6H_5)_2C{=}C_6H_4$, but did not specify just how the "phenylene" part of the molecule was arranged, although he clearly recognized that it was likely to react easily with oxygen.

After continuation of some work on selenium and tellurium, begun with Remsen, Norris became rather generally concerned with some of the preparations and reactions of relatively simple compounds such as those that made up the backbone of the synthetic aliphatic chemistry of the time. Thus, he and his students investigated the conversions of alcohols to halides and the reactions of these halides with hydrocarbons by Friedel–Crafts catalysts to build up more complex substances.

As a result of these studies, in which it must have become clear to him that there were large differences in reactivity associated with rather similar substances in the same preparative reaction, he published in 1925 the first of what was to be a twenty-paper series on "the reactivity of atoms and groups in

organic compounds." Much, but not all, of this work was concerned with the rates of the reaction of alcohols with acyl halides. These studies began before the mechanisms of any of the reactions involved were known and, necessarily, wound up providing only empirical correlations. The correlations were useful nonetheless for planning synthetic work and for pointing to striking differences in behavior that would ultimately require explanation. An example of the latter was the discovery of a 2,800-fold greater reactivity of 4,4′-dimethyldiphenylchloromethane relative to 4,4′-dichlorodiphenylchloromethane toward ethyl alcohol in a reaction that is rather well, but still not perfectly, understood forty-five years later. This program involved two of the best-known Ph.D. students Norris had—A. A. Ashdown (who later became the storied master of MIT's graduate student house) and, three years subsequently, A. A. Morton (discoverer of the alfin polymerization catalyst and many interesting metalation reactions). The research on reactivity was extended gradually to include thermal decompositions of malonic acids, and certain parallels were noted between the effect of R as an α substituent in influencing the carboxylation of malonic acid and the effect of R in ROH in changing reactivity toward *p*-nitrobenzoyl chloride.

Norris was rather less successful in his work on reactivity than was his younger counterpart at Harvard, James B. Conant, who displayed an almost unerring instinct for choosing reactions for study of greater simplicity and involving wider ranges of reactivity, along with an excellent feel for the basic physical chemistry involved. Nonetheless, Norris had the prescience to be at the forefront of the still-developing area of making comparisons of organic reactivity under controlled conditions, and some of the reactions he was first to study are among the most important in preparative chemistry.

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KEY TO ABBREVIATIONS

Am. Chem. J. = American Chemical Journal
Ind. Eng. Chem. = Industrial and Engineering Chemistry
J. Am. Chem. Soc. = Journal of the American Chemical Society
J. Ind. Eng. Chem. = Journal of Industrial and Engineering Chemistry
Org. Syn. = Organic Syntheses

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