

## HENRY BURCHARD FINE—IN MEMORIAM

Dean Fine was one of the group of men who carried American mathematics forward from a state of approximate nullity to one verging on parity with the European nations. It already requires an effort of the imagination to realize the difficulties with which the men of his generation had to contend, the lack of encouragement, the lack of guidance, the lack of knowledge both of the problems and of the contemporary state of science, the overwhelming urge of environment in all other directions than the scientific one. But by comparing the present average state of affairs in this country with what can be seen in the most advanced parts of the world, and extrapolating backwards, we may reconstruct a picture which will help us to appreciate their qualities and achievements.

Henry Burchard Fine was born in Chambersburg, Pennsylvania, September 14th, 1858, the son of Lambert Suydam Fine and Mary Ely Burchard Fine. His father, a Presbyterian minister, died in 1869 leaving his widow with two sons and two daughters. Mrs. Fine lived with her children for a while at Ogdensburg, New York, and afterward at Winona, Minnesota, and in 1875 brought them to Princeton to complete their education. She was, by all accounts, a woman of great ability and force of character and launched all her children on honorable careers.

Thus Fine's early years were those of a country boy under pioneer conditions. He was always enthusiastic about the two great rivers, the St. Lawrence and the Mississippi, beside which he lived in those years and on which he learned to row. Rowing, by the way, was the only college sport in which he took an active part, though he was always keen on athletics and gave much time and energy to the direction of them up to the end of his life. During the years when I knew him he got much of his exercise on his bicycle, which he used both in going to and from his classes and for long rides in the country.

He finished his preparation for college during his first year in Princeton and entered the College of New Jersey, as it was then called, in 1876. Throughout his college course he was ranked at the head of his class and he graduated with first honors in 1880. As an undergraduate he specialized in the Classics, which he expected to teach later on, and he also began the study of Sanskrit. Besides this he found time for a normal undergraduate's interest in athletics, and played the flute in the college orchestra. He served for three years on the board of the college paper, the *Princetonian*, of which he was managing editor in his senior year. It was in this connection that he formed a life-long friendship with Woodrow Wilson.

The picture which one gets of his undergraduate years fits in completely with the impression which those of us got who knew him only in the last three decades of his life. We saw that he was widely read in literature and history, that he was fond of good music and active in bringing good concerts to Princeton, and that he took a keen interest in the games and the daily life of the undergraduates.

It seems that his adoption of mathematics as a career was largely due to George Bruce Halsted, that extraordinary enthusiast for non-euclidean geometry. Halsted had graduated from Princeton in 1875 and after studying under Sylvester at the Johns Hopkins, spent the years from 1878 to '81 as "instructor in post-graduate mathematics" in Princeton. Halsted communicated his enthusiasm to a little group of undergraduates and in particular to Fine, who had a natural bent for questions of a logical order.

On graduating, Fine was appointed Class of 1860 Fellow in Experimental Science. In this capacity he did a certain amount of experimental work and even published a paper, *On the shadows obtained in the glow discharge*, in the American Journal of Science, vol. 21 (1881) pp. 394-5, in collaboration with W. F. Magie who was subsequently Professor of Physics in Princeton. But Fine was never really interested in experimental work and in 1881 gladly accepted a position as Tutor in Mathematics, which he held until 1884.

In March 1884 he and Magie sailed together for Germany. According to his own account, he knew very little German and almost no mathematics. Nevertheless he developed so rapidly that he obtained the Ph.D. in Leipzig in May, 1885. He used to tell how Klein advised him, in spite of his ignorance, to come into the advanced lectures, and assured him that he would be learning mathematics even if he did not seem to understand everything as it went along. Fine did so and after a few months was surprised, on looking back at his early notes, to find that the whole story was clear to him. The thesis subject first proposed by Klein (on enumerative geometry) turned out to be unsuitable and, with Klein's consent, he changed to another subject suggested by Study. The latter, also a student of Klein's, has remained one of Fine's closest friends. After taking his degree, Fine spent the summer semester of 1885 in Berlin where he listened to Kronecker's lectures on the theory of eliminations and was profoundly influenced by them.

After this brief contact with the main current of mathematics, Fine returned to Princeton as an assistant professor, in which position he remained until 1889. During this period he published four papers in the American Journal of Mathematics. The first was his thesis, *On the singularities of curves of double curvature*, vol. 8 (1886), p. 156-177. The second was an extension of the results of this paper to  $n$  dimensions, vol. 9, pp. 180-184. The other two were: *On the functions defined by differential equations with an extension of the Puiseux polygon construction to these equations*, vol. 11 (1889), pp. 317-328, and *Singular solutions of ordinary differential equations*, vol. 12 (1890) pp. 295-322.

He was married September 6, 1888 to Miss Philena Fobes of Syracuse, N. Y. In 1889 he was promoted to a full professorship and in 1898 was appointed Dod professor of mathematics.

In the summer of 1891 he had another short period of study in Germany during which he became better acquainted with Kronecker. There is a reference to this in his charmingly written obituary notice of the latter, *Kronecker and his arithmetical theory of the algebraic equation*, Bulletin of the New York Mathematical Society, vol. 1 (1892), pp. 173-184. Fine remained

an admirer and student of Kronecker's work throughout his life, as is witnessed by his important paper, *An unpublished theorem of Kronecker respecting numerical equations*, this Bulletin, vol. 20 (1914), pp. 339-358. This was Fine's retiring address as President of the American Mathematical Society.

From this time onward Fine's mathematical activities were devoted more and more to teaching and to the logical exposition of elementary mathematics, though he always kept up an active interest in higher analysis, and indeed published a paper of some importance, *On Newton's method of approximation* (Proceedings of the National Academy of Sciences, vol. 2, pp. 546-552) as late as 1917.

His first book, *The Number System of Algebra treated Theoretically and Historically* (Boston and New York, Leach Shewell and Sanborn, 1891), was devoted in a single-minded way to the exposition of the logical foundations of analysis. It is still a very useful reference book on this subject. The subsequent books were all intended as text-books for undergraduates. They were *A College Algebra* (1905), *Coordinate Geometry* (with Henry Dallas Thompson) (1909) and *Calculus* (1927). Of these, the first and the last are the most successful and probably are not excelled by any other books in their respective fields from the point of view of accuracy of statement and the adequacy with which they represent the subject. They are admirably concise and free from unnecessary verbiage. In every case they had been printed or mimeographed in a preliminary form and used with classes for many years, and modified time and again as a result of this experience, before they were published.

In 1903 shortly after Woodrow Wilson became President of Princeton, Fine was made Dean of the Faculty and his energies were devoted chiefly to university administration. When Wilson resigned to become Governor of New Jersey in 1910, Fine carried the chief burden of the university administration for two years until another president was appointed. He then resigned as Dean of the Faculty but was induced to continue as Dean of the Departments of Science, which he did till his death.

His firmness of character and wisdom in counsel made him the pre-eminent figure among his colleagues of the Princeton faculty up to the very end. He was the man to whom they turned more than to anyone else for leadership or advice, both in public and private affairs. These qualities were widely recognized outside Princeton, for he had more than one opportunity to become a University President, and President Wilson made several efforts to induce him to take important posts in his administration. But as he said quite simply, he preferred to continue as a professor of mathematics.

In 1905, when the Princeton faculty was being enlarged because of the institution of the preceptorial system, Fine was in a position to determine the character of the new personnel in the scientific departments. He used the opportunity so well as to bring about a development in these departments which has had a vital effect on the scientific history of the whole country. To mention only a few instances in other departments than his own, which show the style of his choices, Fine was instrumental in calling or

in promoting Richardson in Physics, Russell in Astronomy, Hulitt in Chemistry, and Conklin in Biology.

In his own department, the expansion of 1905 meant the promotion of Eisenhart and Gillespie to preceptorships and the calling in of Bliss, Veblen, and Young to the same rank, and Jeans to a professorship. When Bliss and Young were called away Birkhoff and Wedderburn were called in, and later Boutroux in succession to Birkhoff. Without cataloguing more names it can be said that Fine's department has had the services of a considerable proportion of the best mathematicians of America during this period. In every case these men were called in before they became well known, at the time when this recognition meant the most to them. Though many of them stayed only a few years their contact with Fine and his group was important both to them and in the continuing growth of this group as an organism. No doubt this organism has had a greater influence on the mathematical enterprise in general because its constituents have changed rather rapidly.

In Fine's last years he was able to seize another opportunity for the advancement of science. Largely because of the confidence which he inspired, the General Education Board offered Princeton University a million dollars for research in pure science on condition that the University raise two additional millions for the same purpose. The fund was completed in 1928, chiefly by the contributions of Mr. Thomas D. Jones, a life-long friend of Fine's. Mr. Jones graduated from Princeton in 1876 before Fine entered, but they became acquainted and learned each others qualities during Wilson's administration as President of Princeton while Mr. Jones was one of the Trustees. This friendship is commemorated by the Henry B. Fine Professorship of Mathematics founded by Mr. Jones, and the Thomas D. Jones Professorship of Mathematical Physics founded by Miss Gwethalyn Jones. As a further memorial, Mr. Jones and his niece are giving a building for the department of mathematics which is to bear the name of Fine.

Fine was one of the founders of the American Mathematical Society. In January 1891, Professor T. S. Fiske as secretary of the New York Mathematical Society wrote to six prominent mathematicians asking their cooperation in enlarging the scope of this society and thus enabling it to publish a Bulletin. Of these six, Fine and Woolsey Johnson promised unqualified support. With this, and the somewhat less definite backing of the others, Fiske and his colleagues went ahead with another appeal to a wider circle of mathematicians. The first number of the Bulletin of the New York Mathematical Society appeared before the end of the same year. It records (p. 54) that Fine was appointed to fill a vacancy on the Council of the Society at the October meeting in 1891. The name of the Society was changed to the American Mathematical Society in 1894 and the first number of the present Bulletin was issued in the Autumn of that year. Fine was elected a member of the Council of the reorganized society at its first Annual Meeting in December 1894. He was President in 1911 and 1912.

In the latter part of his life Fine had to suffer the loss of two of his children and of his wife, who died in April, 1928. His own death was the

result of an accident. In the evening of December 21, 1928, he was riding his bicycle on a road in the outskirts of Princeton and was struck from behind by an automobile, the driver of which failed to see in the uncertain evening light that he was starting to make a left turn. He died early the next morning without having recovered consciousness.

The last time I saw him was in Princeton in August 1928 just after his return from a trip to Europe in which he had revisited old scenes and old friends and had recovered to some extent, in the distractions of travel, from his personal sorrows. He looked strong and well and seemed to have many years of activity before him. He spoke with humorous appreciation of the change he had observed in the attitude of European mathematicians toward their American colleagues and with pride of the esteem in which he had found his own department to be held. But most of our talk was of the future.

Shortly after this I was myself in Europe and met some of those who had seen and conversed with him on his last trip, most of them younger men who had met him for the first time. They all spoke of his charm of manner and the impression they had gained of a man of serene strength and poise and wisdom. It was a striking testimony to the way in which a man's character can be written into his appearance and manner by a long and strenuous life.

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