JAMES PIERPONT—IN MEMORIAM

James Pierpoint died in San Mateo, California, on December 9, 1938, at the age of seventy-two. During the last year he had been in ill health.

James Pierpont belonged to an old New Haven family which has been associated with Yale in various ways. His forefather and namesake, the New Haven minister James Pierpont, was one of the founders of Yale College. James Pierpont's father, Cornelius Pierpont, was a wealthy business man in New Haven. He had four children, three sons and one daughter.

James, the second son, was born on June 16, 1866. He prepared for college at New Haven High School and then went to Worcester Polytechnic Institute. Originally he wanted to become a mechanical engineer, but it may be surmised that he gradually found that the practical applications of engineering appealed less to him than the study of the theoretical foundations of the subject. In any case, it must have been during his stay at Worcester that he discovered his love for the pure sciences because his plans were already laid. Shortly after his graduation in 1886 he left for Europe to begin a prolonged study of mathematics at various universities.

Most of the time he studied in Berlin and Vienna. In Berlin he became familiar with the works of Kronecker, and all of Pierpont's early papers show the profound influence of this algebraic school. The last years in Europe were spent in Vienna where he obtained his doctor's degree in 1894. Here he made many friends, and it seems that the "Gemütlichkeit" of university life in Vienna suited his own jovial temperament particularly well. His associations with Wirtinger and von Escherich were close and cordial and the friendships were renewed by Pierpont's occasional returns to Vienna. This period of studies was a very happy one, and in his later years Pierpont liked to reminisce about it, repeating often what a revelation the acquaintance with European mathematics and mathematicians had been to him.

After having received his Ph.D. degree Pierpont returned to New Haven and was appointed lecturer at Yale the same year, 1894. He was thoroughly imbued with the ideas of modern mathematics and he set to work with the zeal of a missionary to spread them among American mathematicians. In his first period he was particularly interested in algebra and equation theory. Together with Bôcher he gave the first Colloquium Lectures of the American Mathematical Society in Buffalo in 1896. Pierpont's topic was the Galois theory of equations. It was a set of lectures obviously inspired by Kronecker's and Weber's expositions, but Pierpont's presentation had, as most of his contributions, a clearness of its own which dissolved the complications of the theory. This colloquium lecture [7] is one of the few which have not been published in book form, and Pierpont sometimes expressed regret that this had not been done.* Pierpont was one of the outstanding leaders in the meetings of the Society in this period. After the meetings Bôcher, Osgood, and other friends often stopped in New Haven on their way home to continue the discussion of the problems which interested them.

Pierpont's academic career may be described in few words. At Yale he was rapidly promoted. In 1895 he was made an instructor, in 1896 assistant professor, and in 1898 professor in Yale College, a position which he held until his retirement in 1933. In 1923 he was appointed to the Erastus L. DeForest professorship in mathe-

* In the following the numbers refer to the list of Pierpont's printed articles appended to this article.

matics. It should also be mentioned that he was invited to lecture on algebraic numbers at Harvard 1899–1900 and during the summer session 1929 he lectured at the University of California at Berkeley. In 1909 he received an honorary LL.D. degree from Clark University.

Pierpont stimulated the advanced study of mathematics at Yale from the very first days. He attracted a number of graduate students, and the list of doctorates in mathematics increased soon after his appointment. The following represents a fairly complete list* of mathematicians who prepared for their Ph.D. degrees under his supervision: S. Kimura, W. A. Granville, G. T. Sellew, J. Westlund, W. M. Strong, L. M. Pierce, H. E. Hawkes, A. S. Gale, H. A. Merrill, C. E. Stromquist, E. L. Dodd, C. E. Smith, R. B. McClenon, J. C. Morehead, R. G. D. Richardson, G. E. Wahlin, F. J. Holder, E. B. Lytle, M. S. Walker, J. K. Lamond, E. W. Sheldon, H. L. Agard, I. Barney, B. H. Camp, J. L. Jones, W. A. Wilson, P. D. Schwartz.

Pierpont's teaching consisted mainly of graduate and more advanced undergraduate courses. His courses on Real and Complex Variables were long among the most important in the mathematics department. He enjoyed teaching and contact with the students, and he usually succeeded in transmitting some of his own enthusiasm to them. His lectures were forceful and clear and showed the impression of his wide knowledge of mathematics. At times this knowledge would throw him off on a tangent so that his lecture would end in fields far from the scheduled subject, to the delight of the enthusiastic students and to the grief of those whose interests were chained to the text of the day. He spent considerable time with the students, discussed and gave advice and helped them both mathematically and otherwise. He was one of the moving forces in the mathematics club and one of its most frequent and popular speakers. His activity at Yale can perhaps best be characterized by recalling G. D. Birkhoff's remark in his recent lecture on the history of American mathematics, where he considers "mathematicians who have shown the rare quality of leadership": "I would also mention with high esteem James Pierpont, who for many years was a source of inspiration at Yale." He was always interested in the improvement of the scientific standards of the department. He was mainly responsible for the appointment of E. W. Brown and also for the various other attempts made to attract leading mathematicians to Yale.

Pierpont was one of the most widely read men I have ever met. He could frequently be seen on the campus with his old-fashioned canvas book-bag over the shoulder, and during his close to forty years at Yale he carried a considerable part of the library in his bag. For many years he held the distinction of being the greatest borrower of books at the university library. His interest was in no way limited to mathematics. On the contrary his interests did not seem to have any limits at all. He devoured books on science, history, languages, geography, and travel with the same interest as novels and biographies.

Perhaps it might be worth while to recall a couple of his peculiar personal aptitudes. He seemed to have equal mastery over both hands. He could write with them both and it always used to impress the undergraduates when he drew illustrations on the blackboard using both arms simultaneously and independently. He could read and write upside down with great facility and I still remember vividly my surprise

---

* The printed list of doctorates at Yale does not contain any indication of the name of the professor under whose supervision the thesis was written. The above list of names was obtained through the cooperation of some of the former students. Any corrections or additions would be welcome.

at the first conference with him across a table where he used this method in explaining his formulas.

Pierpont enjoyed friends, company, and conversation. Walking was his only exercise. He loved a good discussion and when one came to see him it usually would not be long before one was drawn into some argument. Even if one at times would disagree with him, it was impossible not to admire his wide knowledge and memory. Personally he was always very modest about his own achievements. At times he could show a burst of temper, mostly in cases where matters of principle were involved, sometimes in meetings of the department or faculty. He usually regretted it afterwards but this did not prevent him from showing the same temper in the same questions shortly afterwards. This was quite contrary to his informal dealings with the students, where he did not like to enforce the rules too strictly; "the individual before the institution" was his usual comment in such cases.

In the recent Semicentennial Publications one finds ample evidence of Pierpont's devotion to the American Mathematical Society and his constant interest in its progress. He was elected a member in 1894 after his return from Europe. It should be mentioned that he served as a member of the Council for the periods 1899–1901, 1927–1929, 1931–1933, and was elected vice-president in 1905. He also was a nominee of the American Mathematical Society to the National Research Council and a member of the committee on the semicentennial celebration. One should mention particularly Pierpont's work in connection with the foundation of the *Transactions of the American Mathematical Society* in the period 1898–1900. He spent considerable effort and time in travel and conferences to pave the way for the new publication. Beside his more material contributions he also added a considerable amount of optimism which was needed at this time since there were grave doubts whether there would be an adequate supply of memoirs to keep such a publication in existence. The successful financing of the *Transactions* during the first period was in no small degree due to Pierpont's efforts.

Pierpont presented a large number of papers to the Society at its various meetings. During his first years as a member his contributions to the *Bulletin* were particularly numerous. During his later years one will perhaps remember him best from the several invited addresses which he gave with his usual clarity in his own eloquent and entertaining manner. His colloquium lectures at the Buffalo meeting have already been mentioned. At the summer meeting at Wellesley in 1921 he gave the address: *Some mathematical aspects of the theory of relativity.* In 1925 he was invited to give the Gibbs lecture at Kansas City and spoke on: *Some modern views of space.* At the annual meeting in Nashville in 1927 he gave a very interesting lecture on: *Mathematical rigor, past and present.* This lecture was later translated and published in the Revista Matemática Hispano-Americana. At the annual meeting in New York in 1928 he discussed: *On the motion of a rigid body in a space of constant curvature,* and at Berkeley in 1929 he gave the address: *Non-Euclidean geometry, a retrospect.*

Let us finally turn to Pierpont's contributions to mathematics. He was always very modest, but he had the true scientist's pleasure in his work. A new result delighted him and he had to communicate it and discuss it with his associates, and it usually would not be long before he presented it in a lecture to the mathematics club at Yale.

While his production touches upon many domains it may suitably be divided into three separate periods. During the first period 1894–1900 Pierpont was largely interested in algebra and the theory of equations, directly inspired by his early

German training. Most of his publications in this time are expository, concerned with the development of the Galois theory of equations, construction of regular polygons and modular equations [**1, 4, 5, 6, 7, 10**]. His first paper, published in the Monatshefte für Mathematik und Physik, contains a quite exhaustive history of the quintic equation. His own contributions to the theory are in most cases only new methods of presentation and modifications of proofs [**2, 9, 12**]. In this connection one should mention, however, two later more important papers connected with the theory of equations [**30, 39**]. The first gives a generalization of the secular equation and provides a simple proof for the fact that all its roots are real. This paper has been reproduced in Bieberbach's *Algebra*. The second paper is concerned with an equation occurring in electron theory and provides an opportunity for a critical discussion of the various approximation methods for the determination of the complex roots of an algebraic equation.

A number of popular expositions written around the turn of the century still make interesting reading, for instance: *Mathematical instruction in France* [**14**], and *On the arithmetization of mathematics* [**11**], later translated into Polish. At the Congress of Arts and Sciences at the Universal Exposition in St. Louis in 1904 Pierpont gave an address on *The history of mathematics in the nineteenth century*.

The second period (1900–1920) in Pierpont's mathematical production is characterized by his interest in the theory of functions of a real variable and integration. To this period belong the papers [**17, 19, 20,**] and his two textbooks: *Lectures on the Theory of Functions of a Real Variable*, dedicated to Andrew Phillips, and *Functions of a Complex Variable*, dedicated to von Escherich. It is difficult to form an opinion of the importance of Pierpont's contribution to the theory of integration, but it seems established that he independently created a theory of integration which in many ways was similar to Lebesgue's theory and in some ways different from it, but he had the misfortune of seeing it anticipated by the classical investigations of Lebesgue. Certain objections to Pierpont's theory published by Fréchet seem to be due mainly to a misconception of the meaning of Pierpont's terminology. A remark by Pierpont in his reply may be of historical interest: "To be historically accurate, I had no intention whatever of generalizing Lebesgue's integrals. When years ago I hit on my definition of integration, I did not know how it was related to Lebesgue's theory. I found out later that when the field of integration is measurable my integrals are identical with Lebesgue's and I have therefore called them Lebesgue integrals throughout my book."

The last period in Pierpont's production falls after 1920 and is entirely inspired by the theory of relativity. In a large number of papers he considers the properties of non-euclidean geometries. The resulting mechanical problems are discussed in detail, for instance various gravitational problems, Foucault's pendulum, the motion of a rigid body about a fixed point. The theory of optics in spaces of constant curvature attracted him particularly, and he even went into the specialized problems of lenses and refractors in such spaces. He prepared a book on non-euclidean geometry, but the manuscript does not seem to have been completed.

The published works of James Pierpont

1. *Zur Geschichte der Gleichung des* V. *Grades* (*bis* 1858), Monatshefte für Mathematik und Physik, vol. 6 (1895), pp. 15–68.

2. *On the invariance of the factors of composition of a substitution group*, American Journal of Mathematics, vol. 18 (1896), pp. 153–155.

3. *Note on C. S. Peirce's paper on "A quincuncial projection of the sphere,"* American Journal of Mathematics, vol. 18 (1896), pp. 145–152.

4. *Lagrange's place in the theory of substitutions*, this Bulletin, vol. 1 (1894–1895), pp. 196–204.

5. *On an undemonstrated theorem of the "Disquisitiones Arithmeticae,"* this Bulletin, vol. 2 (1895–1896), pp. 77–83.

6. *On the Ruffini-Abelian theorem*, this Bulletin, vol. 2 (1895–1896), pp. 200–221.

7. *Galois' theory of algebraic equations* (reproduction with slight alterations of parts of a course of lectures at the Buffalo Colloquium of this Society in September, 1896), I. *Rational resolvents*, Annals of Mathematics, (2), vol. 1 (1899–1900), pp. 113–143; II. *Irrational resolvents*, ibid., vol. 2 (1900–1901), pp. 22–56.

8. *Maxima and minima of functions of several variables*, this Bulletin, vol. 4 (1897–1898), pp. 535–539.

9. *On modular equations*, this Bulletin, vol. 3 (1896–1897), pp. 279–292.

10. *Early history of Galois' theory of equations*, this Bulletin, vol. 4 (1897–1898), pp. 332–340.

11. *On the arithmetization of mathematics*, this Bulletin, vol. 5 (1898–1899), pp. 394–406.

11a. *On the arithmetization of mathematics* (translation of [11] into Polish by S. Dickstein), Wiadomosci Matematyczne, vol. 3, pp. 249–263.

12. *On elliptic functions*, this Bulletin, vol. 5 (1898–1899), pp. 490–492.

13. *The summer meeting of the Deutsche Mathematiker-Vereinigung at Munich, September*, 1899, this Bulletin, vol. 6 (1899–1900), pp. 282–287.

14. *Mathematical instruction in France*, this Bulletin, vol. 6 (1899–1900), pp. 225–249.

15. *Galois theory of equations*, Encyclopedia Americana.

16. *The history of mathematics in the nineteenth century* (address delivered before the department of mathematics of the International Congress of Arts and Science, St. Louis, September 20, 1904), this Bulletin, vol. 11 (1904–1905), pp. 136–159.

17. *On multiple integrals*, Transactions of this Society, vol. 6 (1905), pp. 416–434.

18. *Lectures on the Theory of Functions of Real Variables*, vol. 1, Ginn, 1905, xii+560 pp.

19. *On improper multiple integrals*, Transactions of this Society, vol. 7 (1906), pp. 155–174.

20. *Area of curved surfaces*, Transactions of this Society, vol. 7 (1906), pp. 489–498.

21. *The Theory of Functions of Real Variables*, vol. 2, Ginn, 1912, xii+645 pp.

22. *Functions of a Complex Variable*, Ginn, 1914, xiv+583 pp.

23. *Reply to Professor Fréchet's article*, this Bulletin, vol. 22 (1915–1916), pp. 289–302.

24. *A reply to a reply*, this Bulletin, vol. 23 (1916–1917), pp. 174–175.

25. *Geometric aspects of Einstein's theory*, Annals of Mathematics, (2), vol. 23 (1921–1922), pp. 228–254.

26. *The geometry of Riemann and Einstein*, Part I, American Mathematical Monthly, vol. 30 (1923), pp. 425–438; Part II, ibid., vol. 31 (1924), pp. 26–39.

27. *Non-euclidean geometry from non-projective standpoint*, Proceedings of the International Congress of Mathematicians, Toronto, 1924, vol. 1, pp. 117–128.

28. *Some modern views of space* (the Gibbs Lecture for 1925), this Bulletin, vol. 32 (1926), pp. 225–258.

29. *Note on horospheres*, this Bulletin, vol. 32 (1926), pp. 525–528.

30. *On a generalization of the secular equation*, this Bulletin, vol. 33 (1927), pp. 294–296.

31. *On an application of Bouguer's theorem*, American Mathematical Monthly, vol. 34 (1927), pp. 134–135.

32. *Optics in hyperbolic space*, Transactions of this Society, vol. 30 (1928), pp. 33–48.

33. *Optics in space of constant non-vanishing curvature*, American Journal of Mathematics, vol. 49 (1927), pp. 343–354.

34. *Classification of quadrics in hyperbolic space*, American Journal of Mathematics, vol. 49 (1927), pp. 143–151.

35. *On the geometry whose absolute is a ruled quadric*, Monatshefte für Mathematik und Physik, vol. 35 (1928), pp. 111–128.

36. *Mathematical rigor, past and present*, this Bulletin, vol. 34 (1928), pp. 23–53.

37. *El rigor matemático pasado y presente* (translation of [**36**] into Spanish), Revista Mathemática Hispano-Americana, Part I, vol. 3, pp. 181–192; Part II, vol. 3, pp. 208–216.

38. *Note on Einstein's equation of an orbit*, this Bulletin, vol. 34 (1928), pp. 582–584.

39. *On the complex roots of a transcendental equation occurring in the electron theory*, Annals of Mathematics, (2), vol. 30 (1929), pp. 81–91.

40. *Foucault's pendulum in elliptic space*, Transactions of this Society, vol. 31 (1929), pp. 444–447.

41. *On the motion of a rigid body about a fixed point in space of constant curvature*, American Journal of Mathematics, vol. 51 (1929), pp. 287–294.

42. *A note on Foucault's pendulum*, American Mathematical Monthly, vol. 36 (1929), pp. 161–162.

43. *On the attraction of spheres in elliptic space*, this Bulletin, vol. 35 (1929), pp. 351–356.

44. *Non-euclidean geometry, a retrospect*, this Bulletin, vol. 36 (1930), pp. 66–76.

45. *Cayley's definition of non-euclidean geometry*, American Journal of Mathematics, vol. 53 (1931), pp. 117–126.

OYSTEIN ORE