A Century of Mathematics in America

Part I

Edited by Peter Duren
with the assistance of Richard A. Askey
Uta C. Merzbach

AMERICAN MATHEMATICAL SOCIETY

HISTORY OF MATHEMATICS

Volume 1

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Preface

In the year 1888, Thomas S. Fiske and some of his colleagues at Columbia University founded the New York Mathematical Society. As the organization grew to national scope, the name was changed in 1894 to the American Mathematical Society. Since that time, the Society has grown to represent a large and diverse group of mathematicians and to exert a strong influence on the progress of mathematical research throughout the world.

Observing the approach of the Centennial year, the AMS Committee on the Publication Program decided to mark the occasion with the publication of appropriate historical materials. The Committee on History of Mathematics was appointed to organize and oversee the collection of suitable materials, and to continue a program of publication of mathematical history beyond the Centennial year. The members of the latter committee were Peter Duren (Chairman), Richard Askey, Bruno Harris, and Uta Merzbach.

In August 1987, the Committee on History sent a letter to a group of distinguished senior American mathematicians, consisting of past Presidents of the AMS and others thought to have an interest in some aspect of mathematical history. Each was invited to contribute "an autobiographically oriented historical article" discussing some aspect of American mathematical history over the past century.

The response exceeded all expectations. The outpouring of enthusiasm was almost overwhelming. A large variety of topics emerged, additional writers were suggested, and materials appropriate for reprinting were identified. The result is a two-volume collection of historical articles, both newly written and reprinted, glimpses of America's mathematical past. This volume begins with two reprinted accounts of the early days of the Society by Thomas Fiske. Other subjects are mathematicians, institutions, organizations, books, computers, political events, refugees, war work, social currents, meetings, working conditions, and of course mathematics itself.

The great diversity of the articles seemed to defy coherent organization. A rough chronological ordering was attempted, with some groupings by topic.

Articles received too late for inclusion in this volume have been assigned to Volume II.

The editors would like to acknowledge the very substantial contribution by Mary Lane, Director of Publication of the AMS, to the shaping of these volumes. Her advice, encouragement, and direct participation in the editorial work were invaluable.

But above all, we want to thank the writers. They responded to the call, put aside other projects, and produced fine papers in remarkably short time. All readers present and future will appreciate their efforts.

Peter Duren
Richard Askey
Uta Merzbach

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Part I

MATHEMATICAL PROGRESS IN AMERICA

PRESIDENTIAL ADDRESS DELIVERED BEFORE THE AMERICAN MATHEMATICAL SOCIETY AT ITS ELEVENTH ANNUAL MEETING DECEMBER 29, 1904.

BY PRESIDENT THOMAS S. FISKE.

IN the remarks that follow, I shall limit myself to a brief consideration of progress in pure mathematics. This I may do the more appropriately, inasmuch as one of my predecessors, Professor R. S. Woodward, at the annual meeting of 1899, gave an account of the advances made in applied mathematics during the nineteenth century. In his address, which was published in the BULLETIN for January, 1900,* is included a description of the more important advances made by Americans in the field of applied mathematics.

In tracing the development of pure mathematics in America, it seems convenient to recognize three periods. The first period extends from colonial days up to the establishment of the Johns Hopkins University in 1876; the second period extends from the establishment of the Johns Hopkins University up to 1891, when the New York Mathematical Society took on a national character and began the publication of its BULLETIN; the third period extends from 1891 up to the present time.

The most valuable source from which the general reader may secure information in regard to the first period, is a work entitled The Teaching and History of Mathematics in the United States.† This work, written by Professor Florian Cajori, was published in 1890 by the United States Bureau of Education.

Before the founding of Johns Hopkins University there was almost no attempt made to prosecute or even to stimulate in a systematic manner research in the field of pure mathematics. Such mathematical journals as were published were scientifically of little importance and as a rule lived but a year or two. The only exception that we need mention was the *Analyst*, edited by Dr. J. E. Hendricks and published at Des Moines, Ia., from 1874 to 1883; and the publication of this journal began practically at the close of the period referred to above.

* BULLETIN, series 2, vol. 6, pp. 133–163.

† U. S. Bureau of Education, Circular of Information No. 3, 1890.

However, there were a certain number of men, for the most part self-trained, who were eminent among their fellows for their mathematical scholarship, their influence upon the younger men with whom they came in contact, and their capacity for research. Of these the most conspicuous were Adrain, Bowditch, and Peirce. Adrain is known for his apparently independent discovery of the law of distribution of errors ; Bowditch is known for his translation of Laplace's Mécanique Céleste, accompanied by a commentary of his own ; and Peirce is now known chiefly for his classical memoir, Linear Associative Algebra, which was the first important research made by an American in the field of pure mathematics.

With the arrival of Professor Sylvester at Baltimore, and the establishment of the *American Journal of Mathematics*, began the systematic encouragement of mathematical research in America. Professor Sylvester drew about him a body of deeply interested students, and through his own untiring efforts and his inspiring personality a most powerful stimulus was exerted upon the mathematical activities of all who were associated with him. His work in this country, however, continued only seven years. In 1884 he returned to England to take the chair offered to him by Oxford University.

The first ten volumes of the *American Journal of Mathematics*, published from 1878 to 1888, contained papers contributed by about ninety different writers. Of these thirty were mathematicians of foreign countries. Almost one-third of the remaining sixty were pupils of Professor Sylvester ; the others were mathematicians some of whom had come under the influence of Benjamin Peirce, some of whom had been students at German universities, and some of whom were in large degree self-trained. They seemed to need only an opportunity of publication and a circle of readers to induce them to rush into print. In fact several of them had already sent papers abroad for publication in foreign journals. Among the contributors to early volumes of the *American Journal of Mathematics* we should especially mention Newcomb, Hill, Gibbs, C. S. Peirce, McClintock, Johnson, Story, Stringham, Craig and Franklin.

We must at this point make some mention of the rapidly increasing influence of the German universities upon American mathematical activity. For some time a considerable number of young Americans, attracted by the superior opportunities offered by the German universities, had been going abroad for

the study of the more advanced branches of mathematics. The lectures of Professor Klein were in particular the Mecca sought by young Americans in search of mathematical knowledge. I think that it may be said safely that at present ten per cent of the members of the AMERICAN MATHEMATICAL SOCIETY have received the doctorate from German universities, and that twenty per cent of its members have for some time at least pursued mathematical studies in Germany. It is not surprising that as a result a large portion of the American mathematical output shows evidence of direct German influence, if not of direct German inspiration.

In 1883, as we have already indicated, the publication of the *Analyst* was discontinued. In the following year a new journal, the *Annals of Mathematics*, under the editorial management of Professor Stone of the University of Virginia, began publication. This journal was of a somewhat less ambitious character than the *American Journal of Mathematics*. It is interesting to note in connection with it that to a considerable extent its pages were given to papers on applied mathematics. In 1899 the *Annals* passed into the editorial control of the Mathematical Department of Harvard University. Since that time it has been largely expository or didactic. It has not sought to publish new investigations of an extended character, although it has not hesitated to publish brief papers announcing new results.

Let us now turn to a brief outline of the history of the Society which brings us together on this occasion.

At a meeting held November 24, 1888, six members of the Department of Mathematics of Columbia University formed a society which was to meet monthly for the purpose of discussing mathematical topics and reading papers of mathematical interest. At the meeting held a month later they resolved to call their society the New York Mathematical Society and to invite the coöperation of all persons living in or near New York City who might be professionally interested in mathematics. By the end of the year 1889 the membership of the Society had increased to sixteen. By the end of 1890 it had increased to twenty-two.

At the meeting held in December, 1890, the first president, Professor J. H. Van Amringe, retired from office, and Dr. Emory McClintock was elected his successor. At the same meeting the publication of a mathematical bulletin was pro-

posed. The officers of the Society a month later made a report in which they recommended that this bulletin, if established, should not seek to enter into competition with the existing mathematical journals, but that it should be devoted primarily to historical and critical articles, accounts of advances in different branches of mathematics, reviews of important new publications, and general mathematical news and intelligence. They showed at the same time that the expense connected with such a publication would necessitate an extension of the membership of the Society together with an increase in the annual dues. It was suggested, accordingly, that a general circular be issued, describing the aims of the Society and inviting suitable persons to become members.

After hearing the report, the Society authorized the secretary to undertake a preliminary correspondence with a few of the principal mathematicians of the country with a view to determining whether their favor and assistance might be secured for the proposed enterprise. A month later the secretary reported that he had received favorable responses from Professor Simon Newcomb, Professor W. Woolsey Johnson, Professor Thomas Craig and Professor H. B. Fine. As a result of these favorable responses, approval was given to the plan recommended by the officers of the Society for the extension of its membership and for the publication of a historical and critical review of pure and applied mathematics. A circular letter of invitation such as had been recommended was issued shortly thereafter. The proposals which it contained seemed to meet with general favor, and by June, 1891, the membership of the Society had risen to one hundred and seventy-four. The first number of the BULLETIN was issued in October, 1891. Its appearance increased the interest already excited, and by the summer of 1892 the membership of the Society had risen to two hundred and twenty-seven.

Professor Klein and Professor Study, who visited the United States in 1893 for the purpose of attending the International mathematical congress held in Chicago, were present at the meeting of the Society held in October of that year. They both delivered addresses before the Society and expressed great interest in its work.

By the spring of 1894 it was felt generally that the operations of the Society had assumed a national character, and a new constitution was adopted providing for a change of name

from the New York Mathematical Society to the AMERICAN MATHEMATICAL SOCIETY. In June of the same year the Society undertook to provide means for the publication of the papers read at the Chicago Congress the preceding year, and arrangements were made for holding in conjunction with the Brooklyn meeting of the American association for the advancement of science the first "summer meeting" of the Society.

At the annual meeting held December, 1894, Dr. Emory McClintock retired from the presidency, being succeeded by Dr. George W. Hill. At this meeting Dr. McClintock delivered an address which was published in the BULLETIN for January, 1895.* It was entitled "The past and future of the Society" and contains an account of the Society during the first six years of its existence. Upon the occasion of Dr. McClintock's retirement from the presidency the Society adopted a resolution expressing its appreciation of the great services that he had rendered while presiding officer, and its recognition of the fact that largely to his initiative were due the broadening of organization and extension of membership which made the Society properly representative of the mathematical interests of America.

The next event of special importance in the history of the Society occurred in 1896. Immediately after the summer meeting of that year, which was held in connection with the Buffalo meeting of the American association for the advancement of science, the Society's first "colloquium" took place. Interesting and instructive courses of lectures were delivered by Professors Bôcher and Pierpont, and at the close of the colloquium those participating in it recommended that similar arrangements be made periodically in connection with subsequent summer meetings. In the same year for the regular October meeting was substituted a special meeting at Princeton in connection with the sesquicentennial celebration of Princeton University. At that meeting addresses were delivered by Professor Klein and Professor J. J. Thomson.

In the spring of 1897 the Chicago Section of the Society was established. At the same time it was determined to replace the meetings held monthly in New York by meetings held four times a year at intervals of two months. The summer meeting of 1897 was held at Toronto in connection with the meeting of the British association for the advancement of science. This meeting was attended by a number of distinguished

* BULLETIN, series 2, vol. 1, pp. 85–94.

visitors from Great Britain, among whom were Professors Forsyth, Greenhill, and Henrici.

A colloquium was held in the summer of 1898 at Harvard University. There was much discussion among those attending it in regard to the need of larger and better facilities for the publication of mathematical researches. The following winter the Society proposed to the Johns Hopkins University that the *American Journal of Mathematics* should be enlarged and issued more frequently and that the Society should be given a share in the editorial control of the *Journal*. It was found impossible, however, to reach an agreement with the Johns Hopkins University, and in April, 1899, the Society determined to establish an organ of its own for the publication of the more important original papers presented at its meetings. The financial resources of the Society were not sufficient to carry on the work already begun and at the same time to provide for the new publication; but it was found possible to secure assistance from ten colleges and universities which promised to join in support of the undertaking. The new publication, known as the *Transactions of the American Mathematical Society*, made its first appearance in January, 1900.

Simultaneously with the meeting held in October, 1899, was held the first meeting of the newly organized American Physical Society. On this occasion the Mathematical Society met with the Physical Society for the purpose of listening to the address of President H. A. Rowland, of the Physical Society. Again, two months later, on the occasion of the annual meeting of the American Mathematical Society, the two societies met in joint session for the purpose of listening to the presidential address of Professor R. S. Woodward, of the Mathematical Society. In this connection it may be of interest to recall that the organization of the American Physical Society was modelled, in a general way, after that of the Mathematical Society. The two societies, which have many members in common, have enjoyed uninterruptedly the most cordial relations.

In 1901 the Mathematical Society was compelled to turn its attention to the management of its rapidly growing library. An agreement was made with Columbia University whereby the library was entrusted to the care of that institution. The University undertook to bind and catalogue the books belonging to the Society and to make the arrangements necessary for the loan of the books to members. In return therefor the Uni-