

The Mathematical Scene, 1940–1965

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1. INTRODUCTION

There was great activity in the mathematical world from about 1940 to the middle of the 1960s. The mathematicians continued their research, but they also engaged in war service, established new journals and edited old ones, revitalized many departments of mathematics and established new graduate programs, conducted summer institutes for high school and college teachers of mathematics, organized and maintained programs of visiting lecturers, established curriculum improvement projects for secondary schools and undergraduate programs, strengthened and expanded their mathematical organizations and created new ones, and developed new organizational arrangements for cooperation on problems of mutual interest. Many of these activities were promoted and supported by the National Research Council, the Office of Naval Research, the National Science Foundation and other Federal agencies, and several of the major private foundations. Mathematics prospered in an era of support provided in response to the contributions of science and mathematics in World War II, to the launching of Sputnik I and Sputnik II in 1957, and to the race to the moon in the 1960s. This article describes a number of these activities and events and recounts my participation in them.

2. INVOLVEMENT IN WORLD WAR II

On the morning of Monday, August 6, 1945, I arrived in Washington, D.C.; I had flown from Kansas City during the night. I had come to Washington to complete preparations for continuing the war in the Pacific, but the news of the Hiroshima atomic bomb that day abruptly changed the prospect for the future.

I had gone to England in November 1943 to join the Operational Research Section (ORS) at Headquarters Eighth Air Force. Its first chief was John Marshall Harlan, a New York lawyer who was later appointed to the U.S. Supreme

Court by Eisenhower; the second chief was Leslie H. Arps, another New York lawyer. I was assigned to the Bombing Accuracy Subsection of ORS; some of the other members were the mathematicians James A. Clarkson, Frank M. Stewart, J. W. T. Youngs, Ray E. Gilman, and the statistician Jack Youden. The mathematicians Edwin Hewitt [14] and W. L. Ayres were members of the Gunnery Subsection of the ORS.

In May 1945 I returned to the United States to attend an Air Force conference in Florida, and in June the Air Force sent me to the MIT Radiation Laboratory to make a report. While I was in Cambridge I saw the Aiken Mark I computer at Harvard (I had seen Vannevar Bush's differential analyzer at MIT in 1936 and Stibitz's Mark I computer at Bell Telephone Laboratories in New York and at the Hanover Meeting in 1940). While waiting in Lawrence for the call from Washington to go to the Pacific, I wrote a paper [1] on some probability questions suggested by bombing problems in the ORS. Finally the call came, and I reported to the Pentagon on August 6 as stated above. When the war ended on August 14, the Air Force asked me to write a report to describe how the work in operations research was carried on in England by a group of civilians working for an Air Force. I wrote a lengthy report [2] which I entitled "Gremlin Hunting in the Eighth Air Force," and by September 1, 1945, I had returned to my position as Professor of Mathematics at the University of Kansas.

3. ASSIGNMENTS IN THE AMERICAN MATHEMATICAL SOCIETY

When the Society made plans for *Mathematical Reviews* in 1939 [3, pp. 327–333], Dean R. G. D. Richardson, Secretary of AMS, asked me to help obtain subscribers for the new journal. At his request, I became the volunteer, unofficial circulation manager (without title) of *Mathematical Reviews*, and I spent the summer of 1940 in Providence to work on this assignment. With the help of local representatives and much correspondence the subscription list grew rapidly. A report [4, 48 (1942), 190] states that there were 1400 subscribers as of December 1, 1941, and a later report [4, 49 (1943), 826] states that there were 1239 subscribers for 1943. The history of the establishment of *Mathematical Reviews* and of my part in building up the circulation can be found in [4].

At the end of 1940 I was elected to the AMS Council for the three-year term 1941–1943. In 1943 I was appointed an Associate Secretary of AMS, but I was replaced in 1944 because of my absence in England. In 1946 the Society appointed me the Associate Secretary in charge of its institutional members. Dean Mark Ingraham of Wisconsin had solicited the initial list of institutional members in the early 1930s, and he was the Associate Secretary in charge of them for a number of years; he was followed by Dean W. L. Ayres, and I succeeded Ayres in 1946. I held the position until the Society moved its

headquarters from Columbia University to Providence at the beginning of 1950; H. M. MacNeille became the Society's first Executive Director then, and henceforth he had charge of the institutional members. During the period when I was the Associate Secretary in charge, I approximately doubled the Society's income from its institutional members.

In 1950 I was elected an editor of the *Bulletin of the American Mathematical Society*, and hence I continued as an *ex officio* member of the Council. Volume 56 (1950) of the *Bulletin* was edited by G. B. Price and E. B. Stouffer with the assistance of E. R. Lorch. Volumes 57–61 (1951–1955) were edited by W. T. Martin and G. B. Price with the assistance of R. P. Boas, Jr. The editors of volume 62 (1956) were W. T. Martin, J. C. Oxtoby, and G. B. Price, and the editors of volume 63 (1957) were J. C. Oxtoby, B. J. Pettis, and G. B. Price. My principal responsibility as an editor was the publication of papers which had been presented as invited addresses at meetings of the Society. After John von Neumann's death in February, 1957, the three editors had a meeting with Stanislaw Ulam to plan a special collection of articles on von Neumann's life and work. I was the managing editor in 1957, and I had trouble getting all of the articles in time to meet the schedule we had planned. At the very end we were almost defeated by a winter storm which left Princeton snowbound. The articles on von Neumann were published as Part 2 of the May, 1958, number of the *Bulletin* [5].

4. THE MAA'S EARLE RAYMOND HEDRICK LECTURES

The program of the Association in the 1930s was rather routine, and, in a talk I gave to the Kansas Section in the spring of 1938, I somewhat brashly suggested some things I thought it ought to do. My talk, published in the *Monthly* with the title "A Program for the Association" [6], came to the attention of Professor Saunders Mac Lane, President of MAA in 1951 and 1952, and influenced him to appoint a committee on Expository Lectures consisting of G. C. Evans, J. C. Oxtoby, and G. B. Price (Chairman) [8], [7, p. 131]. This committee was asked to investigate the desirability and feasibility of having a series of expository lectures at summer meetings and to arrange the first series if it were recommended. The committee recommended the lectures, named them the Earle Raymond Hedrick Lectures after the MAA's first President, and arranged for Tibor Radó to give the first Hedrick Lectures at the summer meeting at Michigan State University in September 1952 [9], [7, p. 142]. The Hedrick Lectures have been a prominent feature of the summer meetings ever since; they carry out one of the recommendations in "A Program for the Association" [6].

5. WORLD WAR II AND THE NATIONAL SCIENCE FOUNDATION

Early in World War II Vannevar Bush created the Office of Scientific Research and Development, “the remarkable emergency agency through which the scientists of America helped win the great conflict by supplying the military with weapons and other instrumentalities of war unknown, and for the most part undreamed of, when the conflict began” [10, p. 36]. The physicists contributed radar, the proximity fuse, and the atomic bomb [11], [12]. The contributions of the mathematicians were less spectacular, but their work included operations research, quality control, acceptance sampling, sequential analysis, ballistic problems, numerical analysis, rocketry and aeronautics, cryptography and cryptanalysis, and consulting on a wide range of problems [13], [14]. Although the history of the contributions of the mathematicians is less complete than that of the physicists, the chemists, and the engineers, the assessment at the time was that the mathematicians had made a major contribution to the war effort. John H. Curtiss, a statistician who participated in the war effort and later was a member of the staff of the National Bureau of Standards, seemed to emphasize these contributions when he wrote as follows in 1949 ([15], quoted on page 369 of [16]):

You will recall that it has been said that World War I was a chemists’ war and that World War II was a physicists’ war. There are those who say that the next World War, if one should occur, will be a mathematicians’ war.

On November 17, 1944, Roosevelt, realizing all of these contributions of the scientists and mathematicians, wrote to Bush to ask how similar benefits might be obtained in peace-time. Bush’s reply was his now-famous “Science, the Endless Frontier” [17]. This report led, after many efforts (described in chapter 3 of [10]), to the establishment of the National Science Foundation by Congress in 1950. Control of the Foundation was placed in the hands of the National Science Board, with 24 members [10, p. 62], and a Director, all to be appointed by the President.

Three events were largely responsible for the great efforts that the United States made in education, science and mathematics, and research and development, and for the huge sums of money that the nation appropriated for these activities between 1945 and 1970 [18, p. 413]. The first of these events was World War II and the role played in it by scientists and mathematicians. The second event was the launching of Sputnik I and Sputnik II by the Russians in October and November 1957. The third event was the race to the moon; it was initiated when the Russian, Yuri Gagarin, orbited the earth

Kennedy made his historic pronouncement on May 25, 1961: “I believe we should go to the moon ... before this decade is out.”

6. NATIONAL RESEARCH COUNCIL COMMITTEE ON REGIONAL DEVELOPMENT OF MATHEMATICS

Two additional assignments were added to the one I already had in 1952. The Committee on Expository Lectures, of which I was chairman, completed its duties by arranging for Tibor Radó and Paul Halmos to give the Earle Raymond Hedrick Lectures in 1952 and 1953, respectively, [8].

The first new assignment came from the Office of Naval Research. An unexpected telephone call in the spring of 1952 asked me to come to Washington. As a result of this trip to ONR, I organized a group of ten persons at the University of Kansas which carried out an operations research investigation — during June, July, and August — of a classified problem which arose in the Korean war [18, pp. 332–334]. Because of the secret nature of the project, I flew to Washington on Sunday, August 31, to deliver the project’s final report, entitled “Biological Warfare and the Navy Supply System.” This project was my last involvement in war work; after that my security clearance lapsed, and I have not been called on again to participate in defense activities. After delivering the project’s report in Washington, I continued on to East Lansing, Michigan, where Tibor Radó gave the first series of Earle Raymond Hedrick Lectures.

The second new assignment in 1952 came from the National Research Council and the National Science Foundation. Marston Morse (one of my teachers at Harvard) was a member of the first National Science Board [10, pp. 29–32] and also Chairman of the Division of Mathematics of the National Research Council [19, p. 113]. In the spring of 1952 Morse appointed the first NRC Committee on Regional Development of Mathematics, and he named me its chairman. The committee consisted of William M. Whyburn, University of North Carolina; William L. Duren, Jr., Tulane University; Burton W. Jones, University of Colorado; Carl B. Allendoerfer, University of Washington; and G. Baley Price (chairman), University of Kansas. As recorded by Kriegbaum and Rawson [19, p. 113], “Morse appointed this committee to study and interpret a report on ‘The Regional Development of Mathematical Research’ by Dr. J. A. Clarkson. He asked the group to study the effect of mathematics on the smaller graduate schools, the NSF fellowship program in mathematics, and the grants-in-aid and research contracts of NSF, Office of Ordnance Research, and Office of Naval Research.” (Clarkson was then the Secretary of the Division of Mathematics and a former colleague of mine in operations research in the Eighth Air Force.) The National Science Foundation had moved quickly to develop its programs after its establishment in 1950, and it sought the help and advice of Morse’s

new committee in its study of the desirability and feasibility of establishing a program of summer institutes. For this reason Krieghbaum and Rawson give an account of some of the work of this committee [19, pp. 113–122]. At a meeting in Washington on November 20, 1952, which was attended also by Solomon Lefschetz, the committee made the following three significant recommendations:

(a) that NSF support a summer institute for college teachers of mathematics, with Burton W. Jones as director, at the University of Colorado in the summer of 1953 [19, p. 119];

(b) that NSF establish a program of visiting lecturers for colleges, in the field of mathematics;

(c) and that the Mathematical Association of America undertake a revision of the undergraduate program in mathematics.

Each of these recommendations foreshadowed a major program in later years. The recommendation in (c) was presented to the MAA Board of Governors at the meeting held on December 30, 1952, at Washington University, in St. Louis, Missouri. The report of this meeting [20, p. 216] states that “the Board (of Governors) voted to approve the appointment by the President ... of a committee on the Undergraduate Mathematical Program.”

7. NSF SUMMER INSTITUTES PROGRAM

The National Science Foundation supported a summer institute for college teachers of mathematics at Colorado and a similar institute for college teachers of physics at Minnesota, both in 1953. Krieghbaum and Rawson’s history shows that the institutes program prospered from the beginning [19, p. 124]: “Institutes in 1954 were held at the University of Wyoming, University of North Carolina, University of Oregon, and University of Washington. The first three were for college teachers, the last for high school teachers.” The increase in the funds appropriated by the National Science Foundation for the support of institutes emphasizes the rapid growth of the program: \$50,500 in 1954, \$147,350 in 1955, and \$1,123,450 in 1956. There was deep concern in the United States about the state of education and the training of scientists and engineers, especially in comparison with the accomplishments of the Russians [19, chapter 11]. Congress “gave NSF a total budget of \$40 million for Fiscal Year 1957, of which ‘not less than’ \$9,500,000 had to be spent on programs for training high school teachers of science and mathematics” [19, p. 202]. By 1957 there were institutes for high school and college teachers, and there were summer and academic year, and also in-service, institutes. “In Fiscal Year 1956, NSF provided stipends for 1300 teachers in all programs; in Fiscal Year 1957 it provided 6565” [19, p. 203]. Many colleges and universities conducted summer and academic year institutes, and many mathematicians taught in them. I taught in a summer institute for college

teachers at Michigan in 1956, and I conducted a summer institute for high school mathematics teachers at Kansas in 1957 and in many later years.

And then came the rude shock: the Russians launched Sputnik I on October 4, 1957. The nation, already troubled over the state of education, was now genuinely alarmed, and Congress greatly enlarged NSF's institutes program. "In 1959, the first full fiscal year after Sputnik, the institutes programs just about tripled in size" [19, pp. 230–231]. Also, institutes at the elementary school level were added during 1958–1959 [19, p. 231]. Institutes continued to be an important part of the National Science Foundation's program until the early 1970s. Kriegbaum and Rawson, in [19], have written the history of this program up to about 1965.

How successful were the institutes? "Probably one of the best measures of the success of National Science Foundation institutes has been the enthusiasm with which countries in Central and South America, Asia, Europe, and Africa have jumped on the institute bandwagon" [19, p. 287]. Chapter 16, entitled "Measures of Impact," of Kriegbaum and Rawson's history [19] provides further evaluations. The following quotation from page 307 must suffice here:

Dr. James B. Conant, in his 1963 book, *The Education of American Teachers*, emphasized the need for continuing inservice training for teachers and cited the work of NSF. Conant said in a sentence that was italicized: *'The use of NSF summer institutes for bringing teachers up to date in a subject matter field has been perhaps the single most important improvement in recent years in the training of secondary school teachers.'*

8. VISITING LECTURERS

The NRC Committee on Regional Development of Mathematics, at its meeting on November 20, 1952, recommended that NSF support a visiting lecturers program; NSF did so by making a grant (NSF's first to MAA) of \$15,000 to MAA in 1954 to support a program of Visiting Lecturers to Colleges [7, p. 109]. The MAA appointed its Committee on Visiting Lecturers, with Burton W. Jones as chairman, to manage the new program [7, p. 131]. Some of the early lecturers were George Polya, A. W. Tucker, W. L. Duren, Jr., and John G. Kemeny [18, p. 356].

I was the MAA visiting lecturer in the spring of 1956, and my experiences were typical of the operation of the program in the early years. Colleges and universities — and especially the smaller schools with the greatest need — submitted applications for a visit, and the committee arranged my itinerary. Between February 12, 1956, and May 21, 1956, I visited more than thirty colleges and universities, attended a meeting of the National Council of Teachers

of Mathematics and other meetings, and paid visits to the MAA headquarters in Buffalo and to NSF in Washington, D.C. As a visiting lecturer, I tried to strengthen departments of mathematics and to attract students to the study of mathematics. I gave lectures on mathematics, served as a consultant for deans and departments, and supplied information about employment for mathematicians. Also, I provided information about curriculum improvement projects such as those of Max Beberman's University of Illinois Committee on School Mathematics, A. W. Tucker's Commission on Mathematics, and W. L. Duren's Committee on the Undergraduate Program. Many of the schools I visited had never had a visitor in mathematics.

Later the Committee on Visiting Lecturers changed the method of operation of the program. The committee recruited a relatively large group of lecturers, and it prepared a brochure which contained information about the lecturers and the lectures they offered. Colleges and universities requested visits and lectures according to their interests. From the beginning, a school which received a lecturer was asked to contribute to the expense of the program, but no school was denied a visiting lecturer because of inability to pay. The program was subsidized by NSF. The MAA's program of Visiting Lecturers to Colleges received grants from NSF of over \$364,000 during the period 1954–1965 [7, p. 109]. B. W. Jones, R. A. Rosenbaum, Rothwell Stephens, R. E. Gaskell, and Malcolm W. Pownall are some of those who have served as chairmen of MAA's Committee on Visiting Lecturers [7, p. 131].

The MAA considers its program of Visiting Lecturers to Colleges one of its important activities, and the program continues today although NSF withdrew its support in the early 1970s. One large gift to MAA contributes to the support of the program, but it is a more modest program today because of the greatly reduced subsidy.

In 1958, after Sputniks I and II, the MAA received a grant from NSF to operate a program of visiting lecturers to secondary schools; John R. Mayor was the first chairman of the Committee on Secondary School Lecturers which the MAA appointed to manage this program [7, p. 132]. Eventually this program provided visits to more than 600 schools per year [7, p. 72]; it received grants of over \$373,000 from NSF during the period 1958–1964 [7, p. 109]. In 1988 the MAA continues to operate various visiting programs for secondary schools, some planned especially for minority students and women.

9. COMMITTEE ON THE UNDERGRADUATE PROGRAM IN MATHEMATICS

As related above, the MAA Board of Governors, at its meeting on December 30, 1952, authorized the President to appoint a “committee on the Undergraduate Mathematical Program.” The committee appointed by E. J. McShane, the incoming President, consisted of G. B. Price (Kansas), A. L. Putnam (Chicago), A. W. Tucker (Princeton), R. C. Yates (U. S. Military Academy), and W. L. Duren, Jr. (Tulane), Chairman. This committee presented its report [21], with recommendations to proceed, in September 1953. C. V. Newsom replaced Yates on the committee, and the work proceeded. The committee received a grant of \$2500 from the Social Science Research Council, through its Committee on the Mathematical Training of Social Scientists. The 1954 Summer Writing Session was held in Lawrence with support from The University of Kansas; this writing session produced one book and a first draft of a second [22]. The committee received grants totaling \$175,000 during 1955 and 1957 from the Ford Foundation [7, p. 109]. During 1957–1958 the Dartmouth writing group, under the direction of John Kemeny, produced two volumes entitled “Modern Mathematical Methods and Models.”

I was the MAA President in 1957 and 1958. As part of the response to the launching of Sputnik I and Sputnik II in 1957, I arranged the Washington Conference [25] in May 1958 to examine all aspects of MAA’s program and to make plans for the future. The Committee on the Undergraduate Program (CUP) asked to be discharged [25, p. 581], [26, p. 214] as of September 1, 1958 so that the committee and its work could be reorganized and expanded. Later in the year a conference was held [26] to survey the needs and to make plans for the future. A concluding note in the report of this conference reads as follows [26, p. 220]: “A Committee on the Undergraduate Program in Mathematics is now being appointed. Members of this committee met in New York City on December 29 and 30, 1958 to plan its future activities in view of the recommendations of the Conference.” The new committee which I appointed consisted of the following: E. G. Begle, R. C. Buck, W. T. Guy, R. D. James, J. L. Kelley, J. G. Kemeny, E. E. Moise, J. C. Moore, Frederick Mosteller, H. O. Pollak, Patrick Suppes, Henry Van Engen, R. J. Walker, and A. D. Wallace; at the committee’s request, I served as its chairman [*Amer. Math. Monthly*, **66** (1959), p. 359]. The committee promptly changed its name from CUP to CUPM: Committee on the Undergraduate Program in Mathematics. By that time there were curriculum improvement projects for the undergraduate programs in physics, chemistry, and biology also, and it was felt that it was necessary to add “Mathematics” to the committee’s former name to identify it properly. “The year 1959 and half of 1960 were devoted to organization and efforts to secure funds, which ended

in June 1960 with a grant from the National Science Foundation adequate to support the Committee for full scale work for two years" [24, p. 30].

R. C. Buck became the chairman of CUPM in April 1960 when it became clear that G. B. Price would become the Executive Secretary of the new Conference Board of the Mathematical Sciences and open the first office for mathematics in Washington, D.C. Price continued to be a member of CUPM until about the middle of the 1960s. With adequate financial support at last, CUPM completed its organization by employing R. J. Wisner as Executive Director and establishing a Central Office in Rochester, Michigan. The list of reports and other publications from the committee show that CUPM maintained a high level of activity [7, pp. 140–141]. In March 1963 the Central Office was moved to Berkeley, California. In June 1963 W. L. Duren, Jr. was appointed chairman of CUPM for a three-year term. MAA records [7, page 109] show that NSF supported CUPM with grants of almost \$2,560,000 during the period 1960–1965.

W. L. Duren, Jr. has written a history of CUPM up to about 1965 [24]. The committee continued to be active until about the middle of the 1970s. Its recommendations dealt with all fields in the mathematical sciences and at all levels from the freshman year through the first year of graduate work. Typically the committee appointed a panel, members of which were not necessarily members of CUPM itself, to prepare recommendations concerning a certain course or field of study. After careful review, these recommendations were published in a paperback pamphlet. In a few cases, these reports were revised and published in a second edition. Some time after 1975 the MAA "decided to publish in permanent form the most recent versions of many of the CUPM recommendations so that these reports may continue to be readily available to the mathematical community..." [27, Preface]. The resulting two volumes, entitled *Compendium of CUPM Recommendations*, Volumes I and II, constitute one summary of the work of CUPM. These volumes contain the names of 206 individuals who served on CUPM and its panels.

10. PRESIDENT OF THE MATHEMATICAL ASSOCIATION OF AMERICA

My positions as Governor from the Kansas Section during 1952–1955, Second Vice President of MAA during 1955 and 1956, President during 1957 and 1958, and *ex officio* positions thereafter made me a member of the MAA Board of Governors from 1952 to January 1984.

My first year, 1957, as MAA President was my last year as editor of the Society's *Bulletin*. Also, in 1957 I conducted my first NSF summer institute at Kansas. But the most significant events of my term as MAA President

resulted from the launching of Sputnik I on October 4, 1957. For a more detailed account of the events of 1957 and 1958, see [18, pp. 381–393].

The nation was shocked and alarmed at the sudden and unexpected beginning of the space age. Many meetings of various kinds were held to discuss problems in education, science, mathematics, and research connected with the crisis. Because I was President of MAA, I was invited to attend many of these meetings. Warren Weaver and the American Association for the Advancement of Science invited me to attend a meeting held at the Park-Sheraton Hotel in Washington, D.C. in late January, 1958. Dael Wolfle interrupted one of the sessions to announce, “Vanguard is in orbit!” Explorer I, the first United States earth satellite to be placed in orbit, and a satellite in the nation’s Vanguard program, was launched on January 31, 1958. Also, I attended a special meeting at the Office of Education in Washington, held to consider a broad range of needs of colleges and universities. Finally, in the summer of 1958 I attended a formal and very elaborate dinner for four or five hundred scientists at the Waldorf Astoria Hotel in New York City; President Eisenhower was the guest of honor. He announced that he had decided to ask Congress to appropriate funds to build the Stanford Linear Accelerator; the dinner had been arranged for the sole purpose of promoting this project.

Another meeting in which I became involved illustrates some of the less solidly based and less successful activities which resulted from the frenzied mood of the times. I was startled one day in December 1957 when I received a telephone call which began: “This is Kevin McCann in the White House.” I had never heard of Kevin McCann, but a call from the White House demanded attention! I soon discovered that Kevin McCann was calling, not as a member of the White House staff, but as President of Defiance College, a college of about six hundred students in Defiance, Ohio. Mr. McCann asked me to come to Defiance College to participate in a science meeting which he was organizing, and which would be held about the end of the 1957 Christmas holidays. With some apprehension, I agreed to participate. I learned that Professor Richardson, a professor of science education at Ohio State University and President of the National Science Teachers Association, had agreed to participate also. When the appointed time arrived, President McCann met Professor Richardson and myself at the Indianapolis airport with a small airplane and flew us to Defiance, Ohio. The airplane, borrowed from a local corporation, had a professional pilot and seats for three others.

No one seemed to know what the purposes and objectives of the meeting were. The faculty members from Defiance College and the scientists from the neighborhood who attended the meeting were unhappy over a meeting they did not understand. Professor Richardson and I felt that President McCann had imposed on us by persuading us to participate in a pointless and

futile undertaking. How did I get involved? One of my friends in Washington suggested me, probably because I was MAA President. Who was Kevin McCann? His connection with the White House resulted from the fact that he was a speech writer for President Eisenhower. A further clue is contained in the following sentence which appears under "Acknowledgements" on page 480 of *Crusade in Europe*, published by Dwight D. Eisenhower in 1948 as his memoirs of World War II: "Brigadier General Arthur S. Nevins and Kevin McCann, who rose from private to lieutenant colonel during the war, were indispensable assistants throughout the preparation of the book, once the decision to write it had been made." It seems that Kevin McCann had no special competence in the field of science, but that he had tried to do something to help because of the mood of the times.

There were many more significant developments during my term as MAA President. Congress greatly increased its appropriations for NSF in 1958, and NSF used some of its additional funds to support the MAA's program of visiting lecturers to secondary schools [see Section 8 above] and to support the Washington Conference [25]. Dr. James R. Killian, Jr., President of MIT and Special Assistant to the President, invited me to come to see him on one of my trips to Washington, and I went. Congress passed the National Defense Education Act of 1958; it was designed to promote the study of science, mathematics, and foreign languages by providing fellowships and other forms of financial support for students in high schools, colleges, and universities. I attended the International Congress of Mathematicians in Edinburgh, Scotland in August 1958 [18, pp. 390–391]. A major conference was held in Washington to reorganize the Committee on the Undergraduate Program [26]; this conference called for adequate financial support to enable it to carry out its assignment. Shortly after the conference, the new CUPM held an important meeting in New York City to plan its future activities. Finally, the School Mathematics Study Group was established during my term as President.

11. SCHOOL MATHEMATICS STUDY GROUP

The Commission on Mathematics, with Princeton Professor A. W. Tucker as chairman, had been appointed in 1955, and the Physical Sciences Study Committee (PSSC) had been established at MIT in 1956 by Professor Jerrold R. Zacharias. By early 1958 mathematics was demanding further attention. An NSF sponsored conference in Chicago on February 21, 1958 [28, pp. 9–10, 145–146] requested the President of AMS, after consulting the Presidents of MAA and NCTM, to appoint a committee to seek funds for the improvement of the school mathematics curriculum. Plans were completed at a meeting which had already been arranged by Mina Rees at MIT on

February 28 and March 1, 1958. The Council of the American Mathematical Society approved the plans that had been made, and, on April 3, 1958, after consulting MAA President G. Baley Price and NCTM President Harold P. Fawcett, AMS President Richard Brauer appointed a committee of eight mathematicians to carry out the instructions of the Chicago and Cambridge conferences. I was a member of the Committee of Eight [28, p. 147]. The School Mathematics Study Group was established at Yale University, and E. G. Begle of its Department of Mathematics became the Director of SMSG. The National Science Foundation made a grant of \$100,000 to SMSG on May 7, 1958 for the purpose of devising “a practical program which will improve the general level of instruction in mathematics in elementary and secondary schools.” Immediately after NSF made this grant, the Committee of Eight appointed an Advisory Committee (later called the Advisory Board) of twenty-six members. I was a member of the original SMSG Advisory Committee, and I remained a member of the Advisory Committee and Advisory Board for several years [28, p. 148]. I participated extensively in the activities of SMSG for several years. I was a member of the first writing session for the full four weeks ([32] was published during this period); it was held at Yale from June 23 to July 19, 1958, and I was assigned to work with the 11th grade subgroup. I spent about two weeks each with the writing groups at Colorado in 1959 and at Stanford in 1960.

William Wooton’s “SMSG: The Making of a Curriculum” [28] contains a detailed account of the establishment of SMSG and of its activities during the first four years of its existence. To obtain the full history, it is necessary to examine the many sample textbooks and other publications [29] and the long series of *School Mathematics Study Group Newsletters* [30]. The SMSG program was one of the important components of the “new math,” and the “new math” remains controversial to the present day. An analysis prepared by a committee of the Conference Board of the Mathematical Sciences in 1975 reported praise for the “new math” because of its “judicious use of powerful unifying concepts and structures, and the increased precision of mathematical expression” [31, p. 21]; others condemn the “new math” because of its novel content, its rigorous deductive logical presentation of ideas, its abstract ideas, and its sterile excesses in terminology and symbolism [31, p. 14].

12. REGIONAL ORIENTATION CONFERENCES IN MATHEMATICS

By 1960 SMSG had written a sample textbook for each of the grades 7 through 12; in addition, there were at least seven other curriculum study groups which had written textbooks or issued reports with recommendations for improved mathematics programs. The National Council of Teachers of Mathematics obtained a grant from NSF to support a series of eight Regional Orientation Conferences in Mathematics, with Frank B. Allen as Director,

to disseminate information nationwide about these curriculum improvement projects. The principal speakers at these conferences were the following: G. Baley Price, CBMS and The University of Kansas; Kenneth E. Brown, US Office of Education; W. Eugene Ferguson, Newton High School, Massachusetts; and Frank B. Allen, Lyons Township High School and Junior College, Illinois. The conferences were held at the following times and places during the fall of 1960: Philadelphia, PA (October 3–4); Iowa City, IA (October 10–11); Atlanta, GA (October 27–28); Portland, OR (November 3–4); Los Angeles, CA (November 18–19); Topeka, KS (December 1–2); Miami, FL (December 9–10); and Cincinnati, OH (December 15–16).

I spoke first at each conference; my talk, entitled “Progress in Mathematics and Its Implications for the Schools,” was designed to explain to teachers and administrators who attended why new and improved mathematics programs were needed in the nation’s schools. Dr. Brown followed me; his talk, entitled “The Drive to Improve School Mathematics,” described — without showing preference for any one of them — all of the new programs that were available for adoption in the schools. Dr. Ferguson was next; his talk, entitled “Implementing a New Mathematics Program in Your School,” described the steps to be taken — retraining of teachers, orientation of parents, etc. — in introducing a new mathematics program. Mr. Allen presided at the meetings, including question-and-answer sessions and panel discussions by teachers who described their own experiences with new mathematics programs, and he gave a summary of the conference at the end [18, pp. 403–404].

The proceedings of the eight conferences were published in a pamphlet entitled “The Revolution in School Mathematics” [33]. The preface of this pamphlet states that “the purpose of these conferences was to give school administrators and mathematics supervisors information that would enable them to provide leadership in establishing new and improved mathematics programs.” This pamphlet received national and even international attention: Associated Press dispatches described it, the education page of the *New York Times* reviewed it, and the Organization of American States translated it into Spanish [34]. I have been told that my article was translated into Portuguese and published in Brazil; it was published later in a paperback collection of readings on education [35]. After the eight Regional Orientation Conferences in Mathematics and the publication of their proceedings, many had heard about the “new math” [18, pp. 403–404].

13. CONFERENCE BOARD OF THE MATHEMATICAL SCIENCES

The chain of events which led eventually to the establishment of CBMS seems to have had its origins in the involvement of the mathematicians in World War I. Rothrock’s list [36] of American mathematicians in war service includes the names of eight who were with Major F. R. Moulton in ordnance

work, and there were twenty at Aberdeen Proving Grounds, including Oswald Veblen, Norbert Wiener, and G. A. Bliss. Many other prominent mathematicians — including G. C. Evans, W. L. Hart, T. H. Hildebrandt, Marston Morse, and Warren Weaver — are listed as being engaged in a variety of activities related to the war.

After World War II began in 1939, the mathematicians established the War Preparedness Committee of the American Mathematical Society and the Mathematical Association of America [37], [38]. Marston Morse was the general chairman of the committee, and the subcommittees and consultants included such mathematicians as John von Neumann, Harry Bateman, Norbert Wiener, T. C. Fry [40], S. S. Wilks, H. T. Engstrom, and W. L. Hart [39]. No account has been found of any official actions which led to the appointment of the War Preparedness Committee; however, G. C. Evans was President of the Society in 1939 and 1940, and Morse was President in 1941 and 1942, and they may have taken the initiative in the appointment of the committee.

After Pearl Harbor in 1941, there was need for something more than a preparedness committee. At a meeting of the Council and Board of Trustees of AMS in New York on December 27–28, 1942, M. H. Stone was elected President of AMS for 1943 and 1944. The report of this meeting states that “President Stone was authorized and requested to appoint a War Policy Committee” [41, p. 199]. Stone appointed “as members of the War Policy Committee (joint committee with the Mathematical Association of America), Professors M. H. Stone (chairman), W. D. Cairns, G. C. Evans, L. M. Graves, Marston Morse, Dr. Warren Weaver, and Professor G. T. Whyburn.” (Cairns was the President of MAA at the time [7, p. 126].) Later Professor MacDuffee, Acting Chairman of the War Policy Committee, reported five significant items, including the following: Marston Morse and M. H. Stone are representing the Society and the Association in Washington, and the Rockefeller Foundation has made a grant of \$2500 to support the work of the War Policy Committee [41, pp. 829–830]. At a meeting in Chicago in November, 1944, Stone (President of AMS and Chairman of the Committee) gave a somewhat lengthy report on the work of the War Policy Committee. Among other actions, he appointed a subcommittee on historical records of mathematicians in war activities; its members were J. R. Kline, R. C. Archibald, and Marston Morse [42]. A report [43] of a subcommittee of the War Policy Committee was published in 1945, and references to many of W. L. Hart’s activities are given in [39]. When World War II was over, the Society and the Association discharged their War Policy Committee. On page 38 of [44] we read: “The Secretary reported that he had submitted to the Rockefeller Foundation a report on the activities of the War Policy Committee for the period August 1, 1944–September 30, 1945.” On page 178 of [45] we find the following: “The Board voted approval of the final report of the War Policy

Committee to the Rockefeller Foundation. Also, in accordance with similar action already taken by the American Mathematical Society, it was voted to discharge this committee, which had been a joint committee of the Society and the Association.”

Apparently the Society and the Association felt that their collaboration through the War Policy Committee had been useful, because, as they discharged this committee, they made plans for a new committee, the Policy Committee for Mathematics, for similar joint efforts in peace time. On page 41 of [44] we read that “the Council approved a plan, submitted by President Hildebrandt and Secretary Kline, for establishing a Policy Committee for Mathematics, and adopted procedures for the selection of the representatives of the American Mathematical Society on this Committee.” At first the Association was reluctant to join the new committee, for the report from the Board of Governors on page 178 of [45] states that “a proposal from the American Mathematical Society for the formation of a Mathematical Policy Committee was discussed but no action was taken on the matter at this time.” But with strong support from prominent members of the Society, the Policy Committee for Mathematics was established, and the Association participated. The committee began with large plans and high hopes, for on page 969 of [46] we read the following:

Professor M. H. Stone reported for the Policy Committee for Mathematics that the committee had discussed in detail a number of problems which face the mathematical profession in the post-war period. Prominent among these are: the various science bills before Congress; atomic research, particularly as it affects freedom of scientific investigation; the various changes in Selective Service regulations; international cooperation problems raised by the United Nations Educational, Scientific and Cultural Organization. A report of the activities of this committee for the period October 1, 1945–June 30, 1946, was submitted during the summer of 1946 to the Rockefeller Foundation, which has been supporting the work of this committee.

Reports of its activities continued. Page 247 of [47] states that “Professor R. E. Langer was elected by the Council to serve as the Society’s representative on the Policy Committee for Mathematics, for a period of four years beginning January 1, 1947. (Professor Langer succeeds Professor G. C. Evans.)” But the Committee began to suffer setbacks. The Committee’s plans for a meeting in Mexico City were abandoned [47, pp. 1105–1106], and the Committee lost the financial support of the Rockefeller Foundation [47, p. 1108]. One by one, additional mathematical organizations requested and received representation on the Policy Committee, and in 1959 the Society for Industrial and Applied Mathematics was admitted as the Committee’s

sixth member organization. The Policy Committee for Mathematics did not develop a large program of activities, but it nominated members for two of the National Bureau of Standard's Advisory Panels; these nominations were later made by the Conference Board of the Mathematical Sciences. In 1956 the MAA representatives on the Policy Committee for Mathematics were D. E. Richmond, W. L. Duren, Jr., and H. M. Gehman [48, p. 216]; and they were D. E. Richmond, G. B. Price, and H. M. Gehman in 1957 [48, p. 222].

A series of events, beginning about 1955, led to the conversion of the Policy Committee for Mathematics into the Conference Board of the Mathematical Sciences and the establishment of its Washington office. As a result of the establishment of NSF, the Association had appointed its Committee on the Undergraduate Program, and it had become involved in summer institutes, visiting lecturers programs, and various other activities. In response to these developments, the MAA appointed its Committee to Study the Activities of the Association [49]. I (G. B. Price) was the chairman of this committee throughout its three-year history. When I was elected President of the MAA in 1957, I became an *ex officio* representative of the Association on the Policy Committee for Mathematics [48]. Only a few relevant items of history can be found in the record, but [50, 64 (1957), 213] contains a recommendation from the Committee to Study the Activities of the Association to the MAA Board of Governors which shows that the committee was seeking a stronger organization through which the mathematicians could cooperate on problems of common interest. Attention focused on a reorganization and modification of the Policy Committee for Mathematics. The MAA met in Cincinnati, January 30–31, 1958; the minutes of the meeting of the Board of Governors [51] states that “the Board ratified the constitution and by-laws of the Conference Organization of the Mathematical Sciences, which is replacing the Policy Committee for Mathematics.” It appears that the name of the new organization was changed almost immediately, because the same 1958 volume of the *Monthly* [52] shows that G. B. Price and H. M. Gehman were the representatives of the Association on the Conference Board of the Mathematical Sciences. While these changes were taking place, the MAA was concerned about its headquarters and its staff; in the report [53] of a meeting held at the University of Rochester on December 29, 1956, we find the following: “On the recommendation of the Committee to Recommend an Association Headquarters and to Nominate a Secretary-Treasurer, the Board voted to re-elect Professor H. M. Gehman for another five-year term (1958–1962) as Secretary-Treasurer of the Association.”

With all of these considerations and activities as a background, Sputnik I was launched on October 4, 1957. The Association had experienced explosive growth both in members and in programs; it had approximately 7500 members, and about 23 percent of them were in non-academic positions. The MAA sought and received a grant from the National Science Foundation for a

conference, known afterward as the Washington Conference, to study a wide range of critical problems [25]. The conference was held in Washington, May 16–18, 1958; the report lists the names of 33 persons who attended. This list includes the following: R. C. Buck, E. J. McShane, Tibor Radó, A. E. Meder, Jr., E. G. Begle, Mina Rees, A. W. Tucker, S. S. Wilks, John R. Mayor, and Dael Wolfle from the American Association for the Advancement of Science, Leon W. Cohen from the National Science Foundation, E. D. Vinogradoff from the President's Committee on Scientists and Engineers, and G. A. Rietz and M. A. Shader from the General Electric Company and the International Business Machines Corporation, respectively. Those who attended were widely representative of mathematics, education, business, and government. The conference considered a multitude of desirable activities for the Association and also the problem of their management and staffing by the MAA. The conference adopted a series of recommendations, one group of which was listed as "Resolutions on a Plan of Action." In the first of these recommendations, the conference recommended that the MAA change its constitution and by-laws so as to provide for a Secretary and a Treasurer (different persons) and also a new officer to be known as Executive Director [25, p. 584]. The second resolution recommended that the Executive Director be located in an office in Washington, D.C. [25, p. 585]. The third resolution reads as follows [25, p. 585]:

The Washington Conference recommends to the Conference Board of the Mathematical Sciences that the Board look to the establishment of an office in Washington coupled with the appointment of a suitable officer based there to deal on a national scale with problems and questions involving mathematics as a whole.

The recommendations of the Washington Conference seemed to receive general approval, because the report of the summer meeting which followed at MIT contains the following statement [54, p. 726]:

At the conclusion of the Thursday afternoon session, the following motion presented by Professor L. W. Cohen was adopted: 'It is the sense of this meeting that the resolutions adopted by the Washington Conference outline a proper and a promising program for the future activities of the MAA and the meeting lends its full support to the officers of the Association in vigorously carrying this program to completion.'

I had become acquainted with a representative of the Carnegie Corporation of New York, and through him I negotiated a grant for the establishment of a Washington office. In December 1958 the Mathematical Association of America received a grant [55, p. 1056], [57]. In [56, p. 354], the report of the meeting of the Board of Governors states that "the Board voted to accept

with an expression of gratitude a grant from the Carnegie Corporation of New York of \$75,000 over a three-year period for the support of a Washington Office of the Association.” At its Salt Lake City meeting in 1959 the Association recommended that the Washington office be established by the Conference Organization with the Carnegie grant. The Conference Organization was incorporated in Washington on February 25, 1960, with the name Conference Board of the Mathematical Sciences (the record does not indicate clearly when the change from “Organization” to “Board” took place). The CBMS was now established and in a position to begin business.

I had been elected Acting Chairman of the Conference Organization (or Board) at the Cincinnati meeting in January 1958, and I was elected Chairman for a two-year term at the Philadelphia meeting in January 1959. Early in 1960 I was asked to be the Executive Secretary of CBMS; when I agreed to do so, I resigned as Chairman and Professor S. S. Wilks of Princeton became Chairman. On July 1, 1960, I opened the office of CBMS in a room of the AAAS Building at 1515 Massachusetts Avenue, N. W. in Washington. The officers of CBMS were S. S. Wilks, Chairman; J. R. Mayor, Secretary; A. E. Meder, Jr., Treasurer; and G. B. Price, Executive Secretary. The Conference Board had no individual members but six member organizations; they were the following:

- American Mathematical Society
- Association for Symbolic Logic
- Institute of Mathematical Statistics
- Mathematical Association of America
- National Council of Teachers of Mathematics
- Society for Industrial and Applied Mathematics

The Association for Computing Machinery was admitted as the seventh member organization in 1962.

By 1960 Washington was the scientific, as well as the political, capital of the United States. Files still in my possession show that CBMS tried (a) to provide a Washington presence for mathematics, (b) to facilitate communication between its member organizations and the various scientific and governmental agencies in Washington, and (c) to operate certain projects of interest to all of its members but which might not be undertaken by one of them alone. Some examples will illustrate these activities; they are based on some fragments of CBMS files still in my possession.

Frequently, CBMS supplied information and help, on request, to organizations and agencies in Washington. Simple requests for information and help were answered by the Executive Secretary by telephone or letter; major requests were answered with help from the entire mathematical community. For example, a letter from the Office of Education in September 1960 invited

the Conference Board to comment on the programs of the Federal Government in support of higher education; the Conference Board called about twenty-five mathematicians to a two-day conference to prepare a reply; the proceedings of this conference were published in a report entitled "Report on a Mathematicians' Conference on the Support of Higher Education by the Federal Government." Free copies of this report were widely distributed, but I do not have a copy of it now. An unexpected invitation to appear before a committee of Congress in August 1961 was declined; CBMS sought to prepare itself so that it could accept such invitations in the future.

A second example concerns a project to study the design of buildings and facilities for mathematics, statistics, and computing. Within a week after I opened the CBMS Washington office on July 1, 1960, I met Mr. Jonathan King, Secretary of Educational Facilities Laboratories, Inc., which was a subsidiary of the Ford Foundation in New York. Through him I obtained a grant of \$56,500 from Educational Facilities Laboratories to the Mathematical Association of America to support the CBMS project (probably the grant was made to the MAA because CBMS had not yet obtained tax-exempt status). J. Sutherland Frame, director of the project, produced a handsome volume which was beautifully printed by Columbia University Press [58], [62]. As required by the grant, Frame's report contains a section on buildings and facilities for secondary schools. My files contain a copy of a letter dated 29 August 1962 from John R. Mayor (CBMS Secretary and Treasurer) to Mr. Jonathan King which reads in part as follows: "We are, of course, very pleased to learn that Educational Facilities Laboratories has granted \$24,000 to the CBMS to enable the Board to publish and distribute 10,000 copies of a report on facilities for the mathematical sciences. Enclosed is the evidence of our tax-exempt status which is now in full force and effect."

A third example concerns Continental Classroom, a television course organized by Dorthy Culbertson and televised nationally by the National Broadcasting Company [18, pp. 401–402]. Professor Harvey E. White from Berkeley had given a physics course on Continental Classroom during 1958–1959, and Professor John F. Baxter from the University of Florida had given a chemistry course during 1959–1960. Continental Classroom presented Contemporary Mathematics over the NBC network during the academic years 1960–1961 and 1961–1962. The first semester of the course was Modern Algebra; it was taught by Professor John L. Kelley from Berkeley and Dr. Julius H. Hlavaty, DeWitt Clinton High School, New York City. During the second semester Professors Frederick Mosteller of Harvard and Paul C. Clifford of Montclair (N. J.) State College taught a course entitled Probability and Statistics. Contemporary Mathematics was sponsored by CBMS and Learning Resources Institute; it was produced by the National Broadcasting Company. The Conference Board, through its Advisory Committee on Television, Films, and Tapes, outlined the courses to be presented and assisted in

the selection of lecturers. Kelley wrote a special book for his semester [59], and much of the material in Mosteller's semester appeared in another book [60].

A draft of a Bulletin of Information (in my files) prepared in October 1961 shows that CBMS had developed a very full program of activities. But some of the member organizations of CBMS had developed strong objections to this program, and CBMS did not prosper. I became the full-time Executive Secretary on July 1, 1960 and lived in Washington; during 1961–1962 I devoted half-time to the position, living in Lawrence, Kansas and commuting to Washington. I had exhausted my leave from my university; therefore, on July 31, 1962 I resigned as Executive Secretary and returned full-time to my position at the University of Kansas [63]. A. W. Tucker was Chairman of CBMS in 1961–1962, and later Chairmen were J. Barkley Rosser and R. H. Bing. Leon W. Cohen became Executive Secretary on August 1, 1962 and served to the end of the summer of 1965; Thomas L. Saaty followed Cohen [57].

Although CBMS did not achieve its early promise, it made a beginning. It opened the first office for mathematics in Washington; later, in 1968, the MAA moved its headquarters to Washington, and the two have helped to provide a “Washington presence” for mathematics ever since (compare the recommendations of the Washington Conference [25]). CBMS has continued to hold important conferences and to sponsor important committees; see, for example, [61] and [31]. Some of the projects of CBMS have borne fruit many years later. For example, my files contain the minutes of a 1963 meeting of the CBMS Committee on a Forum for Mathematical Education. The proposed Forum was not established at that time, but in 1985 CBMS participated in the establishment of the Mathematical Sciences Education Board in Washington.

The awards ceremony of the U.S. Mathematical Olympiad contains a reminder of my Washington service. The AMS nominated me for membership on the U.S. National Commission for UNESCO, and I served two terms (1961–1966) on this Commission. Through this connection, I became acquainted with the Diplomatic Reception Rooms in the State Department Building. When Nura Turner asked me later where in Washington she could find an elegant and impressive setting for the awards ceremony, I told her that I knew of nothing to equal these Diplomatic Reception Rooms. I had no idea that she could obtain them for the awards ceremony, but she did!

14. CONCLUSION

The 1960s developed into a period of racial strife, social reform, and war protest. Mathematics became less important, Congress made significant changes in the National Science Foundation [10, chap. 12], and about 1970

NSF withdrew all of its support for visiting lecturer programs, institutes for teachers, curriculum improvement projects, and other education programs [10, p. 237]. A significant era in mathematics came to an end, and I had time to write my history of the department [18] and to complete the book on mathematics [64] which I had begun long before.

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63. Resolution of the Conference Board, *Amer. Math. Monthly*, **70** (1963), 118.

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