EPADEL
A Semisesquicentennial History, 1926-2000

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An MAA Section viewed as a microcosm of the American mathematical community in the twentieth century.

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INTRODUCTION

The Mathematical Association of America (MAA) is the world's largest organization devoted to the interests of collegiate mathematics, with a major emphasis on the teaching of mathematics at the collegiate level. The MAA is different from many professional mathematical organizations in one vital respect – more activity takes place within its sections than at its national meetings.

This work chronicles the history of one of those sections during its first 75 years. Chapter 1 provides a background to the establishment of the section by outlining the formation of the two major mathematical organizations in the country and their sections – the MAA and the AMS (American Mathematical Society). Chapter 2 discusses the founding of the Philadelphia Section in November 1926. The Section initially included all of central Pennsylvania and southern New Jersey. The next four chapters describe the development of the section into periods defined by external events. The first, 1926-1933, ends with the founding of the Allegheny Section. The second, 1933-1941, includes the role played by émigrés who settled in the area after fleeing their homeland to avoid persecution. The period 1941-1956 begins with wartime activities and ends with the founding of the New Jersey Section. It is followed by a period of immense expansion, 1956-1978. The present name of the section, EPADEL, adopted in late 1978, serves as a divider for the last period, 1978-2000, the focus of Chapter 7. In addition, by the mid 1970s it became necessary to add a second annual meeting to the program; the final chapter describes the resulting spring meetings held annually since then.

This book has been written so all chapters can be read independently. Thus someone who is not interested in the distant past, but wants to recall activities and leaders from, say, the sixties, can jump to the corresponding chapter with impunity. On the other hand, reading the book from front to back provides a greater appreciation for the incremental changes that have taken place over the 75- year duration.

The emphasis of this book, however, is not strictly on the mathematical developments that took place. Rather, the strength of the MAA – and its sections – lies with the vast army of volunteers who march to the front line with plans of actions. Consequently this account emphasizes the people who made the section what it is. In this sense, the book attempts to bring the sectional leaders to life by interspersing biographical sketches into the narrative. Some of theses leaders have been so active – and decorated on a national scale – that larger profiles are provided at the end of chapters. Altogether 16 personalities have been profiled; 88 others have biographical sketches. Appendix 1 provides an alphabetical list of all 104 of them.

Sometimes, finding details about these personalities has presented a daunting task, because few departments have kept very good records. However, I have been helped enormously by several archivists, to whom EPADEL and I owe a great debt of gratitude: Claire L. Andrews and John A. Erdmann (Kutztown),

Raymond Butti (Brown), James Duffin and Ryan M. Janda (Penn), Daniel R. Gilbert (Moravian), Philip A. Metzger (Lehigh), Patricia O'Donnell (Swarthmore), Diana F. Peterson (Haverford), Ann W. Upton (F&M), and Carolyn Weigel (Ursinus).

Many present EPADEL members have also aided me in locating information. I will not attempt to list all of them here, partly for fear of omitting someone who spent a lot of time searching for, say, the exact year of retirement of a colleague. However, I hereby acknowledge the invaluable help I received from a few people who are not sketched in this work: Stephen F. Andrilli (LaSalle), James P. Crawford (Lafayette), Penelope H. Dunham (Muhlenberg), Gary L. Ebert (Delaware), Frederick W. Hartmann (Villanova), Everett Pitcher (Lehigh), Chris Rorres (Drexel), George M. Rosenstein, Jr. (F&M), Jeff Tecosky-Feldman (Haverford), and Paul R. Wolfson (West Chester).

I am particularly indebted to Temple University for a Research and Study Leave during the spring 1999 semester. This sabbatical allowed me to jumpstart a history that had been languishing the previous two years.

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David E. Zitarelli
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PREFACE

The MAA has played a large role in my professional life since my undergraduate days at Pennsylvania Military College (shortened to PMC, but now called Widener University). Three serendipitous events formed the basis for my future involvement in the Association during my three years there.

The first occurred while I was in the school's library doing research for a term paper in one of two required composition courses. Taking a break from Occam's Razor, I perused the stacks in the school's small library, which then consisted of only two rooms. Although a general science major, I maintained a strong interest in mathematics, so my eyes were drawn to the only magazine on mathematics in the stacks, the *American Mathematical Monthly*. I soon learned to call it a "journal" instead of a "magazine". But I found the articles inscrutable. A year later, having scanned every issue of the journal upon its arrival, I asked Professor Claude Helms, then head of the department, "What's topology?" "Some newfangled theory," he replied offhandedly.

But Helms encouraged me to write Harry Gehman, whose name was listed on the cover of the *Monthly*. That led to the second event that would define my career, because the longtime MAA secretary-treasurer responded with a detailed, personal letter explaining the path I should follow to study topology. He also invited me to apply for membership in the MAA. So began my first, tentative steps toward becoming a mathematician, though an algebraist and not a topologist. Upon transferring to Temple University, I elected a course with Dr. Marie Wurster, who taught me the critical ability to write proofs.

The third decisive event took place when the Temple chair, Dr. Walter Lawton, encouraged me to attend a sectional meeting of the MAA. So, on a nasty, wind-swept November morning, I trudged to Haverford College to spend an entire Saturday immersed in words and concepts that belonged on a different planet. Yet the spirit of the speakers, especially Pincus Schub of Penn – a little, old man with big, young ideas – was infectious.

These three events – discovering the *Monthly*, joining the MAA, and attending its sectional meetings – conspired to draw me ineluctably to the present work. They also highlighted the central role that *individuals* play in our professional development. It is my grandest hope that this book enables other sectional members to understand and to appreciate our rich heritage. I also hope that other mathematicians will learn about the important role this local microcosm has played in the more global American mathematical community.

Chapter 1: BACKGROUND

Since 1978 the 17th section of the Mathematical Association of America (MAA) has been called the Eastern Pennsylvania and Delaware Section. This name is usually abbreviated EPADEL, although there is wide disagreement whether to pronounce the first syllable as *eep* or *epp*.

In 1926 two Lehigh University mathematicians joined forces with a colleague from the University of Pennsylvania to organize the first formal program of mathematical lectures in the section. Ultimately their activity generated the very first MAA section in the eastern United States. Beginning with an application for a charter from the MAA, the section was initially called the Philadelphia Section in spite of the fact that its membership ranged throughout eastern and central Pennsylvania, the whole state of Delaware, and southern New Jersey. Even today, 75 years after the founding, the Philadelphia area remains the hub of activity for a geographical region stretching from Wilkes Barre and Mansfield in the north to the tip of Delaware in the south, and from the Shippensburg-Gettysburg-Dickinson triangle in the west to the Lehigh Valley in the east.

The section has a glorious history. Before turning to that history we pause to examine briefly the background of its founding. First we outline the history of the country's two major organizations – the MAA and the AMS (American Mathematical Society). Then we chronicle their official journals, including a biographical sketch of one leading figure, Benjamin F. Finkel, who has strong ties to the area. The chapter ends with a discussion of the emergence of official sections within both the AMS and the MAA.

Readers eager to read about the section's history are encouraged to jump to Chapter 3 for an account of the founding, or to Chapters 7 and 8 for an analysis of activities over the past 25 years. Overall, the chapters are generally independent of one another, though a common thread runs throughout the entire work.

The AMS

Neither the AMS nor the MAA was created in a vacuum. The history of professional organizations in the country began with associations devoted to more general scientific matters, such as the American Philosophical Society. The APS was founded in Philadelphia in 1743 as the country's first professional society devoted to science. By the end of the 19th century many of these general organizations evolved into societies dedicated to a particular science.

The first movement to form an organization of scientists interested primarily in mathematics took place in New York City in 1817 when a transplanted Englishman, William Marrat, convened a gathering of eight mathematicians. Although this group endured for eight years, it seems to have expired when Marrat returned to England in 1825.

No attempt at founding an organization devoted to mathematics would occur for another 63 years. In 1888 Thomas Scott Fiske, inspired by meetings of the

London Mathematical Society, returned to New York City from a yearlong visit to Cambridge, England, "filled with the thought that there should be a stronger feeling of comradeship among those interested in mathematics. I proposed to my classmates and friendly rivals, Jacoby and Stabler, that we should try to organize a local mathematical Society." Together the three graduate students printed and distributed the notice of an organizational meeting of the New York Mathematical Society (NYMS). It is relevant to the history of EPADEL that the meeting was held on Thanksgiving Day (in particular, November 24, 1888).

Interest in the NYMS proceeded slowly at first but by the early 1890s its membership began to increase more rapidly, growing from only 6 in 1888 to 251 in 1894. By 1894 there was sufficient demand to expand the Society's meetings to locales beyond New York City. The name was changed to reflect this expansion to a national organization, called the American Mathematical Society. As a corollary, the Society's official journal was renamed the *Bulletin of the American Mathematical Society*.

The *Monthly*

There were several short-lived attempts to establish mathematical journals throughout the 19th century, including the *Mathematical Correspondent* and three different periodicals called *The Analyst*. The first to find a permanent niche on American soil was the *American Journal of Mathematics*, founded at Johns Hopkins University in 1878 by J. J. Sylvester and William Story. Six years later a second such journal was initiated by Ormond Stone at the University of Virginia, the *Annals of Mathematics*.

Of particular relevance was the launching in 1858 by John Runkle of a journal he called the *Mathematical Monthly*. Although it ceased publication with the onset of the Civil War in 1861, it was reestablished in 1894 as the *American Mathematical Monthly*. Initially the *Monthly*'s masthead read, "founded in 1894 by Benjamin F. Finkel, [and] published by him until 1913. From 1913 to 1916 it was owned and published by representatives of fourteen Universities and Colleges in the Middle West." Because the founding of the MAA is intimately intertwined with the history of its official journal, we must relate a few facts about the journal's founder, including two close ties to the Philadelphia area.

- **Benjamin Franklin Finkel** (1865-1947) earned a B. S. degree from Ohio Northern in 1888 and then taught high school mathematics. He managed to stay professionally active by contributing to the problem departments in several publications, including the *Saturday Evening Post*. In 1895 Finkel was appointed professor of mathematics and physics at Drury College in Missouri, where in 1894 he began to publish the *American Mathematical Monthly* in order to improve instruction in high school mathematics. His first action in publishing the *Monthly* was to secure the editorial assistance of a high school teacher, **John Colaw**, who had received a bachelors degree (1882) and a masters degree (1892) from Dickinson College.

> Colaw's background at Dickinson provides one link between the Philadelphia area and the founding of the MAA. Another involves Finkel himself. He left his position at Drury College for two periods of study, the second at the University of Pennsylvania, where he earned an A. M. degree in 1904 and a Ph.D. in 1906. By the time Finkel returned to Drury College in the fall of 1906, it had become apparent that college and university instructors demonstrated much more interest in the journal than its intended audience of high school teachers.

The NYMS created the *Bulletin* in 1891. The AMS created the *Transactions* nine years later. That is the customary order in which these entities are related, with societies establishing journals. Not so with the MAA, however. The *Monthly* actually spawned the MAA, not the other way around, and so this section of the MAA can lay claim to playing a decisive role in founding the national organization it would become a part of in 1926.

The MAA

We mentioned above that the masthead of the *Monthly* carried the message, "From 1913 to 1916 it was owned and published by representatives of fourteen Universities and Colleges in the Middle West." This note suggests the tenuous nature of funding at this time. Its managing editor, Herbert Slaught, realized that colleges offered uncertain support, so he proposed that the AMS sponsor the *Monthly*. The AMS formed a Committee to consider this issue, but it voted 3 to 2 against such an undertaking. The Council of the AMS accepted the Committee's report, resolving:

> *It is deemed unwise for the American Mathematical Society to enter into the activities of the special field now covered by the American Mathematical Monthly; but the Council desires to express its realization of the importance of the work in this field and its value to mathematical science, and to say that should an organization be formed to deal specifically with this work the Society would entertain toward such an organization only feelings of hearty good will and encouragement.* [Our emphasis.]

Herbert Slaught immediately launched a movement to follow up on the Council's suggestion to form an association. He arranged an organizational meeting at the joint gathering of the AMS and the AAAS (American Association for the Advancement of Science) held December 30-31, 1915, at the Ohio State University. Earle Hedrick presided over the 104 people in attendance. All organizational matters were settled within three hours on the very first day of the meeting except for the official name of the organization, which was adopted the next day. Consequently the Mathematical Association of America was born on New Year's Eve, 1915.

At that time almost all national meetings took place near holidays, especially Thanksgiving and New Year's. Today few meetings of mathematical organizations are held during either the Thanksgiving weekend or the week between Christmas and New Year's Day.

It was only then that a committee was established to negotiate with the owners of the *Monthly* to secure the publication as the official journal of the Association. However, it was the *Monthly* that had spawned the Association to begin with!

Sections

Although the New York Mathematical Society had expanded to the American Mathematical Society in 1894, few Midwesterners were able to make the long journey to the Society's meetings, which continued to be held in the East. To address this issue, a two-day conference was convened in Chicago on December 31, 1896, with the aim of founding a local section of the American Mathematical Society. When the resulting resolutions were later transmitted to the AMS, the Council of the Society authorized the formation of sectional meetings by adding a new clause to its by-laws. The first official meeting of the Chicago Section of the AMS was held on April 24, 1897.

Other parts of the country soon caught the sectional fever. The San Francisco Section was formed in 1902 and the Southwestern Section in 1906. However, as a sign of persisting regional biases, meetings of the Chicago Section were not designated as official AMS meetings until 1913, and meetings of other Sections not until 1929. Such a designation was important professionally because publication in the *Transactions of the AMS*, for instance, was only possible for papers presented at official Society meetings.

In short, the AMS was established from the NYMS in 1894, with its first three sections formed in 1897, 1902, and 1906. The MAA was founded in 1915. How long did it take this organization to form sections?

It took just a few minutes.

The MAA constitution was drawn up on the first day of its organizational meeting in Columbus, Ohio, on December 30, 1915. The authors specifically provided for the formation of sections, so by the time the constitution was formally adopted the next day a group from Kansas had already drafted a petition to become the first official section of the newly formed Association.

Yet that honor would go to a group from another state. A group of college mathematics teachers in Ohio also met on the first day of the organizational meeting to vote on whether to form the Ohio Section of the newly formed MAA. Organizationally savvy, they created a special committee at once to prepare their own constitution. Therefore the Ohio group, like their counterparts in Kansas, was poised for action when the national MAA constitution was approved.

Within one hour of the adoption of the MAA constitution on December 31, three state organizations presented petitions to become formal sections, with Missouri joining Kansas and Ohio. It is no wonder that Missouri would position itself favorably. Since 1894, college mathematics teachers in the appropriately

nicknamed “Show Me” state provided sufficient support for the publication of the *American Mathematical Monthly* under Benjamin F. Finkel. Besides, Earle R. Hedrick, then at the University of Missouri, was one of the founders of the national MAA and served as its first president.

However, the fact that Ohio State was the site of the MAA organizational meeting afforded a distinct advantage in the contest to become the first official MAA section. So, not surprisingly, Ohio beat Missouri by a few minutes in the heated race to secure the first section charter. Kansas placed third.

Faced with the overwhelming and immediate response of applications from three state associations, the Council of the MAA [now called the Board of Governors] created a Committee on Sections right there at its own organizational meeting to formulate terms under which sections could be approved. The application from Ohio was the first to be granted, on March 1, 1916.

The Ohio Section was not the first to hold an official sectional meeting, however. That honor reverted to the Kansas Section, which met on March 18 at the University of Kansas. The Ohio Section held its first meeting a month later for two days, and has held annual meetings every spring since then except for the year 1945. Meanwhile the Missouri Section waited until November to hold its first meeting.

Four more MAA sections were formed during the year 1916. Three of these represented midwestern states: Iowa, Indiana, and Minnesota. The other section established that year had a different geographical boundary: the Maryland-Virginia-District of Columbia Section.

Over the next 10 years state sections were formed in Kentucky, Illinois, Texas, Michigan, and Nebraska. Three other sections were formed from unions of states – the Rocky Mountain Section (Colorado and Wyoming), the Southeastern Section (Alabama, Florida, Georgia, the two Carolinas, and Tennessee) and the Louisiana-Mississippi Section. One new section was a subset of a state – the Southern California Section. The latter was formed at the urging of Earle Hedrick, who had moved from the University of Missouri to the University of California, Southern Branch (now UCLA). Hedrick acted as temporary chairman of the section until a formal election of officers could be held.

Altogether, then, 16 sections were formed up to 1925. Our section would be next.

Chapter 2: FOUNDING

Chapter 1 described the founding of the first national organization of research mathematicians (the NYMS in 1888, expanded to the AMS six years later) and the first national organization of college mathematics teachers, the Mathematical Association of America (MAA). That chapter also discussed the genesis of sections within a professional society like the AMS and outlined the establishment of the first 16 sections of the MAA.

The present chapter describes the founding of the MAA section initially called the Philadelphia Section, including a detailed account of the organizational meeting held at Lehigh University in November 1926. The formation of the section supplies evidence of an emerging community of scholars in eastern Pennsylvania, Delaware, and southern New Jersey, one that boasted sufficiently many members to support and sustain its own MAA section. To provide additional evidence of the emerging community the chapter ends with a brief description of the joint AMS-MAA national meeting held in Philadelphia just one month after the founding of the section.

Who were the leaders of this new section? Where were they employed? What were their interests?

Overall this chapter answers these questions in two ways. First, it describes the efforts of three mathematicians to found the Philadelphia Section in 1926: A. A. Bennett and J. B. Reynolds from Lehigh University and H. H. Mitchell from the University of Pennsylvania. Each founder is profiled at the end of the chapter. Their aim was to foster a spirit of collegial mathematics throughout eastern Pennsylvania, southern New Jersey, and all of Delaware. No organization can thrive with only three leaders, and our section benefited from a large cadre of volunteers. Biographical sketches of some of them are included, as well as brief portraits of most of the section's 14 charter members. This group formed the critical mass needed to establish and energize the section's early meetings.

Atlantic Apathy

Altogether the MAA approved 16 sections from the time of its founding in 1915 through the formation of the Southern California Section in 1925. All but one of these sections was located in the South, Midwest, or West. Why did Eastern states feel such little need for separate sections? Had not the AMS originated New York? Did the AMS, whose primary concern was research, sufficiently address the needs of college teachers?

Leaders at MAA headquarters answered the last question with a resounding "No." Yet they expressed apprehension about the lack of interest of their eastern colleagues. Albert A. Bennett later recalled that Herbert Slaught and longtime MAA secretary W. D. Cairns expressed concern about the "seeming apathy or lethargy" of mathematicians in the Atlantic States. After all, the easternmost

section at that time was the Maryland-Virginia-District of Columbia Section, which had been formed in 1916. Actually, Bennett's Lehigh colleague, Joseph B. Reynolds, had suggested the idea of forming a Lehigh Valley Section as early as 1925, but apparently there was insufficient support in that small area. Just as a critical mass of individuals and institutions was necessary to form the American community of mathematicians, so the formation of an MAA section in eastern Pennsylvania and surrounding areas would require a sufficient number of interested – and qualified – individuals and supportive institutions.

Cairns, Slaught, and Bennett all took part in founding the MAA in 1915. Cairns acted as the temporary secretary of the organization until it took root, and then held the permanent position until his death in 1943. Slaught represented the Board of Editors of the *Monthly*. Many years later, Bennett described conditions that existed at the time of the founding:

> *Our Association was founded under especially auspicious circumstances. The many favorable factors were not accidents, nor miracles, nor achieved through serendipity. Some were the end results of a chain of events, not always desired, not always with the eventual outcome in view. But in large part they were secured through wise planning, tactful compromise, cajoling of the apathetic, courageous facing of pessimists in high places, and unremitting work.*

We will see that this quotation could apply equally to the Philadelphia Section if the word "Association" is replaced by "Section".

The present EPADEL Section of the MAA was initially called the Philadelphia Section. This name might suggest a circle as a model, with the city being the center of primary activity and radial activity emanating from it. However, a more appropriate model is an ellipse because there were two focal points at the time of the section's birth. One focus lay at Lehigh University, where the first idea and initial impetus originated with Joseph Reynolds and Albert Bennett. But it was soon realized that the Lehigh Valley alone did not provide sufficient support for an entire MAA section. A greater population of college mathematics teachers was needed; a critical mass was necessary. It was Philadelphia, the second focus located some 40 miles south of Lehigh, that supplied the bulk of scholars interested primarily in mathematics at the college level.

The First Community

We proceed to describe the small but active community of mathematicians in Eastern Pennsylvania during the year of the section's founding in 1926 by examining articles and reports from the ten issues of the *Monthly* appearing that year. This group would overcome "Atlantic apathy" to form the first Eastern section of the MAA.

The January issue begins with the official report of the ninth annual summer meeting of the MAA held the previous September at Cornell University. Of national interest was the formal adoption of the Chauvenet Prize for mathematical exposition, the first award given by the MAA. The three-person committee charged with selecting the winner of this coveted prize included Bryn Mawr College's Anna Pell Wheeler, who would present the AMS Colloquium Lecture at the 1927 summer meeting. As we will see, Wheeler became the first woman ever to head our section.

The same issue of the *Monthly* reveals that of the 160 mathematicians who attended the Association's national meeting in Kansas City the previous year, only J. R. Kline of the University of Pennsylvania and Harold S. Everett of Penn State came from eastern or central Pennsylvania. However, another attendee, Arnold Dresden, would move from the University of Wisconsin to Swarthmore College the next year.

The February 1926 issue reveals that five of the 61 new MAA members hailed from the Philadelphia area. Not only does this quintet reflect a growing community, but also the scattered locations of their institutions, different levels of their teaching, and wide range of mathematical interests, suggest a diverse local populace. Three of the new members taught at colleges in the Lehigh Valley: Laura F. McDonough (Moravian College), W. B. Marquard (Lafayette College), and Morris S. Knebelman (Lehigh University). Although Knebelman was an active participant in sectional activities, there is no record of McDonough or Marquard ever attending one of the section's annual meetings.

- **Laura F. McDonough** was appointed the head of the mathematics department at the Moravian College for Women in 1925. She had apparently joined the department a year earlier at a miserly "$75 a month and house" (which probably meant a room in a dormitory). McDonough held a B.A. from Penn and pursued graduate studies there. Moravian catalogues list her as a faculty member up to 1930; we assume that she moved after that.

- **William B. Marquard** received an E. M. degree from Ohio State. He came to Lafayette College in 1907 as an instructor in mining engineering. Although he was promoted to assistant professor five years later, in 1920 he moved to the Department of Mechanics as an associate professor. He was promoted to professor of applied mechanics in 1929 and retired as emeritus professor in 1943.

The two other new MAA members were Nora Kieffer, then at the Normal School but later at Cumberland Valley State Teachers College in Shippensburg, and V. Z. Shippy, from the select Central High School in Philadelphia.

A second measure of activity within the section is graduate education. Of the 27 Ph.D. degrees in mathematics granted by American universities in 1925, universities in eastern Pennsylvania awarded four. The University of Pennsylvania awarded three: to longtime MAA secretary Harry Gehman, to Perry Aquila Caris, and to Robert William Hartley. No supervisor is listed for Caris's

dissertation, but our section founder Howard Mitchell supervised Hartley's dissertation while section leader J. R. Kline supervised Gehman's. The remaining Ph.D. degree was awarded to Anna M. Lehr at Bryn Mawr College. Although Marguerite Lehr officially received her degree from the physics department, the title of her dissertation indicates a purely mathematical topic: "The plane quintic with five cusps". Besides, she was one of seven women whose doctoral studies were supervised by the renowned Charlotte Angas Scott, who taught at Bryn Mawr from 1885 to 1925. Scott herself received a Ph.D. from the University of London in 1885, although she had actually carried out her studies at Cambridge University, which did not grant degrees to women at the time. Profiles of Caris and Lehr will appear in chapters devoted to the periods in which they served as chairs of the section – Caris in 1945 and 1950, and Lehr in 1958.

In general we will adhere to the following convention.

> *A profile of each chair of the section will appear in the chapter that covers the year in which the chairman's term occurred.*

A third measure of growth in the local community is the increase in the size of faculties, which was carried out in the face of severe economic conditions. Lehigh hired K. W. Lamson and the famous calculus textbook author L. L. Smail. Other new faculty members in the area included James E. Davis at Drexel and Echo D. Pepper at Bryn Mawr. According to our convention, profiles of Smail and Davis will appear subsequently. For now we provide biographical sketches of Pepper and Lamson.

- **Echo Dolores Pepper** (1897-1979) was born, raised, and mostly educated in the Pacific Northwest. We do not know the origin of her most unusual first name. Hailing from Spokane, Washington, Echo Pepper received her B.S. degree in 1920 and her M.S. two years later from the University of Washington in Seattle. She entered the graduate program at the University of Chicago in 1923 and obtained her Ph.D. two years later under the eminent algebraist Leonard Dickson. After spending a year at Oxford University on a National Research Council fellowship, Pepper accepted an instructorship in mathematics at Bryn Mawr College, a position she held for only two years. Even though she attended national AMS-MAA meetings, she never joined either of these organizations, preferring the AAAS instead. In 1928 Pepper moved to the University of Illinois, where she stayed until becoming the department head at Notre Dame University in 1965. She retired from that position in 1970.

- **Kenneth Worcester Lamson** was born in Vermont in 1885. He obtained an A.B. from Harvard in 1906 at age 21. Lamson played the string bass in college. When he was playing gigs with a band, he would put his physics books on the music stand and study while plucking away subconsciously at the instrument. Five years later he was appointed an instructor at South Dakota College (now the University of South Dakota). He then enrolled at the University of Chicago, where he was situated when he became a charter member of the MAA in 1915. He obtained his Ph.D. in 1917 under Gilbert Bliss for a dissertation on the calculus of variations, which was published in the *American Journal of Mathematics* three years later. Upon graduation Lamson accepted an assistant professorship at Columbia University, where he remained through the summer of 1926. He then moved to Lehigh University, which brought him to the area the same fall that the Philadelphia Section was founded. Three years later he presented an invited lecture at the section's annual meeting. Lamson spent the rest of his career at Lehigh, retiring in 1951 as emeritus associate professor. He then taught in Puerto Rico for three years before returning to teach part-time at Lehigh.

The *Monthly* for 1926 also records vigorous activity by undergraduate students in the area. During its summer term the University of Pennsylvania not only offered standard courses in solid geometry, trigonometry, college algebra, analytic geometry, and calculus, but there was sufficient demand to run three advanced undergraduate courses: elementary statistics with J. D. Eshelman, advanced calculus with G. H. Hallett, and the theory of invariants with O. E. Glenn. Hallett and Glenn had received their doctorates from the University of Pennsylvania. George Hervay Hallett was awarded his degree in 1896 for a dissertation on linear differential equations. He directed the 1905 dissertation of O. E. Glenn. Hallett's son, George H. Hallett, Jr., wrote a dissertation in 1918 under the renowned R. L. Moore at Penn.

In addition to summer courses offered at the University of Pennsylvania in 1926, the *Monthly* reported on activities offered by its Pi Mu Epsilon Chapter. There were also reports submitted on activities sponsored by The Ibis Club at the Women's College of Delaware in Newark, and the Math Club of the New Jersey College for Women.

A traditional measure of faculty activity is publication, and here too the *Monthly* reflects increased bustle in eastern Pennsylvania. Albert Bennett published a note in the November issue on "New properties on an orthocentric system of triangles". The same issue contains a paper by his Lehigh colleague Frank Mark Weida, titled "On the correlation between two functions". The paper was based on a lecture that Weida had presented at the annual AMS meeting on New Year's Day, 1926.

The Philadelphia Story

What's in a name? Apparently, lots. The name Philadelphia Section marked the first time that a section was named after a city instead of a state (or a union of states or a proper subset of a state). The name itself was certainly controversial. In the late 1960s Albert Bennett reminisced about events surrounding that designation.

> *At the organizational meeting … a request for establishing the Philadelphia Section of the MAA was forwarded to Secretary Cairns. His first reaction was that the name was ill-chosen, since all the other Sections were named for States, and to name a section after so small a political unit as a city, would break sound precedent. I wrote back that Pennsylvania had two natural cultural centers, one at the extreme east (Philadelphia), the other at the extreme west (Pittsburgh). One could not expect much of an attendance at either of these places, from residents near the other. Philadelphia should attract persons from Eastern Pennsylvania, Delaware and southern New Jersey. Setting a new precedent might encourage the later founding of a Pittsburgh Section, attracting mathematical instructors from West Virginia and Eastern Ohio as well as from western Pennsylvania. Cairns and Slaught were not obstinate, and in December, the Section was admitted under its proposed name, subject of course to the usual provision of By-Laws, etc., and promises of good behavior.*

Bennett was certainly right on target about attendance from mathematicians located in Delaware and southern New Jersey. Delaware has remained an integral part of the section since its founding. However, a New Jersey Section was created in 1956, and although most residents from the southern part of the Garden State have participated in its activities since its inception, several continue to attend the Philadelphia Section's programs. As we shall see, mathematicians from Princeton and Rutgers were especially active in the Philadelphia Section in the 30-year period from the founding of the section in 1926 to the founding of the New Jersey Section.

If Bennett was accurate about attendance in the eastern part of Pennsylvania, his comments about the western part were uncannily prescient. The Allegheny Mountain Section became the 19th MAA section in 1933. (The Wisconsin Section was created one year earlier.) As Bennett predicted, the Allegheny Mountain Section attracted mathematically oriented residents of West Virginia and eastern Ohio as well as western Pennsylvania. It should be mentioned, however, that the formation of the second section in Pennsylvania caused the Philadelphia Section to lose its colleagues from Penn State, who became affiliated with the Allegheny Mountain Section. As with some New Jersey mathematicians, a cadre of members from central Pennsylvania participated actively in the Philadelphia Section until the new section was formed, and a few of them continued their involvement after that.

Organizational Meeting

The minutes from the meeting of the Board of Trustees (now Governors) that was held during the annual MAA meeting on December 30-31,1926, provide a summary of proceedings that took place during the latter part of 1926:

> *The Trustees voted to approve the organization of a PHILADELPHIA SECTION of the Association, subject to the submission of suitable by-laws, a petition to that effect having been sent by a meeting of thirteen members of the Association. This section is intended to serve more than one hundred members living in the eastern part of Pennsylvania, in southern New Jersey, and in Delaware, meetings usually being held in Philadelphia.*

We do not know if the petition sent to MAA headquarters, then located in Columbus, Ohio, is extant, so the identity of the 13 members who signed it cannot be known with certainty. However, the official report from the most important event in the section's history, the organizational meeting held on Saturday, November 27, 1926, just two days after Thanksgiving, contains details of the proceedings and so provides clues to the identity of the signatories. On that date Howard H. Mitchell of the University of Pennsylvania, and Albert A. Bennett and Joseph B. Reynolds of Lehigh University, arranged a program of talks appropriate for college mathematics teachers at Lehigh. In so doing, these three mathematicians became the founding members of the section. Their profiles are given at the end of the chapter and their continued participation in sectional activities is chronicled in subsequent chapters.

Members of the section today will recognize the format from the 1926 meeting, except for the fact that it was held on the Saturday following Thanksgiving, a tradition that was continued until 1963. (Recall from Chapter 1 that the AMS held its organizational meeting on Thanksgiving Day 75 years earlier.) The initial gathering featured five lectures about mathematics and the teaching of mathematics. It was followed by a break for lunch and a business meeting. In 1926 lunch preceded the business meeting, the reverse of today's order. Besides, the spouses of the local members were present during lunch. But on this historic date, November 27, 1926, there was vital business to conduct, and it was important for the three founders to discuss their major initiative over lunch before proceeding with business. Once the meal was finished, a vote was taken. It was agreed unanimously to request permission of the Trustees of the MAA for the organization of a new section to be known as the Philadelphia Section.

Although the proposed section still had to be approved by the MAA, the 20 persons in attendance moved to set up a governing structure for future meetings. They decided initially to elect two officials to one-year terms. The results of the election reinforce our elliptical model, with officers coming from the two foci, chairman Howard Mitchell from Penn and vice-chairman and secretary-treasurer Albert Bennett from Lehigh.

There followed two other items of business. The first was a vote to approve the section's by-laws. Although the gathering deferred official adoption of the

by-laws until the next meeting the following November in Philadelphia, minutes from the 1927 meeting do not mention the by-laws at all. It is safe to assume they were approved without dissent. The second item of business in 1926 was an expression of appreciation by everyone in attendance for the courtesies extended by Lehigh University. Then the session adjourned. Unlike today, no mathematics followed lunch.

Detailed information about the five lectures will be presented in the next chapter. Here we note that, appropriately enough, the founder Joseph Reynolds of Lehigh presented the first lecture, on evolutes of certain plane curves. The next three talks were also on mathematical topics: Howard Mitchell of Penn spoke on ideals of quadratic forms, Lloyd Smail of Lehigh described Dedekind's theory of irrationals, and William M. Smith of Lafayette discussed differential equations.

The 20 persons who were able to commute to Bethlehem for the meeting included 14 members of the MAA, six of whom were on the faculty at Lehigh. These 14 therefore became the charter members of the section:

Crawford (NJ) High School: Paul A. Knedler
Franklin & Marshall: Rollin L. Charles and William F. Long
Haverford: Albert H. Wilson
Lafayette: Victor H. Doushkess and William M. Smith
Lehigh: Albert A. Bennett, Morris S. Knebelman, Joseph Reynolds, Lloyd L. Smail, Frank M. Weida, and Kenneth W. Lamson
Penn: Howard H. Mitchell
State Director of Mathematics and Science: John A. Foberg

Six of the 14 charter members were eventually elected chairmen so their profiles will appear in later chapters (Bennett, Mitchell, Reynolds, Smail, Smith, and Wilson). We glimpsed Lamson above. Among the others, Knedler and Weida participated actively enough to warrant biographical sketches at their times of maximal service. Here we sketch four of the remaining five charter members.

- **Rollin Landis Charles** (1885-1941), a mathematical physicist born in Bethlehem, PA, was associated with three institutions in the Philadelphia Section. He obtained two degrees at Lehigh University – an A.B. in 1907 and an A.M. in 1910. He pursued additional courses at Lehigh, Columbia, and Penn. Charles began teaching at Lehigh as an instructor in physics in the fall after taking his undergraduate degree, the position he held when he became a charter member of the MAA in 1916. In 1922 he moved to Franklin & Marshall College as professor of physics and applied electricity, the position he held at the time of the founding of the Philadelphia Section. Charles remained at F & M until his death at age 56. In the meantime he was also a professor at Albright College in Reading, PA, from 1928 to 1930. He was a Fellow of the American Association for the Advancement of Science. He was also a member of several other organizations, including the

American Philatelic Society, Sons of the Revolution, and the Pennsylvania German Society.

- **Victor H. Doushkess** (1895-1966) received a B. S. degree at Lehigh University in 1917. He enrolled in the graduate program at Lafayette College two years later, receiving an A. M. degree in 1921. Doushkess was appointed an instructor at Lafayette in 1919 and was promoted to assistant professor five years later. He remained at Lafayette until 1935.
- **Morris Samuel Knebelman** (1890-1972) was born in Russia. After coming to the U.S., he received a B.S. degree from the University of Pennsylvania in 1912 and an M.S. from Lehigh University in 1914. During his second year at Lehigh he was appointed an instructor. In 1925 he enrolled in the graduate program at Princeton University, where he earned his Ph.D. in 1928 for a dissertation on differential geometry written under two notable advisors, Oswald Veblen and Luther Eisenhart. Knebelman served as an instructor at Princeton while completing his degree, and he remained there the next year on a National Research Council Fellowship. Due to the sudden death of a faculty member in the summer of 1929, Princeton had the dire need for someone to head the university's mathematics courses for engineers. Knebelman's background at Lehigh made him a suitable candidate, so he was offered the position of assistant professor. He continued in this capacity until 1939, when he became a professor and head of the department at Washington State University. He later became Dean of the Graduate School at Washington. Knebelman taught there until 1965 when, at age 74, he returned east as a visiting professor at Bucknell University. He died in Lewisburg in 1972 at age 82.
- **William Franklin Long** (1871-1945) was an astronomer who was born in Boyertown, PA. He graduated from Kutztown State Normal School in 1891, earned his bachelors degree from Franklin & Marshall College in 1897, and did graduate work at Cornell, Harvard, Chicago, Pittsburgh, and Columbia. In 1942 F&M bestowed on him an honorary degree of Doctor of Science. Long taught in high schools in Johnstown and Pittsburgh from the time of his graduation from F&M until 1918. He was also a principal during that time. In 1918, Long accepted a professorship of astronomy and mathematics at his *alma mater*, and remained there for the next 26 years. A newspaper clipping states, "he was known by 'thousands of Lancastrians' as the director of the Scholl Observatory." Long retired in June 1944, yet he taught an evening astronomy course in the fall of 1944. He died on New Year's Day 1945 at age 73.

Although we were unable to locate personal items about the remaining charter member, some of the professional activities of **John Albert Foberg** are worth noting because they link the section to current developments in mathematics education. J. A. Foberg graduated from the University of Illinois and taught at

Crane Junior College in Chicago when he became a charter member of the MAA upon its founding in 1915. One year later he was selected to be the representative from the Central Association of Science and Mathematics Teachers to the National Committee on Mathematical Requirements. This committee was formed by the MAA "to give national expression to the movement for reform in the teaching of mathematics in secondary schools and colleges." Foberg and J. W. Young (Dartmouth) received funds to devote the entire year 1919-1920 to writing reports for the committee. Foberg's report, "Junior High School Mathematics", appeared at the end of the year. Three years earlier he had been one of the organizers of the Illinois Section of the MAA. A 1972 MAA publication reported, "It is worth noting, in this day of expansion of the junior college concept, that the first chairman of the Section was J. A. Foberg of Crane Junior College." When the NCTM was founded in the early part of 1920 Foberg was elected its first secretary-treasurer. He also became the business manager for the NCTM's official journal, *The Mathematics Teacher*. During this time he moved to Pennsylvania to become the State Director of Science and Mathematics, the position he held when the Philadelphia Section was founded in 1926. The preceding year he published the book *General High School Mathematics* with D. E. Smith and W. D. Reeve from Columbia Teachers College. Foberg later completed his Ph.D. at the University of Pittsburgh. He then left the Department of Public Instruction to become the head of the mathematics department at California State College. He appears to have lived in Camp Hill during his entire stay in the state. He was last listed in MAA membership rolls for the academic year 1937-1938.

This brief glimpse of those MAA members who attended the organizational meeting shows a solid core of mathematicians with a wide array of interests and abilities. Most of the 14 MAA members were associated with colleges and universities in the area, and most were involved with undergraduate programs entirely. Not all were pure mathematicians, however, as the initial meeting attracted a mathematical physicist and a mathematical astronomer.

Annual Meeting

The year 1926 was a heady time for mathematicians in the Philadelphia area. First came the organizational meeting at Lehigh to form the Philadelphia Section on November 27. Just one month later the University of Pennsylvania hosted the four-day annual AMS meeting from December 28 right on up to New Year's Eve on December 31. The AMS meeting was held in conjunction with Section A of the American Association for the Advancement of Science. This marked the first time such a meeting was held in the region. But of even more relevance for this account, the meeting marked one of the first times that the AMS met in conjunction with the MAA, as the MAA held its 11^{th} annual meeting over the last two days of the conference. We discuss this joint meeting briefly because it provides additional evidence of the broad mathematical community that had coalesced in the Philadelphia area by the end of 1926.

The joint meeting was a roaring success. For one thing, a record 264 people attended, of whom 187 belonged to the MAA. (For comparison sake, attendance at the joint meetings held in January 2000 numbered over 4200.) This was in striking contrast to the previous meeting in Kansas City, whose attendance of 122 members had been disappointing. We have examined the attendance roll from the meeting to obtain a profile of some of the most active mathematicians from the EPADEL area.

It is not surprising that the host institution, Penn, would supply the most attendees, 10 in all. From this group, P. A. Caris and H. H. Mitchell are profiled as section officers and E. S. Crawley will be introduced in the next chapter. The others who attended were Virgil William Adkisson, William Leake Ayres, Joel D. Eshleman, Henry Brown Evans, Oliver Edmunds Glenn, Harold Marshall Lufkin, and Frederick Hollister Safford. Four other MAA members from Philadelphia attended the annual meeting: one college teacher (James E. Davis from Drexel, who would become chair of the section in 1942) plus three high-school teachers (J. A. Clarke from West Philadelphia High School for Boys, V. Z. Shippy from Central High School, and W. Sensenig, who was listed only as "High School").

- **Wayne Sensenig** was born in Goodville, PA, in 1879, and received his bachelors degree from Haverford College in 1901. We suspect that his father was David M. Sensenig, who taught at West Chester at the turn of the century. Wayne Sensenig was employed as an engineer until becoming a high school mathematics teacher in Philadelphia in 1912. While teaching by day he attended classes at the University of Pennsylvania by night, resulting in an A. M. degree in just two years. In 1919 he received his Ph.D. under Oliver E. Glenn. His doctoral dissertation, "Concerning the invariant theory of involutions of conics", was published in the *American Journal of Mathematics* in 1919. He also published a note on definite integrals in the *Monthly* the following year. Having no evidence to the contrary, we assume that Sensenig taught in high school the rest of his life. A charter member of the MAA in 1915, he was last listed on the membership roll for the academic year 1933-1934, when he lived in Bala Cynwyd.

Five faculty members from four different colleges in the Philadelphia suburbs also attended the joint AMS-MAA meeting. The most famous was Anna Pell Wheeler of Bryn Mawr College. Others included L. W. Reid and Albert H. Wilson from Haverford College, John W. Clawson from Ursinus College, and John H. Pitman from Swarthmore College. All but Reid will be introduced in due course.

- **Legh Wilber Reid** (1867-1961) was born in Alexandria, Virginia. He obtained one bachelors degree from VMI in 1887 and another from Johns Hopkins University two years later. He then worked for the U. S. Bureau of the Census and the U. S. Coast and Geodetic Survey, where his job title was listed as "computer". Reid was appointed an instructor at Princeton

University in 1893 while he began taking graduate courses. He obtained a masters degree from Princeton in 1896, after which he sailed abroad to study in Göttingen, obtaining his doctorate under the renowned David Hilbert in 1899. Reid spent the rest of his career at Haverford College, from his appointment in 1900 to his retirement in 1934. Known affectionately to Haverford students as "*f* of *x*", he was one of the founders of the College's chapter of Phi Beta Kappa and served as its secretary for 40 years. His book *The Theory of Algebraic Numbers* was used as a graduate text in American colleges for over 50 years from the time it was published in 1910; David Hilbert wrote a brief introduction. Reid died in 1961 at age 93.

Six MAA members from the Lehigh Valley traveled to Philadelphia for the meeting, including four from Lehigh University: Albert Bennett, Joseph Reynolds, Lloyd Smail, and Frank Weida. The other two were Albert G. Rau of Moravian College and William M. Smith of Lafayette College. All six men played active roles in the Philadelphia Section of the MAA for years to come.

In addition to the two focal points, various other locations within the Philadelphia Section were strongly represented at the joint meeting. Seven faculty members from the Pennsylvania State College [now University] attended, including the married couple Frederick W. and Helen B. Owens. Frederick's affiliation is listed academically (Pennsylvania State College), whereas Helen's is listed geographically (State College). Both participated actively in events sponsored by the Philadelphia Section even beyond the formation of a section in western Pennsylvania.

We already mentioned four faculty members from Princeton who attended the meeting. Added to that list is charter member Morris Knebelman, who had just moved across the Delaware River that year from Lehigh.

Four faculty members from Rutgers also attended, including two who were active in the Philadelphia Section: Albert E. Meder and Richard Morris. The latter was especially vigorous in our section; we will meet him again in Chapter 5. Thirty years later Meder was the driving force behind the establishment of the New Jersey Section.

Four other members who lived within the Philadelphia Section's boundaries are also worthy of mention. W. F. Long of Franklin & Marshall College traveled from Lancaster, H. S. Everett from Penn State, C. J. Rees from the University of Delaware in Newark, and Ruth Thompson from the New Jersey College for Women at Rutgers. Neither Long nor Everett participated in many sectional activities, but Rees was elected chair in 1946 and Thompson organized the section's annual meeting in 1934. We have been unable to find any biographical information on Ruth Thompson. William F. Long and Carl J. Rees will be introduced later, but for now we supply information on H. S. Everett.

- **Harry Scheidy Everett** (1891-1977) was born in Scheidys, PA. He taught in high school from the time of his graduation in 1908 until 1915. In the meantime he attended classes at Bucknell, where he obtained three degrees

in consecutive years – A.B. 1912, A.M. 1913, Sc.M. 1914. He accepted an instructorship at Bucknell in 1915. H. S. Everett spent the year 1921-1922 on a fellowship at the University of Chicago, resulting in his Ph.D. at the end of the year. His dissertation topic involved homogeneous polynomials expressible in terms of determinants whose elements were such polynomials. Upon returning to Bucknell he was promoted to professor of applied mathematics and astronomy. However, in 1927 he returned to Chicago, where he held several positions over the next 29 years – professor of extension courses, professor of home study, dean, and lecturer in the Adler Planetarium. From 1926 to 1933 he served as an associate editor of the *Monthly*. Upon retirement in 1956 as Extension Professor Emeritus, Everett accepted a visiting professorship at Penn State. Five years later he returned to academia full time when he accepted a professorship at East Stroudsburg. Everett moved to West Chester in 1973, and he died there four years later at age 86.

Recall that the MAA part of the meeting was held on the final two days of the joint meeting, December 30 and 31. The major part of the scientific program consisted of eight papers presented at two separate sessions. Two of the eight speakers were from the Philadelphia Section. The title of the talk by Lehigh's F. M. Weida was "On various conceptions of correlation," and the title of the talk by Swarthmore's J. H. Pitman was "Modern methods and results of stellar parallax investigations". Weida is profiled in the next chapter.

- **John Himes Pitman** (1890-1952) was born in Conshohocken, PA. He was awarded two degrees from Swarthmore College, an A.B. in 1910 and an M.A. in 1911. He remained at Swarthmore an additional year as a Lippincott Fellow, and then he crossed the country to become a Lick Observatory Fellow in California. In 1913 Pitman rejoined the Swarthmore community as an instructor in the department of mathematics and astronomy, and remained there the rest of his life. A mathematical astronomer who specialized in stellar parallaxes, masses of binary stars, and orbits and asteroids, he was elected president of the Rittenhouse Astronomical Society. Active politically, Pitman served as a burgess for the town of Swarthmore from 1933 to 1947 and as chairman of the county Democratic Committee. Poor health forced him to resign his professorial and political positions in 1947.

One notable aspect of Pitman's talk was his use of an emerging technology to illustrate the lecture. Rather than merely reading his paper, as was customary at the time, he used lanternslides to display photos of stars whose distances he had measured. Other speakers used lanternslides as well. Although there is no indication when speakers began using this new technology at annual meetings, lanternslides eventually gave way to overhead projectors, which are currently

giving way to computer-generated presentations. There is no record of the first use of either overhead projectors or computers at the section's annual meetings.

At the end of the joint meeting an AMS-MAA dinner was held at the Aldine Hotel (since demolished). Following dessert came four talks of a rather light nature, the first three by Herbert Slaught, George D. Birkhoff, and G. D. Olds. According to the official minutes from the meeting the fourth speaker, Anna Pell Wheeler, "spoke appropriately on behalf of the ladies". No amplification of this quotation was provided. Such a dinner is a regular affair at today's national MAA meetings. Today some sectional meetings hold dinners, but the Philadelphia Section has held few, mainly because of the one-day duration of its meetings.

At the close of the joint session a resolution was adopted by the combined body of mathematicians to express their "grateful appreciation of the gracious hospitality extended them by the University of Pennsylvania, the American Philosophical Society, the Academy of Natural Sciences, the Drexel Institute [now Drexel University], and the Franklin Institute." The participation of the three non-academic institutions reflects the close relationship that existed in the 1920s between mathematics and the natural sciences.

We end this chapter with three related facts about the Penn meetings. This was not the first annual AMS meeting that the University of Pennsylvania hosted, for the University had played host to the annual summer meeting in 1912, though it was the first "Christmas meeting". Although only 29 people attended the meeting in 1912, 26 of them delivered papers. Second, Lehigh University hosted the annual AMS meeting held December 26-28, 1929, three years after the historic Penn meeting, but it was not a joint affair with the MAA. Third, there were two hosts for the 1932 meeting, Princeton University and Atlantic City, both of which were part of the Philadelphia Section at the time. By the time an annual meeting was held in Atlantic City again, in 1971, that resort town was part of the New Jersey Section.

Profile: ALBERT ARNOLD BENNETT (1888-1971)

A. A. Bennett must have been one of the most colorful personalities in the history of EPADEL, and the author wishes he had known him. Although Bennett lived in our area on two separate occasions totaling only eight years he made notable contributions to the Philadelphia Section, the most important being its founding in 1926.

Albert Arnold Bennett was born on June 2, 1888, in Yokohama, Japan. His parents, Albert Arnold and Mela Isabelle (Barrows), were missionaries in Japan at the time. The younger Albert Bennett returned to Providence in 1902 to live with relatives so he could complete his high-school education and prepare for college. He excelled in school, earning two degrees from Brown University, an A.B. in 1910 and an Sc. M. in 1911 (based primarily on a thesis he had written the preceding year).

Bennett entered the graduate program in mathematics at Princeton University in 1910. Just a few months earlier Howard Mitchell, one of the other two founders of the Philadelphia Section, received his Ph.D. from Princeton and was in transit to a position at Yale, so it appears that the two future founders of EPADEL missed each other on the first part of Bennett's initial residence in the Philadelphia area. Bennett earned his second masters degree, an A.M., at Princeton the following year.

Bennett completed his doctoral dissertation in 1915 at Princeton under Oswald Veblen, who had been Howard Mitchell's dissertation supervisor as well. (If Bennett and Mitchell are called the fathers of EPADEL, then Veblen must be the Section's grandfather.) Later in life Bennett undertook advanced training in mathematics at the University of Chicago and at three of the most prestigious centers in Europe: Paris, Göttingen, and Bologna.

Dealing with algebra and projective geometry, Bennett's dissertation appeared in the prestigious *Annals of Mathematics* the same year as his degree under the title, "An algebraic treatment of the theorem of closure". While only 21 pages long, it accounted for over 10% of the 196 pages in that volume of the journal for the years 1914-1915. Moreover, he published a paper in three of the four issues of the next volume, all on topics in analysis. Overall his three papers and one note in the volume for 1916-1917 account for 47 of the 217 pages.

Clearly Bennett's star was rising. He had begun his professional career by remaining at Princeton as an instructor from 1914 to 1916. However, he left the east in the fall of 1916 to accept a position as adjunct professor at the University of Texas at Austin, where he remained for nine years. Although 26 years old when he moved to Texas, patriotism compelled him to enroll in the country's first Officer's Training College. As a result he was sent to Leon Springs, Texas, and later to Fort Monroe, Virginia. On August 15, 1917, he was commissioned as a Captain in C.A.R.C. but it appears that throughout World War I he remained stationed in the States. The following June, Bennett was transferred to the Ordnance Corps, where he served in Oswald Veblen's ballistics research staff at Aberdeen Proving Ground with Gilbert Bliss and Norbert Wiener.

Bennett was honorably discharged on January 15, 1919. Nonetheless, while continuing to teach at the University of Texas, he served as a civilian "mathematician and dynamics expert" with the Ordnance Corps from June 1919 to September 1921. During this time he wrote two books based on his experiences, *Introduction to Ballistics* in 1921 and *Tables for Interior Ballistics* in 1922.

The time Bennett spent in World War I undoubtedly accounts for the three-year gap in his publication record between 1917 and 1920. However, like many mathematicians caught up in war, Bennett did not let combat duty entirely interfere with his studies. The author of the 1918 paper is listed as Captain Albert A. Bennett, C.A.R.C. To emphasize his position, and the isolation of his outpost, the concluding paragraph of the paper reads, "This treatment is believed to be original, but the literature available for examination by the author is that customary to an army post, 'somewhere on the Gulf of Mexico,' – nil."

In 1921, his war duties completed, Bennett was ready to resume a professional career, and Texas rewarded him with a promotion to associate professor. The renowned topologist and educator R. L. Moore had moved from Penn to Texas the previous year. While in Texas, Bennett met Velma McAfee Ely, who hailed from nearby Corsicana. The couple wed on June 17, 1922. They had one child, Betsy Bennett Miller.

In Texas Bennett became active in the nascent Mathematical Association of America, which had been founded only in December 1915. In 1921 he was elected a member of the Council (Board of Governors). The following year he was elected a trustee of the MAA and appointed to the Association's Committee on Publications, and the year after that he assumed the position of editor-in-chief of the MAA's official journal, the *American Mathematical Monthly*. In 1925 Bennett was elected Vice-President of the MAA while at the same time serving as chair of the Texas Section of the MAA.

Bennett had to forego his chairmanship of the Texas Section when he moved to Bethlehem, PA, later that year to accept the position of Professor and Head of the Department of Mathematics at Lehigh University. This marked Bennett's second stay in the Philadelphia area. He held the Lehigh post for only two years before moving to his *alma mater*, Brown University.

Bennett was an inveterate problem solver and problem poser. Many of his contributions were published in the *Monthly*, beginning with problem #246 in the June 1916 issue, when he was an instructor at Princeton. J. B. Reynolds published the solution to Bennett's problem #513 in the February 1917 issue of the *Monthly*. Could it be mere coincidence that Reynolds taught at Lehigh? Or that fewer than ten years later the two would combine with H. H. Mitchell to found the Philadelphia Section?

Bennett's solution to problem #2720 in the September 1918 issue lists his address as C.A.R.C., Galveston, thus defining his whereabouts "somewhere on the Gulf of Mexico". Curiously, Bennett lists the address for his solution to problem #2900 in the June/July 1921 issue of the *Monthly* as the University of

Saskatchewan, which suggests that he was a visiting professor there for the summer.

Although in his 50s, the patriotic Bennett volunteered for the Army during World War II, serving as a Major with the Ordnance Corps at Aberdeen once again from 1942 to 1946 and achieving the rank of Lieutenant Colonel. Once again he served under Oswald Veblen. One of the more illustrious young mathematicians to work under Bennett at the Ballistic Research Laboratory was Herman Goldstine, who wrote of his superior, "From time to time I was very impatient of Albert Bennett, who was a nice old gentleman—but he was a very precise, methodical, plodding person who drove me up the wall."

Bennett retired as emeritus professor from Brown in 1958. After that time he was a visiting professor at Southern Illinois, Rhode Island, and Boston College. He died on February 17, 1971, at the age of 82. He was a charter member of the MAA, meaning that he had been a member for 55 years.

Profile: HOWARD HAWKS MITCHELL (1885-1943)

Howard Hawks Mitchell was one of the most accomplished members of our section. He first came to the area to attend graduate school, and after leaving for a year he joined the faculty at the University of Pennsylvania. He lived in Merion and remained at Penn for the rest of his life. During that time he was one of the three founders of the Philadelphia Section of the MAA.

H. H. Mitchell was born in Marietta, OH, on January 14, 1885, the son of Oscar Howard and Mary Hoadley (Hawks). His father was a well-known mathematics professor at Marietta College. Oscar Mitchell had been one of the first fellows at Johns Hopkins 1879-1882; he received his Ph.D. in 1882 for a dissertation in number theory. Oscar's son's middle name was his wife's maiden name, a custom at that time for the naming of both boys and girls. The younger Mitchell attended local schools in Marietta and received a Ph.B. degree from Marietta College in 1906. (No longer in use, the notation Ph.B. is the abbreviation of the Latin expression for the Bachelor of Philosophy degree.) In 1935 Marietta College conferred upon him the honorary degree of Doctor of Science.

Mitchell enrolled in the graduate program at Princeton in the fall of 1906, holding a university fellowship from 1908 to 1910. [On a related note, Carl E. Stromquist, the brother of the grandfather of former section president Walter Stromquist, was a faculty member in Princeton's mathematics department 1903-1909. More famous mathematicians included Gilbert Bliss, G. D. Birkhoff, J. H. M. Wedderburn, and Luther Eisenhart.] Mitchell was the first doctoral student of Oswald Veblen, completing his dissertation on linear groups in 1910, the very year that fellow EPADEL founder Albert Bennett entered the graduate program. Bennett too would receive his Ph.D. degree under Veblen, five years later. Although the periods of their matriculation at Princeton had nonempty intersection, the lives of Mitchell and Bennett overlapped long enough to establish the Philadelphia Section of the MAA in 1926.

Upon graduation from Princeton, Mitchell was appointed an instructor in mathematics at the famous Sheffield Scientific School at Yale University. However, he remained at Yale only one year before accepting the same position at the University of Pennsylvania, where he taught for the rest of his life. Altogether he supervised five Ph.D. dissertations with topics ranging from finite group theory to Galois fields and cyclotomic field extensions. His most well known student was probably Leonard Carlitz (Ph.D. 1930), who spent a very productive career at Duke University.

In addition to Veblen, Mitchell had another link to an important figure in American mathematics. In 1911, when he began teaching at Penn, another new faculty member was R. L. Moore. Today R. L. Moore is widely known for his method of teaching and for his contributions to topology. Up to that point, however, Moore had not published very much. Yet Penn offered both instructors a stable and supportive environment, and they prospered in Philadelphia.

Moore's manner of teaching exerted a dominant influence on his students. Mitchell's case shows that Moore played a similar role with some of his colleagues too. Moore's second Ph.D. student, G. H. Hallett, Jr., took courses from both Moore and Mitchell. In discussing the Moore Method fifty years later, Hallett recalled:

> *One other course I took at the same time was somewhat similar. It was taught by Professor Mitchell, whom I liked very much. He took a book, I think it was by Dr. Pierpont, in the area of functions of a real variable. I guess Professor Mitchell had found on inspection that not all of Professor Pierpont's proofs held up, so the way he taught this course in that subject, he gave us this book, but asked us to go through all the proofs that were given and find out whether they were watertight proofs or not and if not, why not. This course had many elements of the other course.*

Mitchell married Emma Vestine White on September 18, 1912, shortly before the start of classes for his second year at Penn. The couple resided in the Philadelphia area thereafter. Like his friend Albert Bennett, Mitchell applied his knowledge of mathematics in World War I, serving as a ballistician with Bennett under their dissertation supervisor, Oswald Veblen, at the Aberdeen Proving Ground near Washington, D.C., in 1918.

Mitchell held office in both the AMS and the AAAS. He was on the Board of Trustees (now the Council) of the AMS from 1921 through 1923. In 1926 he was appointed chair of the first Committee on the Cole Prize, which was given for the most meritorious paper on linear algebra. He also was elected Vice President of the AMS in 1932 and 1933, and Vice President of AAAS in 1932. In addition, he served a six-year stint as editor of the prestigious journal, the *Transactions of the American Mathematical Society*, from 1925 through 1930. In 1923 he was one of four authors of the book *Algebraic Numbers*, written with L. E. Dickson, H. S. Vandiver, and G. E. Wahlin for the National Research Council.

Mitchell's publication record was not prodigious; we have been able to locate only 11 items, including his dissertation and his printed solution to a *Monthly* problem. Between 1913 and 1918 he published seven important papers in three of the country's leading journals: two in the *American Journal of Mathematics*, one in the *Annals of Mathematics*, and four in the *Transactions of the American Mathematical Society*. Two appeared after that, an article on ideals in quadratic fields from 1926, and his final paper, which appeared in 1935 and hearkened back to his initial investigations on group theory and projective geometry. Overall, he published papers in four of the five journals that were available in America at the time.

Howard H. Mitchell died of coronary thrombosis on March 13, 1943, at his home in Merion, PA, at the age of 58. He was survived only by his wife. Overall, he was known as an inspiring teacher of both graduate and undergraduate students, and an accomplished researcher in linear groups and algebraic numbers.

Profile: JOSEPH BENSON REYNOLDS (1881-1975)

Joseph B. Reynolds was not only one of the three founders of our section, he was the one who initially proposed the idea of forming an MAA section in the Lehigh Valley. Although he was a productive scholar, he is perhaps the least likely of the trio to be involved in such an undertaking, because the other two had much deeper connections in the American mathematical community.

J. B. Reynolds was born in New Castle, in the western part of Pennsylvania, on May 17, 1881, to Peter Stafford and Lydia Ann (Kemp) Reynolds. He was educated in public schools, graduating from New Castle High School in 1903. Considering his later accomplishments, graduation at age 22 is certainly not due to lack of intelligence; rather it was probably due to the need to work on the family farm. Upon graduation he crossed the state to enroll at Lehigh University, where he earned an A.B. degree four years later. The title of his undergraduate thesis portends an interest in applied mathematics, as well as the inclination of the Department of Mathematics and Astronomy at the time – "The temperature compensation of the Bond sidereal clock of Sayre Observatory at Lehigh University".

Reynolds loved this part of the state from the outset of his undergraduate days. Indeed, he was associated with Lehigh in various capacities for the rest of his career. The first position occurred upon graduation when he accepted an instructorship. His bond to the area was cemented when he met and married Chloey B. Graham on July 2, 1908. The couple had three children: Peter Graham, Jane Niblock, and Joseph Benson Jr.

Reynolds continued his studies while teaching at Lehigh, earning a masters degree in 1910. Once again he wrote a thesis with an astronomical theme, "The determination of the elements of the orbit of a minor planet: Taunton no. 94, 'Lehigh'." In 1928 he was promoted to professor of mathematics and theoretical mechanics. Could his role in the founding of the Philadelphia Section have played a part in the promotion? If it did, it probably was not so important as time spent as Acting Head of the department during 1924-1925.

J. B. Reynolds was an active participant in sectional affairs. He was the first person to present an invited lecture at the organizational meeting in 1926, he served as chairman of the section in 1938-1939, and he represented the MAA officially at the 1949 inauguration of the new president at Moravian College.

The *Monthly* accounted for almost all of Reynolds' publications, with roughly 90 of the 100 entries appearing in its Problems Department. His first endeavor with the journal occurred when he proposed two problems for solution in the May 1915 issue, one on calculus and one in mechanics. In the remainder of that year he was credited with solving three problems; his solution to a problem on mechanics posed by *Monthly* founder B. F. Finkel was published as the most elegant of the correct solutions received. The following year Reynolds proposed three other problems and solved one more. But 1917 was a banner year for submissions to the Problems Department, as he was cited for 19 items – five

posed problems, three solutions to problems posed earlier, four printed solutions, and seven solutions listed under "also solved by". His last solution appeared in 1965, exactly 50 years after his first one. He was 84 years old at the time!

The succession of Reynolds' other contributions to the *Monthly* traces his development as a mathematician. In the banner year 1917 he published a small note in the Discussions Department. However, it would be another six years before his first refereed paper would appear. Altogether Reynolds published eight refereed articles in the *Monthly*, his last three appearing in Classroom Notes. Not all of his papers appeared in the *Monthly*; two were published in the *Tohuku Mathematical Journal* and one in *Agricultural Engineering*.

Reynolds' connection to theoretical mechanics is reflected in four of the six books he wrote. The first one, *Elementary Mechanics*, was published in 1928 and revised six years later. In between those editions he published *Analytic Mechanics* in 1931. It took eight more years to write *Forty Lessons in Analytic Mechanics* (1939), suggesting five lessons per year. His last book, *Elements of Mechanics*, written with his colleague, G. E. Raynor, was published in 1943.

It is this proclivity toward applied mathematics that makes Reynolds seem like an improbable candidate to play such a vital role in founding the Philadelphia Section of the MAA. Yet the very notion of such a section was his alone. In this sense the role that Reynolds played in the founding of the Philadelphia section is reminiscent of the roles played by the first five presidents of the AMS, none of whom was a pure mathematician.

In addition to works on mechanics, Reynolds and his colleague Frank M. Weida published *Analytic Geometry and the Elements of Calculus* in 1930. (Another successful calculus author from Lehigh was Lloyd L. Smail.) Overall Reynolds published three other books between 1918 and 1935, one of which appeared in two editions. The remaining work not yet described is *The Peter Reynolds Family of Lawrence County Pennsylvania*, which he published in 1940.

Reynolds' enduring interest in both pure and applied mathematics can be seen in the very last note he published in the *Monthly* in 1944. Titled "Reversion of series with applications," it dealt with a method for solving differential equations he felt was appropriate for "every student who is trained for engineering or other scientific work."

Reynolds died in Wilmington, Delaware, in 1975 at age 94. His example shows a competent teacher and administrator who, though he found some time for original investigations, contributed mainly to the Problems Department of the *Monthly*. His shared interests with astronomy and applied mathematics hearken back to an earlier period in the history of mathematics in America.

Chapter 3: ESTABLISHMENT, 1926-1932

This chapter describes activities in the Philadelphia Section from the time of the organizational meeting in 1926 to the annual meeting in 1932. We refer to this as the "period of establishment" because the energy that was initially expended to organize the section in 1926 was directed over the next six years to establish it as a thriving organization whose continuity and vitality were assured. Over this period, the section benefited from the emergence of a new set of energetic leaders who sustained it well into the 1930s, thus guaranteeing the permanence of its activities and the success of future endeavors. We profile several of the new leaders and describe their sectional activities.

This chapter also examines the genesis of many of the traditions that now define the section, including the governance structure and the format of annual meetings. Our analysis of the five meetings that took place from 1928 to 1932 serves as a model for subsequent analyses of other periods in the section's history.

The success of any professional organization depends not only on its leadership but also on the vitality of its membership, whom Arnold Dresden called the "rank and file". This chapter confirms such a paradigm by providing brief accounts of the lives and contributions of several MAA members who graced the Philadelphia Section with a diversity of mathematical interests, abilities, and contributions.

First Seven Meetings

Table 1 contains data from the first seven meetings of the Philadelphia Section. The final column provides a reference (date of issue and page numbers) to the official annual reports as they appeared in the *Monthly* for those readers who desire additional details about the meetings.

Date	Location	#	MAA	%	Monthly
November 27, 1926	Lehigh	20	14	70	April 1927, 166-168
November 26, 1927	Penn	60	30	50	February 1928, 52-54
December 1, 1928	Penn	75	35	47	June/July 1929, 301-304
November 30, 1929	Penn	51	35	69	February 1930, 45-46
November 29, 1930	Penn	39	25	64	February 1931, 62-64
November 28, 1931	Lehigh	33	24	73	February 1932, 61-62
November 26, 1932	Swarthmore	74	39	53	February 1933, 63-64

Table 1

The first column of Table 1 lists the dates of the first seven meetings. Nowadays the section holds its annual fall meeting in the early part of November, but initially the date was scheduled for the Saturday following Thanksgiving. It

was not until the meeting of 1939 that this original tradition was formally enacted, when the assembled members voted to hold meetings "on the Saturday after the official Thanksgiving Day of Pennsylvania."

The second column of Table 1 lists the sites of the first seven meetings. They bear out the section's elliptical model of focal points in the Lehigh Valley and Philadelphia. Overall the University of Pennsylvania hosted four meetings sandwiched between two at Lehigh University; Swarthmore College, located in suburban Philadelphia, hosted the seventh.

Chapter 2 reported that 20 people attended the November 1926 organization meeting of the Philadelphia Section held at Lehigh, including the 14 charter members of the section. With the bulk of the section's MAA membership living in the Philadelphia area, the site of the meetings was moved to Penn for the next four years. Columns 3, 4, and 5 of Table 1 provide attendance figures at these meetings:

Column 3 (header #) lists total attendance
Column 4 (header MAA) states the number of MAA members
Column 5 (header %) gives the percentage of MAA members

Table 1 shows that the absolute number and the percentage of MAA members who attended these meetings varied appreciably. The table also shows that initially the move to the Philadelphia area witnessed a surge in attendance, but that the figures dropped precipitously from a peak of 75 in 1928 to only 39 just two years later. A likely explanation for this decline is the stock market crash that intervened between the two meetings. With transportation presenting a greater obstacle than today, it is not surprising that the two meetings held at Lehigh attracted smaller audiences than those held in the Philadelphia area, where a network of trains, trolleys, buses, and subway lines minimized transportation inconvenience.

Overall, during the seven-year period the mean attendance was 50.3, of whom 28.6 (57.4%) belonged to the MAA. Ignoring the organizational meeting of 1926, which statisticians might label an outlier, the mean attendance at the remaining six meetings was 55.3, of whom 31.3 (56.6%) were members of the MAA.

Leaders

As we have noted, every successful professional organization depends upon a small cadre of leaders to get it started and to plan a program of activities, as well as a large contingent of adherents who support and sustain those efforts. In this section we profile the officers and several other leaders of the section from 1926 through 1932. We identify their academic affiliations in order to reinforce the geographic spread throughout the area.

Table 2 addresses the section's governance structure in this period. At the organizational meeting at Lehigh in 1926 it was decided that two officers should govern the section. Not surprisingly, two of the founders were elected to the initial offices, Howard Mitchell as chairman and Albert Bennett as vice-

chairman/secretary-treasurer. The following year a Program Committee was formed to assist the officers in planning the following year's annual meeting.

Year	Chairman	Secretary	Program Committee
1926	Mitchell	Bennett	
1927	Owens	Kline	Dresden, Thomas
1928	Wilson	Caris	Fort, Kline
1929	Miller	Caris	Fort, Kline, Miller (ex-officio)
1930	Fort	Caris	Clawson, Frink, Fort (ex-officio)
1931	Dresden	Caris	Caris, Smith, Morris, Dresden (ex-officio)
1932	Kline	Caris	Caris, Owens, Raynor, Kline (ex-officio)

Table 2

During the period 1926-1932 the Philadelphia Section had 15 different leaders who either held office or served on the Program Committee. Their academic affiliations reflect the geographical diversity of the section. Of the section's three founders, only H. H. Mitchell continued to provide leadership, although he never held another elected office in the section. Bennett moved to Brown University the following year. As we will see, Reynolds continued to participate in sectional activities, even being elected chairman in 1938. However, he never attended a meeting outside the Lehigh Valley area, not even in 1938, though he did ensure that the 1939 meeting, over which he would preside, was held at his home institution of Lehigh.

Because of Bennett's departure and Reynolds' apparent unwillingness to travel to the Philadelphia area, it was necessary for a new group of individuals to assume the mantle of leadership if the section was to survive, let alone thrive. Moreover, this group had to emerge quickly. Fortunately the section boasted many energetic, capable mathematicians who were willing to grab the reins.

It always has.

Table 2 lists three different secretaries of the section. After Albert Bennett completed his term, the title "vice-chairman" was dropped when J. R. Kline of the University of Pennsylvania was elected secretary-treasurer. The following year even the designation "treasurer" was dropped when P. A. Caris of Penn was elected as secretary. Caris held this position from 1928 to 1941.

We adopt the following convention regarding years.

> *Each year refers to the November in which elections are contested, even though the person probably carried out most of the duties the following year.*

- **Perry Aquila Caris** (1890-1966) is a native of Tylersville, PA. He spent a lifetime working his way up the academic ladder. Caris received two degrees from Bucknell University, a bachelors in 1913 and a masters in 1917. He held an instructorship at Bucknell from 1913 to 1915, which explains the four-year period between degrees. Besides, from 1916 to 1925 Caris taught at various high schools in the state, including West Philadelphia H. S. for boys. All the while he pursued graduate studies at the University of Pennsylvania, where he was awarded a Ph.D. in 1925 for a dissertation comprised of several papers he had published in the interim on the theory of numbers and analytic geometry. His doctorate was the very last one granted at Penn for a dissertation lacking a formal supervisor. That same year he accepted an assistant professorship at Penn, where he remained until retirement in 1960. Caris is the author, with E. S. Crawley, of the 1933 textbook *A First Course in Calculus*. In addition to writing several articles in the *Monthly*, he was cited for vital contributions to the Committee to Review the Activities of the MAA in the late 1930s. In 1959 Penn awarded him a prize of $1000 for "excellence in undergraduate teaching." Caris died in 1966 at age 76 after having been a member of the MAA for 43 years.

Table 2 lists seven different people who served as chairmen during this seven-year period, a sure sign of a healthy organization. Indeed, these seven stand at the forefront of a long line of dedicated individuals who have given freely of their time and energy. Although the national MAA had just changed its by-laws to lengthen the term of the President to two years, the Philadelphia Section decided on one-year terms, a practice that persists today, although since the 1960s most chairs have served two one-year terms. The founder and first chairman, H. H. Mitchell, was profiled in Chapter 2. Here we provide biographical sketches of the six other chairmen in the order of their terms.

- **Frederick William Owens** (1880-1961) was born in Iowa and received his B.S. degree from the University of Kansas in 1902. He continued graduate studies at Kansas, where he met and married fellow graduate student **Helen Barten Brewster** (1881-1968). Both Frederick and Helen Owens then enrolled in the graduate program at the University of Chicago. He received

his Ph.D. degree in 1907 under the estimable E. H. Moore. Then he accepted an instructorship at Cornell University, where Helen B. Owens continued her graduate studies, obtaining a Ph.D. in 1910 under the department chairman, Virgil Snyder. In 1926 the couple moved to Penn State, where Frederick became head of the department, a position he held until his retirement in 1949. Although he was unable to attend the organizational meeting of the section in 1926, held just a few months after he moved to State College, he did travel to Philadelphia for the second meeting and was rewarded with election as the section's second chairman. Not only did Helen Owens accompany him to that meeting, but there is no record of the either one of them ever attending a meeting without the other. Helen herself had two careers, one as a suffragette (fighting for women's rights in both New York and Kansas), and, later, as a mathematician (she was an associate editor of the *Monthly* and taught at Penn State 1941-1949). When she died in 1968 she had been an MAA member for 49 years.

- **Albert Harris Wilson** (1872-1958) was born in Tennessee. After receiving a B.S. degree in 1892 from Vanderbilt University, A. H. Wilson spent the next three years in the graduate program at Johns Hopkins University. During the first academic year, 1892-1893, he was a Fellow and obtained a masters degree. He left the program two years later, without taking another degree, to accept an instructorship at Princeton University. He left Princeton for the year 1899-1900 to study in Göttingen. He came to Haverford College as an associate professor in 1910. In the meantime Wilson studied under the renowned Leonard Dickson at the University of Chicago, earning his doctorate in 1911. He remained at Haverford College for the rest of his life, retiring as professor emeritus in 1939. He was a charter member of the national MAA when it was formed in 1915. Wilson died in 1958 at the age of 86.

- **John Anthony Miller** (1859-1946) was born in Indiana. After graduating from high school there, he taught in the public schools for several years before taking his bachelors degree at Indiana University in 1890 at age 30. One year later he accepted an instructorship at Stanford, which was just opening that year. A famous student in his first class was Herbert Hoover. Miller took graduate courses at Stanford, resulting in a masters degree in 1893. The following year he returned to Indiana University as professor of mathematics. He seems to have become interested in applications because, after only one year, he switched from mathematics to the department of mechanics and astronomy, where he remained until 1906. In the meantime he enrolled at the University of Chicago. In 1899, at age 39, he earned his Ph.D. as Heinrich Maschke's first doctoral student. Seven years later Miller accepted the positions of professor of astronomy and Director of the Sproul Observatory at Swarthmore College; he held both for the next 26 years. When he was elected our section's fourth chairman in 1929, at age 70, he not only held two academic positions, he also served as Vice President at

Swarthmore (since 1914). In that same year Indiana University bestowed an honorary doctorate upon him. Miller's retirement in 1932 did not equate to lack of work, as evidenced by the 1935 publication of the second edition of his book *Analytic Mechanics*, which appeared initially in 1915. In 1937 an appreciative group of Swarthmore alumni initiated the Miller Student Loan Fund in his honor.

- **Tomlinson Fort** (1886-1970) was born in Georgia and received two degrees from the University of Georgia, a bachelors in 1906 and a masters in 1909. He then enrolled in the graduate program at Harvard University, earning his Ph.D. in 1912 under Maxime Bôcher. Fort was a faculty member at Lehigh University from 1927 to 1945, serving as Dean of the Graduate School from 1938 to 1945. After that he taught at Georgia, South Carolina, Miami (Fla.), and Emory. His election in 1930 marked the first time a chairman of the Philadelphia Section had come from the Lehigh Valley and undoubtedly explains why the annual meeting returned to Bethlehem the next year after four years in Philadelphia. Fort also served three consecutive terms on the Program Committee from 1928 through 1931. Later he was elected vice-president of the national MAA. He died in 1970 at the age of 83, having been a member of the MAA for 53 years.
- **Arnold Dresden** (1882-1954) was born in the Netherlands and came to the U. S. in 1903. In 1905 he enrolled at the University of Chicago, where he received his Ph.D. four years later under Oskar Bolza. Upon graduation he accepted an assistant professorship at the University of Wisconsin, where he remained until moving to Swarthmore in 1927. When he retired in 1952, his replacement was future EPADEL governor David Rosen. Dresden died in 1954 at age 71. (See the profile of Arnold Dresden at the end of the chapter.)
- **John Robert Kline** (1891-1955) was arguably the best mathematician among all leaders of the Philadelphia Section during the period of establishment. A 1912 graduate of Muhlenberg College, Kline earned the distinction of being R. L. Moore's first doctoral student when he received his Ph.D. at the University of Pennsylvania in 1916. Except for brief stints at Yale and the University of Illinois, Kline spent the remainder of his life at Penn, where he supervised 19 doctoral dissertations from 1925 to 1954, including MAA stalwarts Harry Gehman and Lida Barrett. (See the profile of J. R. Kline at the end of the chapter.)

The final column of Table 2 lists the members of the Program Committee, which came into existence at the second meeting, held in November 1927. Two years later it was decided to make the section's chairman an *ex-officio* member of the committee. As the name connotes, the Program Committee was charged with planning the program for the next year's annual meeting. In 1953 it evolved into the Executive Committee; in 1968 the newly created post of vice-chairman was put in charge of organizing annual meetings.

Members of the Program Committee during this period proved amazingly beneficial to the section. Of the dozen different individuals elected to the committee during this period, ten would ultimately become chairmen of the section. We have already provided sketches of J. A. Miller, (who was chairman in 1929), Tomlinson Fort (1930), Arnold Dresden (1931 and 1940), and J. R. Kline (1932). Subsequent chapters will sketch the lives of William Mackey ("Will") Smith (1933) from Lafayette, Richard Morris (1934) from Rutgers, John Wentworth Clawson (1935) from Ursinus, and George Emil Raynor (1948) from Lehigh.

Altogether the union of the sets of chairmen, secretaries, and members of the Program Committee supplies us with 15 different individuals who provided strong leadership throughout the seven-year period of establishment. Their academic affiliations are diverse. Four of the leaders hailed from the Lehigh Valley: Bennett, Fort, and Raynor from Lehigh and Smith from Lafayette. Three came from the Penn: Caris, Kline, and Mitchell. Moreover, the suburban Philadelphia area provided four leaders from three small colleges: Dresden and Miller from Swarthmore, Wilson from neighboring Haverford, and Clawson from Ursinus.

Three of the 15 individuals were from areas that no longer lie within the section's boundary. Orrin Frink and Frederick W. Owens, from the Pennsylvania State College, represented central Pennsylvania. Their participation in the Philadelphia Section would diminish, but not disappear, with the establishment of the Allegheny Section in 1933. Similarly, Richard Morris of Rutgers College represented southern New Jersey, an area that remained part of the Philadelphia Section until 1956.

We observe the lack of leadership initially from the state of Delaware and from areas north and west of the Lehigh Valley. That situation would change in Delaware in the 1940s but would take a longer period of time for the more geographically remote locations of the section.

Official records from meetings of the Philadelphia Section up to 1954 include complete lists of all MAA members in attendance. In general we make no attempt to analyze these lists, but in this case we present a brief analysis in order to gain a greater understanding of the breadth of the mathematical community in the Philadelphia area during the roaring 20s. Then, as now, all who attended the meetings basked in camaraderie with fellow mathematics teachers. This camaraderie was more valuable at that time than today because only the University of Pennsylvania and Lehigh University contained more than a handful of mathematicians.

Two individuals attained perfect attendance at the first seven meetings – A. H. Wilson (who was profiled above), and P. A. Knedler.

- **Paul Allen Knedler** (pronounced need-ler; 1900-1972) was born in East Texas and graduated from the Keystone Normal School in 1917. Knedler earned a bachelors degree from Muhlenberg College and a masters degree from the University of Pennsylvania. During his career he held various positions. Initially he was a teacher at a high school teacher in New Jersey

from 1920 to 1928. He then became an instructor at Penn, remaining there until 1932, when he moved to Kutztown State Teacher's College (now Kutztown University). Knedler remained at Kutztown as associate professor until his retirement in 1969. During his tenure he served as chairman of the mathematics department for many years. He also taught classes in astronomy, resulting in the university naming part of its science building in his honor – the Gruber-Knedler Planetarium and Observatory.

Next, we provide sketches of three other members of the section who attended frequent meetings.

- **Edwin Schofield Crawley** (1862-1933) attended five of the first seven meetings. Crawley is a native Philadelphian who received his bachelors degree from the University of Pennsylvania in 1882. He then became an instructor in the Department of Civil Engineering at Penn. In 1885 he switched to the Department of Mathematics. Crawley was married in 1888 and resided in the city of Philadelphia his entire life. In 1892 he was awarded the first Ph.D. in mathematics that Penn ever granted. No dissertation supervisor is recorded for his thesis; it was common practice at the time to fashion a dissertation as a collection of published articles so there was no need to acknowledge any special guidance provided by a senior member of the department. In 1899 he was appointed to the Thomas A. Scott professorship of mathematics. Today the Department of Mathematics at Penn dates its modern period from the appointment of E. S. Crawley as head of the department. To commemorate this date the department sponsored a celebration on October 30, 1999, called "A Century of Math at Penn".

- **George Abram Harter** (1853-1943) was born in Maryland. He became an assistant professor of mathematics and Latin at St. John's College (Maryland) after earning his bachelors degree there in 1878. He remained in this position until receiving his masters degree two years later. From then until 1885 he was a principal at two different schools. In the meantime he was awarded a Ph.D. from St. John's College in 1882. Harter joined the faculty of Delaware College (now the University of Delaware) in 1885. Initially he was a professor of mathematics and modern languages, but, after three years, physics replaced languages. In 1896 he was chosen as President of the University of Delaware, a position he held until 1914. Subsequent chapters will record several other instances of Delaware mathematicians rising to top positions in the university administration.

- **Albert Eugene Meder, Jr.**, was born in 1903 in New York City, where he attended Columbia University, receiving an A.B. in 1922 and an A.M. in 1923. He spent 1922-1926 on Columbia's faculty before moving to Rutgers University, where he remained for the rest of his career. He was appointed Dean of the Faculty in 1945, which explains why he was referred to as Dean

A. E. Meder in subsequent literature. Earlier in his tenure at Rutgers, Meder held two administrative positions at the New Jersey College for Women, Acting Dean 1932-1934 and Admissions Officer 1933-1934. This helps to explain why the New Jersey College for Women at Rutgers hosted the annual meeting of the Philadelphia Section in 1933. Meder helped found the New Jersey Section in 1956. He was elected that section's first chairman during the year 1956-1957; he held the position again 10 years later. The report of a panel he chaired at the section's second meeting, "The education of mathematics teachers", was published in the *Monthly* in 1959. Meder also severed on several MAA committees. According to a reviewer, his 1967 pamphlet *Topics from Inversive Geometry* "was apparently designed for high school students … [but] would be enlightening to many college students." Today Dean Meder is retired and living in Manchester, Vermont.

At the other end of the attendance scale, Joseph Reynolds, whose idea sparked the founding of the section, attended only two meetings, both held at Lehigh, his home institution. Two other charter members of the section, Rollin L. Charles of Franklin & Marshall and Victor H. Doushkess of Lafayette, attended only the organizational meeting.

Organizational Meeting

Table 3 lists the five invited speakers at the very first meeting of the Philadelphia Section, held November 27, 1926, at Lehigh University. There are several ways in which this meeting differed from all others. For instance, three of the five speakers were associated with institutions in the Lehigh Valley, two from Lehigh University. One of them, Joseph Reynolds, was given the opportunity to be the section's very first speaker in honor of his role in founding the section. The second speaker was Howard Mitchell, another founder. Leroy Smail and Will Smith were the other two speakers from the Lehigh Valley, with Smail from Lehigh and Smith from Lafayette. Mitchell hailed from Penn.

Speaker	Title
Reynolds	The evolutes of a certain type of symmetrical plane curves
Mitchell	The analogue for ideals of the Lagrange-Gauss theory of quadratic forms
Smail	A new treatment of exponentials and logarithms on the basis of a modified Dedekind theory of irrationals
Smith	The derivation and solution of certain ordinary differential equations
Foberg	The state course of study in mathematics

Table 3

The final speaker was J. A. Foberg, the Director of Science and Mathematics for Pennsylvania who had been a co-chairman of the MAA's National Committee on Mathematical Requirements. In the introduction to his talk Foberg expressed his view on the section's role in pre-college education. He stated, "The attention consistently given by the Mathematical Association to the interests of mathematical instruction in the secondary school makes it appropriate that discussion of mathematics instruction in the public schools should form part of the program of this initial meeting of the Philadelphia Section." Foberg told the audience that "mathematics is a required study through the first nine school years – thereafter it is elective." Nonetheless, "the state program of studies in Pennsylvania contemplates a continuous twelve-year program in such major subjects as mathematics." His concluding remarks encouraged a symbiotic relationship between high school teachers and college professors. "A number of colleges and universities in Pennsylvania now admit applicants upon a showing of twelve units of work done in the three-year senior high school. It is hoped and expected that this plan will become general in the near future."

Three of the other four lectures dealt with themes from the undergraduate curriculum. Joseph Reynolds spoke about a topic from analytic geometry, a subject that was then a typical second-year course taken before calculus. Reynolds demonstrated nine properties of a curve and its evolutes for analytic symmetrical plane curves having continuous evolutes, one infinite branch, and no point singularities. He presented the parabola as an example of the type of curve he was discussing.

Smail and Smith lectured on topics from an undergraduate analysis course. Smail, who became known for his highly successful calculus book, presented material at the boundary of graduate and undergraduate education. He introduced a modified form of Dedekind's definition of irrational numbers to treat rational and irrational exponents and logarithms without explicit use of the theory of limits. Smith's topic fit neatly into the undergraduate curriculum as enrichment material for the usual course in differential equations. He presented an expository account of the derivation of various kinds of differential equations, including the Riccati equation, equations of forced, damp vibrations, and certain others with solutions "arising from a kind of maintained vibration in which the force of restitution … is subject to an imposed periodic variation."

Only one of the lectures appears to be at the graduate level, meaning that it was aimed mainly for the edification of the college professors in the audience. In the talk Howard Mitchell discussed the determination of the number of classes of ideals in quadratic fields by methods used in the theory of binary quadratic forms.

Second Meeting

Table 4 lists the six speakers at the section's second meeting. Unlike the organizational meeting, this one set the tone for most of the meetings that followed. The program featured six speakers representing six different institutions; all of the speakers were introduced earlier in the chapter.

Speaker	Title
Crawley	Descartes' Geometry
Owens	The Malfatti problem
Dresden	On matrix equations
Wilson	Space filling polyhedra
Fort	Difference equations
Morris	Positive integral solutions of an indeterminate equation

Table 4

At the time of the 1927 meeting the 65-year old Edwin S. Crawley held the distinguished Thomas A. Scott Professorship in Mathematics at the University of Pennsylvania. On this occasion he reflected on the history of mathematics by sketching the contents of *The Geometry*, the historic work that was one of three influential appendices to Descartes' monumental *Discourse on Reasoning* (1637). Crawley described Descartes' introduction and use of coordinates in the construction of a normal to a curve. In the sense that the topic was on analytic geometry, the first paper at this meeting was similar to the first paper at the organizational meeting.

The second speaker, Frederick Owens, traveled from State College to attend the meeting, probably by train via Lewistown and Harrisburg on the Friday between Thanksgiving and the date of the meeting. In his presentation Owens gave a historical sketch of the Malfatti problem: to construct three circles in a triangle such that each circle is tangent to two sides of the triangle and to the other two circles. Owens concluded with his own solution to the problem, which differed from those usually given.

The strong historical flavor of the talks by Crawley and Owens would enable them to be understood by advanced undergraduate students. The same is true of the presentation by Lehigh's Tomlinson Fort, who outlined the history and literature of difference equations and stated the principal problems as well. It should be noted that Fort "dwelt upon the advances in difference equations which have been made in America".

The presentation by Haverford College's Albert H. Wilson was similar to Fort's in that his topic has never been part of the mathematical mainstream, and so can be considered as an enrichment topic. Nonetheless, this author wishes that Wilson's talk could have been taped, for it must have been a sight to behold. He

began his lecture by discussing tilings of the plane, a topic that received a major boost in the 1970s with the work of the Dutch artist M. C. Escher. Our own Doris Schattschneider of Moravian College has added immensely to the popularization of this topic and to our understanding and appreciation of it. Unlike Schattschneider, however, Wilson restricted his tilings to polygons, enumerating classes of polygons that tile based on the work of the English mathematician Percy Alexander MacMahon. (Incidentally, George Andrews discussed other results due to Major MacMahon in an invited lecture given 73 years later, in 2000.) Then Wilson moved to tilings of three-dimensional space by prisms, the rhombic dodecahedron, the bees'-cell, and the tetrakaidecahedron, showing models of each and indicating their significance in nature. In the conclusion of what must have been a captivating lecture for the 60 people in attendance, Wilson discussed the work from a related problem in non-Euclidean geometry as well as Euclidean geometry. Models too accompanied this final part, this time four tetrahedra that tile Euclidean space. The question of which tetrahedra tile space is still unsolved, but there are many known families of such tetrahedra.

Lectures by Swarthmore's Arnold Dresden and Rutgers' Richard Morris presented recent results at a research level. The mix of undergraduate and graduate levels, with a wide variety of topics, became standard fare at all sectional meetings after this one. The challenge of the Program Committee at that time and the Executive Committee today is to attract a program of capable speakers who reflect this diversity.

Dresden gave a brief report on a method recently developed by W. E. Roth at the University of Wisconsin for determining solutions of the matrix equation $\boldsymbol{P(X) = A}$ which are expressible as polynomials in A, where $\boldsymbol{P(\lambda)}$ is a polynomial in λ without a constant term, A is a given matrix of order n, and X is the unknown matrix of order n. The fact that Dresden based his talk on work done at Wisconsin combined with Fort's emphasis on contributions made by American mathematicians reflects a heartfelt pride in achievements by their fellow countrymen.

In the final talk of the day Richard Morris discussed a problem in Diophantine analysis that generalized a problem initially posed in the *Monthly*. We have been unable to determine more information about the problem

Speakers

Table 5 lists the invited lectures at the annual meetings of the Philadelphia Section from the third meeting, held in 1928 at the University of Pennsylvania, to the seventh, at Swarthmore College in 1932. We analyze the lectures in two different ways, first in terms of the presenters, including affiliations, and second by mathematical classification.

Year	Speaker	Title
1928	Weida	Errors in computation
	Bennett	The geometry of the triangle
	Frink	An algebraic method of differentiating
	Miller	A mechanical theory of the solar corona
	Alexander	Knots
1929	Lamson	Wave mechanics
	Mitchell	Group characters
	Eisenhart	Dynamical trajectories and geodesics
	Ritt	Integration in finite terms
1930	Shohat	On orthogonal Tchebycheff polynomials
	Clawson	A polar reciprocation of the complete quadrilateral
	Sheffer	Some remarks on non-analytic functions
	Fort	Almost-periodic functions
1931	Rupp	Redundant co-ordinates
	Smail	On some fundamental conceptions in the theory of infinite processes
	Smith	Italy and geometry
	Knebelman	Different kinds of curvature
	Dresden	Swarthmore honors course in mathematics
1932	Raynor	Some boundary value problems in potential theory
	Kline	The independent arcs of a continuous curve
	Lehr	On curves with assigned singularities
	Frink	The problem of measure
	Mitchell	The life and work of Ramanujan

Table 5

During those five years the section sponsored 23 lectures by 21 different individuals associated with 11 different colleges. Lehigh paved the way with five speakers, followed by Penn, Penn State, and Princeton with three each, and Swarthmore with two. The affiliations are shown in Table 6. The five schools with one speaker each are Brown (Bennett), Bryn Mawr (Lehr), Columbia (Ritt), Lafayette (Smith), and Ursinus (Clawson). Bennett himself might even be regarded as representing Lehigh since he had left there just one year before.

Lehigh	Penn	PSU	Princeton	Swarthmore
Fort	Kline	Frink	Alexander	Dresden
Lamson	Mitchell	Rupp	Eisenhart	Miller
Raynor	Shohat	Sheffer	Knebelman	
Smail				
Weida				

Table 6

Analysis

Table 5 shows that 8 of the 23 talks sponsored by the section in this period dealt with topics in the broad area of analysis, with at least one given each year. However, all eight lectures covered topics that can be considered classical analysis, not the emerging area of functional analysis.

Penn State's Orrin Frink presented talks at the first and last meeting of this five-year period. In 1928 he described a method of obtaining formulas from differential calculus without the use of any limiting process. Frink wrote that his method differed from early writers on the calculus by "being rigorous"; it was, in fact, based on the theory of analytic functions of a hyper-complex variable. One can only wonder what the successful calculus textbook author Lloyd Smail thought of this stinging critique while seated in the audience.

Smail, a charter member of the Philadelphia Section, had spoken at the organizational meeting. Five years later, in 1931, he talked again at the second meeting held at Lehigh. This time it was Smail's turn to criticize calculus textbook authors, asserting that a definition due to Konrad Knopp was the only satisfactory alternative to the usual textbook definitions of infinite series. Smail proposed that the general principle of convergence be substituted in place of the usual limit definition of the convergence of infinite sequences. He also stressed the importance of the concept of summability.

In 1932, four years after his first talk to the section, Orrin Frink spoke on measure theory. He began his lecture by noting deficiencies in the definitions of measure given by Jordan, Borel, Lebesgue, Caratheodory, and Hausdorff, then introduced a result by von Neumann that enabled a measurable function to be defined for all sets. During Frink's talk he referred to Banach's use of bounded linear and planar sets, an indication of the section's acquaintance with the emerging specialty in functional analysis, but Frink never mentioned Banach's development of linear operators.

Columbia University's Joseph Ritt became the section's first invited speaker from outside the region when he spoke at the 1929 meeting at the University of Pennsylvania. He might have traveled by train, because the commute between New York and Philadelphia was convenient, 30th Street Station lying within easy walking distance of Penn's Bennett Hall. Ritt described the work of Joseph

Liouville on the impossibility of performing certain integrations in finite terms but the possibility of solving certain differential equations in finite terms.

The Program Committee for the 1930 meeting (Tomlinson Fort, J. R, Kline, and John Miller) selected three speakers who presented talks on classical analysis at the meeting held at Penn. The host institution's James A. Shohat, whose contributions to the Philadelphia Section will be detailed in the next chapter, opened the meeting with a lecture on Tchebycheff polynomials. After reminding the audience of the definition of these polynomials, he proved existence and uniqueness theorems for orthogonal polynomials, and then he proved results about their minimum properties and about the distribution of their roots. Penn State's I. M. Sheffer spoke about non-analytic functions of a complex variable, referring on several occasions to the work of Edward Kasner. Sheffer ended the talk by introducing matrices associated with the differentiation of non-analytic functions. The day's final speaker was Lehigh's Tomlinson Fort, who had also delivered an invited address at the section's second meeting in 1927. In summarizing Fort's talk, the section's secretary, Perry Caris, wrote briefly that Fort "discussed the fundamental notions of the papers by Harald Bohr." That was no mean feat, as the famous Danish mathematician published his results in three long papers that ran to almost 300 pages in the esteemed journal *Acta Mathematica* in 1925 and 1926.

Recall that F. M. Weida spoke at the annual AMS-MAA meeting at Penn in December 1926. His invited lecture to open the 1928 annual meeting of the Philadelphia Section was on numerical analysis, the only time this topic was addressed in the five-year period. He began the lecture by declaring, "The theory of errors is a branch of mathematics which belongs to practical analysis in applied mathematics." We pause to profile Weida before analyzing other lectures.

- **Frank Mark Weida** (1891-1977) was born in Allentown to Penrose John and Sarah Rebecca (Mark) Weida. He made his biggest contributions to EPADEL while a resident of nearby Bethlehem. After receiving a B.S. degree from Kenyon College in 1913 he spent the following year as a graduate student at Johns Hopkins University but dropped out to become the head of the mathematics and science department at St. Albans School in Knoxville, Tennessee. That was the position he held when he became one of the charter members of the national MAA in 1916. In the fall of that year he returned to graduate school. However, after spending a year as a teaching assistant at the University of Chicago he left without obtaining a degree. Instead, he accepted an instructorship in mathematics at the University of Iowa while pursuing graduate studies, culminating in a Ph.D. in 1923. One year later he was appointed assistant professor at Montclair State College in New Jersey, a position he held for only one year before accepting the same position at Lehigh University. He remained at Lehigh from 1925 to 1930. During this period he was a charter member of, and an active contributor to, the Philadelphia Section.

F. M. Weida then took a position at George Washington University, where he remained for the rest of his life. He served as head of the mathematics department from 1935 until his retirement in 1957. While at GWU he became an eminent statistician who applied the subject to problems of interest to the military. One year after being appointed head of the department, the 44-year old Weida married Opal Fern Dickson. The couple had two children, Charles Rietz and Mary Elizabeth. Their son's middle name honors Weida's dissertation supervisor from Iowa, the renowned statistician H. L. Rietz. Frank Weida died on September 13, 1977, just two weeks shy of his 86th birthday.He is buried in Christ Episcopal Churchyard in Port Republic, Maryland.

Applied Mathematics

During the five-year period under discussion the section sponsored three lectures on standard topics from applied mathematics: astronomy, mechanics, and potential theory. In 1928 Swarthmore's John Miller spoke about his first love, mathematical astronomy. He suggested a way of explaining solar coronas by considering particles ejected from the solar surface at successive intervals. In his lecture Miller proposed a theory based on conic sections and orthogonal projections of planes. He concluded, "This theory has been applied to a great many solar coronas that have been photographed in the past twenty years with long focus telescopes … Of course this does not prove that the coronas are produced in this way but it does offer one explanation of their peculiarities."

At the 1929 meeting, one year after Miller's talk, charter member Kenneth Lamson of Lehigh University presented an invited lecture on experiments that led to the use of quantum theory. He described the work of the Austrian physicist Erwin Schrödinger leading to the conclusion that energy in mechanics corresponds to frequency in optics. Here, the Philadelphia Section was being kept abreast of current research being conducted in Europe.

Another Lehigh faculty member, George E. Raynor, spoke about potential theory in his 1932 talk to open the meeting at Swarthmore College. In the first part he described recent progress on the Dirichlet problem. In the second he supplied necessary and sufficient conditions for the Dirichlet-Neumann problem to have a solution for a sphere with a singular point at the center.

Algebra

Only two invited speakers lectured on topics in algebra. One was the 1929 talk on group characters by Howard Mitchell, his second talk to the section he helped found three years earlier. Mitchell concluded his presentation by using group representations to prove a result of William Burnside that no group whose order is divisible by just two different primes can be simple.

The only other lecture on algebra during this five-year period was the opening presentation at the 1931 meeting by Penn State's C. A. Rupp, who used notions

from linear algebra to "draw some geometric consequences of the linear dependence of flat spaces in a space of *n* dimensions."

Geometry/Topology

The section certainly provided the opportunity for mathematicians in the area to keep abreast of progress in differential geometry and topology. With Princeton housing arguably the most prominent set of topologists in the world, it is no wonder that the section would consider the latest developments. James Alexander delivered the first such talk at the section's third meeting, held at Penn in 1928 in front of a record crowd of 75 people. (That record lasted until the 1954 meeting at Princeton, when 115 attended.) Simply titled "Knots," his address examined the unsolved problem of finding sufficient invariants to determine completely the knot type of an arbitrary simple closed curve in three-dimensional space. This topic has a modern ring to it even now.

The following year Luther Eisenhart, a graduate of Gettysburg College, presented an invited lecture on his specialty, differential geometry. His talk was based on a paper that had appeared in the *Annals of Mathematics* just one month before.

The third Princeton faculty member to speak on topology or differential geometry was one of the section's charter members, Morris Knebelman, who had been at Lehigh University when his colleague J. B. Reynolds first broached the idea of an MAA section in 1925. Knebelman's 1931 talk in Packard Laboratory at Lehigh came three years after he received his Princeton Ph.D. In his lecture Knebelman extended the concept of the curvature of a surface – as studied by Gauss, Rodrigues, and Riemann – to topological properties of a space. The section's secretary, Perry A. Caris, wrote, "it is only within the last two or three years that the question of curvature has undergone a closer scrutiny." Knebelman's lecture considered some of the newer results. It ended up being the only lecture he ever delivered to the section, for shortly thereafter he moved to Washington State University. Although he returned to Bucknell in 1964, there is no record of any further participation in the Philadelphia Section.

In addition to the Princeton trio, Penn's J. R. Kline lectured on a topic that straddles topology and differential geometry at the 1932 meeting at Swarthmore College. This was the only time that Kline spoke before the Philadelphia Section. It is not entirely unexpected that a student of R. L. Moore would subject the foundations of a subject to a painstaking analysis. With this in mind, Kline analyzed various definitions of a curve, noting shortcomings of earlier attempts to define the concept. During his lecture he mentioned the work of two of his own students, Leo Zippin and Norman Rutt. (The official report from the meeting incorrectly lists Rutt's surname as Ruth.) Kline ended his lecture by showing interrelations among three types of curves: regular, perfect continuous, and those that are the sum of a countable number of arcs.

Four of the talks given to the Philadelphia Section during 1928-1932 were concerned with geometry, one per year except 1929. The first was delivered in Penn's Bennett Hall by section founder A. A. Bennett, who proposed that

triangles be studied using the theory of binary forms instead of the usual approaches to geometry using synthetic methods, analytic geometry, projective methods, or inversive geometry. The second invited lecture was given by Ursinus College's John W. Clawson, who described a polar reciprocation of a complete quadrilateral and some of its related points and lines with respect to a circle having the focal point (Steiner, Miquel) of the quadrilateral for center. The following year William M. Smith of Lafayette College outlined the facilities available for graduate study in Rome, where he had spent a sabbatical year studying under Enrico Bompiani. Smith also reviewed contributions made by Italian geometers to projective geometry and Riemannian geometry.

In Chapter 2 we pointed out that the 1925 dissertation of Bryn Mawr's Marguerite Lehr dealt with algebraic geometry. Her 1931 talk at Swarthmore College, titled "On curves with assigned singularities," evokes a common theme. In it Lehr presented her solution to the following problem: given a set of nonnegative integers satisfying a plane algebraic curve defined by Plücker equations, does a plane algebraic curve exist having these equations as its Plücker characteristic? Given the content of Smith's talk the year before, it was appropriate for Lehr to make use of a theorem due to the famous Russian born, Italian educated, geometer Oscar Zariski.

Miscellaneous

The two remaining lectures delivered to the Philadelphia Section during 1928-1932 dealt with curriculum and history/number theory. We already noted that Arnold Dresden had been hired by Swarthmore College in 1927 to fashion that school's honors course in mathematics for juniors and seniors. At the 1931 meeting at Lehigh he discussed the results of his endeavor. Minutes from that meeting record only that Dresden gave "an account of the way in which this plan [for honors work] is realized, particularly in mathematics and the natural sciences." Fortunately a note from the May 1927 issue of the *Monthly* supplies more details about the program:

> *Students in that course are not obliged to attend classes, are free to work at tasks assigned to them on which they have conferences with their instructors as often as may seem desirable. No grades or records are kept during these two years. At the end of the senior year they have to take a comprehensive examination covering the work of these two years and conducted both in oral and written parts by an outsider.*

The honors program that Dresden designed required students to complete four seminars in mathematics and two seminars in each of two minors. That was the student's whole course load during the last two years. External examiners conducted examinations in honors. That is still the case today, although parts of the system have been drastically revised; external examiners are still an integral part of the program, however.

One of the founders of the Philadelphia Section, Howard Mitchell, spoke to the section on three separate occasions. We have already described his talks at the organizational meeting in 1926 and the 1929 meeting at his home institution, Penn. He also presented the very last talk in the five-year period under discussion, "The life and work of Ramanujan". As Perry Caris wrote in his official report from the 1932 meeting at Swarthmore College, "The title … sufficiently indicates the nature of the paper." This was not the last time our section would be treated to a talk about the fascinating story of Ramanujan and his phenomenal discoveries in number theory, as Nathan Fine lectured on this same subject in 1952 based on material unavailable to Mitchell at the time. In 1990 George Andrews also spoke about Ramanujan's mathematics at a student conference held at Moravian College. All three Ramanujan speakers – Mitchell, Fine, and Andrews – were associated with the University of Pennsylvania, the first two as faculty members and the last as a doctoral student. Both Fine and Andrews ended up at Penn State.

The discussion in the preceding paragraph raises the question, "Who has delivered the most talks to the section?" Of those who accepted invitations to lecture during the period of establishment, Marguerite Lehr delivered the most, one per decade: 1931, 1944, 1954, and 1963. James Shohat comes next, having delivered all three of his talks in one decade: 1930, 1934, and 1939. Overall, Lehigh University's Albert Wilansky gave the most lectures, five. In addition to Lehr, four other mathematicians spoke to the section on four different occasions: Cletus Oakley from Haverford College, and Hans Rademacher, Isaac Schoenberg, and Herb Wilf from the University of Pennsylvania.

Profile: ARNOLD DRESDEN (1882-1954)

Arnold Dresden was born November 23, 1882 in Amsterdam, Holland, and began his undergraduate education at the University of Amsterdam. In 1903, before completing his program, and against the wishes of his parents, he came to the U. S. to help a friend who was living in Chicago, using tuition money to pay for boat passage to New York. After landing there, he made his way to Chicago, arriving on his 21st birthday.

During his first two years in his adopted land, Dresden worked at various jobs, including stacking merchandise at Marshall Field's wholesale warehouse at $10 a week. He also taught six classes at the high school associated with that university, called the Laboratory School, a task he faced with grave misgivings, not because of the long hours but because of anticipated ill behavior by the students. He stated, "In Holland we tortured our teachers." Yet in America he had no trouble maintaining discipline.

By 1905 he had scraped together enough money to enroll at the University of Chicago. He received his Ph.D. four years later with a dissertation, written under Oskar Bolza, on the calculus of variations titled "The second derivatives of the extremal integral".

Upon graduation in 1909 Dresden accepted an assistant professorship at the University of Wisconsin, where he remained until 1927. He became a naturalized citizen four years later. Dresden felt obligated to volunteer during World War I, so he sailed for France in September 1918 and spent one year working for the Red Cross.

The May 1927 *Monthly* heralded his arrival in the Philadelphia area nine months after the MAA section was founded. "Professor Arnold Dresden of the University of Wisconsin has been appointed professor of mathematics at Swarthmore College. An interesting feature of his work in that college will be in connection with the honors course for juniors and seniors." Dresden described this course in a 1931 lecture to the section. Minutes from that meeting record only that he gave "an account of the way in which this plan is realized, particularly in mathematics and the natural sciences." Fortunately the *Monthly* note supplies more details:

> *Students in that course are not obliged to attend classes, are free to work at tasks assigned to them on which they have conferences with their instructors as often as may seem desirable. No grades or records are kept during these two years. At the end of the senior year they have to take a comprehensive examination covering the work of these two years and conducted both in oral and written parts by an outsider.*

The honors program that Dresden designed required students to complete four seminars in mathematics and two seminars in each of two minors. That was the student's whole course load during the last two years. External examiners conducted all assessment in honors. That is still the case today. Although parts of

the system have been drastically revised, external examiners remain an integral part of the program.

Arnold Dresden was one of the most respected and effective leaders in both the AMS and the MAA. He became actively engaged with our section as soon as he set foot in the area. Two months after arriving at Swarthmore in September 1927, he presented an invited lecture, “On matrix equations”, reporting on a method developed by a former Wisconsin colleague. At the same 1927 meeting he was elected to the Program Committee; he would be elected again in 1939. He also was elected chair for 1931-1932 and 1940-1941.

Dresden was an early, ardent supporter of the MAA, and he became a charter member. However, it wasn’t until his move to Swarthmore that he became active with the MAA, beginning with a paper he delivered at the annual meeting in 1927. He was elected vice president for 1931 (A. A. Bennett followed him in 1933 and 1934) and president for 1933 (succeeding E. T. Bell).

Dresden began his publishing career in 1907 while a graduate student at Chicago with two papers on the calculus of variations in the *Monthly*. Part of his dissertation appeared in the *Transactions* the following year. [14] Further advances would occur in papers that appeared in 1916, 1917, and 1923. In the latter year he also published two papers on symmetric forms in *n* variables. But from that time on, with only a few exceptions, all future contributions seem to appear in the *Monthly*’s Problem or Discussions-Questions Departments.

At Swarthmore, as at Wisconsin, Dresden was known as much for his musical talent and interests as for his mathematics; his Monday evening chamber music sessions at Swarthmore were celebrated. Swarthmore students adored him. The alumni magazine gushed, “Of all the people on Swarthmore’s faculty, one of the most beloved is a man who could easily be mistaken for Santa Claus, both in spirit and in the flesh.” When asked about the history of his beard, called “the finest hirsute adornment on campus”, he replied, “Why, I’ve had it ever since I was born.”

Arnold Dresden resided in the town of Swarthmore from the time of his appointment in 1927 until his death in 1954 at age 71. When he retired in 1952, his replacement was future EPADEL governor David Rosen.

Profile: JOHN ROBERT KLINE (1891-1955)

J. R. Kline was the most influential mathematician in the Philadelphia area during the 1920s, and he became one of the most significant figures in the Philadelphia Section. Indeed, his career is important in the history of mathematics in the United States for two reasons – his relationship with the famed topologist R. L. Moore and his support for African-American students at a time when such encouragement was unusual.

Kline spent almost his entire life within the section's boundaries. It seems only fitting that his place of birth, Quakertown, lies midway between the section's institutional parents, Penn and Lehigh. The child of Henry K. and Emma (Osman) Kline, he was born on December 7, 1891.

Kline obtained an A.B. in 1912 from Muhlenberg College, which granted him an honorary doctorate in 1934. A photo of the college on the front page of the May 30, 1934, edition of the Allentown *Chronicle* includes him as one of the inset faces. Back in 1912 Kline went directly from Muhlenberg to the graduate program at the University of Pennsylvania. The preceding year two new instructors on the Penn faculty were EPADEL founder H. H. Mitchell and R. L. Moore. Apparently Kline took two courses with Moore – Foundations of Mathematics, and a sequel called Theory of Point Sets. Beyond these, individual study was the fashion, with Moore encouraging his better students to work with him. Kline was the best. He obtained a masters degree in 1914 and a Ph.D. two years later. His dissertation, "Double elliptic geometry in terms of point and order", was published in the *Annals of Mathematics* in September 1916. This makes Kline the first in a long, distinguished list of doctoral students of the legendary Texan.

Although Moore strongly disapproved of students getting married before completing their studies, Kline married Anna B. Shafer in June 1915 when he was midway through his thesis. In fact, following the ceremony Moore tendered a luncheon to the newly married couple. Anna and John Kline had one son, John Shafer Kline.

While completing his dissertation during 1915-1916, Kline was an instructor at his *alma mater*, Muhlenberg. After receiving his doctorate he returned to Penn, winning a Harrison Fellowship for the year 1916-1917 and accepting an instructorship for the next year. This enabled him to continue his studies with Moore. Kline left Penn in 1918, but after one year at Yale and one at the University of Illinois, he returned in 1920 to replace Moore, who had accepted a professorship at Texas. Although Moore remained at Texas and Kline at Penn for the rest of their careers, the archives at the University of Texas contain a steady stream of letters between the two, and each sent students to study under the other, either during their graduate studies or as post-doctorates.

The correspondence between Kline and Moore does not seem to address the origin of the famous Moore Method of teaching. More than likely, Moore's techniques evolved over time, as evidenced by course descriptions in the course catalogs at Penn and his influence on fellow faculty members (particularly

EPADEL founder H. H. Mitchell). Besides, the dissertation topics of Moore's Ph.D. students at Texas in the 1920s were similar to Kline's and to Moore's other two Penn students, George H. Hallett, Jr. (1918) and Anna Mullikin (1922). Knowing how Moore directed his students from basic axiomatic systems to doctoral dissertations, it seems clear that the first person to benefit from the Moore Method was J. R. Kline.

At Penn Kline served as chairman of the department from 1928 until the year before his death in 1955. He also held the University's prestigious Thomas A. Scott Professorship from 1940. Kline took several leaves of absence during his tenure. The first was during the year 1925-1926 as a Guggenheim Fellow at Göttingen University, which had arguably the very best mathematics department in the world at the time. Later he was a visiting professor at four different institutions: Bryn Mawr College (1935-1936), Swarthmore College (1938-1939), the University of Colorado (summer of 1949), and the University of Tübingen (first semester of the 1952-1953 academic year). His trip to Göttingen occurred while J. B. Reynolds was advancing the idea of forming an MAA section, which explains why Kline was not one of the founding members of the Philadelphia Section. However, he played an active role thereafter, being elected secretary-treasurer for 1927-1928 and chairman for 1932-1933. In addition, he attended numerous annual meetings.

Kline contributed to the national MAA in one decisive way. During World War II the MAA formed a Subcommittee on Available Teachers in College Mathematics, with Kline one of its three members. (Another was Arnold Dresden. The two friends resided in Swarthmore.) This subcommittee compiled and maintained a register of vacancies and availability of mathematicians for service throughout the war. Kline was also an important AMS officer, serving as associate secretary 1933-1936 and as secretary 1941-1950. When he took ill in 1943, his place was taken by Arnold Dresden. (With Everett Pitcher of Lehigh serving as secretary of the AMS 1967-1988, an EPADEL member held that position for 31 of the 47 years from 1941 to 1988.) Kline also served as an associate editor of the *Transactions* of the AMS, the *Bulletin* of the AMS, and the *American Journal*.

During his tenure at Penn, Kline directed 19 doctoral dissertations. His first graduate, in 1925, was longtime MAA secretary-treasurer Harry Gehman. Kline was a particularly fair and unbiased man who, unlike his academic father, R. L. Moore, permitted any qualified candidate to study under him. Two cases are particularly noteworthy. In 1928 he supervised the doctoral dissertation of Dudley W. Woodward, who became the second African-American student to receive a Ph.D. in mathematics in the United States. William Claytor became the third when he completed his dissertation under Kline in 1933. Recently Claytor's widow Mae recalled that Kline continued to support her husband even after he received his degree, encouraging him to participate in both the AMS and the MAA.

J. R. Kline became a respected member of the international mathematical community, publishing four papers in the Polish journal *Fundamenta*

Mathematicae and three in the *Proceedings of the National Academy of Science*. Moreover, Kline wrote a joint paper with his advisor, the only publication Moore ever coauthored. Most of Kline's publications appeared from the time of his dissertation in 1916 to a long paper on separation axioms in topology in 1928. Administrative duties demanded most of his time and attention after that. Nonetheless, he was elected secretary of the International Congress of Mathematicians for the meeting held in 1950 in Cambridge, MA.

Unfortunately, Kline's life was difficult after the 1950 congress. First, his wife Anna died that year at age 59. However, he married Eunice Story Eaton the following year and the two of them went to Germany with much hope for a renewed life. Kline expected to write a book on the Jordan curve theorem, its extensions, and its applications to topology and analysis, but it never materialized. He was beset with administrative problems upon his return to Penn. Combined with personal tragedy and physical ailments, the torture was too much for him to handle, and Kline committee suicide. He was buried in Quakertown after his death on May 2, 1955.

Chapter 4: ÉMIGRÉS, 1933-1941

The Philadelphia Section was established in 1926 to advance the cause of collegiate mathematics in eastern Pennsylvania, southern New Jersey, and all of Delaware. There was no need to define "eastern" or "southern" because no other sections of the MAA covered the states of Pennsylvania or New Jersey at the time. However, as Philadelphia Section founder Albert A. Bennett so presciently predicted in 1926, the formation of a section centered at one of the two poles in the Keystone State would spur the establishment of a section centered at the other. That event transpired when the Allegheny Section was founded in 1933, so beginning that year the MAA divided the state of Pennsylvania into two parts defined by longitude 77°30′W. This geographical boundary meant that much of central Pennsylvania, including notably Penn State, became aligned with the Pittsburgh axis. Although this arrangement removed from the Philadelphia Section such leading figures as Orrin Frink, Frederick Owens, and Helen Owens, the loss was mitigated by a new wave of energetic, creative leaders.

That is one reason for regarding the year 1933 as a watershed in the section's history. A second reason is external to our section, even external to the country. And external to mathematics. It was the rise to power of the Nazi dictator Adolf Hitler, whose policies caused hundreds of the world's finest scientists to emigrate. Five notable mathematicians settled in the Philadelphia area – Emmy Noether, Salomon Bochner, Hilda Geiringer, Hans Rademacher, and Richard Courant. All but Noether participated in our section.

This chapter describes activities in the Philadelphia Section from the first annual meeting held outside Pennsylvania, in 1933, to the one held two weeks before the United States entered World War II in 1941. The chapter introduces a new set of leaders and describes some of their professional activities. Perhaps the most active of them all – J. A. Shohat – is, like Hans Rademacher, accorded a personal profile at the end of the chapter as a tribute to his many contributions. The five new chairs of the section are associated with five different institutions – W. M. Smith (Lafayette), Richard Morris (Rutgers), J. W. Clawson (Ursinus), L. L. Smail (Lehigh), and C. O. Oakley (Haverford). There are also biographical sketches of two members of the Program Committee – C. B. Allendoerfer (Haverford) and H. W. Brinkmann (Swarthmore) – and one invited lecturer, A. G. Rau (Moravian). The chapter ends by analyzing the themes of the invited lectures, with a discussion of those addresses delivered by émigrés complementing an analysis by mathematical category.

Annual Meetings

Table 1 lists the annual meetings of the Philadelphia Section from 1933 to 1941. The final column provides a reference (date of issue and page numbers) to the official annual reports as they appeared in the *Monthly* for those readers who desire additional details about the meetings.

Date	Location	#	MAA	%	Monthly
Dec. 2, 1933	NJ College for Women	65	29	45	Feb, 1934, 61-62
Dec. 1, 1934	Penn	57	38	67	Apr, 1935, 187-188
Nov. 30, 1935	Lafayette	63	27	43	Mar, 1936, 145-147
Nov. 28, 1936	Penn	41	28	68	Apr, 1937, 192-193
Nov. 27, 1937	Haverford	57	37	65	Feb, 1938, 68-70
Nov. 23, 1938	Ursinus	30	17	57	Mar, 1939, 134-136
Dec. 2, 1939	Lehigh	54	35	65	Mar, 1940, 138-139
Nov. 30, 1940	Penn	45	27	60	Feb, 1941, 91-93
Nov. 29, 1941	Swarthmore	50	33	66	Apr, 1942, 220-221

Table 1

The 1933 meeting was the first official function sponsored by the section that did not include mathematicians from central Pennsylvania. Moreover, whereas the University of Pennsylvania and Lehigh University hosted all but one of the initial seven meetings, a diversity of sites emerged in the period under consideration, with three colleges – Lafayette, Haverford, and Ursinus – each hosting a meeting for the first time.

The remaining columns provide attendance figures at these meetings. They show that attendance remained fairly steady, except for the small gathering at Ursinus College in 1938. On average about 30 of the 51 people who attended these nine meetings belonged to the MAA (59%), figures concordant with attendance at the first seven meetings.

Leaders

Chapter 3 described the outstanding leadership the section received from a cadre of members who sustained the vitality, initially provided by the section's three founders, from the organizational meeting in 1926 through 1932. As we have seen, the chairmen of the section during the period of establishment came from Philadelphia, the suburbs, the Lehigh Valley, and from outside the present section's boundaries.

Table 2 addresses the section's governance structure based on elections held at annual fall meetings from 1933 through 1941. Recall our convention that the year 1933 means that P. A. Caris was elected as secretary at the meeting in 1933 but carried out most of his duties during 1934. Caris continued to serve as secretary until 1941, whereupon Philip M. Whitman continued the unwritten tradition that the section's secretary come from the University of Pennsylvania. Caris remained active in the section up to the time of his death in 1960, being elected chairman twice, in 1945 and 1950.

Chairs

During this period the section prospered under nine different chairmen, only two of whom had been elected to office during the first seven years, H. H. Mitchell and Arnold Dresden. These nine represent geographical areas within the Philadelphia Section that are more scattered than during the preceding period: H. H. Mitchell and J. A. Shohat were from the University of Pennsylvania in Philadelphia, while J. Clawson (Ursinus College), A. Dresden (Swarthmore College), and C. O. Oakley (Haverford College) came from the suburbs. Three chairmen came from the Lehigh Valley: L. L. Smail and J. B. Reynolds from Lehigh University and W. M. Smith from neighboring Lafayette College. The remaining chairman was Richard Morris of Rutgers University. It might be pointed out that by the end of this period no representative from the University of Delaware had yet served as chairman of the section, a situation that would change dramatically in the 1940s.

Year	Chairman	Secretary	Program Committee
1933	Smith	Caris	Brinkmann, Clawson, Morris
1934	Morris	Caris	Fort, Shohat, Smith
1935	Clawson	Caris	Brinkmann, Lehmer, Oakley
1936	Mitchell	Caris	Morris, Wilson
1937	Smail	Caris	Hedlund, Nelson, Smith
1938	Reynolds	Caris	Brinkmann, Fort, Kline
1939	Shohat	Caris	Allendoerfer, Clawson, Dresden
1940	Dresden	Caris	Oakley, Shohat, Smith
1941	Oakley	Whitman	Brinkmann (C), Davis, Shohat

Table 2

The contributions that James Alexander Shohat made to the section warrant him a personal profile at the end of the chapter. Shohat emigrated from Russia in 1923, arriving a decade before the European wave that splashed ashore between 1933 and 1941. He became a naturalized citizen in 1929, but it was not until 1930 that he first visited the area, delivering an invited lecture at the section's annual meeting. He moved to Philadelphia in 1931 as an assistant professor at the University of Pennsylvania, and remained there the rest of his life.

Since the careers of Arnold Dresden, Howard Mitchell, and James Reynolds have already been profiled, we provide biographical sketches of the five other chairmen in the order of their terms.

- **William Mackey ("Will") Smith** (1881-1966) is a native of Oxford, PA. He received a Ph. B. (Bachelor of Philosophy) degree from Lafayette College in 1903, and joined the faculty of his *alma mater* two years later as

an instructor. However, he left that post for two years to enroll in the graduate program at Columbia University, where he received a Ph.D. in 1911. Smith then returned to Lafayette for a year before accepting an assistant professorship at the University of Oregon. Although promoted to full professor there after only one year, he returned to Lafayette as an associate professor in 1915 and remained at the Easton college for the rest of his life. He was appointed head of the department in 1934, a year after serving as the section's chair. Like many Americans, Smith's career was interrupted by World War II, when he served as the Director of War Studies at Lafayette from 1943 through 1945. He died in 1966 at the age of 85.

- **Richard Morris** (1868-1951), who was born in Keyport, New Jersey, graduated from Peddie Institute in 1890. Even though it would be another six years before he would enroll at Rutgers, he entered as a sophomore because in the meantime he had acquired state certificates through study and teaching experience. He graduated from Rutgers with a B.S. in 1899 at age 30. That fall he served as superintendent of nearby schools, but at the same time he accepted an instructorship in the Department of Mathematics and Graphics and initiated graduate studies at his *alma mater*. He earned an M.S. in 1902. While Morris continued to be listed on the faculty at Rutgers, he pursued graduate studies at Cornell University, resulting in a Ph.D. in 1907. Upon graduation, Morris returned to Rutgers for the rest of his life, ending up teaching 45 years there. In 1918 he volunteered to teach at the new branch of the university, the New Jersey College for Women. Later he headed the department there; he also served as head of the mathematics department of the men's colleges from 1913 to 1944. Morris was 66 years old when elected chairman of the Philadelphia Section in 1934. He retired as emeritus professor ten years later at age 76. Even at that point he devoted his time to tutoring Rutgers students, serving as a substitute teacher in the public schools, and filling vacancies in various pulpits of Methodist churches in the area. Morris died in New Brunswick at the age of 83.

- **John Wentworth Clawson** (1881-1964) was born in St. John, New Brunswick. He took his bachelors and masters degrees from New Brunswick College in 1901 and 1905. In between he studied at Cambridge University in England. Clawson came to the department of mathematics and physics at Ursinus College in 1907. He taught at Ursinus and lived in Collegeville the rest of his life, spending the years 1947-1952 as dean of the college. Clawson was a charter member of the MAA in 1916 and was elected chairman of the Philadelphia Section in 1935. Earlier he served two one-year stints on the Program Committee (now the Executive Committee) of the section, in 1930 and 1933. Clawson retired as emeritus professor in 1952 at age 70. He was an inveterate problem solver, beginning with his published solution to a problem in the January 1909 issue of the *Monthly*, ending with the solution to an Advanced Problem in the June/July 1957

issue, and including solutions to over 50 other problems in between. J. W. Clawson died in 1964 after having been an MAA member for 48 years.

- **Lloyd Leroy Smail** (1888-1955) was born in Kansas. He received two degrees from the University of Washington at Seattle, an A.B. in 1911 and an A.M. in 1912. The following year he received a Ph.D. from Columbia University. He then returned to the West Coast as an instructor at his *alma mater*. Smail left Washington for the University of Oregon two years later. He remained at Oregon for two years before heading to the University of Texas, but he left there after only one year to accept a position at Lehigh University. After relatively short durations at three land-grant universities, Smail stayed at Lehigh from 1926 until his retirement as emeritus professor in 1953. He was active in the Philadelphia Section since becoming one of its charter members in the fall of his arrival on the Bethlehem campus. In fact, he presented an invited lecture at the organizational meeting in November 1926. One month later he spoke at the national MAA/AMS meeting at the University of Pennsylvania, with both lectures centering on Dedekind's theory of irrational numbers. Smail spoke again at the 1931 annual meeting of the Philadelphia Section. His last official participation with the section was his election to the Program Committee in 1947. When he died at age 66 he had been a member of the MAA for 31 years.

- **Cletus Odia Oakley** (1899-1990) was born in Texas. Today he is best known for his textbooks, especially his 1955 work *Principles of Mathematics* written with Carl B. Allendoerfer. After serving a one-year tour of duty with the U. S. Navy in 1918-1919 Oakley obtained three degrees in three-year increments, beginning with a bachelors from the University of Texas in 1923. After a one-year stint as an engineer with Western Electric Company, he accepted an instructorship at Brown University, where he stayed for two years, leaving in 1926 with a masters degree. He received his Ph.D. in 1929 at the University of Illinois under Robert Carmichael. Upon graduation Oakley returned to Brown to teach for another five years. He then came to Haverford College in 1934 and spent the rest of his life on the Main Line campus, serving as head of the department from 1942 until his retirement in June 1964. Of course he took several leaves during this tenure, with sabbaticals in 1947-1948, 1955-1956, and 1960-1961, and a leave of absence in 1952-1953. In addition to eight textbooks, Oakley published 14 papers (mostly on differential and integral equations) and served as associate editor of the *Monthly* for five years. In addition he was the chair of the mathematics committee of the College Entrance Examination Board and editor-in-chief of the mathematics section in *Collier's Encyclopedia*. Oakley was also known as an excellent lecturer who was supported by the NSF to address teachers in states along the Atlantic seaboard. At Haverford, however, he was best known among students for his athletic prowess, especially in handball; a standing offer held that any student who beat him was guaranteed an A in his class. He

defeated all comers into his late sixties. Upon retirement Oakley spent two years on a Fulbright grant, his fourth, working with teachers in Australia. He died at age 91 in Ann Arbor, where he lived with his son, a professor of psychology at the University of Michigan.

Program Committee

Next we discuss the composition of the section's Program Committee (today's Executive Committee). During the period 1933-1941 a total of 15 different individuals were elected to the Committee. Ordinarily three people served on this committee, but in 1936 there were only two; the official report from the meeting held at Lafayette does not explain this anomaly. The notation (C) in the bottom row of Table 2 denotes the chairman, a designation that began only in 1941.

Membership on the Program Committee came from colleges and universities located in the city of Philadelphia, its environs, the Lehigh Valley, and New Jersey, but it did not include representation from Delaware or the northern or western part of the section's geographical boundaries. Altogether 15 different individuals served the 26 terms in this period. The suburban Philadelphia area dominated membership on the Committee, with 12 terms (46%): Swarthmore College's three members served six terms (Brinkmann four; Dresden and Wilson one each), Haverford College's two members served three terms (Oakley two, Allendoerfer one), while Ursinus College's Clawson served two terms and Bryn Mawr's Hedlund served one. The Lehigh Valley came next in representation, with 6 terms (23%): Lehigh University provided three terms (Fort two and Lehmer one) and so did Lafayette College (Smith served all three). The city of Philadelphia garnered five terms (19%): the University of Pennsylvania provided four (Shohat three, Kline one), while Drexel Institute's Davis served one. In addition, Rutgers University's Morris served two terms, while the New Jersey College for Women's Nelson, also located at Rutgers, served one.

Just like the preceding period, almost all members of the Program Committee, 11 of the 15, were elected chairman of the section at one time or another from 1928 to 1952. A chronological listing of the chairmen suggests the extent of this group's influence, especially during the 1930s: 1928 (Wilson), 1930 (Fort), 1931 (Dresden), 1932 (Kline), 1933 (Smith), 1934 (Morris), 1935 (Clawson), 1939 (Shohat), 1940 (Dresden), 1941 (Oakley), 1942 (Davis), 1944 (Nelson), and 1952 (Nelson). Recall our convention that brief biographies of chairs appear in the chapters covering the year of the first term. Two members of the Committee are deserving of special mention.

- **Carl Barnett Allendoerfer** (1911-1974) graduated from Haverford College in 1932, after which he held a prestigious Rhodes Scholarship to Cambridge University before receiving his Ph.D. at Princeton University in 1937. Allendoerfer joined the faculty at his *alma mater* Haverford College in 1946 but stayed there only five years, one of which (1948-1949) was spent at the Institute for Advanced Study at Princeton. He then went to the University of Washington, where he became one of the most active members of the

national MAA, serving as President for 1959-1960. Upon his death in 1974 the MAA honored him by establishing Allendoerfer Awards for outstanding expository articles in *Mathematics Magazine*.

- **Heinrich Wilhelm Brinkmann** (1898-1989) was born in Hanover, Germany. Heine Brinkmann received all his higher education in the U.S. and ultimately became a naturalized citizen. He earned a bachelors degree from Stanford University in 1920 and then accepted an instructorship there for a year. During this period he was strongly interested in group theory by Hans Blichfeldt, and he helped W. A. Manning write his book *Primitive Groups*. During the summer of 1922 G. D. Birkhoff became Stanford's first visiting professor. He met Brinkmann and prompted him to apply to Harvard for graduate school. When the prestigious university officially offered Brinkmann admission to the graduate program later that year, he replied with a terse telegraph message, "Yes." He earned a masters degree in 1923 and a Ph.D. in 1925, while holding a Sheldon Fellowship during 1923-1924. He wrote his dissertation on Riemann spaces under Birkhoff. After graduation, Brinkmann spent a post-doctoral year with Emmy Noether at Göttingen before returning to Harvard as a faculty member. He was a very popular teacher; 50 years later his former student J. L. Brenner recalled, "Brinkmann's classes were among the most brilliantly organized … he raised questions in just the right way." In 1933 Brinkmann moved to Swarthmore College, where he remained for the rest of his life. He held the College's Magill Professorship from 1957 to 1965 and the Buffington Professorship from 1965 until his retirement four years later. In 1971 he and future section chair Eugene Klotz published the book *Linear Algebra and Analytic Geometry*. Like several Swarthmore mathematicians, Brinkmann played musical instruments. He became one of the most active mathematicians in the Philadelphia Section during the 1930s, serving a record four terms on the Program Committee. He also delivered invited lectures at annual meetings in 1933, 1941, and 1955. Heine Brinkmann died at age 90 in nearby Wallingford.

Speakers

Table 3 lists information about the invited lectures at the annual meetings of the Philadelphia Section from 1933 to 1941. During those nine years the section sponsored 38 addresses by 32 individuals associated with 19 different institutions.

The table reveals that four different faculty members from the University of Pennsylvania presented a total of six lectures in this period, with James Shohat and Hans Rademacher speaking twice, and James A. Clarkson and E. E. Witmer once each. Shohat and Rademacher are profiled at the end of the chapter. Next came Princeton University with three different speakers who delivered four talks: Samuel S. Wilks (2), Salomon Bochner, and Albert W. Tucker.

Year	Speaker	Institution	Title
1933	Starke	Rutgers	Binomial congruences
	Brinkmann	Swarthmore	The interpretation of imaginaries in projective geometry
	Wilder	Michigan	Connectivity of spaces
	Kasner	Columbia	Polygons and groups
1934	Shohat	Penn	On some applications of Taylor's Formula
	Oakley	Haverford	On successive approximations in differential equations
	Benner	Lafayette	Some geometry associated with $\lim_{N\to\infty}\left(1+\frac{1}{N}\right)^N$
	Moore	IAS	Mathematics and poetry
1935	Bailey	Lafayette	Collegiate curricula in mathematics in this section
	Witmer	Penn	Quantum mechanics
	Hedlund	Bryn Mawr	A macroanalysis of some simple dynamical systems
	Rau	Moravian	The teaching of mathematics in the Pennsylvania German schools
	Bochner	Princeton	Almost-periodic functions
1936	Clarkson	Penn	Remarks on abstract spaces
	Cairns	Lehigh	Triangulations and related problems
	Wilks	Princeton	Inverse probability and fiducial inference
	Murray	F&M	The undergraduate comprehensive exam
1937	Grant	Rutgers	Farey series
	Owens, F.	Penn State	Some multiple perspective relationships
	Rademacher	Penn	On the Bernoulli numbers and the Von Staudt-Clausen theorem
	Wheeler, A.H.	H S Mass.	Stellated polyhedra, illustrated with models
1938	Wheeler, A. P	Bryn Mawr	Functions and sequences
	Tucker	Princeton	Undergraduate courses in topology and other phases of geometry
	Carpenter	Ger. Acad.	Meeting the challenge to secondary mathematics
	Yates	Maryland	Linkages
1939	Lehmer	Lehigh	Mechanical aids in the theory of numbers
	Oakley	Haverford	Equations of polygonal configurations
	Shohat	Penn	Orthogonal polynomials in relation to Lagrangian and Hermitian interpolation
	Johnson	Library	Old mathematical books and instruments in the Schwenkfelder Library
	Owens, H.	Penn State	Mathematics clubs, old and new
1940	Oxtoby	Bryn Mawr	Transitive flows
	Vanderslice	Lehigh	Modern methods in differential geometry

Year	Speaker	Institution	Title
1940	Rademacher	Penn	On Dedekind sums
	Wilks	Princeton	Statistics involved in College Entrance Exams
1941	Bailey	Lafayette	The problem of the square pyramid
	Brinkmann	Swarthmore	Cubic congruences
	Maker	Rutgers	Recent developments in the Cauchy theory of analytic functions
	Courant	NYU	Problems of stability and instability demonstrated by soap film experiments

Table 3

Table 4 provides affiliations for the remaining institutions that housed more than one speaker. Bryn Mawr College, Lafayette College, Lehigh University, and Rutgers University accounted for three lectures each. In addition, Haverford College, Swarthmore College, and the Pennsylvania State University each accounted for two lectures. It is notable that the two speakers from Penn State were the husband-and-wife team of Frederick and Helen Owens.

Institution	Speakers
Bryn Mawr	Hedlund, Oxtoby, Wheeler
Haverford	Oakley (2)
Lafayette	Bailey (2), Benner
Lehigh	Cairns, Lehmer, Vanderslice
Penn State	F. Owens, H. Owens
Rutgers	Grant, Maker, Starke
Swarthmore	Brinkmann (2)

Table 4

Of the remaining 10 institutions that housed one speaker each, four lie within the Philadelphia Section: Moravian College, Franklin & Marshall College, Germantown Academy (a private high school in Philadelphia), and the Schwenkfelder Library.

Themes of Lectures

First we discuss the invited lectures delivered by émigré mathematicians who settled in the region. Then we examine the lectures by their mathematical classification: analysis, geometry/topology, algebra/number theory, probability/ statistics, curriculum/pedagogy, and special topics.

Émigrés

Like the rest of the country, the Philadelphia Section benefited enormously from mathematicians forced to flee their homeland. During the period 1933-1941 six invited lectures were given by four different émigré mathematicians, all of whom chose to speak on some aspect of analysis except for Richard Courant, who spoke on applied mathematics.

The preceding chapter discussed the 1930 lecture by one immigrant from the 1920s, James A. Shohat. The Penn professor accepted two more invitations in the 1930s, the first at the 1934 meeting held at Penn. In this lecture Shohat showed that the trapezoidal formula and Simpson's Rule for approximating a definite integral could be derived by a simple application of Taylor's Formula.

The 1939 annual meeting held at Lehigh provided the highlight of Shohat's association with the Philadelphia Section. At the business part of the meeting, held between the morning and afternoon sessions, he was elected chairman of the section for the next year. On the program he presented a talk contrasting Lagrangian and Hermitian interpolations of certain orthogonal polynomials, based on recent results of Bernstein, Faber, and Fejér.

Princeton's Salomon Bochner was born in Krakow, Poland, in 1899. He was forced to leave his position of lecturer in Munich, Germany, in 1932, and just one year later Oswald Veblen arranged a faculty appointment for Bochner at Princeton. Two years after that, in Bochner's 1935 talk to the Philadelphia Section, he presented an outline of the theory of periodic and almost-periodic functions as viewed from the theory of expansions of general functions on groups. He emphasized that his approach explained adequately why the exponentials formed a complete system of pure periodic functions of one variable. We do not know the cause of James Shohat's emigration from Russia in 1923 but there is no doubt why Salomon Bochner left Poland – to avoid the Nazi persecution of Jews. Bochner always remained grateful to the United States for saving his life.

Hans Rademacher, the third émigré to speak to the Philadelphia Section, also left his native Germany to avoid Nazi persecution, but not for religious reasons. Rademacher was a Protestant who became a Quaker when he came to Philadelphia. He was dismissed from his position as full professor at the University of Breslau in 1933 because he belonged to the International League for the Rights of Man and was president of the Breslau chapter of the German Society for Peace.

During his lifetime Hans Rademacher presented four invited lectures at annual meetings of the Philadelphia Section, two during the period under consideration, the first at the 1937 meeting at Haverford College. A distinguished figure in analysis and analytic number theory, he chose to speak about Bernoulli numbers in his initial talk. Here he regarded the general binomial coefficient $\binom{n}{j}$ as an integral-valued polynomial of the j^{th} degree, which was then expressed as a linear combination of binomial coefficients by means of integral coefficients A_{qj}. The

resulting formula yielded the $(q + 1)^{th}$ Bernoulli polynomial. The master number theorist used this fact to prove that the Von Staudt theorem followed as a direct consequence of a congruence property of the A_{qj}.

Rademacher delivered his second invited lecture to the Section at the 1940 annual meeting at his home institution, the University of Pennsylvania. On this occasion he spoke about one of his favorite topics, Dedekind sums, based on a forthcoming paper written with his first Ph.D. student at Penn, Albert Whitman. Rademacher lectured on an arithmetical property of Dedekind sums called the "theorem of reciprocity".

The lecture by the remaining émigré, Richard Courant, is noteworthy for several reasons. For one, it was the last lecture delivered during the period under discussion. For another, the subject matter was one dear to the speaker's heart: applied mathematics. Another émigré, Lipman Bers, commenting on the value of many immigrants' knowledge of applied mathematics, wrote, "Almost overnight, refugee mathematicians became a boon rather than a burden." Like Bochner, Courant had been born in Poland but educated in Germany, obtaining his doctorate under David Hilbert at Göttingen in 1910. He was professor of mathematics and Director of the Mathematical Institute at Göttingen from 1920 until his dismissal by the Nazis in 1933. After spending the next academic year at Cambridge University, Courant crossed the ocean to become a professor of mathematics and head of the department at New York University. He held both posts until his retirement in 1958. Curiously, the fascinating biography of Courant by Constance Reid does not mention his lecture to our section.

The title of Courant's lecture was "Problems of stability and instability demonstrated by soap film experiments". In it he stated that if a dynamical system permits different states of stable equilibrium, corresponding to relative minima of the potential energy, there must exist transitions between these two states leading over an intermediary state of unstable equilibrium. Courant then demonstrated the principle with soap film experiments of a novel type, relating to minimal surfaces and systems of such surfaces. After that Courant discussed how these experiments pointed to a new field within the calculus of variations. He ended his talk by linking the newly formulated problems to classical isoperimetric problems.

Before discussing other invited lectures during 1933-1941, we pause to mention another one on applied mathematics. Given at the 1935 meeting, Penn's Enos Eby Witmer spoke on "Quantum mechanics". In his talk Witmer viewed the development of quantum theory as developed by Planck in terms of the history of classical physics. His major theme was that every physical problem should be approached as an eigenvalue problem. He concluded, "and that is what quantum mechanics is."

Analysis

The section above described lectures on analysis by James Shohat, Salomon Bochner, and Hans Rademacher. From 1933 to 1941 five other speakers chose to

speak on a theme from analysis. Altogether 10 of the 38 talks presented to the Philadelphia Section during the nine-year period under discussion were on analysis, which reflects a slight de-emphasis from the period 1928-1932, which featured 8 of 23.

Haverford's Cletus O. Oakley delivered two invited addresses during the 1930s. In 1934 he lectured on ordinary differential equations. The title of his 1939 talk, "Equations of polygonal configurations," belies its content, which concerned semilinear equations involving linear forms. By invoking properties of linear operators, Oakley thereby introduced many of the members to topics in modern functional analysis.

A lecture given three years earlier removed all doubt about the intrusion of "soft analysis" into the area. In his 1936 talk, Penn's James A. Clarkson discussed convexity properties of Banach spaces and their subsets, the first time such spaces were mentioned officially at a meeting of the Section. In his talk Clarkson presented a simple proof of the Radon-Riesz theorem on weak convergence in L_p spaces for $p > 1$.

Two Bryn Mawr College professors also spoke on analysis. In 1935 Gustav Arnold Hedlund took a rather nontraditional approach to dynamical systems. Hedlund's lecture did not feature the usual particles. Instead he considered Euclidean and non-Euclidean billiards with a single ball, which maintains its velocity and is reflected from the sides at equal angles. In her 1938 lecture Anna Pell Wheeler presented a study of the correspondence between certain classes of functions analytic in the interior of the unit circle.

P. T. Maker of Rutgers University preceded Courant's talk at the 1941 meeting held at Penn. Like Pell Wheeler, Maker spoke about analytic functions. In his talk he discussed the contribution of measure theory to the problem of relaxing conditions in order for a function of a complex variable to be analytic, ending by generalizing the Cauchy theorem to functions on closed sets.

Geometry/Topology

Eight lectures at the annual meetings of the Philadelphia Section held from 1933 to 1941 were devoted to topics in topology or geometry. Although the previous five-year period witnessed lectures by Princeton topologists James Alexander and Morris Knebelman, nobody from that famous school of topologists spoke during the period at hand. Nonetheless, the three talks devoted to topology maintained the quality achieved by the earlier speakers.

The earliest address on topology was an expository talk by Raymond L. Wilder, one of the first graduates of the Texas school of topology under R. L. Moore. At the time of his lecture Wilder was at the Institute for Advanced Study at Princeton on leave from Michigan. In his talk he outlined the development of various notions of connectivity in higher dimensional polyhedrals, then he described recent extensions of these ideas to arbitrary topological spaces.

The next lecture on topology was given by Stuart S. Cairns of Lehigh University, who spoke on the deep subject of simplicial complexes in both point set and algebraic topology, the latter then known as "combinatorial topology".

After presenting his solution to a problem involving regular manifolds, Cairns applied the material to the usual definition of arc length before supplying a proof of the generalized Stokes Theorem.

The third, and final, invited lecture on topology was given by one of the section's most active members, John C. Oxtoby of Bryn Mawr College, who was elected chairman of the section in 1955. Oxtoby opened the 1940 meeting at Penn by discussing transitive flows, a topic that deals with one-parameter continuous groups of automorphisms of a topological space. As is typical of many aspects of Lie groups, this material was applied to the theory of differential equations.

The five talks on geometry during this period dealt with five entirely different aspects of the subject. At the 1940 meeting John Oxtoby was followed by J. L. Vanderslice of Lehigh University, who gave an expository talk on generalizations of classical differential geometry in which he supplied evidence for the indispensability of tensors and tensor differentiation. Two years earlier R. C. Yates of the University of Maryland presented a lecture titled "Linkages". After presenting a history of the subject from the common pantograph of Scheiner in 1631 to work by J. J. Sylvester, the speaker exhibited several working models of linkages designed for line motion, trisection, and the description of conics and many higher plane curves. Yates would speak to the section again in 1951, at which time he had moved to the U.S. Military Academy at West Point. In 1934 J. Alfred Benner of Lafayette College spoke about a certain class of curves defined by polar equations.

- **Jacob Alfred Benner** (1900-1974) is a native of Hopewell, PA. He received a bachelors degree from Penn State in 1922 and two masters degrees, one from Lafayette in 1925 and another from Columbia four years later. J. Alfred Benner spent his entire career at Lafayette, being appointed an instructor in 1922 and eventually promoted to full professor in 1950.

In 1933 Heinrich Brinkmann of Swarthmore College spoke about projective geometry, a topic also discussed by Penn State's Frederick Owens in 1937. Owens presented an expository paper centered around one theorem: the impossibility of constructing three distinct triangles, real or imaginary, for which each triangle is in six-fold perspective with each of the others. Helen Owens spoke before the section two years later. The fact that the Allegheny Section scheduled annual meetings in the spring enabled mathematicians who had formerly been active in our section to continue their formal ties.

Algebra/Number Theory

During the period 1933-1941 there was only one invited lecture at the Philadelphia Section that truly fits into the classification of algebra. In the last year of the period Heinrich Brinkmann discussed the relations between the discriminant of a cubic polynomial and its roots, concluding with an elementary proof of a theorem due to Voroni. Since this topic deals with the classical algebra

of polynomials, it means that the section had still not heard a talk about any part of the abstract algebra that was developed in the late 1920s and throughout the 1930s, even though the acknowledged leader in the field, Emmy Noether, taught at Bryn Mawr College from 1933 until 1935. In fact, the renowned algebraist Nathan Jacobson replaced Noether at Bryn Mawr, but there is no record of his participation in the section either. Edward Kasner of Columbia University gave an invited lecture on a related topic at the annual meeting in 1933. Titled "Polygons and groups," he extended results from a 1903 *Monthly* article to bi-point transformations connected with a given polygon.

In spite of a dearth of talks on modern algebra, the period 1933-1941 bore witness to five invited lectures on number theory. In the first year Emory P. Starke of Rutgers University discussed binomial congruences on a level accessible to undergraduate students. Starke continued to be active in sectional affairs, serving as chairman for the year 1946-1947. Two of the section's invited talks on number theory were delivered at the 1937 meeting at Haverford College. The one by Hans Rademacher was described above; the Rutgers mathematician H. S. Grant gave the other, on Farey series. In 1941 Richard P. Bailey of Lafayette College gave a talk whose title suggests geometry, "The problem of the square pyramid," but instead deals with integral solutions of systems of equations based on the work of the French number theorist, F. E. A. Lucas.

The final lecture on number theory was the opening presentation at the 1939 meeting held at Lehigh University. The title of D. H. Lehmer's talk has a very modern ring to it, "Mechanical aids to the theory of numbers". In it he described commercial multiplying machines and their adaptations, punch card equipment, sieve and stencil devices, and his own recently constructed electric sieve

Probability/Statistics

During the 1930s the section sponsored talks on two emerging areas, probability and statistics, by one person, Samuel Stanley Wilks, of Princeton. The first talk was given at the 1935 meeting at Penn. Titled "Inverse probability and fiducial inference," Wilks explained some of the difficulties that arise in attempting to apply Bayes's Theorem on inverse probability to the problem of drawing inferences about unknown population parameters from observations, and conditions under which such difficulties can be avoided by fiducial arguments.

S. S. Wilks spoke a second time five years later, at the 1940 meeting again at the University of Pennsylvania. The title of his presentation was "Statistics involved in College Entrance Examinations". In this invited lecture he discussed statistical problems that arise in the construction and reading of examinations, particularly those administered by the College Entrance Examination Board. Wilks stressed that to secure maximum reliability in an examination with a given number of questions, care must be taken to select items of suitable difficulty satisfying the subject-matter requirements such that the correct and incorrect responses on each pair of questions are highly positively correlated.

Curriculum/Pedagogy

Five papers presented at the 1932-1941 annual meetings dealt with some aspect of education, two each at the meetings in 1935 and 1938 and one in 1936. Three of the lectures concerned the college curriculum exclusively, one focused on secondary mathematics, and the remaining one bridged the gap between high school and college.

At the 1938 meeting, the first hosted by Ursinus, Albert W. Tucker described the two one-semester geometry courses he offered at Princeton. One of them, called an "Introduction to Modern Geometry," was designed for sophomores and dealt with geometries characterized by their groups of transformations. The other, "Elementary Topology," was a course constructed for juniors. It dealt with topological properties in two and three dimensions, including the classification of 2-dimensional manifolds and examples of 3-dimensional manifolds, culminating in properties of general topological spaces. By examining manifolds in $\Re^3$, Tucker anticipated a topic that would earn Fields Medals for four mathematicians in the second half of the 20^{th} century: John Milnor in 1962, Steven Smale in 1966, William Thurston in 1982, and Michael Freedman in 1986.

In 1936 W. R. Murray of Franklin and Marshall College described the undergraduate comprehensive examination developed by the faculty at F & M. Murray maintained that although F & M's system of comprehensive examinations offered decided advantages in coordinating a student's course of study, it was more difficult to construct in mathematics than in other areas. In spite of observing several desirable gains, "the experiment is still too new and the operation too imperfect to make any enthusiastic claims for the plan." Apparently the system of comprehensive exams flourished until the 1960s, when they began to disappear across the college. The major hurdle seemed to be the conundrum of the student who, having passed all courses, performed poorly on the comprehensive exams. In mathematics, one of the consequences was to lower the level of the exam to meet the students' achievement, clearly not the intention of the system. Sometime in the early 1970s Franklin & Marshall eliminated comprehensive examinations altogether.

At the tenth meeting of the section in 1935, the first at Lafayette College, the leadoff speaker was Richard P. Bailey from the host institution. His colleague Will Smith, who was chairman of the Section in 1934-1935 and served three terms on the Program Committee in the nine-year period under discussion, introduced him. The section's secretary, Perry Caris, described Bailey's talk in one sentence: "Doctor Bailey presented the results of a survey of the mathematics curricula of the colleges of the Philadelphia Section, calling attention in particular to the most prevalent types of curriculum organization and the major problems to which they give rise." Unfortunately, no further details were provided. Bailey himself had just come to Lafayette that year as an instructor in mathematics, and he remained at Lafayette until 1944. Certainly Secretary Caris knew about Bailey's work in mathematics, because Bailey had just completed his

doctoral dissertation at Penn under James Shohat a few months before delivering his invited lecture to the section.

At that same meeting Albert G. Rau, the Dean at Moravian College, presented his research on the history of the curriculum at Moravian secondary schools and at Moravian College. He indicated that teachers in the Moravian schools were acquainted with algebra and geometry; these subjects became part of the curriculum after 1780. This background enabled Moravian College to add conic sections into the curriculum after 1820. Analytic geometry and calculus were added after 1860 but were discontinued from about 1870 until 1900, perhaps due to the growing tradition at some Lehigh Valley colleges of students burning their calculus books at the end of the year. Rau concluded his paper by stating, "The general question of mathematics in other Pennsylvania German schools can not be examined for lack of evidence and is postponed for a later paper." We do not know if Dean Rau ever pursued his research further in this direction, but we pause to introduce this active member of our section.

- **Albert George Rau** (1868-1942) is the only person to speak to our section who was a full-time administrator his whole professional life. Born on August 7, 1868, in Bethlehem, PA, Rau obtained his bachelors degree from Lehigh University in 1888. In spite of graduating shortly before his 20th birthday, Rau assumed the position of Superintendent of the Moravian Preparatory School that September. He remained in that post until 1909, when he was appointed Dean of the Moravian College and Theological Seminary. Rau attended school in the evening, resulting in a masters degree from Lehigh in 1900 and a Ph.D. from Moravian in 1910. His publications show a wide breadth of interest, a trait reflected in his professional memberships. Rau not only belonged to the MAA and the AMS, but to the American Society for Political and Social Science, perhaps being the only member in the intersection of these three sets. Except for a one-year leave as lecturer on rural sociology at the Teachers College of Columbia University in 1927, Rau retained his deanship until his death on February 23, 1942.

Being the second speaker at the 1938 meeting, Albert W. Tucker discussed his two topology courses before the business meeting, conducted right before lunch. After the meal the audience was treated to another lecture dealing with education, but this one at the secondary level. The speaker, W. D. Carpenter, a mathematics teacher at the private Germantown Academy in Philadelphia, centered his talk about two issues. The first was the growing influence of the College Board Examinations. Carpenter felt that the inclusion of elementary calculus and analytic geometry would cause a lack of thoroughness in the other subjects taught, a theme repeated by many college teachers in the 1980s and 1990s. Next the speaker addressed criticisms of secondary mathematics, again anticipating basic issues that would arise 50 years later. He put the blame for the poor preparation of high-school teachers squarely on the shoulders of the college faculty themselves, and then he laid out a plan of improved methods in the training of future teachers.

Special Topics

Four of the talks delivered to the Philadelphia Section in the 1930s do not fit into any of the categories above but are too important to overlook. In 1934 Charles N. Moore presented an invited lecture in which he compared mathematics and poetry on the basis of certain common aesthetic elements. Moore spent the 1934-35 academic year at the Institute for Advanced Study in Princeton on leave from his usual post at the University of Cincinnati. He had served as vice-president of the MAA in 1931.

In 1937 Albert Harry Wheeler, a high-school teacher from Worcester, Massachusetts, presented a talk titled "Stellated polyhedra, illustrated by models". In his presentation Wheeler showed by means of paper models some unusual transformations of solids. In addition to paper models he showed photographs of many forms of stellated polyhedra, probably passing the photos among the 57 listeners in the room because overhead projectors were not yet in use.

The annual meeting at Lehigh in 1939 included two invited lectures on special topics. One was by Dr. Elmer Johnson from the Schwenkfelder Library in Pennsburg, PA, who exhibited numerous old mathematical books and surveying instruments in the library's collections. He also discussed the history of some of those books and instruments, including facts concerning their acquisition.

The other lecture was by Penn State's Helen B. Owens, whose title was "Mathematics clubs, old and new". We have already discussed Helen and her husband, Frederick, during the time Penn State was aligned with the Philadelphia Section, and even after the formation of the Allegheny Section in 1933. Here Owens suggested various activities that could be used to stimulate interest in mathematics among undergraduate students, including the use of problem contests, joint club meetings, mathematical exhibits (like the one described by Albert Wheeler above), public lectures, and student mathematical publications. The section's Deborah A. Frantz, the indefatigable Kutztown University professor who served as EPADEL's Student Chapter Coordinator throughout the 1990s, carried out every one of these activities in that decade.

Profile: HANS RADEMACHER (1892-1969)

Hans Rademacher was one of several émigré mathematicians to settle in the Philadelphia area during the 1930s. Born in Hamburg, Germany, it seemed as if this brilliant student would follow in the footsteps of other outstanding research mathematicians produced by the country's superior educational system when he obtained his doctorate at Göttingen in 1917 at age 25.

From there Rademacher began to climb the steep German academic ladder. During 1919-1922 he was a Privatdocent at the University of Berlin. Then he moved back to his native Hamburg to become Professor Extraordinarius. However, he remained in Hamburg only three years before accepting a position as Professor Ordinarius (the equivalent of a full professor) at the University of Breslau in 1925. He stayed in Breslau until 1934.

That's when Rademacher's life changed dramatically. He was a socialist who belonged to the International League for the Rights of Man and was president of the Breslau chapter of the German Society for Peace, any one of which was sufficient to get him fired by the ruling Nazis. He was dismissed unceremoniously in 1934.

Germany's loss was the Philadelphia Section's gain.

In the fall of 1934 Rademacher immigrated to the University of Pennsylvania as a visiting professor under a joint grant from the Emergency Committee of Displaced German Scholars and the Rockefeller Foundation. The head of Penn's graduate program in mathematics at the time, J. R. Kline, certainly knew the visitor's worth. In 1936 Kline convinced Penn authorities to offer Rademacher an assistant professorship and tenure. Rademacher accepted, and he ultimately stayed at Penn until retirement in 1962, having been promoted to full professor in 1939.

Rademacher's personal life was not without turmoil, as he married for the third time in 1949. But the third time was a charm, his wife being Irma Schoenberg Wolpe, the sister of his well-known colleague Isaac J. Schoenberg, a faculty member at Penn from 1941 to 1966.

In the meantime Rademacher was a member of the Institute for Advanced Study in Princeton during 1953 and for the academic year 1960-1961. He also spent 1954-1955 in Bombay, India, as a Guggenheim Fellow at the Tata Institute for Fundamental Research.

During his 28-year stint at Penn Rademacher directed 17 doctoral dissertations, more than anyone else at Penn except for J. R. Kline, who directed 19. (He directed four dissertations in Germany before emigrating.) Rademacher's students have also played significant roles in two EPADEL institutions in Philadelphia. His 1959 graduate, Father Frederick Homann, became an institution at St. Joseph's University. But Rademacher's most enduring influence has been on Temple University, where his 1951 graduate, Albert Schild, initiated Temple's Ph.D. program in 1967 and lured another Rademacher student, Emil Grosswald, from a professorship at Penn in West Philadelphia to Temple in North Philadelphia.

Forced retirement from Penn at age 70 did not mean the end of mathematical activity for the indefatigable Rademacher. He joined several other notable immigrants as a visiting professor at the Courant Institute in New York 1962-1964, after which he moved to the Rockefeller University as a visiting professor 1964-1966 and an affiliate from 1966 until his death three years later. The University of Pennsylvania memorialized Rademacher's name with a prestigious lecture series that began in 1978 with talks by Marcel Schutzenberger, I. M. Singer, and John Tate, and has numbered several Fields Medallists since then.

Profile: JAMES ALEXANDER SHOHAT (1886-1944)

James A. Shohat (show′-hot) was one of several émigrés to settle in the Philadelphia area. Born in Brest-Litovsk, Russia, on November 18, 1886, he earned two degrees from the University of Petrograd (now St. Petersburg). The first, an equivalent of our bachelors degree, was awarded in 1910. Shohat was a Fellow there from 1912 to 1916, and from 1913 to 1917 he was an instructor at the Polytechnic Institute of Petrograd. The next year he was an instructor at the Mining Institute of Petrograd. Then he accepted a professorship at Ural University in Ekatherineburg, where he remained until 1921, when he returned to Petrograd as a professor at the Pedagogical Institute. He was awarded the degree of Magister of Pure Mathematics, the equivalent of our Ph.D., in 1922.

Shohat came to the United States the following year. After spending 1923-1924 as an assistant at the University of Chicago, he moved to the University of Michigan as an assistant professor, a post he held until 1929. Although he became a naturalized citizen that year, he moved to Paris for one year to conduct research at the Institut Henri Poincaré.

James Shohat came to the Philadelphia area in 1930 when J. R. Kline, the head of the department at the University of Pennsylvania, hired him as a lecturer. That fall Shohat delivered an invited lecture at the annual meeting of the Philadelphia Section. The following year he was promoted to assistant professor at Penn, where he spent the rest of his career, being promoted to associate professor in 1935 and professor in 1942.

Throughout the 1930s Shohat delivered four invited talks to the Philadelphia Section. He also presented two invited AMS lectures, in September 1934 in Williamstown and in April 1936 in New York. The first was titled, “On the expansion of functions in series of orthogonal polynomials” and the second “The characterization of a distribution function through its moments”. He was the only invited speaker at the annual 1934 summer meeting of the AMS held at Williams College.

Shohat published numerous important memoirs and one book (written with J. D. Tamarkin) on orthogonal polynomials. He wrote several in French for *Comptes Revues* and Russian for *Matematica Sbornik*, reviewed many articles for *Zentralblatt*, and translated works from Russian. He served as an associate editor for the *Duke Mathematical Journal* since its inception in 1935; he was also an associate editor for the *Bulletin of the AMS*.

Shohat resided on Eagle Road in the Manoa section of Upper Darby. He was a member of the Orthodox Greek Church there.

In July 1944 Shohat came down with a case of pneumonia that developed heart problems that caused his death on October 8, 1944, at age 57. He was survived by his wife of 22 years, Nadiashda Galli-Shohat, who had received her Ph.D. in physics from Göttingen in 1914 and who had taught at Bryn Mawr as well as several other colleges.

Chapter 5: WORLD WAR II and its AFTERMATH, 1942-1955

Chapter 4 described many of the activities and dominant figures in the Philadelphia Section during the 1930s, up to the time of the U.S. entry into World War II. This chapter extends coverage to the 14-year period from 1942 through 1955, examining activities that took place during the war and the decade afterwards. The year 1956 marked a watershed in the section's history due to the formation of the New Jersey Section. Hence the period 1942-1955 was the last in which MAA members living in the Garden State were automatically associated with our section.

We begin the chapter with a summary of the section's annual meetings, highlighting contributions made by another set of sectional leaders. In addition to profiles of G. C. Webber, Anna Wheeler, and John Oxtoby at the end of the chapter, our chronicle contains biographical sketches of eight other chairs, three secretaries, three members of the Program Committee, and three speakers. Several notable events are reported, including the election of the first woman as chair of the section and the emerging leadership of members from the University of Delaware and Franklin & Marshall College. This period also witnesses vigorous activity by mathematicians from Rutgers and Princeton. Perhaps the most decisive development for the governance of the section was the evolution of the Program Committee from a group of small size and limited charge to today's expanded, proactive Executive Committee.

The last part of the chapter considers the 56 presentations made during this 14-year period. Unlike earlier chapters, a chronological account precedes the customary analysis by mathematical classification. The lectures clearly reflect the influence of the Penn School of Analysis. They also reflect the emphasis placed on applications at meetings held during World War II and on educational issues at meetings held afterwards. One presentation in 1954 was particularly noteworthy, both because its format preceded the panel discussions that gained popularity afterwards and because it dealt with a new technology – television.

Annual Meetings

Table 1 provides an overview of annual meetings in the period 1942-1955. The final column provides a reference (date of issue and page numbers) to the official annual reports as they appeared in the *Monthly* for anyone desiring further information about the meetings.

The first column of Table 1 lists the dates of the 14 meetings in this period. It is notable that the Philadelphia Section, unlike many others, was able to hold meetings every year throughout World War II. Even two national MAA meetings were canceled, the 1942 meeting scheduled for New York ("at the request of the Office of Defense Transport") and the 1945 summer meeting scheduled for Montreal ("by order of the Office of Defense Transport"). Continuing the official

policy from 1939, the section held its annual meetings on the Saturday following Thanksgiving.

Date	Location	#	MAA	%	Monthly
November 28, 1942	Penn	35	26	74	March, 1943, 210-211
November 27, 1943	Penn	41	27	65	March, 1944, 182-184
December 2, 1944	Penn	27	19	70	April, 1945, 234-235
December 1, 1945	Penn	48	28	58	March, 1946, 179-180
November 30, 1946	Penn	51	35	68	June, 1947, 363-364
November 29, 1947	Bryn Mawr	60	41	68	June, 1948, 391-392
November 27, 1948	Penn	51	42	82	May, 1949, 363-364
November 26, 1949	Haverford	68	48	71	May, 1950, 367-368
November 25, 1950	Lehigh	33	27	82	May, 1951, 366-368
November 24, 1951	Penn	58	44	76	June, 1952, 436-438
November 29, 1952	Delaware	60	39	65	April, 1953, 289-291
November 29, 1953	Drexel	65	44	68	April, 1954, 291-293
November 27, 1954	Princeton	115	78	68	April, 1955, 301-302
November 26, 1955	Penn	87	64	73	May, 1956, 360-362

Table 1

The second column lists the sites of these 14 meetings. Clearly the University of Pennsylvania dominated, hosting eight gatherings, including every one during WW II. The twin institutions, Bryn Mawr College and Haverford College, hosted postwar meetings in 1947 and 1949, respectively. (Bryn Mawr was always a women's college. Haverford was a men's college until 1978, when women transfer students were first admitted; the first fully coeducational class entered in 1980.) Consequently the 1950 meeting at Lehigh University marked the first time the section met outside the Philadelphia area since Lehigh hosted the annual affair in 1939. The site of the 1952 meeting – the University of Delaware – marked the first time the section sponsored a meeting in the "First State". This location represents the culmination of activity by Delaware members that had increased dramatically throughout the 1940s.

The section met in New Jersey for the last time in 1954. The meeting hosted by Princeton University is noteworthy for another reason – attendance exceeded 100 for the first time in the section's history. The Philadelphia Section sponsored no more meetings in New Jersey after 1955 due to the formation of two other MAA sections. In 1941 the Metropolitan New York Section had been carved out of the existing Upper New York State Section, with boundaries including the part of New Jersey north of New Brunswick. However, by the mid-1950s two developments prompted the desire for a New Jersey Section: a committee formed to improve articulation between colleges and secondary schools in the state, and the emerging role of mathematicians within the College Entrance Examination Board, located in Princeton. Due to the efforts of two individuals who had been active in our section up to that time, Dean Albert E. Meder of Rutgers and Albert W. Tucker of Princeton, the New Jersey Section met for the first time on

November 3, 1956, at Rutgers. From that time onward any MAA member who lived in New Jersey became a member of the new section unless another preference was indicated. The by-laws of the New Jersey Section have been lauded for attention to detail, with most of the credit going to our section's former chairman, Cyril A. Nelson. Nelson's affiliation was listed as Douglass College of Rutgers University, the name given to the former New Jersey College for Women in 1955 in honor of its first dean, Mabel Smith Douglass.

As might be expected, attendance at wartime meetings was lower than in other years, yet interest was sufficient to sustain the meetings every Thanksgiving. The 27 people who attended the 1944 meeting at the University of Pennsylvania was the smallest since the organizational meeting in 1926, a result of gas rationing as well as war activity by the membership, but attendance rebounded nicely to 48 the following year. Once again the low attendance at the 1950 meeting held outside the Philadelphia area at Lehigh University reflects the degree to which travel difficulties continued for MAA members. Except for the record-setting attendance at the Princeton meeting in 1954, meetings held in suburban Philadelphia drew the largest numbers, attracting slightly more members than meetings held in the city. Recall that the Philadelphia Section no longer included central Pennsylvania during the 1940s, which provides a partial explanation for the decrease in attendance figures shown in the remaining columns of Table 1, especially during the period 1942-1946. Overall, an average of 57 people attended meetings during this 14-year period, up somewhat from the average of 51 who attended the preceding nine meetings; 40 of the 57 belonged to the MAA, or 70% – an increase from the 60% from the previous period.

Two special events took place at the annual meetings during this period. The first is reflected in the official report from the 1944 meeting at the University of Pennsylvania, which states, "At the instance of Professor Dresden, appropriate action was taken in memory of the late Professor James A. Shohat". We have already profiled Shohat in Chapter 4. This chapter will cite his influence on C. J. Rees (Delaware) and Alexander Tartler (Drexel), while Chapter 6 will cite his influence on Walter Lawton (Temple).

The other event concerns sectional governance. In 1953 it was voted to form an Executive Committee consisting of "the chairman, the secretary, the program chair, and the sectional governor". Although membership on the Program Committee is noted for the 1954 meeting, that committee is never mentioned in any reports, its role having been subsumed by the more expansive Executive Committee.

The report from 1954 provides the first mention of a governor. Initially a Board of Trustees administered the national MAA, with 12 of its members being elected at large. In 1939 these elected members were designated as governors and a Board of Governors replaced the Board of Trustees. Both boards included the Association's officers. The 1939 national by-laws stated that there would be 14 governors elected biennially by regions. Just six years later these unwieldy regions were eliminated in favor of one governor from each section of the MAA. We defer discussion of the section's governors until Chapter 6.

Leaders

Table 2 addresses the section's governance based on elections held at annual meetings from 1942 through 1955. Recall our convention that the year 1942 means that Drexel's James E. Davis was elected chairman of the section at the meeting held in November 1942 but carried out most of his duties during the year 1943, including the running of the annual meeting that year. The section continued to benefit from a cadre of active leaders, altogether boasting 12 different chairmen in 14 years, with Cyril Nelson (Women's College of New Jersey) and Perry Caris (University of Pennsylvania) the only chairs elected to two (nonconsecutive) terms. Many other contributions by Caris have already been cited, principally his service as secretary from 1928 through 1941.

Year	Chairman	Secretary	Program Committee
1942	Davis	Whitman	
1943	Wheeler	Whitman	Brinkmann (C), Fort, Manning
1944	Nelson	Gottschalk	Dennis, Oxtoby (C), Wallace
1945	Caris	Gottschalk	Clarkson (C), Murray, Webber
1946	Rees	Gottschalk	Allendoerfer, Pitcher, Schoenberg (C)
1947	Starke	Botts	Gottschalk (C), Oxtoby, Smail
1948	Raynor	Oakley	Dresden (C), Fine, Tukey
1949	Webber	Oakley	Allendoerfer, Hailperin (C), Lehner
1950	Caris	Oakley	Starke (C), Tartler, Tucker
1951	Manning	R. D. Schafer	Nelson (C), Webber, Wilansky
1952	Nelson	R. D. Schafer	Goldberg, Alice Schafer, Western
1953	Tartler	Webber	Dennis, Kuhn (C), Luxenberg
1954	Koehler	Webber	Fine, Grant, Saalfrank (C)
1955	Oxtoby	Webber	Fine, Koehler, Tuckerman

Table 2

Chairs

The dozen chairmen represent a diverse lot in several ways. Geographically scattered, they span the section from the University of Delaware in the west to Rutgers in the east. The most notable change that occurred during this period was the emergence of MAA members from Delaware into positions of sectional leadership. Until this time the only faculty member from Delaware to participate in any functions sponsored by the section was G. A. Harter. The first official elected to office from the state of Delaware was C. J. Rees in 1946. His colleague G. Cuthbert Webber followed three years later. We profile Webber at the end of the chapter to honor his many contributions to the section during this period.

- **Carl John Rees** (1896-1986) was born in Millersville, PA. He received his A.B. degree from Franklin & Marshall in 1918 and joined the faculty at the University of Delaware two years later. While continuing to teach at Delaware he obtained a masters degree from the University of Chicago in 1925, probably taking classes at Chicago's famed summer session. He received his Ph.D. under section chair J. A. Shohat at Penn in 1940. At that time, Rees was appointed chairman of the department at Delaware, a position he held for the next ten years. He became the Dean of the School of Graduate Studies at Delaware in 1950, holding the post until 1962. In the meantime he also served as Provost of the University from 1955 to 1962. Rees retired as professor emeritus in 1962. He died in Newark, Delaware, in 1986, just three months shy of his 90th birthday.

Like the University of Delaware, Rutgers provided the section with two chairmen whose terms were separated by three years. At Rutgers, however, C. A. Nelson (New Jersey College for Women, Rutgers University) and E. P. Starke (Rutgers University) represented two separate divisions within the same institution. Nelson was elected chair of the section in 1944, and Starke in 1947. Nelson again served as chair in 1952-1953. Recall that Richard Morris of Rutgers was the first person from New Jersey to be elected to the office in 1934.

- **Cyril Arthur Nelson** (1893-1984) was born and raised in Kansas. He received his A.B. degree from Midland College (Kansas) in 1914 and his A.M. from the University of Kansas in 1916. He enrolled in the graduate program at Princeton University for the year 1916-1917 before transferring to the University of Chicago, where he received his Ph.D. in 1919 without an official supervisor. Nelson taught at three different colleges before accepting a position in 1927 at the New Jersey College for Women, which was founded in 1918 and later became affiliated with Rutgers University. He remained at Rutgers until his retirement in 1959. He died in 1984 at the age of 90.
- **Emory P. Starke** (1896-1989) was born in New York City. He received all three of his degrees from Columbia University: A.B. 1916, M.A. 1917, and Ph.D. 1928. He joined the faculty at Rutgers in 1919 at age 23 and stayed there until compulsory retirement as professor emeritus in 1961. Instead of retiring completely, however, Starke spent the next five years as a professor at Bloomfield College. An inveterate problem solver, he is known to many present EPADEL members for his longtime stint of Associate Editor of the *Monthly* and for his many contributions to its problems department. He took over the advanced problems section of the *Monthly* in 1947 when that department's first editor, Otto Dunkel, asked to be relieved. Starke died in 1989 at age 93.

In striking contrast to Delaware and Rutgers, only one person from Penn held the chairmanship during this period, Perry Aquila Caris, who was elected in 1945

and in 1950. Recall that he had served as secretary of the section from 1928 to 1941 and as a member of the Program Committee from 1931 through 1933.

Tiny Bryn Mawr College provided two sterling leaders during the period 1942-1955, the venerable Anna Wheeler (chair in 1943) and the renowned John Oxtoby (chair in 1955). Their contributions are detailed in profiles at the end of the chapter. The election of Wheeler in 1943 marked the first time a woman was elected chair of the section. The next woman to be so elected was Marguerite Lehr in 1958; she too hailed from Bryn Mawr. The first woman from another school to be elected chair was Doris Schattschneider (Moravian College) in 1977. No woman was chosen to head the section during the 1980s, but conditions changed dramatically in the next decade when three women were elected to two one-year terms: Nancy Hagelgans (Ursinus College), 1991-1993; Louise Berard (Wilkes College), 1995-1997; and Kay Somers (Moravian College), 1997-1999.

For now we provide biographical sketches of the remaining five chairs in the order of their terms.

- **James Elmer Davis** (1887-1964) was born and raised in Wisconsin. He attended the Wisconsin State Normal School from 1901 to 1905 but for unknown reasons left without obtaining a degree. He then taught at public schools in Wisconsin and South Dakota until 1910, whereupon he enrolled at the University of Wisconsin, earning two degrees, a bachelors in 1912 and a masters in 1913. That year Davis accepted a position at the Pennsylvania State College (now University), so his affiliation was listed as Penn State when he became a charter member of the national MAA in 1916. He served in the army during World War I from 1917 through 1919. In the early 1920s he taught at the University of Wisconsin and the University of Arkansas before accepting a position at the Drexel Institute of Technology in the fall of 1923. He remained in the EPADEL region for the rest of his professional career, almost all of it spent at Drexel, where he served as chair of the department from 1942 until his retirement in 1952. Davis was an active member of the MAA from the time he attended the annual MAA meeting at the University of Pennsylvania in 1926. He attended almost all of the section's annual meetings and played a pivotal role in the section's being able to hold annual meetings throughout World War II. Davis's election to head the Philadelphia Section made him the first in a line of chairs from Drexel who held that office each decade from the 1940s through the 1980s. He died in Florida in 1964 after having been an MAA member for 48 years.

- **George Emil Raynor** (1895-1975) was born in San Francisco. He earned his B.A. degree from the University of Washington (Seattle) in 1918 and two degrees from Princeton, a masters in 1920 and a Ph.D. in 1923. A stint in the Army in 1918 prevented him from completing his dissertation sooner. After teaching at two colleges, Raynor accepted a position at Lehigh University in 1931. He remained there for the rest of his life, directing the doctoral dissertation of one student. In 1948 he was selected as the head of the Department of Mathematics and Astronomy, a position he held until

1960. He retired as professor emeritus in 1964. Raynor was one of only two chairs of the Philadelphia Section to hail from a Lehigh Valley institution during the period 1942-1955.

- **Frank Leroy Manning** (1898-1986) was born in Mount Hope, New York. He received a B.S. at Cornell in 1919 after having spent the year 1917-1918 with the U.S. Naval Reserves. Later he obtained an M.S. degree in mathematics (1924) from Rutgers and a Ph.D. in statistics (1935) from Cornell. During the 1920s Manning taught high school in New Jersey for two years before becoming a principal in New York the next two years. After a two-year stint at a state teacher's college, he accepted a position at Ursinus College in 1930. He remained at Ursinus for the rest of his career except for the war years 1942-1944, when he taught extension courses in engineering science and management for the war-training program conducted by Penn State. He died in Collegeville at the age of 88.

- **Alexander Tartler** (1905-1985) was born in Budapest, Hungary. He received two degrees from the University of Pennsylvania, a bachelors in 1928 and a Ph.D. five years later. Like Delaware's C. J. Rees, his dissertation was written under J. A. Shohat. After earning his undergraduate degree he joined the faculty at the Drexel Institute of Technology and remained there until 1949, when he moved to Lafayette College. Although Tartler was promoted to full professor and department chairman at Lafayette in 1951, he returned to Drexel the very next year to accept an offer of these same two positions. He retained the chairmanship until 1966 and retired four years later. Tartler was known by his students as a very rigorous instructor whose backboard writings were works of art. Although he drove many engineering students crazy with his precision, this trait inspired several engineering-to-mathematics converts. Tartler died at Beach Haven, New Jersey, just one month before reaching his 80th birthday.

- **Truman Lester Koehler** (1902-1989) was a Lehigh Valley citizen through and through. Born in Bethlehem, PA, he graduated from Muhlenberg College in 1924, taught at Allentown Prep School for the next three years, and then joined the faculty of his *alma mater* in 1927. He remained there for 45 years and chaired the mathematics department for 14 of them. During this time, Koehler managed to pick up his M.A. in 1932 and his Ph.D. in 1950 – both from the University of Pennsylvania. His doctorate was in mathematics education for a dissertation titled, "The selection of certain significant concepts in college algebra and the determination of their degree of emphasis in some widely adopted texts". In World War II, Koehler directed Muhlenberg's Engineering, Science, Management, and War Training Program and, as noted above, served as chair of the Philadelphia Section 1954-1955. He died in 1989, just two weeks shy of his 87th birthday. His son, Truman Koehler, Jr. – a statistician and successful businessman – has been instrumental in keeping alive the memory of his father by generous

contributions to the Department of Mathematical Sciences at Muhlenberg. These include a gift of Euler's mathematical works to the college library, the commissioning of portraits of his parents that now hang outside the departmental offices (Mrs. Koehler was a friend of the students for the better part of half a century), and an endowment for the Truman Koehler Professorship. The present Koehler Professor of Mathematics is William Dunham, who, as many MAA members can attest, has taken full advantage of Koehler's bequest of Euler's works.

Secretaries

The position of secretary of the section changed dramatically during the 1940s after having been under P. A. Caris's direction from 1928 to 1941. Indeed, except for the organizational year of 1926, every secretary came from the University of Pennsylvania until 1947. P. M. Whitman succeeded P. A. Caris for three years. He was followed by W. H. Gottschalk for three years and T. A. Botts for one. When Botts (from Delaware) was elected in 1947, it marked the first time the position was not held by someone from Penn since A. A. Bennett held the post in the section's inaugural year, 1926-1927. Haverford College's Cletus O. Oakley succeeded Botts and held the office for three years. The position returned to Penn for 1951 and 1952, when R. D. Schafer held it. He was followed by former chair G. C. Webber of the University of Delaware for the next three years.

We provided a sketch of Oakley earlier. Webber is profiled at the end of this chapter. Now we sketch four other secretaries.

- **Philip Martin Whitman** (1916-1997) was born in Pittsburgh. He received a bachelors degree from Haverford College in 1937 and a Ph.D. in 1941 under Garrett Birkhoff at Harvard. Whitman spent the next three years at the University of Pennsylvania. Like almost all American mathematicians in the 1940s, World War II interrupted Whitman's career. During 1944-1946 he was a scientist at the Los Alamos Scientific Laboratory at the University of California, which explains why his tenure as secretary ended in 1944. After the war Whitman taught at Tufts College for two years before moving to the Applied Physics Lab at Johns Hopkins University as a mathematician in 1948. In 1961 he left Johns Hopkins to become professor of mathematics and chairman of the department at Rhode Island College. Whitman died in Massachusetts at the age of 80.

- **Walter Helbig Gottschalk** (1918-2004) was born in Lynchburg, Virginia. He took all his higher education at the University of Virginia: B.S. 1939, M.A. 1942, and Ph.D. 1944 (under G. A. Hedlund). He went right from graduate school to the University of Pennsylvania, where he remained until 1963, serving as chairman of the department from 1954 to 1958. Gottschalk spent the academic year 1947-1948 at the Institute for Advanced Study in Princeton. In 1963 he accepted a professorship at Wesleyan University, where he remained until his retirement in 1982. An article from the 1999 *Monthly* titled "The Gottschalk-Hedlund Theorem" reflects the enduring

influence of the advisor/student pair from their initial investigation 55 years earlier.

- **Truman Arthur Botts** was born in 1917 in Florida. He received his B.S. degree in mathematics and physics from then-tiny Stetson University in Florida in 1938, followed by two degrees from the University of Virginia, a masters in 1940 and a Ph.D. in 1942 (under E. J. McShane). He joined the faculty at the University of Delaware in 1946 but remained only two years before returning to Virginia. It was during his second year at Delaware that he was elected secretary of the section. Although his stint lasted but one year it foreshadowed administrative abilities that surfaced when he left the University of Virginia in 1968 to become Executive Director of the Conference Board of the Mathematical Sciences. Today Botts is retired and living in Arlington, Virginia. He is best known for his book *Real Analysis*, written with his dissertation supervisor, E. J. ("Jimmy") McShane, and first published in 1959.
- **Richard Donald Schafer** was born in 1918 in Buffalo, New York. He received two degrees from the University of Buffalo (B.A. 1938 and M.A. 1940) and a Ph.D. in 1942 from the University of Chicago (under A. A. Albert). In 1942 he also married fellow graduate student Alice Turner right after the two of them had earned their degrees. R. D. Schafer was on the faculty at the University of Pennsylvania from 1948 to 1953, during which time he was secretary of our section 1951-1953. His wife served on the Program Committee during the year 1952-1953. However, the Schafers left Pennsylvania in 1953 when he became head of the department at the University of Connecticut. He accepted the position of deputy head at MIT in 1959. Although he stepped down as deputy head in 1968, he remained on the faculty until his retirement in 1988. The Schafers reside in Lexington, MA.

Before moving from secretary-treasurers to members of the Program Committee, we pause to introduce **Alice T. Schafer**, wife of R. D. Schafer and an outstanding mathematician in her own right. Alice Schafer was one of the founding members of the Association for Women in Mathematics in 1971 and its president from 1973 to 1975. In 1990 the Association for Women in Mathematics established the Alice T. Schafer Mathematics Prize to honor her for her many years of unselfish and dedicated service towards increasing the participation of women in mathematics. The prize is awarded every year to an undergraduate woman in recognition of excellence in mathematics courses and special programs. Two undergraduate students from the EPADEL area were recognized for their mathematics excellence in 1992, with Zvezdelina E. Stankova of Bryn Mawr winning the third Schafer Prize and Eugénie Hunsicker of Haverford receiving honorable mention. In 1999 Laura Ciobanu of Franklin & Marshall earned honorable mention.

As mentioned above, Alice T. Schafer received her Ph.D. from the University of Chicago in 1942. Her dissertation on projective differential geometry was written under department head Ernest P. Lane. She taught at Swarthmore and Drexel, as well as several other institutions, before joining the faculty of Wellesley College. She retired from there in 1980 as the Helen Day Gould Professor of Mathematics, but after her husband's retirement the couple moved to Virginia, where she became a professor at Marymount University. She retired a second time in 1996. The MAA bestowed its Distinguished Service to Mathematics award on her in 1998.

The Schafers are the second mathematical couple we have encountered in this history, following in the footsteps of Frederick and Helen Owens. We subsequently describe the contributions of three other EPADEL couples – Charles and Roseanne Hofmann, Anthony and Louise Berard, and William and Penelope Dunham.

Program Committee

Next we discuss the section's Program Committee, whose membership is listed in Table 2. Recall that (C) denotes the chairman of the committee. Table 2 lists the three people who served on this committee in every year except 1942, when the members were omitted in the official report. Recall that in 1953 this committee became part of an enlarged Executive Committee. Although membership on the Program Committee was no longer specified after 1954, we included the 1955 membership of three people who were listed merely as "committee members" in the report from the 1955 meeting.

During the period 1942-1955 a total of 33 different individuals served 39 separate terms on the Program Committee. The foci of Penn and Lehigh dominated representation on the committee, each providing six members. Altogether the Lehigh Valley accounted for nine of the 33 members and the city of Philadelphia eight. Four items about membership on the committee are noteworthy:

(1) a member on the committee came from Delaware for the first time (G. C. Webber in 1945 and 1951),
(2) six members came from New Jersey, which formed its own state section in the last year of this period,
(3) two members came from Franklin & Marshall College in Lancaster, representing a geographical broadening of membership, and
(4) a member came from industry for the first time (Dr. Harold Luxenberg from Remington Rand Corporation in Philadelphia, in 1953).

As we saw in earlier periods, many members of the Program Committee also were elected to other offices so we provide biographical facts the first time they held that office. However, during the period under review three members who served multiple terms but were never elected to other offices deserve special mention: F. L. Dennis, who was one of four people to serve two terms, N. J. Fine, who was elected to three terms in the period, and W. R. Murray. Some prominent

names also served one term on the committee: Arthur Everett Pitcher (Lehigh), I. J. Schoenberg and A. D. Wallace (Penn), and A. W. Tucker and J. W. Tukey (Princeton).

- **Foster Leroy Dennis** (1910-1983) was born on New Year's Day in West Milton, PA. He received a B.S. degree from Ursinus College in 1931, an M.S. from Cornell the next year, and a Ph.D. from the University of Illinois in 1938 (under Arnold Emch). Before enrolling at Illinois he taught at his *alma mater*, Ursinus, for one year, and he returned to the same department upon obtaining his doctorate. Although F. L. Dennis remained at Ursinus for the rest of his life, he also taught courses at a Penn State extension for two years during World War II, worked for the State Department of Public Instruction for a year, and was a consultant for Philco Corporation. He was a member of the Program Committee of the Philadelphia Section in 1944 and 1953.
- **Nathan J. Fine** (1916-1994) was born, raised, and educated in Philadelphia. He received a B.A. from Temple University in 1936, followed by two degrees from the University of Pennsylvania: A.M. 1939 and Ph.D. 1946 (under Antoni Zygmund). N. J. Fine studied for his doctorate while teaching high school for one year, teaching college (Cornell and Purdue) for three years, and being a research mathematician at both the Naval Ordnance Plant in Indiana and the Operations Evaluation Group in Washington, DC. He joined the faculty at the University of Pennsylvania in 1947 and remained there until 1963. It was during this time that he was active with the Philadelphia Section. Fine moved to Penn State in 1963 and spent the rest of his life there, having retired in 1978.
- **Walter Rue Murray** (1905-1993) was born in Maryland but received his early education in New Jersey. He earned a B.S. degree from Colgate College in 1929 and then accepted an appointment at Franklin & Marshall College. While teaching there he pursued graduate studies at Cornell, obtaining an M.S. in 1932. He returned to Cornell from 1938 to 1940 to continue his graduate studies, but he never earned a doctorate because his dissertation advisor, R. J. Walker, was called into government service in connection with WWII. The proposed title of his thesis was "Linear systems of plane curves". Known as "Rue" Murray, he was appointed head of the department at F & M in 1945 after serving as acting head for sixth months. He presented an invited address to the section in 1936 and was a member of Program Committee in 1945. He stepped down as chair in 1951. Murray died in 1993 just one month shy of his 88th birthday.

Presenters

The Philadelphia Section sponsored 56 presentations involving 58 speakers at the 14 annual meetings held from 1942 to 1955. The 1954 meeting included a discussion by three people that accounts for the disparity in the two numbers.

After discussing the presenters and their affiliations, we take a chronological tour of the meetings to analyze sectional activity from this perspective, after which we discuss the lectures in terms of mathematical classification. Unlike previous chapters, however, we do not list a separate table of the presentations. The interested reader is referred to the appendix for the complete list in this period.

Altogether 50 different individuals account for the 58 presenters, a number that clearly indicates a wide span of invited speakers. Nobody spoke more than two times over the 14-year period, with eight different people appearing twice: Bernard Epstein (1950, 1951), Nathan Fine (1947, 1952), Ralph Fox (1945, 1953), Herman Goldstine (1949, 1954), Marguerite Lehr (1944, 1954), Francis Murnaghan (1944, 1947), John Oxtoby (1943, 1949), and Isaac Schoenberg (1942, 1949). Epstein, Fine, and Schoenberg were at Penn at the time of their presentations, Lehr and Oxtoby at Bryn Mawr, Fox at Princeton, Goldstine at the Institute for Advanced Study, and Murnaghan at Johns Hopkins. Epstein's talks in consecutive years mark the only time that has happened in the history of the section.

Institutional affiliations are as diverse as the range of speakers, with 18 different institutions accounting for the 58 presenters. Once again the University of Pennsylvania led the way, with 10 speakers, followed by Bryn Mawr College and Princeton University (7 each), Lehigh University and the University of Delaware (5 each), Haverford College and the Institute for Advanced Study (4 each), and Swarthmore College (3). The preceding chapter noted that only once in the section's 75-year history were there lectures by two individuals from the same institution at the same fall meeting. That happened in 1952 when the University of Delaware's Russell Remage and E. V. Lewis spoke. At the opposite end of the spectrum, Penn's 10 lectures in the present period were delivered in 10 different years. It is relevant to point out that a total of 13 speakers came from institutions located in New Jersey because that state formed its own section in 1956, the last year of the period under discussion.

F. D. Murnaghan was one of the few speakers who were invited from outside the area at that time. Others who came from beyond the section's boundaries were Colonel R. C. Yates (U. S. Military Academy) in 1951 and Morris Kline (NYU) in 1955. Five other speakers were invited in the midst of their stays at institutions in the area, though their normal affiliations were elsewhere. Three of these positions were war related: Haskell Curry was on leave from Penn State at the Frankford Arsenal in 1942, and A. A. Bennett and D. H. Lehmer were at the Aberdeen Proving Ground, on leave from Brown in 1943 and Berkeley in 1945, respectively. We might also mention that in 1954 Ernst Snapper was a visiting professor at Princeton University from the University of Southern California and the famous A. S. Besicovitch was a visiting professor at the Institute for Advanced Study from Cambridge University in England.

Now we take a chronological tour of annual meetings from 1942 to 1955, highlighting some of the more notable events. We already observed, for instance, that three of the speakers worked at war-related institutions at the time they spoke to our section. At the first meeting held after the U.S. entered the war, the

title of the talk by Lehigh's G. E. Raynor was "Exterior ballistics". This is the same meeting at which Haskell Curry spoke while assigned to the Frankford Arsenal in North Philadelphia, though his topic was Heaviside operators. Hilda Geiringer, an émigré who was teaching at Bryn Mawr at the time, spoke on numerical solutions of linear problems, but her talk concerned pure rather than applied mathematics.

- **Hilda Geiringer** (1893-1973) was born in Vienna, Austria. She received all of her degrees from the University of Vienna, where she attended lectures from Sigmund Freud and obtained her doctorate in mathematics in 1917 with a thesis on Fourier series in two variables. She worked at the Institute of Applied Mathematics at the University of Berlin until forced to leave when Hitler came to power in 1933. She spent the year 1933-1934 in Brussels, then taught in Istanbul, Turkey, for the next five years. She immigrated to the United States in 1939, teaching at Bryn Mawr College for five years. While there she married the Harvard mathematician Richard von Mises (1883-1953) in 1943. One year later Geiringer-von Mises accepted a position as professor and chair of the mathematics department at Wheaton College in Massachusetts, to be near her husband. She retired from Wheaton in 1959.

Returning to the theme of war-related activities in the section, the 1943 meeting featured an invited talk by one of the section's three founders, A. A. Bennett of the Aberdeen Proving Ground. The topic of Major Bennett's talk was Euclidian geometry rather than the ballistics research he was involved with on a daily basis. Another speaker, J. B. Rosser from the National Defense Research Committee, chose to talk about a mathematical subject (many-valued logics) instead of a more bellicose topic. The minutes from the 1943 meeting also reflect the war in progress by setting a "tentative" date for the 1944 meeting, which actually was held on the date assigned a year later. Recall that national MAA meetings were cancelled in 1942 and 1945.

The program in 1943 featured the section's first talk on foundations when J. B. Rosser spoke "On the many-valued logics". This was the first time the section heard a talk on foundations, which is rather surprising in light of the fact that Alonzo Church and Kurt Gödel had propelled Princeton into worldwide leadership in the field since the 1930s. However, neither of these stalwarts ever attended a sectional meeting. Theodore Hailperin in 1948 and C. D. Firestone in 1950 gave other talks on foundations during this period.

Interestingly, the 1944 meeting of the Philadelphia Section did not reflect the ongoing war. Even Marguerite Lehr's talk, "Mapping problems in aerial photography," dealt with a method employed by the Canadian Topographical Survey and not with a theme that the title might otherwise suggest. The only vestige of World War II at the 1945 meeting was that D. H. Lehmer's affiliation was listed as Aberdeen. However, the title of his talk was "Some graphical methods in the theory of numbers".

The 1945 meeting thus serves as a dividing line between wartime activities and the period that followed. Although only 27 people attended the meeting in 1944, 44 attended in 1945 and 51 in 1946. All were held at the University of Pennsylvania. The 1945 program consisted of only three lectures, but the presenters were all outstanding mathematicians. One was Ralph Fox of Princeton University, who spoke about homotopy groups. One was Antoni Zygmund, then at Penn but soon to be enticed to the University of Chicago by Marshall Stone; Zygmund spoke on his specialty, trigonometric series. The remaining speaker was Derrick H. Lehmer, who taught at Lehigh University from 1934 to 1940 and spoke to the section in 1939. For the record, D. H. Lehmer's father was the mathematician Derrick N. Lehmer, a 1900 Ph.D. from the University of Chicago. Our Lehmer produced only two Ph.D. students, both at Berkeley, but his two students are household names today and both have been extremely active with the MAA – Tom Apostol and Ronald Graham.

By 1946 sectional meetings had returned to normal. Once again there were three lectures at the meeting. This was the first of the two years that T. A. Botts taught at the University of Delaware. He spoke on "Convex sets". Next, Haverford's C. B. Allendoerfer spoke on "Slope in solid analytical geometry," the topic of a *Monthly* paper that appeared earlier that year. Edwin Hewitt delivered the third paper, "Generalizations of the Weierstrass approximation theorem". Hewitt was at Bryn Mawr for only one year, 1946-1947, so the Program Committee is to be commended for its perspicacious invitation. Hewitt himself received his Harvard Ph.D. under Marshall Stone.

Three of the four talks at the 1947 meeting at Bryn Mawr were delivered by people who accepted multiple invitations to speak at the section's annual meetings. The day began with the first of Nathan Fine's three lectures, "On Walsh functions," based on his 1946 dissertation with the same title written under the supervision of A. Zygmund. The afternoon session featured F. D. Murnaghan's second lecture, on vector methods in teaching trigonometry and geometry. He had spoken three years earlier on an article published in the *Monthly*, "The uniform tension of an elastic cylinder". The final presentation of the day was the third talk by the Princeton statistician S. S. Wilks, who accompanied his remarks on statistical inference "with material on slides". This is the only mention of such technology in the history of the section.

Two of the three lectures at the 1948 meeting are deserving of special mention. Theodore Hailperin (Lehigh) began the day with a talk titled, "Recent advances in symbolic logic". A. W. Tucker (Princeton) gave the other notable lecture that year on game theory, the second of his three invited lectures to the section. This one not only marked the first time the section heard about the theory of games, but it marked the first topic to reflect a post-WWII national trend.

- **Theodore Hailperin** was born in Newark, New Jersey, in 1915. He received a B.S. from Michigan in 1939 and a Ph.D. four years later at Cornell for the dissertation, "A set of axioms for logic", written under Barkley Rosser. Hailperin taught at Cornell for one year after completing his

doctorate, and then he worked at the Ballistic Research Laboratory for two years. He went to Lehigh in 1946 and, apart from a year's absence as Research Associate with Sandia Laboratory, spent the rest of his academic career there. Hailperin directed four Ph.D. dissertations on foundations between 1961 and 1975. After retirement in 1980 he was appointed adjunct professor, supervising the mathematics offerings at Lehigh's Learning Center. He resigned from that position in 1996. He and his wife Ruth are now retired (she from Moravian) and living in Nazareth, PA.

- **Albert William Tucker** (1905-1995) was born in Oshawa, Canada. He obtained a B.A. at the University of Toronto in 1928 and then two degrees at Princeton University: M.A. 1929 and Ph.D. 1932 (under the famous topologist, Solomon Lefschetz). Tucker joined the faculty at Princeton the next year and taught there until his retirement in 1974. Known for his seminal contributions to linear and non-linear programming and to game theory, he held Princeton's prestigious Dod Professorship from 1954 until 1974. Tucker's first Ph.D. student (in 1950) was John Nash, a Nobel Prize winner in economics. He also directed the 1972 dissertation of our own active member, Stephen Maurer. Two other Tucker mathematical products are his sons Thomas W. Tucker (Colgate) and Alan C. Tucker (SUNY - Stony Brook); the latter spoke to our section in 1982. A. W. Tucker died in Princeton at age 89.

A. W. Tucker's talk on game theory was not the only time that sectional audiences could listen to a world renowned specialist speak about a topic that was then at the cutting-edge of research. Over the next five years, invited lectures were given by Herman Goldstine in 1949 and 1954 on computers, by H. W. Kuhn in 1953 linear programming, and by Ralph Fox in 1953 knot theory.

In addition to Herman Goldstine's talk on applications of numerical analysis to computing at the 1949 meeting, A. D. Hestenes of Philadelphia's famous science institution, the Franklin Institute, spoke about industrial research and development organizations. The program also included the third lecture by Bryn Mawr's John Oxtoby in the 1940s, matching the three talks that J. A. Shohat delivered in the 1930s and the three that Bernard Epstein would deliver in the 1950s.

The final lecture at the 1949 meeting was the second of four talks given by Penn's Isaac Schoenberg. In a similar vein, Albert Wilansky's talk to begin the 1950 meeting was the first of the record-number five talks he would give to the section, his others taking place in 1956, 1963, 1970, and 1983.

In the final address at the 1950 meeting at Lehigh, S. T. Hu of the Institute for Advanced Study spoke on "Topological properties of spaces of curves". During this talk the speaker cited the work of our own Everett Pitcher in the field and included a proof of Pitcher's theorem characterizing when certain sets of curves are metrizable.

All four talks at the 1951 meeting are deserving of mention. Two dealt with the increasing attention being paid to mathematical pedagogy. The first speaker,

R. C. Yates of the U. S. Military Academy, described various topics that stimulated interest in mathematics courses taken during the first two college years. Yates had spoken to the section in 1938 when he was at the University of Maryland. The day's final speaker, P. J. Kiernan of the Lawrenceville School, a private secondary school located near Princeton, discussed a theme that garnered increasing interest throughout the 1950s, "Articulation of secondary and college mathematics". In between those two talks the famous algebraist Emil Artin spoke about "Constructions with ruler and divider" and Bernard Epstein gave the first of his three talks in the decade, titled "An infinite-product expansion for analytic functions".

The 1952 meeting featured talks on probability (by Samuel Goldberg of Lehigh University) and statistics (by E. V. Lewis of the University of Delaware). Russell Remage opened the meeting with a lecture titled "Matrix inversion by partitioning". Remage and Lewis continued the active Delaware involvement in the section begun in the 1940s by Rees and Webber. We will meet Remage in the next chapter as chairman of the section.

The next notable event to take place at an annual meeting was a presentation in 1954 titled "Mathematics through the television lens". Not exactly a panel discussion, it featured three speakers who discussed various ways to teach mathematics via this relatively new medium. Although panel discussions *per se* did not start in the section for four more years, this program might be considered the prototype of a format that has been used successfully on numerous occasions since then. The 1954 meeting included three outstanding lectures in addition to this presentation. To open the program Ernst Snapper talked on "Coordinates of algebraic varieties". The two lectures after lunch were "Area and volume" by A. S. Besicovitch and "Some remarks on numerical stability" by Herman Goldstine. Besicovitch's topic was not surprising; 28 years earlier he had shown that there exist planar regions of arbitrarily small area in which a segment of fixed length could be rotated, thus solving the Kakeya needle problem. Goldstine demonstrated the electronic computer that had been developed at the Institute for Advanced Study. Goldstine, a 1936 Ph.D. from the University of Chicago, was appointed a permanent member of the Institute in 1952 and served as the associate director of the electronic computer project there from 1946 to 1955. Although born in 1913, hence approaching his 90th birthday, Goldstine remains active with the American Philosophical Society, located on Independence Mall in Philadelphia.

The last meeting in this period began with a discussion by H. W. Brinkmann of work carried out under the auspices of the College Entrance Examination Board. As we saw in the preceding chapter, Brinkmann was one of the most active mathematicians in the section during the 1930s; he would speak to the section again in the 1960s! Brinkmann was followed on the program by another émigré, Hans Rademacher, who spoke on one of his favorite subjects, Dedekind sums. Two notable speakers ended the day. The renowned probabilist William Feller, yet another émigré, spoke about differential operators. In the final talk of this period NYU's multifaceted Morris Kline spoke about material that he felt

should be included in courses taught to college freshmen. Given Kline's work in applied mathematics and his interest in the history, cultural, and pedagogical aspects of mathematics, it is not surprising that his talk carried the unusual title "Pea soup, tripe and mathematics".

Themes of Lectures

We end the chapter with a mathematical classification of the lectures sponsored by the Philadelphia Section at annual meetings from 1942 to 1955. Analysis continued to be the leading choice of fields during this period, though the topology/geometry union presented a serious challenge to its dominance. The present period is also notable for the emergence of foundations as an attractive subject. However, two fields with little or no history in the section garnered even stronger interest – applications and education/pedagogy.

The reader is urged to keep in mind that it is often difficult to place certain mathematical papers into one category or another, even when the entire paper is available. This task is further complicated when only an abstract, or, in some situations, only a title, appears. The interested reader is reminded that the sources for the secretaries' official reports in the *Monthly* are listed in Table 1.

Analysis

A compelling reason why analysis continued to be a major attraction at sectional meetings was the existence of the internationally strong Penn School of Analysis. Chapter 4 noted earlier contributions of Hans Rademacher, J. A. Shohat, and J. A. Clarkson. During the period 1942-1955 the section heard five talks by four new members of the Penn School, beginning with the 1945 lecture by Antoni Zygmund, "Some unsolved problems in the theory of trigonometric series". Even though Zygmund accepted a position at the University of Chicago the next fall, the Penn School continued its tradition of keeping the section abreast of recent developments. Indeed, the object of N. J. Fine's 1947 talk, "On Walsh functions," was to complete a system of functions described earlier by the School's reigning leader, Hans Rademacher. Five years before, I. J. Schoenberg gave a talk "On a theorem of Jensen" that dealt with circles in the plane and roots of polynomials but which we have classified under analysis because of a familiarity with the speaker's work. We drew the same conclusion about Schoenberg's 1949 paper "On smoothing operations," even though section secretary C. O. Oakley did not provide an abstract of this talk. There can be no doubt that the two lectures delivered in 1950 and 1951 by Bernard Epstein concerned analysis, however. The first one dealt with "The classification of Schlicht functions," a topic that concerns smooth (analytic) functions. Epstein's second talk had a similar theme, "An infinite-product expansion for analytic functions".

Talks on analysis were not given by the Penn School alone. Penn State's H. J. Curry, who was assigned to the Frankford Arsenal in 1942, spoke about "The Heaviside operational calculus". It would be 30 years before Curry would return

to deliver another lecture to the section. In 1950 Albert Wilansky spoke about his emerging specialty, functional analysis, in a talk titled "The essential roughness of mathematical objects". Wilansky's results were based on earlier findings by S. Banach and A. Zygmund.

There were also two lectures during this period on ordinary differential equations. In 1948 W. R. Wasow of Swarthmore College described the effects of omitting terms whose coefficients are very small, especially when such equations are being used to describe physical phenomena. Seven years later, in the penultimate lecture of this period, William Feller took a more abstract approach to differential equations by adopting an approach via operators.

Three lectures in this period dealt with numerical analysis. In the first one, delivered in 1942 and titled "On modern methods in the numerical solution of linear problems," Hilda Geiringer took a classical approach to solving systems of linear equations. Such was not the case with Herman Goldstine's two lectures, which reflected the nascent stage of the computer revolution. In 1949 his lecture, titled "Some problems in numerical analysis," described one of the four major sources of errors that occur in numerical computations – rounding errors – which arise from the "noise" in the computing machine itself. This theme was continued in his talk five years later on numerical stability. At the conclusion of the lecture that completed the 1954 meeting at Princeton, Goldstine was able to demonstrate his results on the computer at the Institute for Advanced Study. This must have been a real treat for the audience!

Geometry/Topology

Eleven talks were devoted to either geometry or topology during the period 1942-1955, seven of which dealt primarily with topology itself. Alexander Doniphan Wallace, who taught at Penn 1941-1947 before going to Tulane and Florida, opened the 1943 meeting with a lecture on "Fixed point theorems". In his talk Wallace applied Brouwer's fixed-point theorem to a surprising realm, the theory of matrices. Two years later Wallace's colleague, W. H. Gottschalk, known for his book on topological dynamics, spoke on "Continuous flows and AP functions". Here AP stands for almost periodic.

R. H. Fox, known as an excellent speaker and expositor, opened the 1945 meeting with a lecture titled "Homotopy groups". Although that subject tends to be rather abstruse – Fox discussed algorithms for calculating homotopy groups – he almost certainly presented the material in terms understandable to an MAA audience. Three other talks during this period dealt with topology: Edwin Hewitt (1946), "Generalizations of the Weierstrass approximation theorem," J. C. Oxtoby (1949), "Minimal sets," and S. T. Hu (1950), "Topological properties of spaces of curves".

Four talks during the period were concerned with assorted topics in geometry. In 1943 the section's founder A. A. Bennett interacted with the section on a formal basis for the last time when he delivered an address titled "Some modern viewpoints on euclidian [*sic*] geometry". Bennett's talk "arose from discussion of an elementary Hermetian [*sic*] geometry of the general simplex," suggesting a

topological connection. We do not know the reason for the nonstandard orthography in Major Bennett's title and abstract.

All three talks at the 1946 meeting at Penn dealt with geometry or topology. T. A. Botts opened the program with a lecture on "Convex sets" in the Euclidean plane, C. B. Allendoerfer followed with "Slope in solid analytic geometry," and E. Hewitt gave the third one mentioned above.

The remaining two talks on geometry occurred in the 1950s. In 1954 A. S. Besicovitch applied methods from topology to solve problems with "Area and volume". The following year R. J. Wisner of Haverford College reported on joint work he had carried out with his colleague C. O. Oakley on "Flexagons," geometrical objects related to n-dimensional polygons for $n \geq 3$.

Algebra/Number Theory

Eight lectures dealt with topics in the algebra/number theory category, but only two concerned topics in algebra proper, thus continuing the limited offerings in this field. In 1951 Emil Artin lectured on "Constructions with ruler and divider," where the divider, as opposed to a compass, was fixed and not free. The following year Russell Remage lectured on "Matrix inversion by partitioning". The talk by Ernst Snapper in 1954, "Coordinates of algebraic varieties," lay at the boundary of algebra and geometry.

Five of the papers delivered during this period dealt with number theory, two of which dealt with continued fractions: G. C. Webber (1943), "Transcendality of certain continued fractions," and V. F. Cowling (1947), "Convergence criteria for continued fractions". Cowling taught at Lehigh from 1949 to 1961 before moving to the University of Kentucky. One of his first doctoral students there, Jerry King, has been extremely active in the section since coming to Lehigh in 1962 with a newly minted Ph.D.

In 1945 D. H. Lehmer applied his specialty, computing, to arithmetical theorems concerning compositions and partitions of numbers in an address titled "Some graphical methods in the theory of numbers".

As we noted at the end of Chapter 3, one of the section's founders, Howard Mitchell, presented a lecture at the 1932 meeting on "The life and work of Ramanujan". Twenty years later the section heard a talk on Ramanujan's work again when N. J. Fine extended some of Ramanujan's results in a talk titled briefly "The Ramanujan identities". Fine subsequently moved from Penn to Penn State. In Chapter 3 we noted that one of Fine's colleagues, George Andrews, lectured on this same subject in 1990.

Hans Rademacher delivered the final talk on number theory in 1955, titled "Dedekind sums and classes of modular substitutions". He had planned to lecture on this same subject when he accepted the invitation to deliver MAA's Hedrick Lecture in 1963, but illness prevented him from giving the talk. However, his doctoral student Emil Grosswald, who would become the section's governor 1965-1968, delivered the lecture in his place. Grosswald further memorialized Rademacher's work in the field by editing and expanding Rademacher's notes into the 1972 Carus Monograph *Dedekind Sums*.

Probability/Statistics

When S. S. Wilks delivered his 1947 talk "A few concepts in modern statistical inference," he was still the only person to inform the section about a topic in probability or statistics. That situation changed dramatically at the meeting held five years later when Lehigh's Samuel Goldberg spoke about "Probability models in engineering and biology" and Delaware's E. V. Lewis included "An in-service program in statistics" as half of his presentation.

Foundations

We mentioned that the period 1942-1955 was notable for sponsoring the first talks on foundations, beginning with a talk by J. B. Rosser in 1943 titled "On the many-valued logics". Five years later Lehigh's Theodore Hailperin discussed "Recent advances in symbolic logic," while two years after that Penn's C. D. Firestone described "Systems of axiomatic set theory".

In addition to talks on foundations, the period 1942-1955 is notable also for its strong emphasis on curriculum/pedagogy and applications.

Curriculum/Pedagogy

Whereas five lectures in the period 1933-1941 dealt with either curricular or pedagogical issues, the present period sponsored seven, highlighted by the three-person presentation "Mathematics through the television lens" at the 1954 meeting. Since the presentation consisted of three people describing their experiences in designing new ways to communicate mathematics using an emerging technology, the presentation serves as a preview of one that might be conducted today under the title "Mathematics on the Internet". First, F. G. Fender reported on a 13-week series of talks presented on TV at his home institution, Rutgers. The aim of this series was to help the general public gain a clearer understanding of "the story of the modern mathematician and his work". Next Bryn Mawr's Marguerite Lehr described a 15-week series of half-hour talks presented on one of Philadelphia's three major channels. (For details on the series see her article in the January 1955 *Monthly*, pp. 15-21.) In the final part of the presentation, Delaware's R. F. Jackson bonded two emerging technologies when he outlined the general philosophy and specific plans for a TV series titled "Thinking machines – From fingers to flip-flops".

A prevailing folklore asserts that the launching of Sputnik in 1957 not only began the space age but also launched mathematics education in the United States into the 20th century. Activities in our section throughout the decade prior to the Russian launch belie that assertion. Indeed, activities at our section's annual meetings show that American mathematical educators were quite concerned about the status of their offerings and were in the process of making changes even before the historic lift-off. In addition to the series on television the section sponsored six other lectures that dealt with high school and college curricula. In 1947 F. D. Murnaghan strongly advocated the use of vector methods in teaching trigonometry and analytic geometry. The meeting four years later included two talks that dealt with educational issues, "The stimulation of

interest" by R.C. Yates and "Articulation of secondary and college mathematics" by P. J. Kiernan. As noted above, Yates described topics that stimulated interest in mathematics courses taken during the first two years of college, including "linkages, cams, paper folding" and more. The prep-school teacher Kiernan noted, "Aside from the curriculum, the major point brought up was that of *reading* … the college teacher must continue the training of the student in the intensive type of reading that mathematics requires". Kiernan reported that the issue arose from a panel discussion conducted under the auspices of the New Jersey Committee on the Articulation of Colleges and Secondary Schools.

In 1953 C. O. Oakley presented a talk titled "A new approach to freshman mathematics" in which the master expositor reported on an ambitious freshman course developed over the previous seven years at Haverford College. How ambitious? The syllabus included topics in logic, groups, the number system, fields, functions, analytic geometry, calculus of polynomials, probability and statistics. Two more lectures on educational themes were delivered at the final meeting of the present period, held at Bryn Mawr College in 1955. H. W. Brinkmann began the day's program with "A report on the Ford Foundation study on the integration of high school and college mathematics". In this lecture Brinkmann summarized the results of mathematics examinations administered that spring by the Conference of Mathematics Teachers in coordination with the College Entrance Examination Board. As noted above, in the final lecture of the day Morris Kline strongly recommended that in all freshman courses, "mathematics be tied intimately to physical problems and to its cultural setting and significance".

Applications

Speaking of applications of mathematics, our section never offered so many talks on this topic in its 75-year history. Their titles indicate the broad scope of the applications covered. Not surprisingly, many of these talks took place during World War II, including three of the four lectures given in 1944: G. E. Raynor (1942), "Exterior ballistics," Peter van de Kamp (1943), "Photographic astrometry," Marguerite Lehr (1944), "Mapping problems in aerial photography," F. L. Dennis (1944), "Spherical triangles on a slide rule," and F. D. Murnaghan (1944), "The uniform tension of an elastic cylinder". The two post-war talks on applications were A. D. Hestenes (1949), "Some observations relative to mathematics in research and development organizations" and Jan Tinbergen (1953), "Mathematical techniques used in economics theory".

Overall, one can see that from 1942 to 1955 the Philadelphia Section (1) was kept abreast of developments in analysis and topology/geometry on a regular basis, (2) remained somewhat in the dark on topics in abstract algebra, (3) was apprised periodically of work done in foundations and in probability/statistics, (4) showed an interest in applications, especially during World War II, and (5) began to take a close look at educational issues relating to the high-school curriculum and the first two years in college.

Profile: JOHN CORNING OXTOBY (1910-1991)

John C. Oxtoby was born on September 14, 1910, in Saginaw, Michigan, the son of William Henry and Ida Jane (Corning) Oxtoby. He received two degrees in mathematics from the University of California at Berkeley, an A.B. in 1933 and an M.A. the following year. He was the president of the Pi Mu Epsilon fraternity at Berkeley for two years, 1932-1934. During this time he delivered one talk each year to the honorary organization, the first titled "Number ratios" and the second "Dimensional analysis". For the next two years Oxtoby enrolled in the graduate program at Harvard University, where he served as the secretary-treasurer of the Harvard Mathematical Club for 1935-1936.

Following graduation Oxtoby remained at Harvard for three years as a Junior Fellow in the Society of Fellows. He was in good company. Between 1933 and 1944, the ranks of junior fellows included the famed economist Paul Samuelson, the noted psychologist B. F. Skinner, and the mathematical logician W. V. Quine, as well as the mathematicians Garrett Birkhoff, Creighton Buck, Lynn Loomis, and Stanislaw Ulam. During this time Oxtoby and Ulam proved that almost every measure-preserving homeomorphism of any "regularly connected" polyhedron of dimension ≥ 2 is metrically transitive. As the authors noted in their joint paper in the July 1939 issue of the *Annals*, "the effect of the ergodic theorem was to replace the ergodic hypothesis (of Ehrenfest) by the hypothesis of metric transitivity (of G. D. Birkhoff)". In reviewing this paper Garrett Birkhoff wrote, "This constituted a notable modern extension of the tradition of Lagrange, Laplace, Poincaré, and G. D. Birkhoff".

Clearly Oxtoby was a brilliant research mathematician. He had published several papers by the time he left Harvard in 1939. Since holding a Junior Fellowship carried more prestige than writing a doctoral dissertation, Oxtoby, like the others mentioned above, never felt the need to obtain a doctorate. He accepted an assistant professorship at Bryn Mawr College in the fall of 1939, and remained there until he retired as professor emeritus 40 years later, in 1979, at age 68. Oxtoby served as the head of the department from 1948 until 1976. Imagine – 28 years! He was appointed to the College's prestigious Class of 1897 Professorship for the last four years of his active career.

Known as an especially effective teacher, Oxtoby received a Lindback Award for Distinguished Teaching in 1978. Two years later, and only one year after retiring, he was awarded an honorary doctorate by Widener University. What is the connection between Widener and Bryn Mawr, except that both schools are located in the same general area of suburban Philadelphia? One of Oxtoby's three Ph.D. students, Francisco Navarro-Bermudez, was chairman of the mathematics department at Widener at the time.

John Oxtoby served as chairman of the Philadelphia Section in 1955-1956. He had been even more active in sectional activities during the 1940s, being an invited speaker at the annual meetings three times (1940, 1943, and 1949) and serving on the Program Committee twice (1944 and 1947), chairing it in 1944. In addition he was the MAA's Hedrick Lecturer in 1956. He is perhaps best known

today for his small but influential book *Measure and Category: A Survey of the Analogies between Topological and Measure Space*.

Oxtoby married Jean Ann Shaffer in 1945. The couple had three children, one of whom, David William Oxtoby, is an author of the 1994 textbook *Chemistry: Science of Change*. John Oxtoby died on January 2, 1991. His widow still resides in Haverford, where the couple lived for most of their married life.

Profile: GEORGE CUTHBERT WEBBER (1906-1981)

George Cuthbert Webber was elected chairman of the Philadelphia Section in 1949. Born in Alberta, Canada, in 1906, Webber was awarded his Ph.D. degree from the University of Chicago in 1934 for a dissertation written under one of the country's leading algebraists, Leonard Dickson. Webber had obtained a B.S. degree in 1930 and an M.A. degree two years later from the University of British Columbia. He spent the years 1934-1936 as a National Research Council fellow, the first year at Brown University and the second at the University of Pennsylvania.

Webber must have enjoyed the EPADEL area because after one year at Penn and another at the Armour Institute of Technology in Chicago, he moved to the University of Delaware and remained there for the rest of his life. Appointed an instructor in 1937, he rose through the ranks until becoming a full professor in 1948. One year later Webber was elected chairman of the Philadelphia Section. The following year he succeeded C. J. Rees as chairman of the mathematics department at Delaware, a position he held for 14 years. In addition, from 1958 to 1971 he also held the University's prestigious H. Fletcher Brown Professorship. He retired as emeritus professor in 1971.

Webber signed his name Cuthbert in all his sectional correspondence, but he was generally called Bert at Delaware. Shortly after his death, the University established a "Webber Award" for outstanding achievement in the field of mathematics education. The first award was given in 1983; it has been given every two years since then. The monetary award comes from an endowment left to the University by Mrs. Webber.

Most of Webber's publications dealt with topics in number theory. However, he was also concerned about the mathematical education of elementary school and secondary school teachers, which explains the conditions of the award named in his honor.

Webber was a tireless worker for the Philadelphia Section in spite of time constraints demanded by administrative duties at the University of Delaware. His first activity with the section was an invited address delivered at the annual meeting in 1943, "Transcendentality of certain continued fractions". Based on recent results of Siegel and Gelfond, this talk showed that Webber was able to remain current with mathematical topics in spite of wartime activities.

Webber's first official position in the section began two years later when he was elected to the Program Committee in 1945. He was elected to this committee again in 1951 and 1952. He also served a three-year stint as secretary of the section.

Profile: ANNA JOHNSON PELL WHEELER (1883-1966)

Anna Johnson Pell Wheeler was one of the best mathematicians to ever grace our section. A charter member of the MAA, her national eminence brought immediate legitimacy to the fledgling Philadelphia Section when it was founded in 1926. However, her lot in life was certainly *not* an easy one.

Anna Johnson was born on May 5, 1883, in Hawarden, Iowa, where she attended public school. Although the youngest of three children, she was the first to attend college, entering the University of South Dakota at age 16 as a sub-freshman. She graduated four years later with an A.B. degree in mathematics. The professor of mathematics at South Dakota, Alexander Pell, became her mentor. Anna then won a scholarship to the University of Iowa, where she earned a masters degree in one year. Next she attended Radcliffe College, also on scholarship. She was awarded a second masters degree the following year, 1905. She remained at Radcliffe one more year before moving to Göttingen University, where she attended lectures by Felix Klein, David Hilbert, and Hermann Minkowski. The Palmer Fellowship that supported her study tour stipulated that all women remain unmarried throughout its duration. Hence she waited until July 1907, to marry her former mathematics professor – over the opposition of her parents, who objected to the 25-year age differential. Pell traveled to Göttingen for the wedding.

Afterwards the couple returned to South Dakota, where Alexander Pell had been promoted to Dean of Engineering. Anna Pell taught courses in the fall semester, but in the spring she returned to Göttingen alone to complete work on her thesis. An apparent disagreement with Hilbert caused her to leave without a doctorate. However, she departed with a completed thesis. When Anna Pell returned to the United States she joined her husband in Chicago. She was awarded a Ph.D. from the University of Chicago in 1910 after satisfying the university's one-year residency requirement. It was only appropriate that E. H. Moore be listed as her thesis advisor because Moore was a Hilbert enthusiast who was involved with research on integral equations, the topic of Pell's dissertation, at that time.

In spite of having a Ph.D. from Chicago, Anna Pell was unable to obtain a position at any large university. Her predicament was exacerbated by a paralytic stroke her husband suffered in the spring of 1911. That fall she accepted a position as an instructor at Mount Holyoke College in Massachusetts. She was at Mount Holyoke when she became one of the charter members of the national MAA in 1916. In 1918 she accepted an assistant professorship at Bryn Mawr College. Her husband died two years later. In addition to teaching graduate courses, in 1924 Anna Pell succeeded Charlotte Angas Scott as head of the mathematics department when the revered Scott stepped down.

However, Pell soon married again, this time to Arthur Wheeler, a professor of classics at Princeton University. Residing in Princeton forced her to resign her administrative duties at Bryn Mawr, but she continued to teach there on a part-time basis. The Wheelers enjoyed summer vacations at their summer home in the

Adirondack Mountains called “Q.E.D”. Unfortunately, her second husband died in 1932. After this Anna Pell Wheeler returned to live and teach full time at Bryn Mawr. The next year she was instrumental in attracting Emmy Noether to the faculty, a hiring that brought an air of excitement and international prestige to the Main Line campus. Unfortunately Pell’s colleague and good friend Noether died unexpectedly in 1935, less than two years after arriving.

The years 1920-1935 certainly brought much sadness to Anna Pell Wheeler, for she lost her father, mother, two husbands, and a close friend/colleague. Yet throughout this time and up to her retirement in 1948, she maintained a busy work schedule at Bryn Mawr that also included weekly trips to a colloquium at the University of Pennsylvania. In the 20-year period between 1922 and 1942 she managed to direct eight doctoral dissertations.

Although Wheeler presented an invited lecture to the Philadelphia Section, her AMS Colloquium Lecture in 1927 probably represents the highlight of her professional speaking career. No woman would be chosen to deliver a lecture in this prestigious series again until Julia Robinson in 1980.

Wheeler died on March 26, 1966, at the age of 82.

Chapter 6: EXPANSION, 1956-1978

The New Jersey Section was founded as the 27th section of the MAA in 1956 under the direction of Dean Albert Meder of Rutgers and Albert W. Tucker of Princeton, heretofore influential members of the Philadelphia Section. From that time onward, all MAA members who lived in the Garden State were affiliated with the New Jersey Section. This chapter traces developments in the Philadelphia Section from 1956 through 1978. It shows that the section continued to prosper in spite of losing a previously vital element. Indeed, the section expanded rapidly; its annual meetings attracted record crowds and the increasingly broad interests of the membership sparked the inauguration of annual spring meetings in addition to annual fall meetings.

At the annual meeting in November 1978, the membership passed "by an overwhelming vote" an amendment to the by-laws to change the name of the section to reflect the boundary that had been in effect for 22 years. That amendment had been moved, seconded, and adopted by the Executive Committee at its meeting on April 8 of that year. Beginning with national MAA approval of the change on January 2, 1979, the section became known as the Eastern Pennsylvania and Delaware Section – in short, EPADEL. Consequently the 23-year period covered in this chapter describes the last phase of the Philadelphia Section.

As usual, the chapter begins with an examination of all annual meetings held during the period: attendance, dates, and locations. We discuss how the first two elements are intimately intertwined. In this chapter the examination of meetings is not followed directly by a discussion of the section's leadership. Instead, we describe a whole raft of new activities that were instituted, including high-school contests, a committee on teaching standards, a newsletter, a panel on industrial opportunities, sessions of undergraduate speakers, results from competitions, films, special interest groups, and, most notably, the restructuring of the section's governance.

Next comes an account of the new leadership that expanded the types of activities the section sponsored. Changes to the by-laws in 1956 and 1968 materially altered the section's governance, resulting in an Executive Committee to assist the chairman and secretary with administering the section. We provide biographical sketches of all 15 section chairs. Profiles of Marguerite Lehr, Will Baxter, Doris Schattschneider, and Albert Wilansky appear at the end of the chapter to honor contributions that span the section's 75-year history. Biographical sketches of three secretary-treasurers and two other leaders are interspersed throughout the text.

Moreover, changes at the national MAA led to the institution of a Board of Governors in place of the previous Board of Trustees. We examine the history of this transformation before looking at the individuals who served as governors. Two sectional governors are profiled.

The last part of the chapter concerns the various activities sponsored by the section in the 23-year period. In addition to panel discussions, films, and student presentations, there were 80 invited lectures. We present a chronological account of the lectures and an analysis of the lectures according to their mathematical classification. Most activities were concerned with educational and curriculum issues. The highest number of invited lectures dealt with analysis and topology/geometry but substantial numbers of talks were devoted to algebra/ number theory, applications, and combinatorics/graph theory as well.

Annual Meetings

Table 1 provides an overview of the 23 annual meetings of the Philadelphia Section held from 1956 to 1978. The final column provides references to the official annual reports from the *Monthly*. We were unable to locate the report from the 1978 meeting at Millersville.

Columns 3, 4, and 5 in Table 1 list those attendance figures we were able to locate. Although the secretaries' annual reports listed total attendance (#) and the number of attendees who belonged to the MAA, they no longer listed the names of MAA members. One salient feature is the dramatic increase in attendance beginning with the 1963 meeting. The doubling of local attendance was evident at meetings held at Lehigh Valley colleges in 1971 and 1977 too, unlike earlier periods when travel difficulties caused relatively low attendance at meetings held there. What might explain this extraordinary increase? A reason might be found by examining MAA membership levels, but those numbers show only a gradual increase from 10,000 in 1960 to 12,800 in 1962, 14,000 in 1963, and 15,600 in 1964.

So what accounts for the sudden doubling of attendance? Focus on the dates of the 23 meetings listed in the first column of Table 1, because they betray a subtle shift. Beginning in 1963, meeting dates were changed from the Saturday after Thanksgiving to the Saturday before, reversing a tradition established officially in 1939 but observed unofficially every year since the section's founding in 1926. This change alone accounts for the increase in attendance.

The second column in Table 1 lists the locations of the 23 meetings. Whereas in earlier periods the University of Pennsylvania dominated the sites of the annual meetings, none was held at Penn from 1955 to 1997. Similarly, Lehigh University, the other focus in our elliptical model for the founding of the section, hosted only one in the 23-year period, in 1958. Lehigh hosted four meetings before this period but would not host another for 40 more years. The examples of Penn and Lehigh suggest that beginning in the mid-1950s the section's leadership decentralized from these two research universities to other colleges and universities scattered throughout the region. This change in the nature of our local section is undoubtedly related to the rapid expansion of faculties in departments of mathematics in many colleges and universities throughout the country at the time.

Date	Location	#	MAA	%	Monthly
November 24, 1956	Muhlenberg	64	50	78	November 1957, 701-702
November 30, 1957	Haverford	67	59	88	June 1958, 474
November 29, 1958	Lehigh	54	39	72	April 1959, 355
November 28, 1959	Delaware	54	44	82	March 1960, 319-320
November 26, 1960	Swarthmore	70	55	79	March 1961, 319-320
November 25, 1961	Ursinus	89	71	80	March 1962, 250-251
November 24, 1962	F & M	83	69	83	March 1963, 358
November 23, 1963	Haverford	173	133	77	March 1964, 351
November 21, 1964	Drexel	158	132	84	April 1965, 453
November 20, 1965	West Chester	145	115	80	March 1966, 335
November 19, 1966	Villanova	172	137	80	March 1967, 351
November 18, 1967	Delaware	121	90	74	March 1968, 331-332
November 23, 1968	Drexel	165	125	76	May 1969, 587
November 22, 1969	Swarthmore	194	157	81	April 1970, 443
November 21, 1970	West Chester	225	172	76	August 1971, 821
November 20, 1971	Lafayette	163	138	85	August 1972, 821
November 18, 1972	Lebanon Valley	167	122	73	June 1973, 723
November 17, 1973	Drexel	179	154	86	August 1974, 822
November 23, 1974	Swarthmore	151	NA		August 1975, 783-784
November 22, 1975	F & M	135	108	80	August 1976, 589-590
November 20, 1976	MCCC	209	149	71	November 1977, 415
November 19,1977	Moravian	170	NA		April 1978, 305
November 18, 1978	Millersville	138	NA		NA

Table 1

Altogether 15 different institutions hosted the 23 meetings. This provides another indicator of a broadening of activity, and concomitant with it a broadening of the leadership base in the section. Drexel University picked up Penn's slack in the city, hosting three of the fall meetings. Swarthmore College was the site of three meetings as well. Four institutions hosted meetings on two occasions: the University of Delaware, Franklin & Marshall College, Haverford College, and West Chester University. The remaining nine institutions hosted one meeting each.

Chapter 5 reported that the annual meeting was held in Delaware for the first time in 1952; it met there again twice in the present period and again in 1980. Haverford hosted two meetings in the present period also, and two prior to the period, but none since then. The 1962 meeting at Franklin & Marshall marked the first time the section met in Lancaster; it would return in 1975 and 1987. Similarly, the 1965 meeting at West Chester marked the first time the section met

at one of Pennsylvania's state teachers colleges. Today the collection of those institutions is called the State System of Higher Education. (The State System of Higher Education consists of 14 universities, with eight located in our section: Bloomsburg, Cheyney, East Stroudsburg, Kutztown, Mansfield, Millersville, Shippensburg, and West Chester). The section also met at West Chester in 1970 and 1982. Several institutions that hosted one meeting in the present period did so for the first time: Millersville University (1978, again in 1989), Muhlenberg College (1956 and 1992) and Villanova University (1966 and 1981). Two institutions hosted an annual meeting for the only time ever: Lebanon Valley College (1972) and Moravian College (1977).

All data in the preceding paragraph refer to annual fall meetings. The section inaugurated spring meetings in 1976. Chapter 8 supplied details ab0ut them separately.

One institution's bid to host an annual meeting during the present period serves as a harbinger of a new kind of institutional affiliation. Toward the end of the period, in 1976, the section met at Montgomery County Community College (MCCC), marking the first time the annual event was held at a community college. Chapter 7 describes several meetings held at two-year institutions.

Activities

During the first 30 annual meetings almost all activity was centered on the invited lectures, most of which dealt with strictly mathematical topics. However, in the period 1956-1978 the section began to sponsor other activities that reflected the broadening of the section's leadership and interests. Of particular importance was the section's involvement with high school mathematics contests and standards.

The matter of contests arose at the 1956 meeting when the national MAA's Committee On High School Contests, formed the year before, sought the views of all sections on their participation in the National Mathematics Contest for High Schools. Our section discussed the issue at the business part of the meeting, at which G. Cuthbert Webber briefly described the examination for high school students given in Delaware in the spring of 1956 under partial sponsorship of the MAA. When the plenary discussion ended, the section adopted the following resolution:

> *The Philadelphia Section of the Mathematical Association of America agrees in principle with the establishment of a National Contest for High Schools. The Section believes that considerable autonomy should be left with the Sections to determine the particular form of organization most suitable for the Section within the national regulations.*

At the meeting held the next year the matter of sectional participation was raised again. This time two actions were taken:

1) *The Philadelphia Section approves in principal* [sic] *that we participate in the Mathematics Contest for high schools in our region.*

2) *The chairman shall appoint a committee to work out details with power to act for the Association. This committee shall plan to hold these contests beginning in March of 1959, and shall decide on methods of administration, publication, and awards. It shall, by March 30, 1958, submit its recommendations by mail to the entire membership for comments.*

The section officers appointed a committee to study the matter, with Walter Lawton (of Temple) as chairman, and Truman Koehler (Muhlenberg), G. Cuthbert Webber (Delaware), Donald Western (F & M), and E. R. Mullins, Jr. (a high school teacher) as committee members. The secretary's report from the 1959 meeting notes only, "Professor Lawton reported on the progress of the High School contest conducted in the Philadelphia area." No further details were forthcoming. Yet by 1976 the section's newsletter was informing its readership that 550 students from the Philadelphia area were among the 350,000 students nationwide who took the 80-minute, multiple-choice exam in March of that year.

Another activity from this period concerned teaching standards, an issue that reappeared on the national scene in the 1990s, although standards in the 1950s were much different than standards in the 1990s. Once again the secretary's report from the 1959 meeting provides precious little information. F. L. Dennis wrote, "Professor Lehr reported on the Professional Standards Conference." However, Dennis supplied further details in his report from the next meeting, writing, "At the business meeting Professor J. A. Brown reported on the progress of the Committee on Professional Standards." An elaboration of this statement reveals that the entire afternoon session was devoted to this theme, beginning with a keynote address by Howard Fehr of the Teachers College at Columbia. A panel on "Professional standards for teachers of mathematics in the school" followed. B. H. Bissinger (then at Lebanon Valley) moderated the discussion along with three participants: Albert Filano (West Chester) and two Philadelphia high-school teachers, K. S. Kalman and Joseph Gavin. The panel's recommendations make fascinating reading almost 50 years later. One can only wonder what the present state of high school and college mathematics might be if the committee's recommendations had been enacted.

What teachers must know depends upon the subject matter they will teach. What will be taught depends largely on the caliber of scholar that can be attracted to the teaching of high school mathematics. On the assumption that the high school program will eventually be of the standards shown in the SMSG materials, the teachers must have a five-year training period. Entrance to the program should demand four years (9-12) of high school mathematics study as prerequisite. The four year undergraduate program should consist of calculus and analytic geometry, 12 s.h.; algebra (polynomial, linear, abstract), 6 s.h.; geometry (affine, Euclidean, vector, projective, algebraic), 6 s.h.; probability and statistical inference, 6 s.h.; professionalized subject matter, 6 s.h.; methods of teaching and practice teaching, 6 s.h. The fifth year should include a 3 to 4½ s.h. course in each

of the following: (a) higher analysis or function theory; (b) theory of numbers; (c) structures, i.e., theory of sets, topology, or vector spaces; (d) logic or non-euclidean geometries; (e) applications, i.e., mathematical physics, econometrics, game theory, statistical analysis, etc.; and (f) history of mathematics. All this should be accompanied by a seminar in mathematical education.

The abbreviation SMSG might not ring a bell for some younger readers. Its meaning can be understood from the title of an address presented at the 1959 meeting by Vincent Haag of Franklin & Marshall College: "Work of the School Mathematics Study Group at Boulder and Ann Arbor".

Of related interest, the following resolution was adopted at the business part of the 1959 meeting: "*Be it resolved* that the Philadelphia Section … direct and empower the Executive Committee to take the necessary steps to institute a Mathematics Newsletter directed primarily toward the secondary schools of the area." However, the proposed newsletter was not mentioned in any subsequent reports of sectional activities. The section did initiate a newsletter in 1976, but it was (and is) aimed at the entire membership, not some proper subset.

Not all activities that arose in the period 1956-1978 were related to high school mathematics. The entire 1958 meeting was devoted to the topic "Desirable mathematical training for the mathematician who plans to work in industry". The impetus for the program came from the section's chairman, I. Edward Block, then at Burroughs Corporation, who was unable to attend the 1958 meeting. Lafayette's Charles Saalfrank presided in his place. The morning session consisted of three papers, two of which were delivered by speakers from Bell Telephone Laboratories and IBM. The afternoon session consisted of a panel discussion moderated by Mina Rees, then at Hunter College but known today primarily for her work administering grants for mathematicians from the Office of Naval Research. The panelists were Lehigh's Everett Pitcher and the three speakers from the morning session.

The issue of industrial mathematics gave way to other applications at the 1961 meeting, when two of the three invited speakers lectured on related topics. Both hailed from New Jersey, which was no longer part of the Philadelphia Section. After the eminent Hans Rademacher began the program with a traditional mathematical talk, A. G. Grace of the Radio Corporation of America (RCA), then located across the Delaware River in Cherry Hill, NJ, suggested ALGOL 60 as a computer language appropriate for undergraduate mathematics majors. Grace said perceptively, "the dearth of compilers and the lack of suitable educational materials are thought to be vanishing problems." The well-known mathematician Henry O. Pollak followed him on the program. Pollak, then associated with Bell Labs in Murray Hill, NJ, described the report titled, "Recommendations of the Panel on Physical Science and Engineering, Committee on the Undergraduate Program in Mathematics". The practice of devoting an entire meeting to one specific issue occurred several times in the early 1970s.

Undergraduates appeared on the program at annual meetings for the first time in 1962, when one Swarthmore and two Penn students spoke. They were

followed by James Bartoo, then the chairman of the department at Penn State, whose title was "Undergraduate mathematics: Problems posed by large enrollments". A special session for students featured six 20-minute talks by undergraduates at the meeting held in 1974. Similarly, there were three student speakers in 1975 and four in 1977.

Chapter 5 described the 1954 session on teaching mathematics using television as a prototype for panel discussions. So far this chapter has described panels that were held in 1958 and 1960. Panels became all the rage at annual meetings after that, with one on every program from 1964 to 1970, except 1967 (which had none) and 1970 (which had two). Table 2 lists all panel discussions conducted during the present period.

Year	Panel
1958	Desirable mathematical training for the mathematician who plans to work in industry
1960	Professional standards for teachers of mathematics in the schools
1964	The freshman and sophomore mathematics program
1965	Report of Joint Committee on Teacher Certification Standards
1966	The CUPM general curriculum in mathematics for colleges
1968	Two year colleges – CUPM panel
1969	Panel on community colleges
1970	Computers and the first two years of college mathematics
1970	Accreditation and certification in mathematics
1972	Programs for students having difficulties with the transition from high school mathematics to college mathematics
1975	How do we tell them they need us?
1978	How much is enough?

Table 2

The 1967 meeting was the first at which the section recognized its top performers on the Putnam Competition. Each was awarded a year's membership in the MAA. The report from that meeting states that all three winners hailed from Swarthmore, but unfortunately it does not name them. Names of Putnam awardees were provided at every meeting up to 1976, but no such reports appeared thereafter.

The meetings in 1956 and 1968 turned out to be critical for the future governance of the section. The by-laws had to be rewritten in 1956 to account for the loss of New Jersey members, and the section took advantage of the opportunity to change its administration. For one thing, it expanded the duties of the secretary to include treasurer as well. In addition, an Executive Committee was defined as consisting of the chairman, secretary-treasurer, governor, and three members-at-large. Thirdly, the relation of the new committee to the former

program committee was described: “The executive committee shall constitute the program committee, the senior member being chairman.”

This governance system worked without interruption for 12 years. However, the unexpected death of section chair Emil Amelotti on March 3, 1968, midway through his second one-year term, showed the need for additional change. Amelotti’s illness had prevented him from presiding over the meeting the previous fall; secretary-treasurer Voris Latshaw presided in his place. S. S. McNeary agreed to fill Amelotti’s remaining term, including presiding at the annual meeting held in November 1968. At the business part of the meeting one amendment to the by-laws provided for a new position of vice-chairman of the section. The vice-chairman would assume the chairmanship should that position become vacant (it has not since then); the vice-chairman’s main duty was to plan the program for the next annual meeting. Another amendment to the by-laws increased the number of Executive Committee members from three to six. Both of these changes are still operative today. The section’s by-laws were amended again in 1971 to bring them “into conformity with the model By-Laws” suggested by the MAA’s Committee on Sections.

The report from the 1972 meeting mentions the MAA dues structure for the first time. It states that at the business meeting, “The Section voted to support a graduated dues structure for the Mathematical Association of America.” Annual dues had been set at $3 for the MAA’s first year, 1916, but increased to $4 five years later. The amount remained at $4 until 1957, leading MAA President Lester Ford to quip that the three most famous mathematical constants were e, π, and 4. Dues rose to $5 in 1957 and $6 in 1968. A graduated dues structure has been in effect since the mid-1970s.

An MAA Committee on the Production of Films met from 1958 to 1962, when the Committee on Educational Media superseded it. The first time a film was shown at one of our section’s meetings was 1966, when George Pólya was featured in “Let us teach guessing”. The following year “Fixed points” with Solomon Lefschetz was shown. The annual meeting in 1974 was special, however, for its screening of “Rotating polyhedral forms: M. C. Escher with a twist”. The film’s producer was, not surprisingly, Doris Schattschneider, the Escher specialist from Moravian College. No program has featured films since that time, although Robert Devaney showed a particularly impressive animated segment as part of his 1987 presentation titled “Computer graphics experiments in complex dynamical systems”.

In addition to the usual business, two matters occupied most of the leadership’s efforts in 1974. One was a questionnaire designed by Eugene Klotz to ascertain “further information about our constituent institutions, and the interests and problems of our colleagues.” The initial response was small so Klotz sent a gentle reminder to each department in the section that did not respond. “The questionnaire was not meant to be a formidable task; casual estimates, guesses, and even occasional blanks are all quite acceptable responses.” Yet the follow-up garnered only a few more responses. Klotz summarized the results from the sample of 25 departments in a brief memo to a

committee headed by Dorothy Wolfe called "A possible organization of the local MAA activities suggested by the questionnaire". The memo stated three activities: a newsletter, special meetings, and special topics at regular meetings. The latter two areas combined to produce spring meetings, which were first held two years later; they are discussed in detail in Chapter 8.

The other area took root even sooner, in 1974, when the section broke new ground with something called "special activities". The chairpersons of these special activities presented brief reports at the meeting: "applied mathematics" (Wallace Growney, Susquehanna University), "Community colleges" (Louis Hoelzle, Bucks County Community College), "Newsletter" (Dorothy Wolfe, Widener College), and "Visiting lectures" (Jerry King, Lehigh University). Some of these activities reappeared later in the form of Special Interest Groups.

One of the special activities planted in 1974 began to sprout buds the following year, when minutes from an Executive Committee meeting stated, "We agreed to try to get a Newsletter going in the near future. Dorothy Wolfe will make the editing attempt and Phil Bedient will look into the production problem." A lack of sufficient finances caused a delay in appearance, but the first section newsletter was published in February 1976 with Dorothy Wolfe (Widener) as editor. Since that time the newsletter has become the section's primary source of communication, especially because, as we will see in Chapter 7, by about 1980 the *Monthly* discontinued the practice of publishing sectional reports. For now we relate two items about the national MAA that appeared in the second newsletter (published in October 1976). In that issue the section's governor, David Rosen, wrote, "You will also be interested to know that the 1978 January meeting has been moved to January 6-8 … the usual late January meeting time has become inconvenient for many schools."

Rosen's report also mentioned the search for national headquarters. He wrote, "The Board of Governors authorized the National Executive Committee to move along with plans for acquiring a building in Washington as rapidly as possible. Paying for this new building should not be a hardship on the membership because two members of the Association have pledged substantial amounts of money towards this project." The MAA purchased a three-building complex at 1529 18th St. NW in Washington in 1978 that has served as the Association's headquarters since then.

While David Rosen was assuring the Philadelphia Section membership that no sudden increase in dues would be imminent, his colleague, section chair Gene Klotz, was playing a different tune locally. Klotz wrote, "Our By-Laws prohibit charging more than $1.00 registration fee at our fall meeting. We have recently taken to inviting speakers from outside the section to our fall meeting and special meetings … It has been recommended that we raise the registration fee (one specific figure mentioned was to $3.00.)" The by-laws were subsequently changed and the registration fee rose to $2.50 at the fall 1977 meeting. For comparison's sake, that fee had increased to $17 ($15 in advance) at the fall 2000 meeting at Penn State – Abington.

The visiting lecture program was started about 1970 by the Executive Committee, with Phillip Bedient (F&M) in charge of the initial stage. He turned the program over to James Brooks (Villanova), under whom the program seemed to languish. When Bedient was elected secretary-treasurer he asked Jerry King (Lehigh) to take charge. As Brooks had discovered, it was not an easy task. However, two years later King wrote, "Some twenty members have agreed to speak at nearby schools." A list of names and topics was mailed to all departments in the section. Chapter 7 discusses the continuation of this program in the next era of the section's history.

A program of institutional representatives was established in 1977 to enhance communication with the membership. At that time secretary-treasurer Willard Baxter began to send official communications to the representatives, who were asked to forward the information to their colleagues. Since not all institutions have representatives, secretary-treasurers sometimes rely on department chairs for this task.

By the end of the 1970s the emerging role of two-year institutions was being felt in the section. In 1977 section chair Gene Klotz wrote, "Some members have expressed an interest in establishing closer relations with the Pennsylvania State Mathematics Association of Two Year Colleges." He then appealed for ways to meet this challenge.

Leaders

We mentioned that the section's governance structure changed dramatically in 1956 and 1968. These changes are reflected in Table 3, which lists all officers from 1956 to 1978. The section derived great benefits from a cadre of leaders during this period, altogether having 15 different chairs in 23 years.

Chairs

Several changes in the chief executive position occurred during the period 1956-1978. The second column in Table 3 shows that almost all chairs were elected for two terms starting with Charles Saalfrank in 1962. This tradition was not codified, however. As the section's newsletter editor Dorothy Wolfe wrote in 1976, "It is customary, although not necessary, to keep the chairperson and vice-chairperson in office for two years."

The 15 sectional chairs embody a diverse lot. The election of I. Edward Block from Burroughs Corporation represented the first time in the section's history that a chair carried a nonacademic affiliation. The only other chief officer to hold nonacademic employment has been Walter Stromquist. Because the section no longer included New Jersey, it was impossible for chairs to be as geographically scattered as before, but when Joerg Mayer of Lebanon Valley College was elected in 1973 and 1974 he provided leadership from the section's northwestern region. In a similar vein, the election of Donald Western as the only chairman ever to come from Franklin & Marshall College provided leadership from a similar part of the section. The University of Delaware continued its tradition of

leadership when Russell Remage and Willard Baxter were elected for a total of four years.

Year	Chair	Vice-Chair	Sec-Treas	Executive Committee
1956	Wilansky		Webber	Mullins, Saalfrank
1957	Block		Webber	Western
1958	Lehr		Dennis	Epstein
1959	Lawton		Dennis	Brown, Jackson
1960	McNeary		Dennis	Linton, Rosen
1961	Western		Latshaw	Filano
1962	Saalfrank		Latshaw	Woodruff
1963	Saalfrank		Latshaw	Kerr
1964	Remage		Latshaw	Leser, Maclasky
1965	Remage		Latshaw	Hubley
1966	Amelotti		Latshaw	Kohlmeyer
1967	Amelotti/McNeary		Filano	Baxter
1968	Baxter	Albright	Filano	Beck, Cunningham Jones, Mamelak
1969	Baxter	Albright	Filano	Bedient
1970	Albright	Pervin	Filano	Brooks, Mamelak
1971	Albright	Pervin	Filano	Tuckman, Wurster
1972	Pervin	Mayer	Filano	Smith, Wolfe
1973	Mayer	Klotz	Bedient	King, Plotkin
1974	Mayer	Klotz	Bedient	Bragg, Grant
1975	Klotz	Schattschneider	Bedient	Denlinger, Porter
1976	Klotz	Schattschneider	Baxter	Arnold, Babcock
1977	Schattschneider	Anton	Baxter	Leinbach, Schwartz
1978	Schattschneider	Anton	Baxter	Wilf, Wong

Table 3

Although nobody from the University of Pennsylvania was elected chair during this period, the city of Philadelphia was home to chairs from other academic institutions in the Quaker City for eight of the 23 years. This included officers from the Drexel Institute of Technology (McNeary and Pervin) in addition to first-time representation from LaSalle (Albright), Temple (Lawton), Villanova (Amelotti), and Burroughs (Block). Albright and Amelotti were their schools' only chairs in the section's 75-year history. Lehr (Bryn Mawr) and Klotz (Swarthmore) were the last representatives from their schools to be elected chair. Lehr's election in 1958 followed Bryn Mawr's Anna Pell Wheeler (1943)

and John Oxtoby (1955), while Klotz's elections in 1975 and 1976 made him the only other chair from Swarthmore except for Arnold Dresden (1940).

Chairs from Lehigh Valley schools presided for five of the 23 years. The election of Albert Wilansky in 1958 was the last time that an MAA member from Lehigh University was elected chair. However, the elections of Lafayette College's Charles Saalfrank in 1962 and 1963 and Moravian's Doris Schattschneider in 1977 and 1978 show that the Lehigh Valley continued as a hub of leadership.

Lehr, Schattschneider, and Wilansky are profiled at the end of the chapter. For now we provide biographical sketches of the 12 remaining chairs in the order of their terms. The position of vice-chairman was created in 1968 when LaSalle's Hugh Albright was the first person elected to the position. Without express mention, the title of the position was changed to vice-chairperson when Doris Schattschneider was elected in 1975. Correspondingly Gene Klotz was referred to as the chairperson. Since every vice-chair became the next chair, there is no need to present separate sketches of the vice-chairs. A biographical sketch of the final vice-chair in this period, Howard Anton, appears in the next chapter. (Several section leaders were involved in the founding and the establishment of SIAM – the Society for Industrial and Applied Mathematics – which has had its headquarters in Philadelphia since it was conceived in the fall of 1951.)

- **Isaac Edward Block** is a native Philadelphian who was born in 1924. He received his bachelors degree in physics from Haverford College in 1944. He then obtained two degrees from Harvard, an M.S. in 1947 and a Ph.D. in 1952, both in mathematics with the latter under the famous analyst Joseph Walsh. Ed Block was a mathematics consultant for Philco Corporation from 1951 to 1954. During this time he was a founder of SIAM; he was elected its first secretary and served as managing editor of its first journal. Subsequently, as a volunteer, he served as chair of the SIAM's publications committee, and eventually as chair of the SIAM board. In 1954 Block accepted a position with the computer company Burroughs Corporation as manager of its Philadelphia Computer Center. He was employed there when elected chair of the Philadelphia Section three years later. Block later worked at another computer company, Remington Rand Univac - Philadelphia, as manager of its applied mathematics department. Later he became a vice-president of Auerbach Publishers, Inc. In 1976 he was persuaded to become SIAM's first full-time managing director, a position he held until his retirement in 1994. That same year Block was awarded the MAA's Certificate of Merit, the only person from our section to receive it during the section's first 75 years. The Certificate of Merit is a special award given at irregular intervals for some special work or service associated with mathematics or the wider mathematical community. Block still resides in the Philadelphia area.

- **Walter S. Lawton** was born in 1906 in Mt. Carmel, PA. He received his A.B. degree from Temple University in 1929, and then obtained two degrees from the University of Pennsylvania: an M.A. in 1930 and a Ph.D. in 1934 (for a dissertation written under former section chair J. A. Shohat). Lawton spent his entire professional career at Temple, from his hiring in 1930 until his retirement 40 years later. He served as chair of the department from 1954 to 1970. During World War II he served his country in the U. S. Naval Reserves from 1942 to 1945. He was nominated as chairman of the section's Committee on High School Contests in 1957 and was elected chair of the section two years later. The section newsletter reported Temple's initiation of Lawton Lectureships in 1976 to honor his contributions to the University. It was cryptically recorded there that "Lawton disappeared about six years ago at his summer home in the Poconos." He was pronounced dead officially in February 1971.

- **Samuel Stewart McNeary** (1913-1996) is a native Philadelphian who spent most of his life in the area. He received a B.S. from Haverford College in 1936 and an M.A. from the University of Pennsylvania seven years later. Sam McNeary was an instructor at the Drexel Institute of Technology from 1939 until his retirement 1978, except for three years during World War II. He introduced Drexel's first courses in statistics and numerical analysis. During the war, from 1943 to 1946, he worked as a design engineer on defense-related projects at Westinghouse Corporation in Philadelphia. McNeary was a member of the founding group of SIAM in 1951. He was Drexel's representative to SIAM, and he served for several years as an editor of the *SIAM Newsletter* and the *SIAM Review*. He was elected chair of the Philadelphia Section in 1960. He also agreed to assume the chairmanship in 1968 when Emil Amelotti passed away midway through his second one-year term. McNeary was the author of a calculus text and several papers on hydraulics and other engineering projects. After retirement he became interested in home renovations and bought, refurbished, and sold a dozen houses. McNeary died after suffering a stroke in suburban Philadelphia three months shy of his 83rd birthday.

- **Donald Ward Western** (1915-2003) was born in Poland, New York. He obtained a bachelors degree from Denison University in 1937, a masters degree from Michigan State University in 1939, and a Ph.D. from Brown University in 1946 for a dissertation on integral norms written under Paul Rosenbloom and Jacob Tamarkin. Western joined the faculty at Franklin & Marshall College two years after receiving his doctorate, remaining there until he retired in 1980. During that time he served as chair of the department for 20 years, 1952-1972. He was elected to the section's Executive Committee for a three-year term in 1957, the same year that he was appointed to the committee on high school contests. He was active in the Philadelphia Section in several other ways – serving on the Program Committee 1952-1953, being elected chair for 1961-1962, being elected

sectional governor for 1962-1965, and being a panelist at meetings held in 1966 and 1972. Western was an NSF faculty fellow in 1960. He still resides in Lancaster.

- **Charles W. Saalfrank** is a native Pennsylvanian, born in 1919. He received a B.S. from the University of Pennsylvania in 1941 and an M.A. from the University of Nevada two years later. He then returned to Penn as an instructor from 1943 to 1947, all the while completing requirements for the doctorate. He was awarded the Ph.D. the next year for a dissertation written under A. D. Wallace, the first of 22 that Wallace directed. Saalfrank taught at Franklin & Marshall during the 1947-1948 academic year but then left for Rutgers University. He remained at Rutgers from 1948 to 1952, and then crossed the Delaware River again to accept a professorship and become chair of the department at Lafayette College, where he spent the rest of his career. Saalfrank was elected chair of the Philadelphia Section in 1962 and 1963. Amazingly, he was chair of the mathematics department for 30 years, 1952-1982. Charlie Saalfrank retired from Lafayette in 1986. Since then, his wife Marie and he have been living in Ormond Beach, Florida.

- **Russell Remage, Jr.** (1915-2001) was born in West Virginia. By age 21 he had earned bachelors and masters degrees from West Virginia University, an A.B. in 1936 and an A.M. in 1937. Four years later he was commissioned in the Navy, where, at age 25, he became one of the youngest commanding officers in World War II. Following the war, Russ Remage accepted an instructorship at the University of Delaware in 1946. Over the next four years he juggled teaching duties, raising three daughters, and graduate studies at the University of Pennsylvania, resulting in a Ph.D. in 1950 for a dissertation on invariance and periodicity of transformations written under G. Schweigert. He remained on the Newark campus until his retirement in February 1981. The year 1964 was particularly propitious for Remage – he was promoted to professor, selected department chairman, and elected chair of the Philadelphia Section. He remained as chair of the section for a pair of one-year terms and chair of his department for six years. During this time he took the lead in establishing the department's Ph.D. program. Remage and his Delaware colleague Robert Jackson served as co-editors of the SIAM's first journal at its start in 1953. He held an NSF faculty fellowship for the year 1959-1960. An athlete throughout his life, Remage remained an avid tennis player in retirement; inspired by Tiger Woods, he took up golf at age 81. He died on May 23, 2001 at the age of 85.

- **Emil Amelotti** (1904-1968) was born April 10, 1904, in Italy. He received two degrees from the University of Illinois, a B.S. in electrical engineering in 1926 and an M.S. in mathematics in 1928. Although he did graduate work for one year at the Politechnico Institute (Turin, 1931-1932) and five years at the University of Chicago (1933-1938), he did not receive a doctorate. Amelotti came to Villanova in 1938 and remained there until his untimely

death on March 3, 1968, one month shy of his 64th birthday. Amelotti was the first chair of the mathematics department at Villanova when it was founded in 1947. Five years later he was elected SIAM's first treasurer. He was also elected chair of the Philadelphia Section in 1966 and 1967 but died midway through his second term. Amelotti was an MAA member for nine years.

- **Hugh Norton Albright** was born in Jerusalem in 1928. He received a bachelors degree from Catholic University (Washington, DC) and two degrees from the University of Pennsylvania. A Christian Brother, he received his Ph.D. in 1959 for a dissertation written under Morikuni Goto titled, "Compact complex homogeneous manifolds." Brother Albright has taught at LaSalle his whole career – a total of 44 years! – from his arrival in January 1951 until retirement in 1995. He was chairman of the mathematics department from 1964 to 1970. He was elected chair of the Philadelphia Section in 1970 and 1971 after having served as vice-chair for two years. To add to his administrative duties at this time, he served as the Dean of Arts and Sciences at LaSalle from 1970 to 1976. When asked how he handled 12 straight years of university administration Brother Albright responded, "I attended Saturday classes at the University of the Arts for three hours every week for eight semesters, from 1977 to 1980, to help me overcome the experience." Although he retired from full-time teaching in 1995, he has continued teaching part-time at LaSalle since then.

- **William Joseph Pervin** is a Pittsburgh native, born there in 1930. He received two degrees from the University of Michigan in 1952, a B.S. and an M.S., and a Ph.D. five years later from the University of Pittsburgh for a dissertation written under Norman Levine. While in graduate school at Pitt he was employed by the Atomic Power Division of Westinghouse Electric Corporation as a senior scientist (1954-1955) and also by Pitt as an assistant professor (1955-1957). Upon receiving his doctorate in 1957 he accepted a position at Penn State, where he remained until 1964 except for a year at Heidelberg University as visiting professor. He then became chair of the department at the University of Wisconsin at Milwaukee for three years before moving to Drexel University in 1967. He directed doctoral theses at Penn State and Wisconsin. William J. Pervin participated in the section as soon as he came to the area, delivering an invited address at the November 1967 annual meeting on "Algebraic topology for undergraduates". When he was elected chair of the Philadelphia Section in 1972, he was in the midst of a two-year stint as Director of the Computing Center at Drexel. Pervin was the section's last chair to hold the position for only one year. He has worn various mantels at the University of Texas at Dallas since leaving Drexel in 1973, mostly in computing. However, Pervin steadfastly maintained his professorship in the department of mathematics and computer science, serving as chair of the department from 1983 to 1985 and master of the

Engineering School (1987-1994). He resides in Richardson, Texas, with his wife and 12-year-old daughter.

- **Joerg Werner Peter Mayer** was born in 1929 in Germany. He received his advanced degrees at Universität Gießen, with a 1954 doctorate based on a dissertation written under A. Peyerimhoff. He taught at the University of Malaysia 1954-1957. Mayer then came to the University of New Mexico, where he directed six Ph.D. students. He left New Mexico in 1968 to become chair of the department at George Mason University in Virginia. However, two years later Mayer found an area much more to his liking and moved to Lebanon Valley College, where he remained until his retirement in 1997. He served as chair of the department 1970-1982 and as director of the new computer center 1973-1975. Mayer discussed his chairing of our section and the MD-VA-DC section in a 1982 MAA invited lecture titled, "Reflections of a maverick chairman". He is the author of two books, *Algebraic Topology* (1972) and *Assembly Language Programming* (1991). Although he has a daughter and four sons, he is not related to Jörg-Peter Mayer, who received a doctorate from Universität Kiel in 1997. Our Mayer has lived in Brattleboro, VT, since his retirement.

- **Eugene Arthur Klotz** was born in Iowa in 1935. He received a B.S. from Antioch College in 1958 and a Ph.D. from Yale in 1965 for a dissertation on Lie rings written under the famous algebraist Nathan Jacobson. Gene Klotz came to Swarthmore College in 1963 and has remained there ever since. In 1971 he published the book *Linear Algebra and Analytic Geometry* with former section chair Heinrich W. Brinkmann. Klotz was an associate professor when elected chair of the Philadelphia Section in 1975 and 1976, but was promoted to full professor the following year. He was an NSF Science Faculty Fellow in 1974 and the principal investigator for a 1981-1982 NSF grant on mathematical education using information technology. His interests shifted to computers and mathematics during the 1980s, and he was one of the founders of the Math Forum on the Internet that has garnered international acclaim.

Earlier we noted the waning influence of the University of Pennsylvania on sectional leadership. This can be seen in the sketches of the 15 different chairs in the period, none of whom was on the faculty at Penn. However, Table 4, which lists the doctorate granting university for the 13 chairs who received a Ph.D., reflects Penn's continuing influence in a different light. It shows that 5 of the 13 (or 38%) received their Ph.D. from Penn. Indeed 10 (77%) received their highest degrees from Ivy League institutions. Moreover, we will see below that Penn continued to produce the greatest number of invited speakers of any institution.

Chairman	Doctorate
Albright	Penn
Baxter	Penn
Block	Harvard
Klotz	Yale
Lawton	Penn
Lehr	Bryn Mawr
Mayer	Germany
Pervin	Pitt
Remage	Penn
Saalfrank	Penn
Schattschneider	Yale
Western	Brown
Wilansky	Brown

Table 4

Secretary-Treasurers

Let us review briefly the history of the position of secretary-treasurer of the section. At the organizational meeting in 1926 one of the founders, Albert Bennett (Lehigh), was elected as vice-chairman and secretary-treasurer. The next year the title "vice-chairman" was dropped when J. R. Kline (Penn) was elected secretary-treasurer. In 1928 the designation "treasurer" was dropped when P. A. Caris of Penn was elected as secretary. The secretary then resided at the University of Pennsylvania until 1947, with Perry Caris serving a record 13 years from 1928 to 1941. The present period began with G. Cuthbert Webber (Delaware) at the helm; he was elected to the post at meetings held from 1953 through 1957. As previously noted in this chapter, the by-laws were changed in 1956 to return the position of secretary-treasurer.

The section owes a great debt of gratitude to every secretary-treasurer. During the 23-year period under discussion only six individuals held the position. Two of them were profiled in Chapter 5 – G. C. Webber and F. L. Dennis (Ursinus). Willard Baxter (Delaware) is profiled below. Here we provide biographical sketches of the three remaining secretary-treasurers, who were associated with Lehigh, West Chester, and F & M, in the order of their terms.

- **Voris V. Latshaw** (1903-1988) was born, raised, and educated in Indiana. He received all three of his degrees from Indiana University, an A.B. in 1927, A.M. in 1928, and Ph.D. in 1930. After spending a year as acting head of the department at Fort Hays (Kansas) State College, he accepted a position at Lehigh University and spent his entire career there. During World War II he took leave to serve as a mathematician with the National Advisory Committee on Aeronautics from 1944 to 1946. He was the secretary-treasurer of the Philadelphia Section during the period 1961-1967

when the MAA celebrated its 50th anniversary (in 1965). Part of the celebration called for a history of MAA sections, a task that fell to Latshaw. His account of the first 40 years of the section appeared in the resulting book, Kenneth O. May (ed.), *The Mathematical Association of America: Its First Fifty Years*, MAA, 1972, pp. 94-95. Latshaw died in Delray Beach, Florida, at the age of 84.

- **Albert E. Filano** was born in Penfield, PA, in 1925. He received two degrees from the University of Pennsylvania, a B.S. in 1948 and an M.A. the following year. He obtained his Ph.D. in mathematics education from Penn State in 1954. Filano taught at several colleges before settling at West Chester State College in 1958. He served as chairman of the department from his appointment until 1969; from 1967 to 1969 he also was the director of the college's Division of Science and Mathematics. Filano then became the vice president for academic affairs, a position he held until his retirement. During his tenure he also served as acting president of the college. Filano has written several texts and workbooks, and he was the principal investigator on several NSF grants. He was awarded the Four Chaplains Legion of Honor Service Award, the Pennsylvania Council of Teachers of Mathematics Outstanding Leader Award, the Outstanding Alumnus Award from the Bennetts Valley Alumni Association, and the Outstanding Educators of America Award. Filano still resides in West Chester.

- **Phillip E. Bedient** was born in China in 1922. He received an A.B. from Park College in 1943 and then two degrees from the University of Michigan, an M.A. in 1946 and a Ph.D. in 1959. His doctoral dissertation was written under the well-known author of differential equations texts, Earl Rainville. Between the latter two degrees he taught at Juniata College from 1950 to 1955. He then moved to Michigan as an instructor. After receiving his doctorate Bedient accepted a position at Franklin & Marshall College and remained there until his retirement in 1987. He served as chairman of the department from 1972 to 1981. He still resides in Lancaster.

Executive Committee

The Program Committee evolved into the Executive Committee in 1956 and expanded 12 years later. From that time onward, the committee was composed of six at-large members, each serving a three-year term, with two new members elected every year. It became customary to fill the three new slots that were added to the committee in 1968 with members associated with a two-year institution, a high school, and a nonacademic employer.

It also became customary for leading members of the Executive Committee to ascend to higher ranks of sectional governance. Thus, for example, David Rosen became governor of the section, Albert Filano secretary-treasurer, and Gerald Porter governor and treasurer of the national MAA. It is worthwhile to note that

two women were elected to the Executive Committee in 1971 – Marie Wurster of Temple University and Claire Tuckman of Cheltenham High School. (Tuckman directed many successful problem-competition teams). Another woman was elected the next year, Dorothy Wolfe, chair of the department at PMC (now Widener University).

One amusing incident related to the Executive Committee shows diligence at the national level. It was reported to the MAA that at the 1962 annual meeting Shaylor Wood of Abington Senior High School was elected to the committee. The Executive Director Harry Gehman wrote, "According to our records, Mr. Wood is not a member of the Association and is, therefore, ineligible to hold office. We have, however, invited Mr. Wood to become a member." Only then did Gehman notice that the name in the report sent by sectional secretary Voris Latshaw differed from the name in his account of the annual meeting. Two days later Gehman sent a letter to J. Shaylor Woodruff that began, "If you receive a letter addressed to Shaylor Wood inviting you to become a member of the Association, please ignore the letter."

Too many different individuals served three-year terms to warrant biographical sketches and, as far as we know, none but Woodruff was involved in a noteworthy incident. However, we introduce Wurster here to honor her widespread contributions to the section and to cite important connections with earlier section leaders.

- **Marie Anna Wurster** was born in Philadelphia in 1918. After attending public schools in the city, she entered Bryn Mawr College in 1936 at the height of the depression. A scholarship enabled her to live on campus during her final two years. Wurster remained at Bryn Mawr as a graduate assistant 1941-1943, taking all her courses from three other sectional leaders – Anna Pell Wheeler, Marguerite Lehr, and John Oxtoby. Then she accepted a fellowship to the University of Chicago. During her three years in the Windy City she was very active with the Junior Mathematical Club, serving on the Executive Committee and presenting a paper on Fourier coefficients her first year, being elected social chair the second year, and elected chair the final year. She also completed her dissertation (under Lawrence Graves) in 1946 on the calculus of variations. Upon graduation she accepted an instructorship at Temple University and remained there until retirement in 1985. She is the author of a textbook with Thomas H. Slook and two with the current chair at Temple, John J. Schiller.

Governors

Although the section's administrative structure changed dramatically at the annual meeting in 1968, actions taken at the national level 30 years earlier resulted in another change in the section's governance. Because this change has turned out to be so important for our section, we pause to look at its history. To our knowledge, no such account of the history of MAA governors exists elsewhere.

By 1938 many of the leaders of the national MAA had become concerned about the tenuous relationship between the MAA and its sections, so the Trustees appointed a Committee to Review the Activities of the Association. The Committee reported its findings in the *Monthly* two years later. The Trustees subsequently accepted the report and discharged the committee with appreciation. Its five recommendations provided the most extensive analysis of the structure and operations of the MAA since its founding in 1915. One of those recommendations replaced the Trustees with the now familiar Board of Governors that administered and controlled all scholarly and scientific activities of the Association.

The Board's membership was composed of six national officers, a set of six governors elected at large, and a set of 14 governors elected by region. Initially two MAA members with ties to our section were elected governors at large – Arnold Dresden (Swarthmore) and the section's founder, A. A. Bennett (Brown). The term for governors at large was three years, so two governors were elected annually.

The principal change to this organizational scheme, however, concerned the regional governors. The Committee to Review the Activities of the Association acknowledged the vital role that the MAA sections played. Their report stated, "The Sections are … vital and active and have a conscious and definite purpose … [yet] the inter-relation between the Sections and the Association as a central body is tenuous almost to the point of non-existence." Hence the report recommended the creation of 14 regions, each to elect one governor for a term of two years. Region 3 consisted of four states: Delaware, New Jersey, Pennsylvania, and West Virginia. The first governor elected from the region was Frederick W. Owens, who, as we have seen, had been an active member of the section even after Penn State was formally associated with the Allegheny Section in 1933. His term ran from 1941 to 1943. Owens was succeeded by Arnold Dresden for 1943-1945. The next regional governor, L. L. Dines (Carnegie Institute of Technology), had no ties to our section. His term was 1945-1947.

However, the regional setup turned out to be unnecessarily cumbersome, so in 1945 the Board of Trustees began to phase out the system of regional governors in favor of a system of sectional governors serving three-year terms. The first governor elected from the Philadelphia Section was Emory P. Starke, who, as we have seen, had been an active member of the section from Rutgers. His term ran from July 1, 1947, to June 30, 1950, which overlapped his 1947-1948 term as chairman of the section. The term of the second sectional governor, George E. Raynor, came on the heels of his year as chairman of the Philadelphia Section in 1948-1949. Raynor's successor, Cletus Oakley, began 11 years after he completed his one-year chairmanship of the Philadelphia Section. Incidentally, A. E. Meder (Rutgers) was elected as the first sectional governor of the newly formed New Jersey Section in 1955.

Table 5 provides the complete list of sectional governors up to 1980. During the present period of expansion these governors assumed an even greater role in sectional administration as well as serving as liaisons with the national MAA.

Governor	Institution	Term
Emory P. Starke	Rutgers	1947-1950
George E. Raynor	Lehigh	1950-1953
Cletus O. Oakley	Haverford	1953-1956
Nathan J. Fine	Penn	1956-1959
Albert Wilansky	Lehigh	1959-1962
Donald W. Western	Franklin & Marshall	1962-1965
Emil Grosswald	Penn	1965-1968
Bernard H. Bissinger	Penn State - Middletown	1968-1971
Willard Baxter	Delaware	1971-1974
David Rosen	Swarthmore	1974-1977
Jerry King	Lehigh	1977-1980

Table 5

Many of these sectional governors have already been profiled for other contributions made to the section. Here we provide sketches of the last two governors in Table 5 to honor their continuous involvement with the section right on up to the present time.

- **David Rosen** (1921-2003) was born in New Haven, Connecticut,. He received an A.B. from New York University in 1942 and then two degrees from the University of Pennsylvania, an M.A. in 1949 and a Ph.D. in 1952 (for a dissertation written under Joseph Lehner). Rosen was an assistant instructor at Penn during his last three years of graduate study. In 1955 he accepted a position at Swarthmore College, replacing Arnold Dresden, the former section chair who had just retired. Rosen remained at Swarthmore until his retirement in 1987. He was an NSF faculty fellow in 1961-1962 and a Fulbright Professor in Ireland in 1971-1972. Rosen served the section in two official capacities, as a member of the Executive Committee 1960-1963 and as governor 1974-1977. His volunteer activity in sectional affairs was inspired by Arnold Dresden; Rosen in turn was responsible for the involvement of Jerry Porter. Rosen resides in Swarthmore. Although he continues to play the bass in the college orchestra, he is no longer able to play his favorite sport, tennis.

- **Jerry Porter King** was born in Dyersburg, Tennessee, in 1935. He took all his degrees from the University of Kentucky, a B.S. in electrical engineering in 1958 followed by two degrees in mathematics, an M.S. in 1959 and a Ph.D. in 1962. In Chapter 5 we noted that King's thesis advisor, V. F. Cowling, taught at Lehigh University from 1949 to 1961 before moving to the University of Kentucky. Jerry King was one of Cowling's first doctoral students at Kentucky, and Cowling must have retained sufficiently cordial relations with the Lehigh administration, because he recommended his student to the Bethlehem school. The fit was perfect, and King has been at Lehigh since accepting that first position in 1962. Between 1966 and 1984

he produced nine Ph.D. students, two of whom have been active in sectional activities – Frederick ("Fritz") Hartmann (1968) and Deborah Frantz (1984). King also served in two high-ranking administrative capacities, associate dean of the College of Arts and Sciences 1979-1981 and dean of the graduate school 1981-1987. In addition, he has served the section in numerous ways: as director of the program of visiting lectures (1974), member of the Executive Committee 1973-1776, director of the program for student speakers (1977), and governor 1977-1980. Besides that, King presented two invited lectures, in 1981 and 1997; he also delivered invited addresses at three other MAA sections: Kentucky in 1981, Allegheny in 1995, and New Jersey in 1997. He resides in Bethlehem.

The 1945 change in the MAA's by-laws also prescribed that two at-large governors would be elected triennially from the national membership. Four members of the section were elected to those positions up to 1978: Carl B. Allendoerfer (Haverford) 1949-1951, Albert W. Tucker (Princeton) 1953-1956, Heinrich W. Brinkman (Swarthmore) 1955-1957, and Hans Rademacher (Penn) 1962-1964. All four at-large governors were profiled in earlier chapters.

Presenters

The Philadelphia Section sponsored three forms of professional activity during the period 1956-1978 that were quite different from any before: films, panel discussions, and student contributed-paper sessions. We already discussed the three films that were shown.

Altogether there were 12 panel discussions involving 39 panelists in the 23-year period. Five panelists appeared twice: Barnard Bissinger (1960, 1970), Albert Filano (1960, 1965), David Rosen (1964, 1966), Benjamin Volker (1969, 1975), and Donald Western (1966, 1972). Because the topics of many panels dealt with pre-college mathematics, it is not surprising that among the 39 panelists, eight came from two-year institutions and six from high schools. Four of the remaining 25 panelists came from outside the area: Brown, Colgate, Columbia, and Hunter. From our section, four of the 21 panelists were affiliated with Franklin & Marshall, while five institutions were home to two panelists: Delaware, Drexel, Lehigh, Swarthmore, and West Chester.

The program for the 1962 meeting included student speakers for the first time. At the time two students from Penn and one from Swarthmore were listed as part of the usual program. Apparently that program was not deemed successful because students were not part of any program for another 12 years. In 1974 there was a special session of 20-minute contributed papers at which six students from a number of schools spoke (two from Swarthmore and one each from Villanova, Delaware, Moravian, and even Princeton). The topics ranged from calculus to graph theory to computer programming. Special sessions were also held in 1975, when three papers were presented (by students from Muhlenberg, Swarthmore, and Lafayette) and in 1977, when four papers were presented (by

students from Temple, Muhlenberg, Shippensburg, and Delaware). The success of the program of student speakers hid the difficulty of attracting students to present their work in such a public forum. The head of the program, Jerry King, hinted at the underlying problem in his report from the fall of 1977, when he wrote, “There’s been a problem in the past in getting volunteers for student talks, although those that have been given have been appreciated.”

Overall, invited lectures continued to be the mainstay of sectional activity, with 80 invited lectures being given from 1956 to 1978. After discussing the lecturers and their affiliations, we analyze the lectures in two ways, a chronological tour and mathematical classification. The complete list of lecturers and the titles of their talks is given in an appendix.

Altogether 70 different lecturers account for the 80 invited talks, a number that clearly indicates a wide mix of invited speakers. It also attests to the oratorical skill of those few individuals who were invited to speak a second time. With that in mind, what can one say about the two mathematicians who were invited three times? One can say that H. O. Pollak (of Bell Labs in 1961 and 1965, and as president of the MAA in 1975) and Albert Wilansky (of Lehigh, who spoke in 7-year cycles: 1956, 1963, and 1970) not only were captivating speakers but that the mathematical topics they investigated were of interest to a large number of MAA members in the section. It was noted in Chapter 3 that Wilansky delivered the most lectures to the section, five. The six speakers who were invited twice in the present period were Frederick Cunningham (Bryn Mawr), Samuel Gulden (Lehigh), Edwin Moise (Institute for Advanced Study and Michigan), David Rosen (Swarthmore), Isaac Schoenberg (Penn), and Herbert Wilf (Penn). Recall that overall both Schoenberg and Wilf accepted four invitations to speak at the section’s annual meetings.

Institutional affiliations are as diverse as the speakers, with 18 institutions accounting for the 80 lecturers. Once again the University of Pennsylvania led the way with 14, followed by Lehigh University and Princeton University (7 each), Bell Labs and Swarthmore College (4 each), Bryn Mawr College and Penn State (3 each), and the University of Delaware, Drexel University, and New York University (2 each). It is notable that even though the section’s boundaries no longer included New Jersey or central Pennsylvania, seven speakers came from Princeton and three from Penn State. It is also notable that whereas heretofore few speakers were invited from outside the area, there were so many after 1956 that we do not bother to single them out. Academic diversity amongst invited speakers is reflected in a different way, because three of them were high school teachers and nine held nonacademic affiliations at the time of their lecture. From the latter set, four came from Bell Labs and one each from the Bureau of Standards, General Motors, IBM, American Cyanamid, and the Department of Public Instruction. The last affiliation is reminiscent of the program at the organizational meeting in 1926 when the final speaker was J. A. Foberg, the State Director of Science and Mathematics for Pennsylvania.

Now we take a brief chronological tour of the lectures from 1956 to 1978. The first meeting in this period was taken up with four invited lectures, one of which was given by Edwin Moise of Harvard with the same title as the talk he delivered in 1964, "How to tell that a simple overhand knot is really knotted".

Two talks at the 1957 meeting by Albert W. Tucker (Princeton) and David Rosen (Swarthmore) discussed aspects of high school mathematics. Tucker reported on a list of recommendations made by the Commission of Mathematics of the College Entrance Examination Board, while Rosen described a course he had designed for, and taught to, teachers taking part in an NSF summer institute. Two years later the concern for the preparation of high school teachers arose again when Vincent Haag of Franklin & Marshall reported on the recent progress of SMSG and M. A. Linton, a teacher at the William Penn Charter School in Philadelphia, discussed "Liaison problems in collegiate mathematics today – With the high school". JoAnne Growney (Bloomsburg) wrote a two-page editorial in the section's fall 1978 newsletter addressing the issues that Linton raised 20 years earlier. The unusually long title of the editorial provides a good synopsis of its content: "QUESTION: How can colleges and universities enroll students with better mathematical preparation? ANSWER: Work with elementary and secondary schools to improve programs there."

Also at the 1957 meeting Penn's Bernard Epstein examined the undergraduate curriculum in his lecture, "College mathematics for the prospective graduate student". The fact that Epstein spoke on an educational theme, which differs markedly from the analytic functions he examined in invited lectures at annual meetings in 1950 and 1951, shows the extent to which deep concerns with educational issues had penetrated the local mathematical establishment.

Two of the three invited speakers at the 1961 meeting supplied viewpoints from industry. A. G. Grace recommended ALGOL 60 as a programming language appropriate for the undergraduate mathematics curriculum, while H. O. Pollak reported on recommendations from the CUPM Panel on Physical Sciences and Engineering.

In 1963 Cletus Oakley (Haverford) presented a history of the "revolution in mathematics" since 1955. Based on these developments the former section chair predicted, "College algebra and analytic geometry as college courses are on the way out. The first two years of college mathematics for most liberal arts students is, or will be very shortly, calculus and linear algebra. And sooner than you think, students will enter college with a solid year of high school calculus."

The 1964 meeting began with an Edwin Moise lecture bearing the same title as a talk he gave eight years earlier. Princeton probabilist William Feller followed Moise. He spoke on exactly the same topic as his 1955 talk – differential operators – only this time he gave an intrinsic characterization of second order differential operators on the line. Once again there was no mention of probability in the talk.

V. V. Latshaw's report from the 1965 meeting reads, "At the business meeting R. L. Wilder read the names of six charter members of MAA now affiliated with the Philadelphia Section." However, the report does not list the six names. An

examination of the MAA's list of charter members has turned up four who lived within the section's boundaries in 1965. Two resided in the area when they joined the MAA in 1915 – Joseph B. Reynolds and William M. Smith. In addition, George E. Raynor lived in the state of Washington, while Anna Pell (later Anna Pell Wheeler) lived in Massachusetts.

At the 1966 meeting Preston Hammer, the first head of the new computer science department at Penn State, lectured on a purely mathematical subject. Samuel Gulden of Lehigh, who took the audience on "A brief trip through the affine plane", followed him on the program.

The 1967 meeting began with the first of Herbert Wilf's four talks to the section. This time the Steele Prize recipient from Penn spoke on "Counting finite graphs". Two speakers who would later become section officers, James Brooks of Villanova and William Pervin of Drexel, followed him on the program.

The attendance of 165 at the 1968 meeting at Drexel smashed the previous record (115 at the 1954 meeting in Princeton) but the new record would be short lived – the 225 who attended the 1970 meeting at West Chester eclipsed it. The 1969 meeting at Swarthmore was also well attended (194), but it was the program that day that deserves mention. The morning session began with a lecture by Moore School topologist Gail Young titled "Topological methods in analysis". Next came Eric Wolman of Bell Labs who discussed applications in communication systems as "an application of topological methods". After the audience dined in Swarthmore's student center, the famous mathematician L. J. Mordell from Cambridge regaled the assembly with memories he titled "Reminiscences of an octogenarian mathematician".

The program at the 1970 meeting was typical of many that were held at the time. It started with a national figure discussing his specialty, this time Victor Klee on geometry. Then local favorite Albert Wilansky (Lehigh) answered the question, "What is an FK space?" The afternoon session consisted of two panel presentations. The first one, on the place of computers in the mathematics curriculum, featured two emerging section leaders, Gerald Porter of Penn and Carl Leinbach of Gettysburg.

One panelist at the 1972 meeting at Lebanon Valley College, Charles Hofmann of LaSalle, subsequently became the section's newsletter editor (along with his wife, Roseanne). A notable speaker at the that meeting was Haskell Curry, who had addressed the section 30 years earlier while on leave from Penn State at the Frankford Arsenal in Philadelphia. Curry's talk on the foundations of mathematics was the only lecture on this subject during the present 23-year period.

- **Haskell Brooks Curry** (1900-1982) was David Hilbert's last American student, receiving his Göttingen doctorate in 1930. He taught at his *alma mater*, Harvard, and at Princeton in the 1920s before accepting a position at Penn State in 1929. Except for World War II stints at the Frankford Arsenal (1942-1944), Applied Physics Lab (Johns Hopkins, 1944-1945), and Aberdeen Proving Ground (1945-1946), Curry spent the rest of his career at Penn State. In 1960 the University awarded him its prestigious Evan Pugh

Research Professorship, which he held until his retirement six years later. Instead of remaining in State College he moved to Amsterdam as director of the Institute for Foundational Research; he retired from that post in 1970.

Two of the invited speakers at the meeting in 1973 later played active roles in the section, Marialuisa McAllister (Moravian) and David Rosen (Swarthmore). A speaker of national reputation on the program was Martin Davis of New York University.

James England, then a Swarthmore mathematician and later a provost there and at Temple, opened the 1974 meeting at Swarthmore College. He was followed by two regular contributors to sectional activities, Herman Gluck (Penn) and Frederick Cunningham (Bryn Mawr). Doris Schattschneider (Moravian) showed her film at the end of the day. What a way to end a great program conducted entirely by local talent!

The 1976 meeting at Montgomery County Community College included two talks by section members whose affiliations reflect the academic (two-year institution) and geographic (northeast Pennsylvania) broadening of the section. The host school's Samuel Plotkin spoke about applications of group theory, though that topic might not be evident from his theatrical title, "The sound of music". The day began with a talk by John Koch of Wilkes College titled "The proof of the four color theorem".

Doris Schattschneider led off the 1977 meeting with a lecture on tiling. She was followed by Stephen Shatz (Penn), who spoke about algebraic curves. The afternoon concluded with a talk by William Thurston (Princeton) simply titled "Symmetry". That talk was delivered five years before Thurston received the Fields Medal.

The three speakers on the final program in the present period reflect the diversity of affiliations and topics seen at many sectional meetings. Dorothy Bernstein (Goucher College), the president-elect of the MAA, began the day with a lecture on applications. After lunch Chris Rorres (Drexel) also spoke about applications. In between the graph theorist Thomas Saaty presented an address titled, "Priorities, hierarchies, and behavioral systems". Saaty was affiliated with Penn's renowned Wharton School of Business.

Themes of Lectures

We end the chapter with a brief analysis of the mathematical classification of the lectures sponsored by the Philadelphia Section at annual meetings from 1956 to 1978. Although the leading choice of categories by the speakers during this period continued to be analysis, topology emerged as the leading contender. The present period also saw seven talks on applications and five on algebra. Because strict classification is impossible, the interested reader is urged to consult the *Monthly* reports listed in Table 1.

Analysis

No longer was the Penn School of Analysis responsible for the continued dominance of talks on analysis. In fact, Penn faculty gave only three of the 14 talks in this category. I. J. Schoenberg gave two – "Mass distributions on the circle and convex conformal maps" (1957) and "On spline interpolation" (1963). N. J. Fine gave the other, "Integrability of continuous functions" (1963). The most popular topic in analysis was differential equations, which was chosen by Solomon Lefschetz (in 1960), William Feller (1964), J. P. Diaz (1968), and Louis Nirenberg (1971).

Local speakers whose lectures mainly dealt with topics in analysis were Albert Wilansky, "On the Cauchy criterion for the convergence of an infinite series" (1956), G. A. Stengle, "Some asymptotic problems in analysis" (1962), Frederick Cunningham, "Arzela's theorem" (1963) and "In search of a modern understanding of differentials" (1974), and James England, "Bernoulli processes after the isomorphism theorem" (1974).

Curiously the 14 talks on analysis dealt neither with complex variables nor with numerical analysis.

Geometry/Topology

What caused the sudden upsurge of interest in topology? Two of the section's leaders were perhaps responsible – William Pervin and Albert Wilansky. Wilansky spoke twice (in 1963 and 1970), Pervin once (1967). Besides, three MAA officers, all prominent members of the R. L. Moore School of Topology at Texas, accepted invitations address the section: R. L. Bing, Raymond Wilder, and Gail Young. None dealt with the logical relations among axioms popularized by their famous mentor. Instead Bing's title was "Homogeneity," Wilder's "Intuition" (probably in algebraic geometry), and Young's "Topological methods in analysis". The section also heard Edwin Moise speak twice on knot theory. William Thurston delivered a notable lecture on topology titled simply "Symmetry".

Herman Gluck gave yet another notable lecture on topology in 1974, when he stated that Cauchy's rigidity problem was still open. Just four years later Gluck's Ph.D. student, Robert Connelly, then at Cornell, announced his solution of the problem. The paper containing the counterexample Connelly constructed was subsequently published in the *Journal of I.H.E.S.*

Herman R. Gluck had obtained his Ph.D. in 1961 at Princeton under the legendary Ralph Fox for a dissertation on embedding 2-spheres in 4-spheres. Recall that Fox had spoken to the section at annual meetings in 1945 and 1953. As of this year Gluck has supervised seven doctoral dissertations at Penn, where he has taught since 1966.

Five lectures on geometry combined with the 12 on topology make the geometry/topology classification the most popular. We already mentioned geometry talks by Samuel Gulden and Doris Schattschneider. Famous mathematicians delivered the remaining three lectures. A. S. Besicovitch, known

for his negative answer to the Kakeya conjecture, spoke on a related topic in his 1959 talk, "Some extremal problems in geometry". Initially he had selected a different subject, as suggested by the title he first submitted, "Sharpening Lebesque theorems on differentiation", but he must have changed his mind in the days leading up to the meeting. It does not seem to be well known that Besicovitch directed a Ph.D. dissertation at Penn in 1962. In 1970 Washington's Victor Klee discussed "Some unsolved problems from intuitive geometry," and one year later Rafael Artzy viewed "Analytic geometry stripped of all but incidence". Artzy was then at Temple University, but in 1976 he became the department head at the University of Haifa in Israel.

Algebra/Number Theory

Eight addresses in the category of algebra/number theory were delivered, and all six in algebra dealt with mainstream topics. We already mentioned Samuel Plotkin's 1976 talk on applications of group theory to music and Stephen Shatz's 1977 talk on algebraic curves. The four other talks on algebra were M. O. Rabin (1956), "Impossibility of computational algorithms for group-theoretic problems"; J. C. Moore (1966), "Some aspects of homological algebra – Background and recent developments"; James Brooks (1967), "Equivalence of matrices and modules over Dedekind domains"; and Charles Curtis (1968), "Characters of finite groups". The two talks on number theory were Peter Scherk (1956), "Integers," and Hans Rademacher (1961), "Gaussian polynomials and pentagonal numbers". Rademacher's talk was the last of four that he gave to the section.

Applications

Chapter 5 noted that many of the lectures on applications from 1942-1955 were delivered during World War II. In the period 1956-1978, however, there was a much wider range of applications, and not one was war-related. The first, titled "Mathematical models in the biological sciences," was given in 1971 by Willard Baxter, who played a key role in developing the excellent program in applied mathematics at the University of Delaware. Two years later A. J. Goldman, Chief of Operations Research at the National Bureau of Standards (now NIST, the National Institute of Standards and Technology), spoke on "Some mathematical operations research in government". The 1976 meeting featured two talks on applications, Nelson Max, "Catastrophe theory and its applications," and Jane Cronin, whose lecture carried the intriguing title, "Mathematical aspects of periodic catatonic schizophrenia". The following year Steve Rohde, of General Motors Research Laboratories, drove home several points in his lecture, "Some mathematical aspects in the design of automotive components". In 1977 Rohde received the Newkirk Award from American Society of Mechanical Engineers for his contributions to tribology (the study of friction, wear, and lubrication). We already mentioned Dorothy Bernstein's 1978 lecture, "The role of applications in pure mathematics". That same year Chris

Rorres presented a lecture titled “The application of linear programming to the optimal harvesting of a renewable resource”.

Combinatorics/Graph Theory

A new interest in the section surfaced during this period – combinatorics/ graph theory. Not surprisingly, Herbert Wilf fanned this interest with his 1967 lecture “Counting finite graphs”. Wilf delivered another talk from this field eight years later, “How to choose *k* out of *n*”. In 1972 Roger Entringer traveled from New Mexico to discuss “Open problems in combinatorial analysis and graph theory”. Earlier we mentioned the two remaining talks in graph theory – John Koch (1976), “The proof of the four color theorem,” and Thomas Saaty (1978), “Priorities, hierarchies, and behavioral systems”.

Probability/Statistics

As usual, only a few talks were dedicated to probability or statistics. Three were given in this period: Stuart Hunter (1957), “Experimental statistics – Some of the concepts and mathematical requirements,” R. D. Luce (1959), “Probabilistic models in psychology for the study of choice behavior,” and Bennett Eisenberg (1975), “Uniformly distributed sequences, stationary processes and the ergodic theorem”.

Miscellaneous

Five of the lectures do not fit into any category yet are deserving of mention because they celebrated mathematics for its own sake. Three were delivered at the 1963 meeting: C. K. Brown, “The search for delightful results,” Marguerite Lehr, “A little mathematics of the multiplication table variety,” and Pincus Schub, “Some mathematical crumbs”. Lehr’s lecture was the fourth she gave to the section, 31 years after her initial talk in 1932. She also spoke in 1944 and 1954. We already mentioned Mordell’s 1969 talk titled “Reminiscences”. We end with the delightful title of a lecture delivered in 1971 by longtime MAA Executive Director Alfred B. Willcox, “England was lost on the playing fields of Eton: A parable for mathematics”.

Overall, this discussion shows that most of the activities that took place at annual meetings from 1956 to 1978 centered on educational issues, as evidenced by both panel discussions and invited lectures. Among the invited lectures, the categories of analysis and topology/geometry garnered the greatest number of speakers, although an increasing number were concerned with algebra, applications, and combinatorics/graph theory. Talks in algebra considered mainstream topics for the first time, while the applications were varied and unrelated to war projects.

Profile: WILLARD ELLIS BAXTER

Willard E. Baxter was born on December 14, 1929, in Chester, PA. He obtained his bachelors degree from Ursinus College in 1951 and an M.S. from the University of Wisconsin the following year. He then enrolled in the graduate program at the University of Pennsylvania, leading to a Ph.D. in 1956 for a dissertation on ring theory written under the algebraist I. N. Herstein.

Upon graduation Baxter taught at Ohio University for two years before accepting a position as assistant professor at the University of Delaware in 1958. He remained at Delaware until his retirement in 1994. In 1970 he succeeded Russell Remage as chair of the department.

Baxter was elected chair of the Philadelphia Section in 1968 for the first of two consecutive terms. He remained as chair of his department even longer, five years. During that time Baxter served as the section's governor from 1971 to 1974. He has been one of the most active members of the section, being elected to the Executive Committee in 1967, being a panel member in 1970, accepting an invitation to speak in 1971, serving as secretary-treasurer from 1976 to 1982, and reminiscing about the history of the section at the luncheon held during the annual fall meeting at Delaware in 1990. (The text of Baxter's address is reproduced in Appendix 2.)

In 1984 the national MAA instituted an award "for service to the MAA at the national level or for service to a Section of the Association". Honorees are recognized annually at the January meeting of the Association. Will Baxter was the first recipient from our section, being awarded the Certificate of Meritorious Service in 1986. We quote the MAA citation in its entirety:

CERTIFICATE OF MERITORIUS SERVICE

The Eastern Pennsylvania and Delaware Section of the Mathematical Association of America is pleased to nominate Professor Willard E. Baxter as the section's first recipient of the MAA certificate of meritorious service. The section gratefully recognizes the many contributions Will has made not only to the MAA but to the wider mathematical community of researchers, teachers and students, both in high school and universities.

A student of I. N. Herstein, Will Baxter received his Ph.D. from the university of Pennsylvania in 1956. Known as a fine research algebraist, he has been on the mathematics faculty at the University of Delaware for 28 years, and served as department chairman 1970-75.

For over thirty years, Will has been an active participant in MAA activities. He has served the EPADEL section in every possible capacity: as a member of the Section Executive Committee 1967-69, as Section Chairman 1969-71, as Section Governor 1971-74, and as Section Secretary-Treasurer 1976-82. An enthusiastic and popular lecturer, he has given invited addresses at two section meetings. Mindful that Delaware is not a suburb of Philadelphia, he was

instrumental in having the section name (formerly “Philadelphia Section”) changed to its present geographically descriptive form. Throughout his years as officer of the section, Will was the person to turn to when a difficult task had to be done, and was a primary source of guidance for section activities and policy matters.

Will’s enthusiasm for and encouragement of young mathematical talent is evidenced by his long and continuing involvement as regional coordinator of the annual American High School Mathematics Examination and as director of the Delaware Junior Science and Humanities Symposium. He has also had a fruitful association with in-service training of teachers of mathematics, and is currently involved in materials development for high schools. His concern for the teaching of service calculus courses, coupled with his interest in mathematical modeling produced a pioneering book, co-authored with Clifford W. Sloyer which combined probability with calculus and was intended for students in the biological and managerial sciences.

All of these activities have contributed to the life and health of the mathematical community. For his many years of dedication and service, we are pleased to honor Will Baxter with this award.

Profile: ANNA MARGUERITE MARIE LEHR (1898-1987)

We have met Marguerite Lehr in every chapter but the first. Who is this woman who received her Bryn Mawr Ph.D. under Charlotte Angas Scott in 1925 (Chapter 2), who delivered four invited addresses to the Philadelphia Section – in 1932 (Chapter 3), in 1944 (Chapter 5; on aerial photography), in 1954 (Chapter 5; on a TV series), and in 1963 (this chapter) – and who was elected chair of the section in 1955, the first woman to hold this office since Anna Pell Wheeler in 1943?

Marguerite Lehr was born in Baltimore, Maryland, on October 22, 1898. Her father was a grocer. Marguerite was the only one of five children to attend college. While a student at Goucher College, she gave a talk to the mathematics club titled "Geometry of four dimensions". She graduated from Goucher in 1919 with a B.A. degree in mathematics.

Lehr planned to remain in Baltimore, at Johns Hopkins, for graduate work. However, a job offer as a Reader for Charlotte Angas Scott caused her to change her mind, so she enrolled at Bryn Mawr instead. This position required Lehr to answer questions in Scott's classes and to hold office hours for her. (Scott was completely deaf by then.) In addition to Scott, Lehr studied mathematics at Bryn Mawr under Anna Pell Wheeler and W. B. Huff. Indeed, Lehr can be seen as continuing the tradition of mathematical excellence at Bryn Mawr, as the following dates suggest:

Charlotte Angas Scott (1858-1931)
Anna Pell Wheeler (1883-1966)
Marguerite Lehr (1898-1987)

Lehr ended up as Scott's last Ph.D. student when she received her degree in mathematics and physics in 1925. Her dissertation, "The plane quintic with five cusps," appeared in the *American Journal of Mathematics* in 1927. Almost 50 years later Lehr wrote a biography of her beloved mentor for the book *Notable American Women, 1607-1950* (pp. 249-250).

Bryn Mawr awarded its Thomas Fellowship to Lehr in 1920, but she did not use it to travel abroad until 1923. That year she combined it with an AAUW fellowship to study algebraic geometry with the Italian geometers at the University of Rome.

Lehr returned to Bryn Mawr in 1924 and accepted an instructorship in mathematics. She remained there for the rest of her professional career. During this time she took study leaves at Johns Hopkins (1931-1932), the Poincaré Institute in Paris (1949-1950), and Princeton (1956-1957). She also taught in the war-training program at Swarthmore College in 1944.

One of Lehr's main interests was the use of television for teaching mathematics. This was first seen when she conducted a series of television shows from October 1953 to January 1954. Titled "Invitation to mathematics," the series was shown on Channel 6, WFIL, one of Philadelphia's three major network stations, as part of the program called "University of the Air". Lehr's

aim was "to show the average viewer the intention of mathematics, the mathematization drive, as a natural and power aid toward ordering our experience". She prepared a course syllabus of abstracts and readings that the TV station circulated for twenty-five cents! The first topic – regular shapes via tiles – brings to mind a topic favored by Doris Schattschneider, who is profiled below.

The 1950s was a time of live TV so all of Lehr's lectures were delivered without any re-takes! She summarized her experiences in two articles. Her paper, "An experiment with television," appeared in the January 1955 issue of the *Monthly*. In addition she wrote an article in the fall 1956 issue of the *Goucher Alumnae Quarterly* with the cute title, "Of dice and men".

Lehr became known as one of the experts in the use of this new medium. In 1957 NBC hired her as a consultant for a TV series on mathematics whose guests included Emil Artin, H. M. S. Coxeter, Saunders Mac Lane, William Feller, and Richard Courant. She was also appointed to the MAA's Committee on Instructional Films, which produced a series of films to reach teachers and students who had no access to creative mathematicians. The Committee's report was published in the June/July 1958 issue of the *Monthly*.

Lehr was appointed one of the MAA's visiting lectures for 1958-1959. Other visiting lecturers that year were Tom Apostol, John Kelley, Lynn Loomis, S. S. Wilks, and S. Ulam. Impressive company! During the year Lehr accepted invitations to speak in New England, northern New York, Ohio, Kansas, Iowa, and Minnesota.

Marguerite Lehr retired from Bryn Mawr College in 1967. Upon her retirement she received a prestigious Lindback Award "in recognition of her brilliance as a teacher, for which generations of students will remember her."

In addition to the publication of her dissertation in 1927, Lehr published two more papers in the *American Journal* – one in 1931 with Virgil Snyder of Cornell on involutions of infinite discontinuous Cremona subgroups of S_4 and the other in 1932 on singularities of curves. After World War II her primary mathematical interest shifted to probability theory and its applications.

Profile: DORIS JEAN SCHATTSCHNEIDER

Doris Schattschneider is one of the EPADEL's most decorated members. Born in New York City to Robert and Charlotte (Ingalls) Wood, she took her undergraduate degree in 1961 from the University of Rochester. She then enrolled in the graduate program at Yale. One year later she married David E. Schattschneider. The newlyweds moved to Northwestern that year because David had won a Danforth internship there, so Doris spent the 1962-1963 academic year as a graduate student there as well. At the end of the year she received an M.A. degree from Yale. When David next moved to Chicago to embark on his Ph.D. program, Doris called Ralph Boas to ask if there were any openings. She recalled, "Two days later he phoned me to say I had a job as instructor." So Doris taught at Northwestern for the 1964-1965 academic year before moving to the nearby University of Illinois at Chicago campus, where she taught until 1968.

With impressive tenacity, Doris continued her own doctoral program at Yale. Although Ichiro Satake (University of Chicago) mentored her, and gave her the research problem she solved to complete her dissertation when she ran up against a stone wall with the original problem, the official Yale advisor for her 1966 degree is T. Tamagawa. The title of her dissertation, "Restricted roots of a semi-simple algebraic group", contains no hint of her future expertise in geometry.

Schattschneider accepted a professorship at Moravian College in 1968 and she has remained at the Bethlehem school ever since, serving two stints as chair of the department, 1971-1974 and 1985-1991. Her initial involvement with the Philadelphia Section came at the annual meeting in 1974 when she presented the film she had produced with the captivating title, "Rotating polyhedral forms: M. C. Escher with a twist". She was elected vice-chair of the section in each of the next two years (1975-1977) and elected chair the following two years (1977-1979). She also presented an invited lecture at the 1977 annual meeting titled, "Tiling the plane with pentagons: A perplexing problem". An excellent speaker, in 1988 she became the first woman to deliver Pi Mu Epsilon's J. Sutherland Frame Lecture.

Moreover, in 1995 Schattschneider was selected to present the MAA's prestigious Hedrick Lectures. Named for the first president of the MAA, these lectures were established in 1952 to be delivered by a mathematician "of known skill as an expositor of mathematics who will present a series of at most three lectures accessible to a large fraction of those who teach college mathematics". Only two other section officers, John Oxtoby (in 1956) and Nathan Fine (1966), have delivered Hedrick lectures. However, several of our section's invited speakers did: Paul R. Halmos (1953), William Feller (1959), R. H. Bing (1961), Hans Rademacher (1963), George E. Andrews (1980), John Conway (1991), and Ronald Graham (1994).

Schattschneider has also been an active participant in the national MAA. She was the first woman editor of *Mathematics Magazine* (1981-1985), served as a governor from 1981 to 1989, and was elected vice-president from 1994 to 1996. In addition, she was a councilor for Pi Mu Epsilon from 1990 to 1996. Her

activity has garnered her several awards, including the 1979 Allendoerfer Award for her paper "Tiling the plane with congruent pentagons," which appeared in *Mathematics Magazine* the previous year. She was also awarded a Certificate of Meritorious Service by the MAA in 1991. In the year 2000, Gerald Porter and she were awarded certificates of appreciation for their role "in the installation of a very special tiling in the front lobby area" of the MAA headquarters. Finally, she won the MAA's initial Haimo Award for Distinguished College or University Teaching of Mathematics in 1993. Only two other members of our section have won this award, Herbert S. Wilf in 1996 and Rhonda Hughes in 1998.

Doris Schattschneider has written numerous works that have been popular and positively reviewed. In 1979, she wrote the book (with L. F. Baker), *The Perceptive Eye: Art and Mathematics*, which was based on a special exhibit held at the Allentown Art Museum in the spring of that year. Schattschneider was a curator of this exhibit! An especially successful book titled *M. C. Escher Kaleidocycles*, written with Wallace Walker, appeared in different versions in 1977, 1982, and 1987. From 1986 to 1991 she was the senior associate and "geometer" of the Visual Geometry Project, directed by Gene Klotz and funded by the NSF. This project produced videos and activity books on polyhedra and symmetry; it now offers the popular software program called *The Geometer's Sketchpad*.

Schattschneider's most famous work might be her 1990 book *Visions of Symmetry: Notebooks, Periodic Drawings, and Related Work of M. C. Escher*. With funding from FIPSE, she joined Dennis Ebersole, Alicia Sevilla, and Kay Somers in developing and disseminating a course that integrates precalculus review with the first course in calculus; this project produced the 1995 text *A Companion to Calculus*. Schattschneider returned to the mix of art and mathematics in 1996 while serving as a "talking head" to explain Escher's tessellations on the CD Rom *Escher Interactive: Exploring the Art of the Infinite*. More recently she was an editor for the 1997 MAA book *Geometry Turned On*. In that same year she was interviewed live for a radio program in honor of the Canadian geometer H. S. M. Coxeter; a cassette from the program is available in the Reeves Library at Moravian. Her current project is editing a book of 40 articles that resulted from the 1998 Escher Centennial Congress in Rome.

Profile: ALBERT WILANSKY

Albert Wilansky has been one of the most active members of the Philadelphia/EPADEL Section. Born in 1921 in St. Johns, Newfoundland, Wilansky remained in Canada for his undergraduate education, his first degree being an M.A. from Dalhousie University in 1944. He then enrolled in the graduate program at Brown University and received his Ph.D. under C. R. Adams three years later for a dissertation titled, "Application of Banach linear functionals to summability".

Wilansky is mostly known as "Tommy". The origin of this name is obscure; his family thinks it is due to the name of the doctor who delivered him. In 1947 Tommy Wilansky married Ruth Leah Paton, whom he had met at Dalhousie University. They had two daughters, Eleanor and Laura. His daughter Eleanor Myers is a professor at the Temple University School of Law who received a Lindback Award for Distinguished Teaching in 2001.

Wilansky came to Lehigh in 1948 and has remained there ever since, retiring officially in 1992. He was the university's Distinguished Professor of Mathematics for the final 14 years of his tenure. During his 44 years at Lehigh he was a Fulbright visiting professor several times, at universities in Reading (1972-1973), London (1973), Tel Aviv (1981), and Berne (1981). Outside of academia he was a consultant for the Frankford Arsenal for the year 1957-1958.

Wilansky published numerous papers in analysis (especially summability), linear topological spaces, Banach algebras, and functional analysis. He is also the author of several books in these fields. His first, *Functional Analysis*, appeared in 1964. Three years later a book based on lecture notes from a graduate course he offered, *Topics in Functional Analysis*, was published by one of his doctoral students, William D. Laverell. Wilansky's *Topology for Analysis* was first published in 1970; the second edition appeared in 1983. His *Modern Methods in Topological Vector Spaces* appeared in 1978. A manuscript stored in the library at Lehigh indicates that the intended title of this work was going to be *Topological Vector Spaces*. As the author stated, "It will continue to say 'Modern' forever." Wilansky's last book appeared in 1984, *Summability Through Functional Analysis*.

In addition to this prodigious output, Albert Wilansky directed 20 doctoral dissertations between 1958 and 1980, an average of almost one a year. Two of his students, James Crawford (Lafayette) and Peter Jessup (Ursinus), have also been active members of this section, a wonderful gift handed down from their mentor.

Wilansky has been active in sectional affairs in various ways. For one, he served as chair of the section for 1956-1957. For another, he holds the record for delivering the most invited lectures to the section, five, over a span of 34 years (1950, 1956, 1963, 1970, and 1983). In 1969 the MAA presented him its prestigious Ford Award for a paper he published in *Mathematics Magazine.* Today these awards recognize authors of articles of expository excellence published in the *Monthly*, but up to 1976 articles could have been published in

Mathematics Magazine as well. Since then, the Allendoerfer Awards – named after another EPADEL leader – recognize outstanding papers written in the latter journal.

In 1969, after the death of his first wife, Wilansky married Rose Kutler, and together they raised her three children – Kathy, Leslie and Carole. All three live close to Bethlehem, where he currently resides. Since Wilansky's retirement in 1992, he has been deeply involved in the lives of his eight grandchildren, and has maintained an active worldwide correspondence with many children of his five brothers and sisters.

Chapter 7: EPADEL, 1979-2000

Chapter 6 described the period of transition in which the local section of the MAA evolved from the Philadelphia Section to EPADEL, the Eastern Pennsylvania and Delaware Section. The name change that officially took place in 1979 was more than cosmetic because it reflected a geographic reality that existed since the formation of the New Jersey Section in 1956. Nonetheless, the section lost the distinction of being the only one named after a city. We have seen that from 1956 to 1978 the character of the section changed from one devoted almost exclusively to the development of mathematics to one that sponsored a variety of activities on pedagogical and curricular themes.

This chapter discusses the modern phase of the section, from the time its name change was approved on January 2, 1979, up to the dawn of the third millennium. The chapter begins with an examination of the annual meetings held during the 22-year period. No attempt is made to analyze attendance figures because they were reported only sporadically.

The next part of the chapter describes the major sectional initiatives carried out during this period. Unlike before, the account is not based on secretaries' reports from the *Monthly* because at first the reports merely listed elected officers and invited lectures, but then those reports disappeared from the *Monthly* altogether. Instead, the account here is mostly gleaned from files archived in the section's records and from newsletters. Even though the range of sectional activities broadened initially, our brief chronicle provides evidence of a membership strongly committed to numerous and diverse initiatives. We describe these activities in four broad categories: *students* (student paper competitions, student chapters, visiting lecture series), *professional development* (Special Interest Groups, MAA representatives/liaisons, promotion of the cause of female mathematicians, promotion of the cause of underrepresented groups, Project NExT, a professional chapter), *education* (workshops, distinguished teaching award, contributed papers), and *public policy* (public information officers, newspaper articles).

The account of sectional activities is followed by a brief look at leaders who shaped those activities over the past 22 years. We provide brief sketches of all presidents, secretary-treasurers, and governors, as well as a few other selected individuals who contributed in vital ways. One president, Marvin Brubaker, is profiled at the end of the chapter to honor his many contributions to the section and the national MAA. We also analyze the academic affiliations of the elected officers. Although we examine membership on the Executive Committee, we provide sketches of only two members who were not elected to other positions of leadership.

The last part of the chapter analyzes the programs from meetings held at the annual fall meetings during the EPADEL period. The chapter ends with a categorical analysis of the content of the invited lectures. Chapter 8 analyzes spring meetings held during this period.

Annual Meetings

Table 1 provides an overview of EPADEL's 22 annual fall meetings held from 1979 to 2000. Unlike the analogous tables in earlier chapters, there is no column providing references to the official annual reports from the *Monthly* because of changes that took place in the journal. Starting in 1981, section reports were moved from a *Monthly* column called "Mathematical Association of America" to a new Center Section of the journal. But that policy lasted only four years. In 1986 the Center Section no longer carried section reports, only telegraphic reviews. Even the Center Section disappeared the next year. In short, section reports were not made public after 1985. The interested reader might consult the *Monthly* for reports on meetings held from 1979 to 1984, yet we hasten to add that these reports listed only elected officers and invited addresses. To compound matters, the report of the 1979 meeting at Drexel appears twice, the one from the 1978 meeting never appeared at all, and the journal's index is unreliable. Even attendance was reported sporadically, often carrying the qualifier "approximately", although in general, attendance figures were in line with those reported from meetings held in the 1970s.

From the founding of the section in 1926 until 1962 all annual meetings were held on the Saturday *after* Thanksgiving. The resulting shift to the Saturday *before* Thanksgiving in 1963 caused a dramatic increase in attendance. As Table 1 indicates, this tradition changed in 1989, when an earlier date was established. The present policy of holding annual fall meetings on the first Saturday in November has been in effect for every meeting since 1994, except for the 1996 gathering at Delaware State University.

One other fall meeting was held in October, but it is not included in Table 1 because it was not the annual fall meeting. On October 13, 1990, the section sponsored a special program at the Community College of Philadelphia. We will discuss this meeting later in the context of other sectional activities.

The dates in Table 1 obscure one other attempt the section made to accommodate its members. The meeting at Drexel on November 23, 1986, was held on a Sunday at the request of several Jewish members who were unable to attend meetings held on Saturdays. Minutes from the Executive Committee meeting the following February state, "The attendance (145) was satisfactory and members do not in general oppose having Sunday meetings in the future."

The second column in Table 1 lists the locations of the 22 annual fall meetings, which were held at 17 different institutions. Drexel University and the Penn State campus in Montgomery County (which underwent a name change recently) hosted three meetings each. Since the section's founding in 1926, Drexel has hosted seven fall meetings, with at least one in each decade since the first one in 1953. (The meeting held there in 1991 coincided with the university's 100^{th} anniversary.) It is a completely different story for the Penn State campus, formerly Ogontz, now Abington. The section only met there in the present period, and one person deserves the lion's share of the credit. (The meeting there

in 2000 coincided with the branch campus's 50th anniversary. Those who attended were given commemorative T-shirts.)

Date	Location
November 17, 1979	Drexel University
November 22, 1980	University of Delaware
November 21, 1981	Villanova University
November 20, 1982	West Chester University
November 19, 1983	Bryn Mawr College
November 17, 1984	Swarthmore College
November 23, 1985	Temple University
November 23, 1986	Drexel University
November 21, 1987	Franklin & Marshall College
November 19, 1988	Penn State – Ogontz
November 4, 1989	Millersville University
November 10, 1990	University of Delaware
November 9, 1991	Drexel University
November 14, 1992	Muhlenberg College
November 13, 1993	Cedar Crest College
November 5, 1994	Montgomery County Community College
November 4, 1995	Penn State – Ogontz
October 26, 1996	Delaware State University
November 1, 1997	University of Pennsylvania
November 7, 1998	Lehigh University
November 6, 1999	Elizabethtown College
November 4, 2000	Penn State – Abington

Table 1

- **Ayoub Barsoum Ayoub** was born in Cairo, Egypt, where he received his B.Sc. in 1951 at Ain-Shams University. He taught high-school mathematics in Cairo from 1951 to 1955, when he accepted an instructorship at his *alma mater*. He came to the U.S. in 1975 and enrolled in the graduate program at Temple University, receiving an M.A. in 1977 and a Ph.D. in 1980. His dissertation on units in prime cyclotomic fields was written under the supervision of sectional governor Emil Grosswald. Upon graduation, Ayoub returned to Ain-Shams for two years, directing one masters thesis while there. A naturalized citizen, he returned to the U.S. as a visiting professor at Temple. He has been at the Penn State - Abington since 1983, serving as coordinator of the mathematics program 1991-1993. He has won several teaching prizes, including Penn State's Atherton Award for Excellence in Teaching in 1990. Conversely, he endowed the Student Mathematics

Achievement Award on the Penn State campus. Ayoub served on EPADEL's Executive Committee 1991-1994 and headed up the section's Undergraduate Paper Competition 1993-1997.

The only other institution that was the site for more than one meeting in the 22-year period is the University of Delaware, which hosted meetings in 1980 and 1990. This makes five times in the history of the section that an annual fall meeting was held in Newark. The 1990 meeting was historic; over lunch, Willard Baxter presented a short history of the section. Besides, the day began with a welcome by university president, and former mathematics professor, David P. Roselle, yet another instance of Delaware mathematicians holding top administrative positions. Recall from Chapter 3 that G. A. Harter, Delaware president 1896-1914, was an active member of the section from its inception in 1926.

That leaves 14 different institutions that hosted the remaining 14 meetings, a reflection of the broadening of active participation throughout the section. It is notable that the two institutions that had dominated the sites of earlier meetings, the University of Pennsylvania and Lehigh University, hosted consecutive meetings toward the end of the EPADEL period after long interludes. The 1997 meeting at Penn was the first held there in 42 years, while the 1998 meeting at Lehigh was the first in 40.

Overall, Penn has hosted 16 fall meetings, the most of any institution in the section. Next comes Drexel with seven, followed by Lehigh and Swarthmore with six each, including the meeting at Swarthmore College in 1984.

Now we provide information on the remaining 12 institutions that hosted one meeting during the EPADEL period. The 1982 meeting at West Chester University and the 1987 meeting at Franklin & Marshall College were the third hosted by each institution; West Chester hosted earlier meetings in 1965 and 1970, while F&M hosted meetings in 1962 and 1975. Five schools hosted their second meeting: Villanova University in 1981 (the first was in 1966), Bryn Mawr College in 1983 (1947), Millersville University in 1989 (1978), Muhlenberg College in 1992 (1956), and Montgomery County Community College in 1994 (1976). The four remaining meetings were held at institutions hosting a fall meeting for the only time in the section's history: Temple University in 1985, Cedar Crest College in 1993, Delaware State University in 1996, and, to celebrate the school's 100th anniversary, Elizabethtown College in 1999. The meeting at Delaware State marked the only time the section met at one of its three historically black institutions; none has been held at Lincoln University or Cheyney University so far.

All data here refer to annual fall meetings. The section began to sponsor annual spring meetings in 1976 but we consider them separately in the next chapter. Also, the Community College of Philadelphia hosted a meeting in October 1990 but it was a special meeting, not the annual meeting. CCP thus became the second community college to host a meeting sponsored by the section.

Activities

The broadening of sectional activities that began in the period of expansion, 1956-1978, intensified and widened even further during the EPADEL years. As usual, the program of invited lectures provided the centerpiece for the section's activities, but several endeavors that had been initiated in the period of expansion were continued while several new ones emerged. President Nancy Hagelgans summarized the section's underlying twin goals in her 1993 message reviewing ten years of volunteer service: "These meetings were designed for faculty members to further undergraduate mathematics education and to provide interesting mathematical talks."

We begin our look at sectional activities from 1979 to 2000 by discussing the major ways in which the membership furthered the cause of undergraduate education. In one of her two governor's messages from 1996, Hagelgans noted that the MAA's mission was served by its Web site in four different areas: education, professional development, students, and public policy. These four areas provide a useful tool for summarizing all sectional activities.

Students

In 1986 Anthony Hughes (then at Villanova) announced the initiation of a new sectional activity aimed at involving more undergraduate students in its programs. He wrote, "EPADEL is sponsoring a Student Paper Competition. Undergraduates are invited to submit papers in any area of the mathematical sciences. Winners will receive a one-year membership in the MAA." There was no further mention of the competition until 1990, when Richard Grassl (Muhlenberg) took over. Grassl announced that the prize was raised to $100, an amount that would remain constant until 1998, when it was doubled. Six years earlier the name of the competition was changed to the Student Mathematical Papers Prize Competition, which it remains today. There have been four subsequent directors of the program: Nancy Hagelgans of Ursinus (1991), Walter Stromquist (Daniel Wagner's) (1992-1993), and two members from Penn State – Abington: Ayoub Ayoub (1994-1997) and Lothar Redlin (1997-2000). Winners of the competition have been announced sporadically in the newsletters.

In January 1989 the national MAA inaugurated a program of student chapters that has proved to be immensely successful in our section. The official notification read, "The Board of Governors of the MAA has approved a plan to develop Student Chapters for the purpose of attracting students to careers in the mathematical sciences. MAA Student Chapters will be formed at individual institutions, and the members of the Student Chapters will be regarded as members of the MAA section associated with their institution." The MAA envisaged chapter activities to include films, speakers, mini-courses, and career information. Our section served as a model for others right from the start. No wonder – the national coordinator of the program was Howard Anton (then at Drexel), the former EPADEL president.

The first coordinator of EPADEL Student Chapters was Nancy Baxter (Dickinson College), who initially found our section's response to Anton's call

discouraging. After a few months in office she pleaded with the membership, "It's time to organize an MAA Student Chapter at your institution! … At this point only one school in the EPADEL section has requested application materials from the MAA office." Baxter did not identify that school, though she suspects it was Kutztown. In a private correspondence, she wrote, "Deb Frantz was so gung-ho that I passed the torch to her. She was excited and enthusiastic. She organized the first student paper sessions and brought her students to the meetings – she set a great example for the rest of us to follow."

Although Kutztown's indefatigable Deborah Frantz became the EPADEL coordinator one year later, she recalls that Albright was the first school to request information from Baxter. Nonetheless, the new coordinator was soon boasting that our section sponsored 10 of the 160 nationwide sections. (EPADEL is the 13th largest of the 29 sections.) Moreover, Frantz manned a student-chapters table at our section's spring 1990 meeting and arranged for a program of 10-minute talks to run in a parallel session in the afternoon. When asked how she became involved in student chapters, she replied, "In the spring of 1990 the national MAA Committee on Student Chapters was in its infancy and I got a call from then-chair Howard Anton asking if I'd be willing to write a newsletter for the newly-created Student Chapters. The idea was that I'd write a first issue and then serve as editor of the newsletter once things caught on. As newsletter 'editor', I served on the National MAA Committee on Student Chapters for about seven years. This entailed not only the compilation of newsletters twice each year, but also attending the National Joint Meetings and helping to develop the newly-created Student Chapters."

Clearly EPADEL student chapters were in enthusiastic and energetic hands. The number of chapters in the section grew to 20 in 1991 and leveled out at 24 by 1996. Throughout the 1990s students were kept abreast of competitions (Putnam, Modeling, and Problem-Solving in addition to our own section's contest), opportunities for involvement at the two annual MAA meetings, Pi Mu Epsilon meetings, the magazine *Math Horizons*, and the NSF program in Research Experiences for Undergraduates. In addition to these activities, Deb Frantz initiated a series of biennial conferences called "Careers in Mathematics", which have met at Kutztown (in 1991), Lebanon Valley (1993), Messiah (1995), Millersville (1997), and East Stroudsburg (1999). Those conferences garnered national interest as early as 1991. EPADEL President David Hill wrote, "The 'Careers in Mathematics' student conference coordinated by Deborah Frantz was an outstanding success and generated national interest." Inspired by the success of this endeavor, Douglas Ensley initiated a series of annual Student Mathematics Conferences at his home institution, Shippensburg, in 1996. After a decade of excellent leadership, Frantz handed the mantle of leadership to Alicia Sevilla (Moravian) in the year 2000.

- **Deborah A. Frantz** is a native of Reading, PA. She earned a B.S. degree in mathematics and computer science (with teacher certification in mathematics) at Saint Joseph's College (Rensselaer, IN) in 1977. Then she entered the graduate program at Lehigh, earning an M.S. in 1981 and a

Ph.D. three years later. Her dissertation on summability methods, probability distributions, and linear operators was written under EPADEL governor Jerry King. Frantz spent the year 1981-1982 as a visiting instructor at Moravian. Upon receiving her doctorate she accepted an assistant professorship at Western Kentucky, where she stayed for two years. She then returned to Lehigh, spending the year 1986-1987 as an adjunct assistant professor. In 1987 she moved to Kutztown University, where she has remained since then.

As noted in Chapter 6, student talks made their way onto the program for the first time in 1962 but they occurred only irregularly after that. However, these student talks became a staple at both the fall and spring meetings under Deb Frantz and they have continued under Linda Thiel (Ursinus and SIAM), who assumed the coordinator position for student talks in 1995.

The program of visiting lecturers has run continuously since it was directed by Jerry King (Lehigh) in 1974. Within two years King produced a list of 20 members who agreed to speak at nearby schools. He was succeeded by Charles G. Denlinger (Millersville). By 1979 the program had a new chairperson, Bruce Babcock (Penn State – York) and a formal name, the Visiting Lecture Program. Three years later there was a new chairperson, Marialuisa McAllister (Moravian), and a slightly expanded name, Visiting Lecturer and Consultant Program. In her call for additional members McAllister wrote that she was looking for volunteers who "have interesting topics or special expertise to share with colleagues within the section (either as a lecturer or as a consultant) and are willing to forgo the usual honoraria." She noted too that the Program was aimed to complement the national MAA Program of Visiting Lecturers and Consultants on a regional scale. The Newsletter for the annual fall meeting in 1983 is almost entirely taken up with the complete list of speakers in the Program, some 16 in all. Chairpersons who succeeded McAllister (with the year of first mention in the sectional newsletter) are JoAnne Growney of Bloomsburg (1986), Nancy Hagelgans of Ursinus (1987), Growney again (1990), Louise Berard of Wilkes (1992), and Douglas Ensley of Shippensburg (1995). Berard reported 23 members on her list in 1994 and Ensley increased that total to 25 in 1996.

An activity of a different type occurred at the luncheon during the annual 1993 meeting when JoAnne Growney gave a public reading titled "Mathematics in poetry". This endeavor reflected a humanistic approach to mathematics that was beginning to take hold nationally at that time.

Professional Development

The idea to form Special Interest Groups (SIGs) appeared for the first time at the annual fall meeting in 1980 when forms were distributed for members to declare their areas of special interest. By the next spring meeting Marialuisa McAllister declared, "EPADEL proudly announces the birth of its first SIG – Mathematical modeling and applications in mathematics." At the fall meeting that year an hour was set aside for the SIGs to organize themselves. At that time

Carl Leinbach of Gettysburg was appointed SIG Chairman. The newsletter for the 1982 meeting listed nine SIGs and their membership: computing and modeling, logic and foundations, mathematics anxiety, student programs, mathematics and statistics education, graduate school and job opportunity, linear programming, public policy on mathematical sciences, and the history of mathematics. Two years later Marialuisa McAllister took the reins again and distributed forms for new groups and new members. Her new list added several new groups: mathematical programming, graph theory/networks/combinatorics, student programs, and statistics. In 1986 that list expanded to include two new special interest groups: the monster simple group, and statistics/operations research. Apparently interest in SIGs dissipated quickly, because no sectional documents mention them after that time.

One of the issues central to the success of SIGs was communication. In an effort to improve overall communication with the entire membership the national MAA office initiated a program of Institutional MAA Representatives in 1977. These volunteers distributed MAA material to colleagues, encouraged the participation of members in sectional and national activities, and recruited new members. The newsletter from the fall 1988 meeting lists EPADEL representatives from 76 different institutions. A decade later the MAA changed from an unstructured set of representatives to an integrated program of liaisons with essentially the same charge and under the leadership of the section's governor.

EPADEL played an active role in promoting the professional development of women and minorities. The Philadelphia Region of Women and Mathematics (WAM) has been coordinated since 1986 primarily by Gloria Dion (at Penn State – Ogontz and the Educational Testing Service). The major aim of WAM, initially funded by an IBM grant, was to encourage girls to continue their study of mathematics throughout high school by providing speakers who worked in fields that used mathematics or statistics. Along these lines it should be mentioned that Regina Brunner (Cedar Crest College) conducted a series of annual MathConns at her home institution throughout the 1990s to celebrate Mathematics Awareness Day for seventh- and eighth-grade girls and their teachers.

The year 1990 was a banner year for sectional activities aimed at increasing minority representation in mathematics. First a lunch table was set-aside at the annual spring meeting "for anyone who would like to discuss ways of drawing more minority students into mathematics." This gathering generated a special EPADEL meeting held under the leadership of Joanne Darken at Community College of Philadelphia on October 13. Titled "Underrepresented groups in mathematics: Overcoming the obstacles", the program began with a morning session featuring two stellar speakers, Johnny Houston and Uri Treisman. The afternoon session consisted of two one-hour panel discussions, "Filters in the pipeline", moderated by Joan Countryman (Germantown Friends School), and "Pumps in the pipeline", moderated by Marvin Brubaker (Messiah College). The meeting's success generated interest at the national MAA meeting the next year, as reflected by an article in the Association's journal *Focus*. EPADEL then

sponsored a workshop conducted by Uri Treisman at Swarthmore on October 27, 1991, on programs designed to improve minority participation and performance in college-level mathematics courses.

In the middle of the last decade the section began participating in Project NExT, a national program aimed at helping graduate students (in the last two years of their doctoral program) and new professors (in their first three years) get acclimated to New Experiences in Teaching college mathematics. In 1994 section governor Marvin Brubaker reported that five of the 66 participants came from EPADEL. Two years later section governor Nancy Hagelgans reported that the four EPADEL participants kept in touch via e-mail. In 1998 EPADEL president Kay Somers hosted a breakfast for the seven sectional participants before the annual fall meeting at Lehigh.

Not all endeavors are as successful as those mentioned above. In 1992 Jerry Porter (Penn) asked if it was time for the formation of a professional chapter intended to meet the needs of the section's nonacademic members. So Walter Stromquist (then at Daniel Wagner Associates) and Porter arranged a dinner that May at which 18 people heard a lecture by Herbert S. Wilf on efficient sorting algorithms. A second dinner meeting was held that November at which Brent Morris spoke about computer science and magic. However, the meetings were poorly attended – only eight were present at the second one – and the effort did not continue past that point in spite of a $500 grant to support it.

Another development that never came to fruition was a sectional database. The use of, and need for, a means of maintaining information about the membership was discussed at Executive Committee meetings throughout the early 1980s. However, by 1986 it was decided to table the issue because the national MAA maintained its own database that would satisfy the section's needs.

Education

The workshop to improve minority participation and performance, sponsored by the section in 1990, was one of many conducted under EPADEL's aegis to enhance faculty development. Most of these workshops have been held during summer sessions at Messiah College under the direction of Marvin Brubaker.

Table 2 (on the next page) lists some of the Messiah workshops taught by EPADEL members.

EPADEL was also involved in several other workshops, including those devoted to the history of mathematics, run by Paul Wolfson of West Chester, and those devoted to using calculators in mathematics courses, run by Roseanne Hofmann of Montgomery County Community College.

Year	Speaker	Affiliation	Title
1989	Nancy Baxter	Dickinson	Using ISETL to teach mathematics
1990	Carl Leinbach	Gettysburg	A laboratory approach to calculus using DERIVE
1990	David Hill	Temple	Teaching numerically with MATLAB
1992	Stephen Maurer	Swarthmore	Discrete algorithmic analysis
1992	Doris Schattschneider	Moravian	Symmetry and group theory
1993	William Dunham	Muhlenberg	A mathematical sampler: 1647-1900
1996	Carl Leinbach	Gettysburg	The impact of the TI-92 on mathematics teaching

Table 2

In 1991 the MAA announced the initiation of a program of awards for outstanding teaching. Formally called the Award for Distinguished College or University Teaching of Mathematics, each section could elect one winner, and that winner automatically became a nominee for one of at most three annual national awards (except the first year, when seven were awarded). Of course EPADEL participated in this program right away, naming a Selection Committee headed by David Rosen (retired from Swarthmore). The first winner was announced at the 1992 annual spring meeting. Table 3 lists the winners to date. Initially the award included a framed certificate and a donation to the recipient's college for the purchase of library materials in the mathematical sciences. Beginning in 1997, however, funding from the Goodville Mutual Casualty Company allocated $500 to the recipient and $500 to the recipient's library.

Year	Outstanding Teacher	Institution
1992	Doris Schattschneider	Moravian College
1993	David Sprows	Villanova University
1994	William Dunham	Muhlenberg College
1995	Herbert S. Wilf	University of Pennsylvania
1996	Nancy Baxter	Dickinson College
1997	Rhonda Jo Hughes	Bryn Mawr College
1998	James Crawford	Lafayette College
1999	Joanne Darken	Community College of Philadelphia
2000	Anthony D. Berard, Jr.	King's College

Table 3

The final element under continuing education concerns contributed papers at annual meetings. A note in one of the 1988 newsletters disclosed, "The Executive Committee is considering a selected contributed paper session at a future meeting." The Committee probably did not envision "future" to mean "10 years",

yet it was not until the spring 1998 meeting at Shippensburg that a session of 10-minute contributed papers under the direction of the host institution's Cheryl Olsen was included on the program. Similar sessions were conducted during the fall meetings in 1999 and 2000.

Public Policy

In 1979 the MAA hired a part-time publicity specialist for the first time. By the mid 1980s some national leaders felt that a local version might be a valuable asset to the sections as well. Toward the latter part of the 1980s the section attempted to increase public awareness of mathematics in two different ways. First, in 1987 the section created a new position, Public Information Officer, to promote sectional activities. The three PIOs to date have been David Zitarelli (Temple) 1987-1992, Regina Brunner (Cedar Crest) 1992-1999, and Cheryl Olsen (Shippensburg).

Second, in 1993 James Crawford (Lafayette) attempted to promote local mathematical developments from a different vantage point – maintaining a "Mathematics in the news" bulletin board at annual fall meetings. He announced, "Issues of mathematics and mathematics education appear from time to time in newspaper articles which we clip and post on our bulletin boards and office doors … At the fall meeting we plan to have a bulletin board emphasizing news items from Eastern Pennsylvania and Delaware." Crawford maintained the bulletin board at two fall meetings but an apparent lack of interest in his novel program caused him to drop the idea.

The section has been more successful in maintaining communication with its members in two different ways. Beginning in 1990 the newsletters included the e-mail addresses of those section officers who maintained e-mail accounts. Four years later the section announced, "EPADEL goes Electronic," meaning that the section's newsletters could be sent to members by e-mail. The announcement also notified the members of the MAA's fledgling Gopher server and the intended link from it to the section's Gopher server. In 1996 president Louise Berard (Wilkes) announced the completion of the section's Web page, maintained at the University of Pennsylvania by Dennis DeTurck, and its link to the national MAA Web page at http://www.maa.org/.

Leaders

Sectional leadership expanded and broadened throughout the EPADEL period. Initially, the ten-member Executive Committee – three officers, the section governor, and six members elected at large – planned and implemented all of the section's activities. Toward the end of the preceding period, the newsletter editor joined the committee *ex-officio*. Membership burgeoned after that. From 1982 through 1987 the SIG chairman became an *ex-officio* member. So did the public information officer in 1989. The next year, the coordinators of three programs also came aboard in the same capacity – student chapters, workshops and special events, and visiting lecturer and consultant program. Finally, beginning in 1994, the publisher's liaison was added to the roll. The

tradition of the newsletter editor, PIO, coordinator of student clubs, and publisher's liaison serving as *ex-officio* members of the Executive Committee continues today. Although the by-laws permit voting only by elected officials, the Committee has found that over the years a consensus is reached, so formal votes are rarely taken.

Another persisting tradition is that any officer of the national MAA or editor of an MAA journal becomes an *ex-officio* member of the Executive Committee. In the present period, Doris Schattschneider served on the Executive Committee 1980-1985 for her role as editor of *Mathematics Magazine* and 1994-1996 as first vice president of the national MAA. Gerald Porter joined the Committee in 1989 when he was elected governor-at-large of the MAA. The next year he joined the MAA's Finance Committee and three years later was elected treasurer of the national Association. Schattschneider was profiled in Chapter 6; Porter is profiled in Chapter 8.

Table 4 lists the section's officials who were elected from 1979 to 2000. Even though all positions of leadership remained the same as they had been since the dramatic revision of 1968, we now include section governors on the list since they began to assume leadership roles in the middle of the preceding period. Although we do not list members elected to three-year terms on the Executive Committee, we describe some of their efforts below.

The header in Table 4 indicates a slight change in the titles of the section's officers during the EPADEL period. At the business meeting held during the lunch hour at the spring meeting in April 1979, the section's chair Doris Schattschneider "appointed Will Baxter and Herb Wilf to prepare changes in the Bylaws to make them 'unisex'." At the meeting in November 1979 the section's membership voted to affect those changes; since then "president" replaced all former references to "chairperson".

Recall our convention that the year 1999 in the penultimate row of Table 4 refers to the November meeting at which Douglas Ensley (Shippensburg) was elected president of the section even though he carried out most of his duties in the year 2000.

The section derived great benefits from a cadre of leaders during this 22-year period, including 11 different presidents, one additional vice-president, three additional secretary-treasurers, and four additional section governors. These 19 officers were affiliated with 15 different institutions, with only Drexel, Gettysburg, Moravian, and Wilkes being home to more than one office holder. The officers represent a wide geographic area, ranging from Wilkes (Wong and Berard) in the north to Delaware (Baxter) in the south, and from Lehigh (King) in the east to Shippensburg (Ensley) in the west.

Year	President	Vice-Pres.	Sec.-Treas.	Governor
1979	Anton	Wong	Baxter	King
1980	Anton	Wong	Baxter	Porter
1981	Wong	Flesner	Baxter	Porter
1982	Wong	Flesner	Brooks	Porter
1983	Flesner	Kolman	Brooks	Anton
1984	Flesner	Kolman	Brooks	Anton
1985	Kolman	Brubaker	Brooks	Anton
1986	Kolman	Brubaker	Brooks	Schattschneider
1987	Brubaker	Hill	Brooks	Schattschneider
1988	Brubaker	Hill	Brooks	Schattschneider
1989	Hill	Hagelgans	Somers	Leinbach
1990	Hill	Hagelgans	Somers	Leinbach
1991	Hagelgans	Stromquist	Somers	Leinbach
1992	Hagelgans	Stromquist	Somers	Brubaker
1993	Stromquist	Berard	Somers	Brubaker
1994	Stromquist	Berard	Somers	Brubaker
1995	Berard	Somers	Wagner	Hagelgans
1996	Berard	Somers	Wagner	Hagelgans
1997	Somers	Ensley	Wagner	Hagelgans
1998	Somers	Ensley	Wagner	Hill
1999	Ensley	Crannell	Wagner	Hill
2000	Ensley	Crannell	Wagner	Hill

Table 4

Presidents

The section boasted 11 different presidents in the 22-year EPADEL period. Although the by-laws prohibit more than two consecutive terms, no president has served two nonconsecutive terms. This feature is clearly seen in Table 4. Equally evident is the tradition of the vice-president serving a two-year term before ascending to a two-year presidency.

The presidents represent a diverse lot in various respects. Walter Stromquist was only the second officer in the section's 75-year history to hold a nonacademic affiliation. (Ed Block was first, in 1957-1958.) The 10 presidents with academic affiliation came from eight different schools. Howard Anton and Bernard Kolman continued the line of six different presidents from Drexel University that began with James E. Davis in 1942. Wilkes College was the only other institution to boast two different presidents in the EPADEL period; Bing Wong and Louise Berard are the only two officers (in any capacity) ever affiliated with Wilkes in the section's history. Nancy Hagelgans was the third

president to come from Ursinus College, having been preceded by John Clawson in 1935 and Frank Manning in 1951. Two presidents were the second to come from their home institution: Kay Somers (Moravian College) was preceded by Doris Schattschneider by 20 years, while David Hill (Temple University) was preceded by Walter Lawton by 30 years. The remaining three presidents were the only ones to ever represent their institution in this office: David Flesner (Gettysburg College), Marvin Brubaker (Messiah College), and Douglas Ensley (Shippensburg University.) Contrary to the section's earlier history, no president in the EPADEL period came from the four institutions that produced the most presidents up to 1979: the University of Pennsylvania, Lehigh University, Swarthmore College, and the University of Delaware.

Unlike the period 1956-1978, when 38% of the section's chairs received their doctorates at Penn, in the present period only Bernard Kolman did (9%). Similarly, whereas 77% of the chairs received their doctorate from Ivy League institutions in the earlier period, only three (Stromquist, Berard, and Kolman) of the 11 did so in the present period (27%).

Before proceeding we pause to emphasize a point made in Chapter 4: the last decade of the 20th century was a period of female leadership of the section. Table 4 reveals that Nancy Hagelgans, Louise Berard, and Kay Somers held office in six of the 10 years. These leaders follow in the pioneering footsteps of Anna Pell Wheeler (1943-1944), Marguerite Lehr (1958-1959), and Doris Schattschneider (1977-1979).

We provide sketches of all presidents (in the order of their terms) except Marvin Brubaker, who is profiled at the end of the chapter.

- **Howard Anton** is a native Philadelphian who received his higher education at three different institutions, receiving a B.A. at Lehigh (1960), M.A. at Illinois (1963), and Ph.D. at the Polytechnic Institute of Brooklyn (1968). Anton worked as a mathematician at Burroughs Corporation after receiving his undergraduate degree. His first academic position was at Hunter College, where he taught from 1964 to 1966. Anton came to Drexel University immediately after receiving his doctorate in 1968. He remained there until 1983, when he left to form Anton Textbooks, Inc., an enterprise spawned by his many successful textbooks.

- **Bing Kuen Wong** was born in Shanghai, China, and received his higher education in the U.S. After receiving his A.B. at Pittsburgh State (Kansas) in 1961 he entered the graduate program at the University of Illinois, obtaining an M.A. in 1963 and a Ph.D. in 1966. His doctoral dissertation on dynamical systems was written under Waldemar Trjitzinsky. Wong held assistant professorships at two institutions before arriving at Wilkes College (now Wilkes University) in 1968 as a professor. He has remained there ever since, serving as department chair twice (1968-1984 and 1990-1992) and as the associate dean of the School of Science and Engineering from 1992 to 1996.

- **David Edwin Flesner** was born in Indiana. He received his A.B. at Wittenberg University in 1966 before enrolling in the graduate program at the University of Michigan, where he obtained an A.M. (1968) and Ph.D. (1971). His dissertation – on maximal subgroups of four-dimensional symplectic groups in characteristic two – was written under Jack E. McLaughlin. Upon receiving his doctorate, Flesner came to Gettysburg College and has remained there ever since. He became chair of the department in 1999. His book *Aging and the Aged: Problems, Opportunities, Challenges* (edited with Edwin D. Freed) was published in 1980. For several years after that he directed an interdepartmental senior honors Seminar on Aging and the Aged. He also took part in a project at Maryland involving applications of group theory in chemistry and physics. In 2000, Flesner completed a toolbar package to implement the Klein model of hyperbolic geometry within the *Cabri Geometry* software.

- **Bernard Kolman** was born in Havana, Cuba, and became a naturalized citizen in 1953. He received all of his higher education in the U.S., earning a B.S. *summa cum laude* from Brooklyn College in 1954 and an Sc. M. from Brown University two years later. From 1957 to 1964 he was a principal mathematician at the UNIVAC Division of Sperry Rand Corporation. Meanwhile he completed his doctoral studies at Penn, and received his Ph.D. in 1965 for a dissertation on the lattice of subalgebras of a Lie algebra written under Morikuni Goto. Kolman had accepted an assistant professorship at Drexel in 1964, and he remained there 34 years until his retirement in 1998, having served as department head 1971-1972. During that tenure he organized two well-known conferences in Lie algebras and edited the proceedings from them. He also directed one Ph.D. student. Kolman is the author of numerous textbooks that have been translated into several other languages.

- **David Ross Hill** is a native of Homestead, PA, who received a B.S. degree in education from Indiana University of Pennsylvania in 1964 and an M.A. in mathematics from the State University of New York at Buffalo two years later. He spent the year 1966-1967 as a computer analyst with Koppers Corp. in Pittsburgh before entering the graduate program at the University of Pittsburgh, where he received his Ph.D. in 1973. His dissertation on numerical solutions of delay differential equations was written under the supervision of George D. Byrne. Hill joined the faculty at Pittsburgh as an associate instructor during the last two years of graduate school. Upon receiving his doctorate he accepted an assistant professorship at Temple University, where he has been since, except for a visiting position at the College of the Virgin Islands in 1980. During his tenure he directed two masters theses. Hill has been a principal investigator on three major grants – two from the NSF (one with D. Zitarelli established linear algebra as a lab course in 1990) and one from FIPSE (to produce an interactive text for linear algebra with G. Porter). In 1988 Hill presented a mini-course on

MATLAB at the AMS summer meeting in Providence, R.I, and in 1995 he delivered a one-hour invited address at the annual MAA meeting on teaching linear algebra with technology. In addition to talks at the EPADEL spring meetings in 1986 and 1995, he has been an invited lecturer in Holland, England, and the Czech Republic. He also taught a short course at Messiah College sponsored by EPADEL in 1990. His expertise in teaching with computers led him to conduct numerous workshops – at the Northeastern Section of the MAA in 1994, the MAA MathFest in Seattle in 1996, and the NSF-sponsored ATLAST Project from 1992 through 1996. Hill is the author of several successful textbooks, including three with Bernard Kolman. In addition, he was the recipient of a Distinguished Teaching Award at Temple in 1996.

- **Nancy Lineken Hagelgans** was born in Burlington, Vermont. She received an A.B. from Goucher College in 1956 before entering the graduate program at Johns Hopkins, earning an M.A. three years later. Hagelgans taught at two Baltimore institutions (Goucher 1967-1968 and Towson State 1967-1972) before moving to the EPADEL area. While teaching at Haverford from 1975 to 1977 she decided to complete her doctorate at Hopkins. Her supervisor, Jean-Pierre Meyer, suggested that James Stasheff of Temple might act as her advisor. He did, and Hagelgans completed her dissertation on local spaces with three cells as H-spaces in 1977. She spent 1977-1978 at Bryn Mawr, all the while searching for a tenure-track position. Since it seemed that the only openings involved computer science she completed an M.S. in that field at Villanova in 1979. In 1978 Hagelgans landed a tenure-track position at Ursinus in both mathematics and computer science. She has remained there ever since, except for the year 1986-1987 spent as a visiting professor at the University of Delaware. She served as the department chair at Ursinus 1988-1992 and resumed that post in January 2001. Hagelgans was elected to a three-year term on the EPADEL Executive Committee in 1986, when she also began coordinating the Consultants and Speakers Program. In addition to four years as president and vice president, she was elected to a three-year term as governor 1995-1998. She also was an invited speaker at the section's spring meeting in 1996 on one of her specialties, cooperative learning in discrete mathematics. Along this line, she is one of the authors of the book *A Practical Guide to Cooperative Learning in Collegiate Mathematics*, published in 1995 as MAA Notes Number 37. Hagelgans has been active in the national MAA in many other ways – serving on the Committee on Consultants (1997-1999), the task force on the MAA publication *Guidelines for Programs and Departments in Undergraduate Mathematical Sciences* (1997-2000), the Professional Development Committee (1998-2001), and the Committee on Sections (1999-2002). She has also been involved in Project NexT as a mentor since 1995, as a workshop presenter in 1996, and as a panelist in 1998 and 1999.

- **Walter Rees Stromquist** possesses very strong mathematical genes. His father, Walter Kellogg Stromquist (1917-1999), was a nuclear engineer with a Ph.D. in chemical engineering from Tennessee. WKS worked at the Oak Ridge National Laboratory when his son WRS was born. WKS's uncle, Carl Eben Stromquist (1877-1925), received his Ph.D. in mathematics from Yale in 1903 and was on the faculty at Princeton 1903-1909. CES then moved to the University of Wyoming, where he remained until ill health forced him to resign in 1922. During this time he was a charter member of the MAA in 1915 and one of the organizing members of the Rocky Mountain Section of the MAA two years later.

  EPADEL chair Walter Rees Stromquist received his B.A. from the University of Kansas in 1970 before enrolling in the graduate program at Harvard, where he earned two degrees – an M.A. in 1972 and a Ph.D. in 1975. His dissertation on the four-color problem was written under the supervision of Andrew Gleason. Stromquist did not restrict himself to mathematics during his stay at Harvard, however, electing graduate courses in economics and tax law. Thus it is not particularly surprising that his first professional experience was with the Office of Tax Analysis in the U.S. Treasury, where he worked 1973-1977. In 1979 Stromquist accepted a position with Daniel H. Wagner, Associates, ultimately rising to become vice president of the company before leaving in 1998 to become an independent consultant. During his tenure he was a visiting professor at Temple 1987-1988; he also taught as an adjunct professor at Bryn Mawr, Eastern College (in economics), George Washington, and West Point (as an Army reservist). Stromquist served as a member of the section's Executive Committee 1987-1991 before being elected to stints as vice president and president. At the national level, Stromquist was elected MAA Governor at Large for Industry and Government in 2000 and served as an associate editor of the *Monthly* 1996-2001.

- **Louise McNertney Berard** is a native of Hazleton, PA. She received her bachelors degree from King's College in 1975 and her Ph.D. from Brown University five years later. Her dissertation, "One-Parameter Families of Surfaces with Constant Curvature in Lorentz 3-Space", was the second one written under the supervision of MAA president Thomas F. Banchoff. Berard accepted a position at Wilkes University upon receiving her doctorate. She has remained there ever since, serving as chair 1992-1996. She received the Carpenter Outstanding Teacher Award at Wilkes in 1988. In addition to being elected president and vice president of EPADEL for two years each, Berard served as the coordinator of the section's Visiting Lecturer and Consultant Program 1992-1995.

- **Kay Bergstresser Somers** is a native of Fountain Hill, PA. After receiving her bachelors degree from Ursinus in 1968 she worked for a year as a statistical research analyst with the NY State Department of Mental Hygiene. Then she enrolled in the graduate program at Rensselaer

Polytechnic Institute, earning a masters degree in 1971 and a Ph.D. two years later. Her dissertation, "A generalization of strong unicity", was written under the supervision of Harry McLaughlin. Kay Somers then was a visiting lecturer at Virginia Polytechnic Institute and State University before accepting an assistant professorship at Lafayette in 1975. She left there in 1979 to work as an operations research analyst with Air Products and Chemicals, Inc. Somers moved to Moravian College in 1981 and has remained there ever since, serving as chair 1992-1998. In addition to being elected president and vice president of EPADEL, she also served as secretary-treasurer for six years. In addition, she was an invited speaker at annual meeting of the Michigan Section of the MAA in 1994. At the national level, Somers was a member of the MAA Ad Hoc Committee to review the *Monthly* in 1999. Two of her students have won MAA student paper contests.

- **Douglas Edward Ensley** was born in Phenix City, Alabama. After earning a B.S. degree from the University of Alabama at Huntsville in 1986, Ensley moved north to enroll in the graduate program at Carnegie Mellon University. He received an M.S. degree two years later and a Ph.D. in 1993 for a dissertation on measures on categorical structures written under the supervision of Michael Albert. Upon receiving his degree, Ensley moved to Shippensburg, where he became a 1993 project NExT fellow. He served as assistant chair at Shippensburg 1995-1999. Summers found him back in Pittsburgh, however, as the mathematics instructor for the Pennsylvania Governor's School of the Sciences (PGSS) held at Carnegie Mellon. His contributions were recognized by the PGSS with an Exemplary Service Award in 1996. In addition to serving EPADEL as president and vice president, Ensley volunteered in two other capacities, coordinating the Visiting Lecturer and Consultant Program 1995-1999 and directing (with Joanne Darken) Project NExT 2000-2001. In his short career Ensley has also been active with the MAA, serving as a Visiting Mathematician during the fall of 2000. This led to his being appointed editor of the MAA Digital Classroom Resources, a part of the Mathematical Sciences Digital Library. Winning a graduate student teaching award at Carnegie Mellon in 1993 foreshadowed successful teaching at Shippensburg, as three of his students have won MAA awards for student paper presentations at two different Mathfests.

We end this subsection by profiling the one vice-president who is ineligible to become president until the next period in the section's history.

- **Annalisa Crannell** was born to be an academic, having been delivered to a pair of graduate students in physics at the Stanford University Hospital in Palo Alto, California. She crossed the country to take her undergraduate education in the EPADEL area, earning a bachelors degree Magna Cum Laude with honors in mathematics from Bryn Mawr at age 20 in 1986. From

there Crannell traveled further east to enroll in the graduate program at Brown, where she received a masters degree three years later and a Ph.D. in 1992. Her doctoral dissertation, "The existence of many periodic, nontraveling solutions to the Boussinesq equation", was written under the supervision of Walter Craig. Crannell went directly to Franklin and Marshall upon receiving her degree and has remained there since then. She will chair the department beginning in 2001. Crannell engaged in professional activities soon after reaching F & M by serving on three national committees – the Joint Committee on Employment Opportunities (1992-1995), the AMS Committee on the Profession (1995-2000), and the AMS Short Course Committee (beginning in 2000). In addition she wrote articles, edited a video, and organized panels about finding jobs in mathematics in a tight market. Crannell was elected vice president of EPADEL for 1999-2001. Starting in 2001 she will become an Associate Editor of *Mathematics Magazine* and an editor of MAA Notes series.

Secretary-Treasurers

During the EPADEL period the four individuals who served as secretary-treasurer of the section continued the long tradition of lengthy, dedicated service. Altogether, 17 different people have been elected secretary-treasurer in the 75-year history of the section. However, three of them served only one year, meaning that the remaining 14 secretary-treasurers served a total of 72 years in office. We have already met two of the four secretary-treasurers who served in the EPADEL period – Will Baxter and Kay Somers. The latter was the only female to hold this position in the 75-year history of the section.

We provide sketches of the other two secretary-treasurers below, but first we note that both of them have been particularly effective in their role as treasurer. In 1983 the section received a letter from Alfred B. Willcox at the national MAA indicating that the remission of $120 to the national office by treasurer Jim Brooks was "extraordinary." Willcox added, "Aid to sections is available … If the fortunes of EPADEL should take a turn for the worse, you might keep this in mind." Although the section's finances continued to run in the black, the treasurer's report to the Executive Committee at the meeting held September 1984 came with a caveat: "Our current bank balance is $578. We need to be careful about expenditures." Subsequent treasurers carried on the tradition of careful expenditures, and in Cliff Wagner's final account to the Executive Committee he reported a balance of over $13,000.

- **James Oliver Brooks** was born in Evanston, Illinois. After obtaining his A.B. from Oberlin College in 1952 he entered the graduate program at the University of Michigan, receiving an M.A. the following year and a Ph.D. in 1964. His dissertation on the theory of representation of modules was written under Donald Higman. While completing his graduate studies, Brooks accepted an assistant professorship at Haverford College, which he held from 1959 until 1964. He then moved to nearby Villanova University,

where he taught until 1993. Brooks served the department as acting chair for one year, followed by an eight-year stint as chair, 1969-1977. He served on the section's Executive Committee 1971-1973, and was elected secretary-treasurer 1982-1989.

- **Clifford Henry Wagner** was born in Cincinnati, Ohio. He received three degrees from three different institutions – an A.B. from Cincinnati in 1967, an A.M. from Michigan in 1968, and a Ph.D. from SUNY - Albany in 1973. His dissertation, "Symmetric, cyclic, and permutation products of manifolds", was written under E. S. Thomas, Jr. Upon graduation Wagner accepted an assistant professorship at Fitchburg State College (MA), where he remained until moving to Penn State - Harrisburg in 1978. In addition to serving EPADEL as secretary-treasurer for six years, Wagner was elected to the Executive Committee 1993-1995. Beyond that, he has helped organize MATHCOUNTS competitions in the Capital Region since 1989. Wagner was presented with the MAA's Allendoerfer Award in recognition of an article that appeared in the November 1982 issue of *Mathematics Magazine*. He also wrote (with Martin Barrett) the textbook *C and UNIX: Tools for Software Design*.

Governors

Chapter 6 provided a brief history of MAA governors and listed those members who were elected as this section's governor. Table 5 reveals that eight different section governors from eight different institutions were elected between 1979 and 2000. Sketches of all but two were already provided due to other offices held; Porter will be profiled in Chapter 8.

Governor	Institution	Term
Jerry King	Lehigh	1977-1980
Gerald Porter	Penn	1980-1983
Howard Anton	Drexel	1983-1986
Doris Schattschneider	Moravian	1986-1989
Carl Leinbach	Gettysburg	1989-1992
Marvin Brubaker	Messiah	1992-1995
Nancy Hagelgans	Ursinus	1995-1998
David Hill	Temple	1998-2001

Table 5

- **Lewis Carl Leinbach** is a native of Palmerton, PA, who received his B.A. at Lafayette College in 1962 and an M.S. two years later from the University of Delaware. He then went west for graduate school, earning his Ph.D. in 1967 at the University of Oregon. His dissertation on order properties in Banach algebras was written under Bertram Yood. Carl Leinbach returned

to the EPADEL area immediately upon receiving his degree, accepting a position at Gettysburg College. He was a member of the mathematics department at Gettysburg until 2000, when he joined the college's new computer science department. Leinbach has been one of the most active members of EPADEL over the past 30 years. In addition to serving as governor, he was elected to the Executive Committee, was the SIG chair, and taught EPADEL-sponsored workshops at Messiah College in 1990 and 1996. At the national level, he was a member of the MAA Classroom Resources Committee, the associate editor for software reviews in the *College Mathematics Journal*, and the editor of an MAA Notes volume on "Calculus as a Laboratory Course". As a result of these activities, Leinbach was awarded the 2001 MAA Certificate for Meritorious Service for work done in 2000.

Executive Committee

Altogether 37 different individuals were elected to the Executive Committee during the 22-year EPADEL period. Five subsequently became officers, with three elected president – Nancy Hagelgans (Ursinus), David Hill (Temple), and Walter Stromquist (Daniel Wagner) – one vice-president – Annalisa Crannell (Franklin & Marshall) – and one secretary-governor – Clifford Wagner (Penn State - Harrisburg). In a similar way three other Executive Committee members held other EPADEL positions: Anthony Berard (Wilkes), newsletter editor; JoAnne Growney (Bloomsburg), coordinator of the Visiting Lecturers series; and Robert DeVos (Villanova), publisher's liaison. In addition, one member, James Crawford (Lafayette) was an invited lecturer at an annual meeting.

Three members of the Executive Committee served two three-years terms: Walter Stromquist, Dennis DeTurck, and Hanson Umoh. Stromquist was sketched above.

- **Dennis Michael DeTurck** is a native Philadelphian who took all of his degrees in the city. Before receiving his bachelors degree from Drexel in 1976 he was awarded the munificent sum of $12 from the section for achieving the highest score on the Putnam exam of any undergraduate within its boundaries. DeTurck then entered the graduate program at Penn, earning a masters degree in 1978 and a Ph.D. two years later. In his dissertation, written under Jerry L. Kazdan, DeTurck constructed a local theory for metrics having prescribed Ricci tensors. Following graduation he went to the Courant Institute as a post-doctoral instructor for two years. He returned to Penn after that and has remained there since 1982. DeTurck was promoted to full professor in 1989. He was the 1991 winner of the Lindback Award for Distinguished Teaching; four years later he was appointed to the Davidson Kennedy Professorship as a reward for successful undergraduate teaching. (One of Penn's undergraduate students won the 2001 EPADEL Undergraduate Research Award.) DeTurck served as undergraduate chair of the department 1992-1997 and was elected chair in 1997. During his tenure

he has directed six doctoral and two masters dissertations. DeTurck was an associate editor of the *Monthly* for ten years, 1986-1996. During that time he was elected to the EPADEL Executive Committee for two three-year terms. Finally, DeTurck won the section's Distinguished Teaching Award in 2001.

- **Hanson Matthew Umoh** came to the U.S. in 1970 from his native Nigeria, where he studied at the Federal School and Science in Lagos. Umoh earned a B.S. degree in mathematics from Virginia Union and an M.A. in mathematics from Morgan State. He accepted an instructorship at Howard University in 1981. While teaching he also took graduate courses there, resulting in a Ph.D. in 1988; he had been promoted to assistant professor the previous year. However, upon graduation he accepted an assistant professorship at Delaware State University, where he has remained ever since.

Traditionally three of the six members elected to the Executive Committee represent specific constituencies. In this regard, six members held nonacademic positions: the ubiquitous Stromquist, Barry Belkin (Daniel Wagner), Joseph J. Bolmarcich (Quantics), Gloria Dion (Educational Testing Service), Bruce Scranton (Daniel Wagner), and Michael Temple (Ketron). In addition, four members represented two-year institutions: Joanne S. Darken (Community College of Philadelphia), Roseanne Hofmann (Montgomery County Community College), Shirley C. Miller (Montgomery County Community College), and Robert J. Ulrey (Harrisburg Area Community College). Finally, four members were high-school teachers: Santo Diano (Central H. S.), Robert Murphey, the Rev. Joseph Oeschele (Malvern Prep), and Claire R. Tuckman (Cheltenham H. S.) Recall that Tuckman served another three-year stint on the Executive Committee during the period of expansion (Chapter 6).

Before leaving the Executive Committee we note that 12 of the 39 different members in the EPADEL period were women. We have already mentioned Crannell, Darken, Dion, Growney, Hagelgans, Miller, Hofmann, and Tuckman. The others are Lynne Butler (Haverford), Penelope Dunham (Muhlenberg), Marialuisa McAllister (Moravian), and Patricia Overseer (Penn State – Ogontz).

Presenters

During the period 1979-2000, most of the slots on the programs at annual fall meetings were taken up with the traditional mainstay, invited lectures on mathematical topics. Although no films were shown, the section set aside slots on the program for four other types of activities – contributed paper sessions, student paper sessions, a meeting for SIGs, and panel discussions.

The first panel discussion was held in 1979. Its theme, "The machine in the garden: The relationship of computer sciences and the undergraduate mathematics major", remains as relevant today as it was two decades ago. The three panelists were John Kellett (Gettysburg), John Koch (Wilkes), and Walter Brown (Moravian). The panel discussion conducted three years later, "CUPM

recommendations", was moderated by Gerald Porter (Penn) and included Joerg Mayer (Lebanon Valley) and Larry E. Sigler (Bucknell). In 1989 the panel discussion was titled "A model of an undergraduate research program in mathematics". The program for the meeting lists only two speakers, Fred Schultheis (Moravian) and Clifford Reiter (Lafayette). The theme of the final panel in the section's history, held in 1992, was "Encouraging participation among underrepresented groups". This panel was a sequel to the section's special session organized by Joanne S. Darken two years earlier. Along with Darken (Community College of Philadelphia,) the other panelists were Charles M. Grinstead (Swarthmore), Elizabeth W. McMahon (Lafayette), and Allen R. Schweinsberg (Bucknell).

The largest part of the section's annual meetings continued to be the invited lectures. Altogether 81 invited lectures were delivered from 1979 to 2000. After discussing the speakers and their affiliations, we analyze the topics of the lectures in terms of their mathematical classifications. The complete list of speakers and titles is given in an appendix.

Altogether 76 different lecturers delivered the 81 invited talks, providing yet another indication of the impressively diverse mix of invited speakers the section was able to attract. The five lecturers who spoke twice during the EPADEL period were William Dunham (Muhlenberg), Ronald Graham (AT&T), Paul Halmos (Indiana), Jerry King (Lehigh), and Herbert Wilf (Penn). Of the five repeat speakers, only Wilf had spoken at a meeting before this period. As noted earlier, Wilf is one of only five people to deliver four invited talks to the section. The all-time leader with five talks is Albert Wilansky.

The list of 76 speakers includes several of national prominence, including Mark Kac, Kenneth Appel, Walter Feit, Stanislaw Ulam, Lynn Steen, Paul Halmos, Ronald Graham, Thomas Banchoff, John Conway, Uri Treisman, and Mary Ellen Rudin. Advances in air transportation during this period were responsible for the section's ability to invite more and more speakers from outside the area.

Overall, EPADEL members delivered 28 of the 81 lectures. One notable pairing is the duo of Herbert S. Wilf and Doron Zeilberger, whose work on the eponymous WZ-method earned them the prestigious Steele Prize in 1998 for seminal contributions to research. Also of local interest is the fact that the first African-American invited to deliver an address is an EPADEL member. However, Shiferaw Berhanu (Temple) was unable speak at the 1991 meeting due to illness. Robert S. Smith (Miami of Ohio) thus became the first African-American speaker four years later. To draw a longtime EPADEL connection, Smith received his Penn State Ph.D. in 1969 under Orrin Frink, who had spoke to the section in 1928 and 1932.

During the EPADEL period, institutional affiliations of the speakers were more diverse than at any time in the section's history, with 54 different institutions accounting for the 81 lecturers. Once again the University of Pennsylvania led the way with nine speakers. Next came Lehigh University with four, while Temple University and AT&T Bell Laboratories had three each.

Eleven different institutions were home to exactly two invited lecturers: American University, the University of Delaware, Dartmouth College, Haverford College, Lafayette College, Indiana University, the MAA, Muhlenberg College, the Pennsylvania State University, Princeton University, and SUNY at Binghamton.

Table 6 lists all EPADEL members who presented invited lectures in this period, by institution. We comment on a few of the institutional affiliations. William Dunham's talks in 1992 and 1999 mark the only time in the section's history that a faculty member from Muhlenberg delivered an invited lecture. Similarly, talks by Paul Wolfson (1987), Kenneth A. Brakke (1993), and James P. Fink (1994) represent the only times that speakers have ever come from West Chester, Susquehanna, or Gettysburg, respectively. Although Gary Gordon was the sixth faculty member from Lafayette to give an invited lecture, his 1996 talk was the first since 1941; James Crawford kept the Lafayette tradition alive in 1999.

Institution	Speaker	Year	Institution	Speaker	Year
Penn	Porter	1980	Temple	Coughlin	1984
Penn	Wilf	1982	Temple	Newman	1985
Penn	Shatz	1984	Temple	Zeilberger	1998
Penn	Gluck	1989	Delaware	Baxter	1979
Penn	DeTurck	1991	Delaware	Kennedy	1990
Penn	Steele	1994	Haverford	Greene	1979
Penn	Kannan	1995	Hav./Penn	Golub	1985
Penn	Wilf	1995	Lafayette	Gordon	1996
Penn	Harbater	1996	Lafayette	Crawford	1999
Lehigh	King	1981	Muhlenberg	Dunham	1992
Lehigh	Wilansky	1983	Muhlenberg	Dunham	1999
Lehigh	King	1997	Gettysburg	Fink	1994
Lehigh	Dobric	1998	West Chester	Wolfson	1987
Susquehanna	Brakke	1993			

Table 6

Although the institutional affiliations of the speakers were diverse, all but five speakers held academic positions, and none was a high school teacher. The speakers holding nonacademic positions were Ronald Graham (AT&T), John D. Grace (Atlantic Richfield Corp.), Elaine Jacobson (Control Data Corp.), Fern Hunt (National Institute of Standards and Technology), and Karvel Thornber (NEC Research). Jacobson had obtained her Ph.D. at Temple under Theodore Mitchell ten years before delivering her invited lecture in 1987.

Themes of Lectures

We end the chapter with an analysis of the mathematical classification of the invited lectures presented at the annual EPADEL fall meetings from 1979 to 2000. Keeping in mind that strict classification is impossible, interested readers are urged to consult the list of titles of all talks in the appendix, or abstracts provided in sectional newsletters.

This period was witness to one dramatic development: talks in analysis no longer dominated the programs, as they had done in every period heretofore. In fact, the EPADEL period showed an almost even distribution among speakers in the three main areas of mathematics: algebra/number theory (11.5), topology/geometry (10.5), and analysis (9). The fractional part comes from David Harbater's 1996 talk, "Symmetry in algebra and geometry".

This period also reflects three other noteworthy changes. For one, there were a dozen talks related primarily to educational themes, continuing the section's involvement with the central concern that manifested itself in the 1950s. Second, 10 lectures were devoted to topics in the history of mathematics, the most ever. Third, eight lectures discussed computer science. On a related note, the EPADEL period bore witness to six talks on applications.

The talks in the ***algebra/number theory*** category were almost evenly divided between the two subjects. The second lecture in the present period, presented in 1979 by local algebraist Willard Baxter, was titled "Rings with involution - An overview". The two lectures on algebra presented four years later were both notable, one because of a local connection, with topologist/analyst Albert Wilansky describing "What matrices can do". Wilansky followed Yale's Walter Feit, who discussed the history and future prospects for completing the classification of the finite simple groups. The next lecture on algebra did not occur until 1996, when two more were given, including EPADEL member Gary Gordon's "Using symmetry in teaching group theory".

Although none of the six speakers on number theory is a member of our section, two have strong local ties. George Andrews, a Ph.D. student of Emil Grosswald and Hans Rademacher at Penn, presented his recent research in a lecture titled, "An old algorithm in a new era: Major MacMahon, you were born too soon!" Andrews was one of only four invited speakers to take the podium at Penn's Centennial Celebration in 1999. It is not surprising that David Bressoud, the other EPADEL speaker on number theory, would lecture on this subject because he earned his Ph.D. at Temple under sectional governor Emil Grosswald after having matriculated at Swarthmore. Bressoud's 1988 talk "Factorization and primality testing" was followed five years later by one of the country's leading experts in this field, Carl Pomerance. The three other speakers on topics in number theory were internationally known Donald Zagier (1984), MAA president Kenneth Ross (1997), and acclaimed great teacher Arthur Benjamin (1999).

Of the 10.5 lectures in ***geometry/topology***, seven were on topology proper, four by EPADEL members: Kenneth A. Brakke of Susquehanna (1993), "Soap

films and covering spaces", Herman Gluck of Penn (1989), "How can a drum change shape while sounding the same?", Judy Kennedy of Delaware (1990), "Exotic topology in dynamical systems", and James P. Fink of Gettysburg (1994), "Bifurcation, catastrophe, singularity, and all that". Chapter 6 described Gluck's invited lecture on topology in 1974.

Robert L. Devaney of Boston University delivered a particularly memorable lecture in 1987 titled "Computer graphics experiments in complex dynamical systems". A pioneer in the use of computer graphics to demonstrate dynamical systems, Devaney's lecture included an impressive array of color graphics at a time when such presentations attracted throngs of curious viewers.

We categorized David Harbater's 1996 lecture as half algebra – half geometry. Three of the lectures given in the present period were devoted to purely geometrical subjects. Harbater's Penn colleague Stephen S. Shatz gave an invited lecture 12 years earlier entitled, "Mordell's conjecture: Ideas and the confluence of arithmetic and geometry", which seems to suggest an intersection with algebra as well. However, the remaining two talks in topology/geometry were strictly geometric. In 1982 Peter Hilton (SUNY at Binghamton) gave a lecture titled "Descartes, Euler, and polyhedra". Ten years later Princeton's John Conway lectured on "Polyhedra and their symmetries" in his inimitable style, replete with physical models to enhance the presentation.

We have seen that members of the Penn School of Analysis dominated the invited lectures in the category of ***analysis*** until 1961, but Penn analysts gave only three of the 14 talks from 1956 to 1978. This trend almost reached a limit of zero in the present period, when the only talk on analysis given by someone associated with Penn was "Strange attractors and chaotic motion", by Jerry P. Golub, who held a joint appointment in physics at Haverford and Penn in 1985. Two Temple analysts accepted invitations to speak on analysis during this period but only famed problem-solver Donald J. Newman (1985) was able to deliver his, "Addition chains when multiplications are free". Shiferaw Berhanu (1991) was prevented by illness from presenting, "A nonlinear Fourier transform and its applications to complex vector fields".

Temple was not the only institution with two faculty members lecturing on analysis. In addition to Jerry Golub, Haverford's chair Curtis Greene presented the very first lecture in the present period, "Problems and results in unimodal sequences". The only other talk on analysis during this period by an EPADEL member was "Real, complex, and metaphysical ideas of Karl Weierstrass" by Jerry King (Lehigh) in 1997. Some prominent members of the American mathematical community who spoke on themes from analysis during this period include Richard Anderson of LSU (1980), Paul Halmos of Santa Clara (1987), and Mary Ellen Rudin of Wisconsin (1993). Rudin is yet another prize graduate of the famous R. L. Moore School of Topology to speak to our section.

This chapter has already described the section's overwhelming preoccupation with various themes in ***education*** during the entire EPADEL period in various realms. To support the notion that educational themes presented the

membership's overarching concern, the section invited 12 speakers to address educational issues on a wide range of subjects, more than any other category.

EPADEL members delivered two of these talks. In 1984 Temple's Raymond F. Coughlin, a pioneer in "short calculus" texts, gave a lecture about teaching what then was becoming an increasing problem at many institutions, students ill-prepared for university-level mathematics. The title of Coughlin's talk, "Remediation: A waste or a gold mine?", provides no clue to the speaker's strong feeling that remediation presented a potential lucrative market for universities if they took it seriously. Lafayette's James Crawford presented a talk about teaching a contrasting set of students. At the 1999 meeting commemorating the 100th anniversary of Elizabethtown College, Crawford dealt with students who came to college well prepared for calculus courses in a talk titled "Teaching calculus: A personal, institutional, and historical perspective".

Individuals with strong MAA ties delivered five of the remaining ten lectures that carried educational themes. In 1982 Alan C. Tucker, of SUNY at Stony Brook, whose father, Princeton's Albert W. Tucker, lectured to the section in 1938, 1948, and 1957, described the "Mathematical sciences curricula". His talk was immediately followed by an EPADEL panel discussion on a related topic, "CUPM recommendations". Two years later, MAA president-elect Lynn A Steen (St. Olaf) made a plea for "Renewing undergraduate mathematics". Two years after that, in 1988, Martha Siegel (Towson State) discussed "Freshman mathematics for the modern age". The sectional newsletter for that meeting carried an MAA advertisement for the position of Executive Director. Thanks to the knowledge and foresight of sectional governor Gerald Porter, the person chosen to fill that position, Marsha Sward, gave her very first presentation to any MAA section at the meeting held the next year at Millersville. In a lecture titled "Everybody counts: From vision to reality", Sward discussed timely work initiated by the National Council of Teachers of Mathematics. The very next year, Kenneth Hoffman, then Director of the Mathematical Sciences Education Board, continued this line of investigation in his lecture, "Mathematics education reform: Our critical role".

There are three other categories in which numerous invited talks were presented, history (10), computer science (8), and applications (6). This was the very first period in the section's history when talks dealing with the ***history of mathematics*** attracted such widespread interest. Local historians Paul Wolfson (West Chester) and William Dunham (Muhlenberg) accounted for three of the 10. Earlier in this chapter we noted Wolfson's involvement with European tours covering various aspects of the history of mathematics. A book-review editor for the journal *Historia Mathematica*, he highlighted one of those aspects in his 1987 talk, "Newton: The calculus, the *Principia*". The other local historian, the husband of present Executive Committee member Penelope Dunham of Muhlenberg College, presented two invited lectures during the 1990s. The clever title of his 1992 talk was "Constructing the regular heptadecagon: Ingenuity or just a lucky Gauss?" The topic of Dunham's 1999 lecture, "Euler's sums and Euler's crumbs", concerned the main theme from one of his best-selling books,

Euler: The Master of Us All. (Recall from Chapter 5 that the Koehler family donated a set of Euler's works to the library at Muhlenberg College.)

Distinguished historians delivered five of the remaining lectures on the history of mathematics. In 1985 Ann Hibner Koblitz (University of Washington) read the paper, "The mythification of Sofia Kovalevskaya". The very next year V. Frederick Rickey (Bowling Green) answered many a question asked by calculus teachers everywhere in his talk, "The invention of calculus: Who, what, when, where, and why?" Just two years later Harold Edwards, of the Courant Institute at NYU, spoke about "Kronecker's views of the foundations of mathematics". In 1995 Marcia Ascher, recently retired from Ithaca College, presented "Tracings in the sand: An introduction to ethnomathematics", while three years after that James Tattersall (Providence College) showed some "Mathematical vignettes from Cambridge University".

In the remaining two talks on the history of mathematics, two prominent members of the international mathematical community reminisced about their involvement in the development of the subject in the 20th century. In 1980 Mark Kac presented "Recollections and reflections on 50 years of probability theory" and three years later Stanislaw Ulam gave "Mathematical reminiscences and suggestions for the future". The 1983 meeting was held at Bryn Mawr College, the home of John Oxtoby, our section's former president and Ulam's good friend.

Chapter 6 noted the section's interest in computers as early as 1970, when it sponsored a panel discussion on their place in the mathematics curriculum. This interest intensified in the present period, which featured eight lectures on topics related directly to ***computer science***. Two of these talks were given by individuals with ties to Temple University. In 1987 Elaine Jacobson, a Ph.D. graduate of Temple then employed by Control Data Corporation, spoke about "Parallel processing architectures". Twelve years later, Temple faculty member Doron Zeilberger spoke about the role of computing in the future in a lecture that carried the unusual title, "Synopses of two textbooks: Levi Ben Gerson's *Ma'asei Khoshev* (ca. 1320) and Shalosh B. Ekhad's *Plane Geometry* (ca. 2050)."

Three of the remaining talks on computer science were presented by distinguished personalities in the field. In 1985 Frank Thomson (Tom) Leighton of the Department of Mathematics and the Lab for Computer Science at MIT spoke on "Networks, parallel computation and VLSI". At the Sunday meeting the following year Thomas Kurtz (Dartmouth) presented a talk called "Computing in the classroom". Kurtz is one of the inventors of the language BASIC, which was taught to all undergraduate students at Dartmouth since the late 1950s. The final speaker from this New England troika was recent MAA president-elect Thomas Banchoff (Brown), who in 1991 presented the invited address titled, "Computer graphics and surfaces in four-space: Visualizing characteristic classes".

Although the section sponsored six talks on traditional ***applications*** of mathematics during the present period, the types of applications varied considerably. The two lectures by EPADEL members concentrated on economics. In 1994, J. Michael Steele, of the Wharton School at Penn, spoke on "Ruin and riches from Bachelier to Black-Scholes". Four years later Lehigh's

Vladimir Dobric lectured on a similar theme in his presentation, “A fundamental model in mathematical finance”. The other four speakers described a range of applications whose content can be inferred from their titles – Ward Whitt (1980; AT&T Bell Laboratories), “Approximation for networks of queues (description of complex systems adequate for engineering purposes)”, Daniel Gottlieb (1988; Purdue), “Topology and the robot arm”, John D. Grace (1990; Atlantic Richfield Corp.), “Oil and uncertainty”, and Joseph A. Gallian (1993; Minnesota), “The mathematics of identification numbers”.

Chapter 6 noted that Penn’s Herbert S. Wilf presented the very first lecture in the category ***combinatorics/graph theory*** in 1967. He gave two more talks on this topic during the present period: “Some bijective proofs in combinatorics” (1982) and “Finding and proving identities with your computer” (1995). Wilf’s stranglehold was broken in 1997 when Rodica Simion (George Washington) lectured on “The many lives of set partitions”. The same could be said about a 1998 talk by Wilf’s partner in proving identities, Doron Zeilberger, but we categorized the latter talk under computer science.

Three lectures were devoted to ***probability/statistics*** in this period, although one of them was a hybrid. As the title “Probability and the approximation of continuous functions” suggests, the lecture delivered by former EPADEL governor Jerry King of Lehigh in 1981 contained as much analysis as probability. The invited lecture by Mary Gray (American University) carried the fetching title, “Justice by lot: Olympic gold medals, Rwandan prisoners and employment discrimination”. Gray had been one of the founders of the Association for Women in Mathematics. The remaining talk in this category was special too. Recall that Shif Berhanu had to cancel his talk due to illness. On almost no notice, Alan J. Rossman (Dickinson) prepared a lecture with another alluring title, “Bayesian statistics in the courtroom”. The section chair at the time, Walter Stromquist, has called Rossman a hero for his duty beyond the call of service.

There was only one talk on ***mathematical logic*** during this period, and someone with nonacademic credentials delivered it. In 1994 Karvel Thornber, of the NEC Research Institute, presented a paper with the title, “Inference beyond logic”.

Seven lectures seem to defy exact classification yet are worthy of mention. Penn professors delivered three of them. In a perspicacious presentation in 1980 sectional governor Gerald Porter spoke about “The future of the MAA”. In 1991 his colleague Dennis DeTurck answered the question, “What problems are we trying to solve?” DeTurck described several problems in which powerful theories were developed to deal with generalized problems while the original “simple” problem remained unresolved. Four years later Sampath Kannan spoke on “Tractable algorithms for phylogeny reconstruction”.

Two of the remaining lectures in the “miscellaneous” category were concerned with the mathematics involved in juggling, by Ronald Graham of AT&T Bell Laboratories, in 1991 and 1998. Ten years before Graham’s first lecture/demonstration the renowned author Paul R. Halmos asked “Does mathematics have elements?” Immediately after lunch Kenneth Appel lectured

on his celebrated – and controversial – computer-aided proof (with Wolfgang Haken) of the four-color problem, which had been completed in 1976.

Overall, this chapter has indicated that the greatest number of activities at annual meetings during the period 1979-2000 was concerned with educational issues, as reflected principally by panel discussions and invited lectures. Among the invited lectures, there was almost a dead heat among the three major categories of mathematics. Close on the heels of the "big three" were the history of mathematics, computer science, and applications.

Profile: MARVIN LINUS BRUBAKER

Marvin L. Brubaker was born in rural Snyder County in Central Pennsylvania. He attended public schools and then enrolled at Susquehanna University (located in Selinsgrove, PA), where he received an A.B. (*cum laude*) in 1961. He carried a double major in both physics and mathematics.

After a year of teaching mathematics and science at Middleburg High School, Brubaker enrolled in the graduate program at Bowling Green University. He taught physics labs and problem sessions while completing requirements for his M.A. in mathematics in 1964. This was followed by a three-year appointment as instructor in mathematics at his *alma mater*, Susquehanna, 1964-1967. He then accepted an assistant professorship at Moravian College. This move to the Lehigh Valley made it particularly convenient to begin work toward his doctorate at Lehigh University. In spite of teaching full-time all the while, Brubaker earned his Ph.D. in October 1973 for a dissertation titled, "A comparison of the Shukla cohomology with a cotriple cohomology", and written under Franklin Brenneman.

Brubaker remained at Moravian for 16 years, serving as chair of the mathematics department the last nine years. In 1983 he moved to Messiah College, where he has remained ever since. During his tenure at Messiah he has been actively involved in faculty development and the process of introducing technology into the classroom. In addition, he has directed more than 120 secondary mathematics student teachers and has been actively involved in offering technology workshops locally, regionally, and nationally. (He has presented workshops on *Derive* in 14 states and two provinces!) He has also spent a considerable amount of time coaching students for presentations at EPADEL meetings and at the Moravian College Student Paper Conference.

To accomplish his goal of introducing technology, Brubaker organized and directed three one-week faculty development workshops at Moravian College and followed up with more than 18 similar workshops at Messiah College from 1986 to the present time. Several workshops received NSF support. Since many of them were sponsored by EPADEL, they stand as perhaps his most visible contribution to the section.

But workshops represent only a portion of Brubaker's volunteer activities with the section. He was elected president for two one-year terms, 1987-1989, after being vice-president for two one-year terms. Not surprisingly he has also served as workshop coordinator for the section, holding that position from 1985 to the present. In addition, he was elected sectional Governor for a three-year term, 1992-1995.

In appreciation for all these volunteer activities, in January 1996 Brubaker was the recipient of the Award for Distinguished Service for the EPADEL Section, an award given by the national MAA. In addition, he served as a member of Mini Course Committee of the MAA from 1992 to 1998. He has also been an active participant with the MAA's interactive mathematics text project.

Chapter 8: Spring Meetings, 1975-2000

The need to hold a second annual meeting was felt by the late 1950s. A letter from I. Edward Block (who had been chair 1957-1958) to the newly elected chair Marguerite Lehr in December 1958 noted, "There seems to be a certain state of indifference which permeates the Section, but perhaps through continued effort the situation will change." It did, resulting in a report by the Executive Committee in 1959 listing 10 possible activities. The first was to organize complete programs around a particular topic, and the second was to hold two meetings each year.

It would take another 15 years before these suggestions would become a reality, and even then they would be somewhat controversial. Yet due to the success of two special sessions held in 1975, the section sponsored its first spring meeting in 1976. The success of these meetings has resulted in a tradition of annual spring meetings that continues today. The two annual meetings often exhibit markedly different characters, however, as the 1959 report suggested. Whereas fall meetings were designed to appeal to a wide variety of interests within mathematics and mathematics education, each spring meeting is generally devoted to one theme.

This chapter is divided into four parts. The first deals with the "pre-history" of spring meetings, as evidenced by the two special sessions in 1975. The second examines the dates, sites and themes of all spring meetings held from 1976 through 2000. The third analyzes the sites of annual meetings at combined fall and spring meetings. The final part presents a chronological account of the spring meetings from 1976 to 2000, singling out some of the individuals who played integral parts. Gerald Porter is profiled at the end of the chapter to honor his contributions to the section and the national MAA over a period exceeding 30 years.

Pre-History

The impetus for holding special sessions devoted to a particular theme was a questionnaire designed by Eugene Klotz in 1973-1974 and sent to all departments in the section. As noted in Chapter 6, Klotz summarized the responses by listing three activities that would appeal to a wide segment of the membership. Two of them were holding special meetings and accentuating special topics at regular meetings. Joerg Mayer organized the first special session in April 1975 at his home institution, Lebanon Valley College. Mayer was then in the final leg of his second year as chair of the section. Another special session was held that October. For the next two years the two aspects of the Klotz report came together as special meetings devoted to a single topic. We examine these four sessions.

The special session on computers held at Lebanon Valley on April 12, 1975, consisted of three one-hour talks in the morning followed by a bevy of workshops in the afternoon. After the opening remarks by the organizer, Joerg

Mayer, the first invited address was delivered by Wallace J. Growney, who had moved to Susquehanna University from the University of Oklahoma a few years earlier. His talk, entitled “Computer underwear”, was described as “an elementary but fast-paced talk on the hardware and software beneath the surface of computing.” Next came another EPADEL member, John A. Beidler (University of Scranton), with the clever title, “The computer, as seen by the computer scientist and by the mathematician”. The final talk at the morning session was “Some views on computer science in small colleges” by R. Austing of the University of Maryland.

Table 1 lists the six workshops that were offered on the afternoon program of the special session. The people who offered the workshops were called moderators.

Moderator	Affiliation	Workshop Title
Leonard Garrett	Temple	Computer science courses and programs
Edgar R. Mullins	Swarthmore	Computer sciences courses and programs (alternate section)
Carl Leinbach	Gettysburg	The computer and mathematics courses
John A. Beidler	Scranton	The computer and mathematics courses (alternate section)
William A. Hansen	Wilkes	The various high-level languages, their advantages and disadvantages
Richard Wood	LTV Aerospace	Choosing a computer

Table 1

About 75 people attended this special session. Its success prompted Wallace Growney to organize another special session in the fall, this one devoted to “The new applied mathematics”. The meeting on October 4 was impressive, prompting section secretary-treasurer Phillip Bedient to send a congratulatory note to Growney. It read, “By every measure that I can devise the recent Special Session on Applied Mathematics held at Rosemont College was a success. … Since the Session was largely your doing from start to finish, the section owes you a strong expression of gratitude for a job well done.”

Bedient’s report to the MAA listed the attendance at 158. The section’s archives do not contain a meeting program so we are unable to provide details. However, the archives include Growney’s outline beforehand, from which we conclude that the program consisted of four one-hour sessions. The morning program included “Mathematics in the social sciences” (moderated by Eugene Klotz) and “Mathematics in biology and medicine” (moderated by Growney). The afternoon program was envisioned to consist of “Statistics, computer science, operations research, and other applied areas in the departmental curriculum” and “Careers for mathematics majors”.

A letter from Phillip Bedient to Eugene Klotz in December 1975 uses the term "spring meeting" for the first time. As we record below, these meetings have been conducted every year since the spring of 1976.

Annual Meetings

Table 2 provides an overview of the dates, sites, and themes of EPADEL's 25 annual spring meetings held from 1976 to 2000.

Date	Location	Theme
April 10, 1976	Gettysburg College	Mathematical models in undergraduate teaching
April 23, 1977	Kutztown University	Structured programming
April 8, 1978	Ursinus College	[No specific theme]
April 28, 1979	Univ. of Pennsylvania	Computer graphics
April 26, 1980	Cedar Crest College	Combinatorics
April 4, 1981	Penn State – Ogontz	Computational geometry
April 17, 1982	Albright College	Curricular Interfaces
April 9, 1983	Millersville University	Mathematics and artificial intelligence
March 31, 1984	Lehigh University	Mathematics and communication theory
March 30, 1985	Bloomsburg University	Discrete algorithmic mathematics
April 5, 1986	West Chester University	Numerical linear algebra
April 4, 1987	Moravian College	Actuarial mathematics
April 9, 1988	Ursinus College	Operations research
April 8, 1989	Univ. of Pennsylvania	Computer algebra systems
April 7, 1990	Swarthmore College	Geometry
April 6, 1991	LaSalle College	Decision sciences
April 11, 1992	Messiah College	Mathematical models
April 3, 1993	Villanova University	Improving mathematics learning
March 12, 1994	Harrisburg Area C. C.	Calculus reform
April 8, 1995	King's College	Interactive texts
April 13, 1996	Millersville University	Active learning
April 19, 1997	Ursinus College	Mathematics and the Internet
April 18, 1998	Shippensburg University	Game theory
April 10, 1999	Villanova University	Mathematical applications throughout the curriculum
April 8, 2000	Messiah College	Statistics

Table 2

Table 2 indicates that, with the exception of 1994, spring meetings are held during the last part of March or the first two weeks in April. The reason for the earlier meeting date in 1994 was because of the joint session with PSMATYC, the Pennsylvania State Mathematical Association of Two-Year Colleges.

The 25 annual spring meetings have been held at 18 different institutions. This spread reflects the continuing broadening of sectional activity. Curiously the section has met neither at Drexel nor Delaware, although Drexel hosted seven fall meetings, the second-most altogether, and Delaware hosted five.

Ursinus College hosted three spring meetings, the most of any institution in the section. The fall meetings held there in 1938 and 1961 occurred a long time before spring meetings were inaugurated. Four institutions hosted two spring meetings – Messiah, Millersville, Penn, and Villanova. Millersville and Villanova were also the sites for two fall meetings during this period, and Penn one, but the section never met at Messiah in the fall.

The remaining 13 institutions, where spring meetings have been held once, also reflect wide differences regarding fall meetings. For instance, Lehigh and Swarthmore are tied for third place in fall meetings with six each. Similarly, both Penn State - Ogontz and West Chester were the sites of three fall meetings. Two of these institutions hosted one fall meeting – Cedar Crest and Moravian. The spring meeting that the remaining seven colleges hosted was the only time the section met there – Albright, Bloomsburg, Harrisburg Area Community College, King's College, Kutztown, LaSalle, and Shippensburg.

Combined Meetings

Before considering the themes of the spring meetings, we pause to examine the sites of the combined 103 meetings, including the 75 annual fall meetings, the 25 annual spring meetings, the special meetings held in April and October 1975, and the special meeting in October 1990. Table 3 lists the 34 different institutions that have hosted at least one of the section's 101 meetings from the organizational meeting in 1926 through the fall meeting in the year 2000.

The final column in Table 3 classifies each institution into one of five categories: D (doctoral university), S (belongs to the State System of Higher Education), F (other four-year school that does not offer doctoral programs), B (branch campus), and CC (Community College). Table 4 summarizes the hosting institutions for the 103 meetings according to this classification. The second column gives the number of different institutions in each category. The final column indicates that the section's meetings were held primarily at four-year schools or doctoral universities (82.5% altogether), split almost evenly. The remaining 18 meetings were almost evenly split between universities in the State System (10) and a combined category of branch campuses/community colleges (8).

Location	Fall	Spring	Special	Total	C
University of Pennsylvania	16	2		18	D
Drexel University	7			7	D
Lehigh University	6	1		7	D
Swarthmore College	6	1		7	F
University of Delaware	5			5	D
Ursinus College	2	3		5	F
Haverford College	4			4	F
Millersville University	2	2		4	S
Penn State – Ogontz/Abington	3	1		4	B
Villanova University	2	2		4	F
West Chester University	3	1		4	S
Franklin & Marshall College	3			3	F
Bryn Mawr College	2			2	F
Cedar Crest College	1	1		2	F
Lafayette College	2			2	F
Lebanon Valley College	1		1	2	F
Montgomery County Community College	2			2	CC
Messiah College		2		2	F
Moravian College	1	1		2	F
Muhlenberg College	2			2	F
Albright College		1		1	F
Bloomsburg University		1		1	S
Community College of Philadelphia			1	1	CC
Delaware State College	1			1	F
Elizabethtown College	1			1	F
Gettysburg College		1		1	F
Harrisburg Area Community College		1		1	CC
King’s College		1		1	F
Kutztown University		1		1	S
LaSalle College		1		1	F
New Jersey College for Women	1			1	D
Princeton University	1			1	D
Rosemont College			1	1	F
Shippensburg University		1		1	S
Temple University	1			1	D

Table 3

Classification	Number	Fall	Spring	Special	Total
F	19	28	15	2	45
B	1	3	1		4
CC	3	2	1	1	4
D	7	37	3		40
S	4	5	5		10

Table 4

Chronological Survey

The first public notice of the Executive Committee's express interest in sponsoring a second meeting each year occurred in the section's February 1976 newsletter. An item titled "Special spring meeting" announced, "Plans are brewing for a special session on the use of mathematical models in undergraduate teaching Saturday, April 10, at Gettysburg College. Carl Leinbach (Gettysburg) is chairman of the planning committee. Other members are Jerry Porter (Penn) and Eugene Klotz (Swarthmore.) Professor Leinbach is willing to organize some special entertainment for families of members. If enough interest is shown, he will plan a bus tour of the battlefield conducted by a member of the Gettysburg College History Department." Although those plans did not materialize exactly, the idea of holding a spring meeting in addition to the annual fall meeting got off to a good start.

The meeting began with welcoming remarks by Leonard Holder, the dean of the college and former chair of the mathematics department. Next came a panel discussion on the question, "What do we mean by mathematical modeling?" Moderated by Jerry King (Lehigh), the panelists were Fred Roberts (Rutgers) and Gerald Thompson (Carnegie-Mellon). The two panelists delivered invited lectures after that. Before lunch Thompson spoke on "Combinatorial decision – Problem applications and solutions." After the meal Roberts described "Interval graphs, traffic lights, and ecological phase space". Samuel Merrill (Wilkes) followed that with a third invited lecture, "Citizen voting power under the Electoral College system." The day ended with another panel discussion, this one devoted to "Experiences in the teaching of courses on mathematical modeling." Eugene Klotz (Swarthmore) was the moderator, while Gene D. Chase (Messiah) and Randall King (Gettysburg) were the panelists.

The format of spring meetings began to evolve the next year when the section met at Kutztown. This time the gathering was called a Spring Symposium; the theme was "Structured Programming". Although the March 1977 newsletter did not announce the program, it did list three sessions to be covered by the program that would run "from 8:00 or 8:30 to 3:00 or 3:30":

- An overview of structured programming,
- Problem solving and structured FORTRAN, and

- An example using structured FORTRAN to introduce some basic data structure concepts.

There were four organizers: John Beidler, Ranan R. Bannerji, Wallace Growney, and John Koch. Dalton Hunkins was in charge of local arrangements. The newsletter also carried an editorial whose title asked, "Why should mathematicians be interested in structured programming?" The question was answered by listing three benefits derived from teaching proper programming:

- Less emphasis on learning all the idiosyncrasies of a particular language;
- More emphasis on the use of the three simple control constructs (sequence, conditional, and looping);
- More emphasis on analysis and design techniques that help to verify the correctness of algorithms before programs are written.

Beginning with the 1978 meeting at Ursinus, and continuing ever since, the new annual gathering was called the Spring Meeting. Its format resembled a typical fall meeting – it began with welcoming remarks and continued with three speakers. However, the speakers delivered their lectures before lunch, which was served at the unusually late time of 1:30. The final speaker, whose talk was scheduled an hour later, was "to be announced – speaker from the area of Computer Science." The program chairman for the meeting was Leslie K. Arnold of Daniel H. Wagner Associates. Although no general theme for the meeting was stated officially, one can deduce from the topics of the lectures that the theme was applied, or even industrial, mathematics. The three announced speakers, with affiliation and title are:

1. Sinclair Scala (General Electric Corp.), "Mathematics of heat protection systems for planetary entry probes,"
2. Arnold Dicke (Penn Mutual Life Insurance Company and Temple University), "Calculation of mortality fluctuation surplus for a life insurance company,"
3. Joseph Bolmarcich (Quantics, Inc.), "Polya contagion with fatalities."

The meeting at Penn's David Rittenhouse Labs the next spring, under program chair Gerald J. Porter, was the first one sponsored under the section's new EPADEL name. The announced theme was computer graphics, with one-hour morning sessions on graphics hardware and graphics software. Next came lunch in the Egyptian Gallery of the University Museum. The two-hour afternoon session was devoted to applications of computer graphics in undergraduate mathematics education.

The 1980 meeting at Cedar Crest College in Allentown was devoted to combinatorics. Two speakers from the AT&T Bell Laboratories in Murray Hill, NJ, addressed this theme in the morning session, Neil Sloane and Jessie MacWilliams. The titles of their presentations were "Hadamard, Hotelling, and Harwitt: A new application of some old mathematics," and "A survey of coding theory," respectively.

Although the 1981 meeting was ostensibly devoted to computational geometry, the lectures reveal a much broader theme. Initially Philip J. Davis was scheduled to open the meeting with a talk on computer graphics but due to unforeseen circumstances he was replaced by Sandra Fillebrown, who spoke about cryptography. Next, Drexel's William J. Gordon spoke about "Computer graphics as an aid to problem solving in science and engineering". His colleague, Oleh J. Tretiak, from the Department of Biomedical Engineering, followed lunch with a talk on tomography, a field whose role in CAT scans was only beginning to surface at the time. In the final presentation, cleverly titled, "Is μ-math the ν-math?" Penn's Albert Nijenhuis demonstrated "a symbolic manipulative program capable of performing symbolic differentiation, integration, and other feats on a digital computer."

The program at the 1982 meeting reflected the advantage of the flexible format over the traditional fare at fall meetings. The theme was curricular interfaces, a term that was defined in the first talk of the day, when Anthony Ralston (SUNY-Buffalo) proposed replacing calculus as the first course in the standard curriculum for mathematics majors by a course in discrete mathematics. Next, James P. Crawford (Lafayette) provided a 15-minute rebuttal by raising some concerns about such a radical change. Following that came a 30-minute "Audience discussion" moderated by Carl Leinbach (Gettysburg). The final part of the morning session featured a lecture by Eugene M. Luks (Bucknell) titled, "Recent advances in graph isomorphic testing: An application of group theory in computer science". Like the morning session, the afternoon did not adhere to the usual format of two one-hour talks. Instead, there was a "Microcomputer medley" of five 30-minute presentations on "the use of microcomputers and intelligent terminals in the teaching of undergraduate mathematics." Table 5 lists the five speakers, their affiliations, and the titles of their presentations. Some presentations were conducted concurrently so the audience could view the demonstrations up close and gain hands-on experience with the materials; some were also repeated.

Speaker	Affiliation	Title
John G. Bergman	Delaware	Simulation models in calculus
Richard Heiberger	Temple	Interfacing with statistical packages
Eugene A. Klotz	Swarthmore	Trigonometry tutorials
Gerald J. Porter	Penn	Linear algebra in computer graphics
Paul S. Putter	Penn State - Ogontz	Extending the mathematical background

Table 5

The morning and afternoon formats did not present the only variations from the usual program. Instead of the book display, the Gettysburg duo of David Flesner and Carl Leinbach conducted an information exchange concerning computer science and mathematics programs.

The next two meetings were conducted in a manner similar to the standard format at fall meetings. The theme of the 1983 meeting, "Mathematics and artificial intelligence", was addressed in two lectures in the morning and two in the afternoon. Only three of the talks were announced, however – Aravind Joshi (Penn), "Grammatical representations in natural language processing: Some mathematical results," Jack Minker (Maryland), "Logic and its uses in artificial intelligence and databases," and Casimir Kulikowski (Rutgers), "Expert systems".

The there for the 1984 meeting was "Mathematics and communication theory". The morning session began after a welcome by the host institution's Dean of the Graduate School, Jerry King. The two invited lectures were Chester Salwach (Lafayette), "Codes that detect and correct errors," and Andrew Odlyzko (Bell Telephone Laboratories), "Public key cryptography." A demonstration of a Hewlett-Packard processing system occurred between these two lectures. The afternoon session featured two lectures, Walter Hiver (Hewlett-Packard Corp.), "Computer system performance evaluation," and Jack Wolf (UMass), "Mu Hiaccess communications."

The 1985 meeting took advantage of the flexible format in several ways. For one, a social hour was held at the historic Hotel Magee in Bloomsburg on Friday night. For another, Garrett Birkhoff reminisced publicly about his life in mathematics over lunch on Saturday. But the largest deviation was the four-hour workshop on "Discrete algorithmic mathematics" taught by Swarthmore's Steven Maurer. The four hours were divided evenly into morning and afternoon sessions.

The format of the 1986 meeting was also different. The first lecturer, M. Zuhair Nashed (Delaware), reflected the day's theme on numerical linear algebra in his talk, "Computational methods for linear least squares problems". However, the rest of the morning session and the entire afternoon session consisted of workshops run by three EPADEL presidents. Drexel's Howard Anton presented a 2½-hour workshop on the linear-algebra software package he developed, LINEAR-KIT. Two other one-hour workshops ran concurrently – David Hill (Temple), "An introduction to PC-MATLAB", and Bernard Kolman (Drexel), "Matrix algebra for the Macintosh".

The main part of the program for the 1987 meeting consisted of three lectures and a panel discussion on the theme of actuarial mathematics, with all participants hailing from the EPADEL area. The first speaker was Roy G. Shrum, an actuary and a vice-president of the Pennsylvania National Casualty Insurance Company, who had passed two actuarial examinations while still an undergraduate student at Penn State. Shrum had, in fact, passed all ten exams before delivering his presentation, "A day in the life of an actuary". The next two speakers represented emerging academic programs at local universities. Bonnie Averbach, the director of the program in Actuarial Science at Temple, spoke about "Life contingencies". She was followed by Neil Vance, from Penn's Department of Insurance, a specialist on the use of Fourier analysis in insurance problems, whose lecture was titled "Approximating total claims of a life

insurance company". The panel discussion aimed to answer the question, "How do you prepare to become an actuary?" Moderated by Brian Hearsey, the director of Lebanon Valley's acclaimed actuarial program, the panel consisted of recent graduates from liberal arts colleges who had pursued careers in actuarial science.

While the format of the program at the spring 1987 meeting might have been fairly standard, the day did not end that way. The last item on the agenda treated attendees to a reception at Moravian's Payne Gallery where they could view an exhibit titled "A mathematician views M. C. Escher," hosted by our section's Escher specialist, Doris Schattschneider.

The program for the 1988 meeting consisted of four lectures on the theme of the day, operations research. Shippensburg's Fred Nordal, the recipient of a Virginia Tech Ph.D. in operations research, began the day with a talk titled, "Origin, history and some applications of operations research". He was followed by George Freestone, the manager of operations research for chemical systems development and services at Air Products and Chemicals, Inc. His talk on "Logistics planning for chemicals at Air Products" dealt with the application of linear programming to customer sourcing and product mix problems in the chemicals business. Next, Jeffrey Lagarias of AT&T Bell Laboratories provided EPADEL members with an updating on very recent developments in his lecture titled, "Karmarkar's linear programming algorithm and nonlinear programming". The final speaker, Temple's Leon Steinberg, spoke on "Simulation and the Monte Carlo method". He based his remarks on the history and application of Monte Carlo methods from his vast years of experience as a mathematical consultant.

Like the 1987 spring meeting, the 1989 version, whose theme was "Computer algebra systems", consisted of three invited lectures and a panel discussion, this one devoted to "An introduction to computer algebra systems and their use in undergraduate mathematics education". In the first talk, "Computer algebra using the HP28S," John Kenelly described his department's use of Hewlett Packard hand-held calculators, emphasizing the fact that these very powerful calculators placed symbolic calculation in the palms of his Clemson students. Next, Paul Zorn (St. Olaf) emphasized mathematical content and pedagogy rather than technical matters in his lecture titled, "*Mathematica* in undergraduate mathematics". Zorn stated, "Although it seems obvious that computing should be a powerful force for change, so far that force has proved eminently resistible. Elementary calculus courses, for example, have hardly changed after 20 years of experiments with numerical computing. Symbolic computer systems, such as *Mathematica*, will be harder to ignore." The purpose of the day's remaining talk, "Computer algebra systems: Issues and inquiries," by Warren Page (NY City Technical College) was "to initiate dialog and raise awareness of the many critical issues related to the introduction of CASs into the mathematics curriculum."

In his president's message introducing the 1990 spring meeting, David Hill noted that the national MAA was about to embark on a series of new programs at the same time it looked to the past to celebrate the Association's

semisesquicentennial anniversary. He wrote, "Within EPADEL we hope to follow suit … the spring meeting offers an opportunity for you to bring students and high school math teachers. The morning program on GEOMETRY should be especially appealing to a wide audience." While that morning session was indeed appealing, in retrospect its introduction of the Visual Geometry Project was historic. The Project, under the direction of Eugene Klotz (Swarthmore) and Doris Schattschneider (Moravian), had been created in response to the widespread concern for the lack of 3-dimensional geometry in the schools. The former section presidents wrote, "Our multi-media approach seems of much broader applicability than our target high-school geometry population, and in particular some of our materials should be of use in a variety of college courses. In our presentation we will demonstrate some of the materials we have under development, including a videotape, some 3-dimensional models, and a computer program."

The presentation by Klotz and Schattschneider was followed by a computer-animated video by Eiji Hirai from Swarthmore College, and two lectures, the first by Cynthia Schmatzried on "The relationship of pre-college math to college mathematics: What should we be teaching secondary teachers?" and the second by Ann Fetter and Cynthia Schmatzried on "Hands-on models". The final part of the morning session was a demonstration of *The Geometer's Sketchpad* by its developers, Nicholas Jackiw and Eugene Klotz. *The Geometer's Sketchpad* has been highly successful and is currently available commercially from Key Curriculum Press. (Incidentally, Key Curriculum's president, Steven Rasmussen, holds two Temple degrees, a B.A. in mathematics in 1976 and a masters degree in mathematics education in 1978.)

The afternoon session at the 1990 meeting consisted of two lectures – Paul Kumpel (SUNY - Stony Brook), "Untangling a bicycle chair", and Andrew Hume (AT&T Bell Laboratories), "Folding polyhedra and other computer databases".

The following year president Hill wrote, "The theme of this year's spring meeting is Decision Sciences … While there is significant movement to reform our calculus instruction format, there is ample reason to believe that a similar effort in elementary statistics instruction should be initiated at a variety of levels." William E. Rosenthal addressed the same issue in his opening lecture, "No more sadistics [*sic*], no more sadists, no more victims", in which he called for a radical reconstruction of the standard college-level elementary statistics course. Besides being a member of the mathematics department at Ursinus, Rosenthal was the co-coordinator of the College's women's studies program. In the final talk of the day, Temple statistician Janos Galambos, who had lectured on all continents except Antarctica, spoke on his specialty in a lecture titled, "Bonferroni-type inequalities: Fatigue failure of metals and the twin-prime conjecture". The two lectures between Rosenthal and Galambos were by James M. Landwehr (AT&T Bell Laboratories), "What should be in an introductory statistics course?" and Fred S. Roberts, "Meaningless statements".

The 1991 meeting also featured a new element at spring meetings, student paper sessions. Deborah Frantz (Kutztown) moderated two one-hour sessions that ran parallel to lectures given in the morning and the afternoon. The following year Lamarr Widmer (Messiah) ran a 2½-hour session of student papers in the morning session. The theme of that year's meeting, "Mathematical modeling", was a reprise of the section's inaugural spring meeting held at Gettysburg 15 years earlier. Jefferson S. Hartzler (Penn State Harrisburg) began the day with an address whose title was congruent to the day's theme. His lecture described, *inter alia*, a junior/senior modeling course developed for Messiah College and his own campus of Penn State. Next David ("Chris") Arney (United States Military Academy) described the modeling course that formed the core of the four mathematics courses required of all cadets at West Point. After a discussion by Joseph H. Discenza (Daniel Wagner Associates) on modeling aspects of search problems about target *a priori* location, Ben A. Fusaro ended the day with a lecture on his specialty, environmental modeling. Fusaro included an outline of a six-week module appropriate for a general-education or liberal arts course.

At the 1993 spring meeting, four lecturers described projects related to the day's theme, "Improving mathematics learning". All four talks reflected the change in perspective that was taking place in the mathematics community at the time – from an emphasis on instructors and teaching to an emphasis on students and learning. Two of the presentations described projects developed in classrooms in the EPADEL area. One was a joint presentation by Gerald J. Porter (Penn) and David R. Hill (Temple). Former EPADEL governor Porter began by describing an interactive linear algebra text the two speakers had written; he then related experiences in using it at Penn in what he called "Linear algebra AS a laboratory course". Former EPADEL president Hill then described a similar course at Temple and contrasted it with Porter's course. The distinction between the two can seen in the title Hill adopted, "Linear algebra WITH a laboratory course". The other EPADEL speaker, Nancy Baxter (Dickinson), discussed design and implementation issues that arose when she adopted a lab-based, collaborative, constructivist approach to teaching functions, in her lecture "Teaching mathematics without learning".

The two outside speakers are well known for their involvement in undergraduate mathematics education. Cornell's Beverly H. West described the interactive computer graphics she developed for use in calculus, linear algebra, and differential equations courses in a lecture titled "Integrating friendly graphics technology into the calculus curriculum". In the remaining lecture, "Mathematics as a thinking subject," Robert B. Davis (Rutgers) presented data obtained from school mathematics and innovative calculus courses that helped students learn mathematics in a reflective and analytical way.

Once again the flexible format of the spring meeting allowed the organizers to insert yet another element into the mix. During the day William Hawkins (MAA) ran a two-hour SUMMA workshop on proposal preparation, and Deborah A. Frantz moderated two one-hour student-paper sessions. (SUMMA is the MAA program Strengthening Underrepresented Minority Mathematics Achievement.)

The 1994 spring meeting was run in conjunction with PSMATYC, the Pennsylvania State Mathematical Association of Two-Year Colleges. President Walter Stromquist invited EPADEL members to "hear from Roseanne Hofmann and Stan Clemens on the use of graphing calculators, and from David A. Smith and Andy Gleason on their projects in calculus reform." Stromquist then noted, "There will be parallel sessions of student presentations, including (a new emphasis) student papers on the teaching of mathematics." Table 6 lists information about the four EPADEL presentations. Table 7 lists workshops offered under the aegis of PSMATYC.

Speaker	Affiliation	Lecture Title
Stan Clemens	Bluffton College (OH)	Using a graphing calculator to enhance the teaching of college and intermediate algebra
Andrew M. Gleason	Harvard	The Harvard calculus consortium and the reform program in mathematics
Roseanne Hofmann	Montgomery CCC	Teaching undergraduate mathematics using technology
David A. Smith	Duke	Calculus: Concepts, computation, composition, and cooperation

Table 6

Leader	Affiliation	Workshop Title
Roseanne Hofmann	Montgomery CCC	Using the TI-82 calculator
Sidney Johnson	Harrisburg Area CC	Tech today – We don't mind change but do we change our minds?
Linda McCauslin Ellen Shatto	Harrisburg Area CC	A laboratory approach to college algebra with the TI-81
Marvin L. Brubaker L. Carl Leinbach	Messiah College Gettysburg College	Calculus: Concepts, computation, composition, and cooperation
Dan Apple	Pacific Coast Software	Critical thinking with PCSolve

Table 7

In announcing the theme for the 1995 meeting, Walter Stromquist wrote, "Printed texts might be near the end of their run … they may hang on for a while, but students can now demand electronic tutorials … fortunately for EPADEL, much of the leadership in meeting this demand is coming from within our region. Hence the attraction of the spring meeting, whose focus on interactive texts will give us the best glimpse we are likely to get of the future of this technology." To begin the day, William J. Davis (Ohio State) described the interactive calculus text called *Calculus&Mathematica*. Then James E. White (UNC, Institute for Academic Technology) described some of the design implications for computer-

based teaching and learning environments that were then emerging from computational styles that included object orientation, graphical user interfaces, and hypertext.

But it was the afternoon session that fulfilled Stromquist's promise. He wrote, "We are experimenting with a somewhat different format, in order to allow attendees to sit at the keyboards and work directly with several of the most promising interactive systems." Four 20-minute presentations demonstrated the systems Stromquist mentioned: Charles E. Hofmann (LaSalle) and Roseanne S. Hofmann (Montgomery CCC), "Explorations in mathematics using MathKit," Jack R. Stodghill and Barry A. Tesman (both from Dickinson), "Mathematica-based labs for calculus I, II, and III," David R. Hill (Temple) and Gerald J. Porter (Penn), "Interactive linear algebra in MathCAD," and Charles E. Ashley (Villanova), "Maple projects for differential equations and linear algebra". Two types of parallel sessions were conducted during these presentations – a 90-minute student-paper session organized by Linda C. Thiel (Ursinus), and a series of interactive demonstrations on MathKit, Mathematica, MathCAD, and Maple.

The 1996 meeting, devoted to active learning, returned to the theme from the 1993 meeting, improving mathematics learning. President Louise Berard wrote beforehand, "Active learning at first may sound redundant because all learning IS active. However, traditional classroom techniques often allow students to be more passive than we would like regarding their educational experience. Our invited speakers will share with us some important suggestions for engaging students more actively in the learning process."

Two of the four speakers came from the EPADEL section, with Louise's husband, Anthony D. Berard, Jr. (King's College), leading off the program. His lecture, "Applying logic/designing small axiom systems", described a course in which students worked in small groups in class to develop proofs together. He ended his talk by supplying an example of an axiom system designed by first-semester students. In the final talk of the day Nancy L. Hagelgans (Ursinus), the former section president who was then the section's governor, discussed "Cooperative learning in discrete mathematics". This talk described a sophomore-level course in which students solved problems in three different settings – using a computer algebra system by participating in groups during class, in the computer laboratory, and outside scheduled hours. In the remaining two lectures, E. Jacquelin Dietz (North Carolina State) presented two hands-on activities that were developed to teach the concept of sampling distribution, while Richard W. Decker (Hamilton College) described an introductory survey course in computer science in his presentation "A suite of hands-on laboratory exercises".

The 1997 meeting duplicated the theme of that year's Mathematics Awareness Week – "Mathematics and the Internet". The local highlight was Eugene Klotz's presentation with the fetching title, "How the WWW is taking over all of mathematics and what you can do about it". In the talk the former EPADEL president surveyed old and new developments in the study of symmetry from algebraic and geometric viewpoints. By the time of his lecture Klotz was known

internationally for his role in developing the highly successful Math Forum Web site. Three other talks completed the program – Frank Wattenberg (Montana State), "Using the WWW, Netscape, and Helper applications to create a learning environment exploiting hands-on equipment, a CAS, Java, and the Internet to study mathematics across the curriculum", David Cerone (Union College), "Mathematics on the Web: Looking back and looking forward", and Frank Beatrous (Pittsburgh), "The use of network resources in calculus instruction".

The game theoretic theme for 1998 was addressed by three invited lectures. Fan Chung Graham (Penn) discussed a variety of graph pebbling problems, described some classic results, and mentioned several unsolved problems in her talk titled, "Pebbling on graphs". In the day's opening address, Alan D. Taylor (Union College) focused on game-theoretic approaches to the question of whether honesty is the best policy in his lecture, "Strategic aspects of fair division". The third lecture, "Puzzles and paradoxes in game theory" by Ed Packel (Lake Forest College), discussed four problems from game theory. The remaining hour was comprised of contributed papers.

The 1999 meeting at Villanova was cosponsored by the Middle Atlantic Consortium for Mathematics and Its Applications Throughout the Curriculum (MACMATC), so the day's theme – mathematical applications throughout the curriculum – is not surprising. The morning session offered 11 workshops, four of which were offered by key members of our section: Annalisa Crannell (F & M), "The mathematics behind depth in drawings"; Joanne Darken (CCP), "Precalculus in the here and now: Payoffs the same semester"; Linda Thiel (Ursinus), "Life's a risk!"; Dennis DeTurck and Larry Gladney (Penn), "Moments of inertia – Integrated first-year calculus and physics". The afternoon session featured two keynote addresses – "Comparison with disclosure" by Peter Winkler (Bell Labs) and "Slime molds, tiger bush, and bamboo" by Ben Bolker (Princeton).

The first EPADEL meeting of the third millennium (or the last meeting of the second millennium, depending on your viewpoint) was devoted to statistics. Hence it was not by chance that two of the four speakers were graduates of the host institution, Messiah College. Mark Heise B.A. 1986) spoke on "Statistics and the drug development process". As senior statistician at SmithKline Beecham Pharmaceuticals, and formerly a statistician at Procter & Gamble Pharmaceuticals, Heise was particularly suited to discuss this topic. Tonya Sharpe King (B.A. 1992) spoke on "The role of the statistician in the academic research hospital setting". Like Heise, her employment record certainly made her well suited for the task because, after obtaining her Ph.D. in biostatistics, she accepted an assistant professorship in biostatistics at Penn State's College of Medicine at the Hershey Medical Center.

President Douglas Ensley promised that the 2000 meeting would extend beyond local success stories. He wrote, "The meeting features speakers known nationally through the MAA." One of the renowned speakers was Laurie Snell, known primarily for his 1950s pioneering work in developing (with John G. Kemeny and Gerald Thompson) the now-standard finite mathematics course and

writing the first book on the subject. In his talk Snell discussed his more recent interest, *Chance News*, an electronic newsletter dealing with current news based on probability and statistics. In the remaining talk, “Applications of MAPLE in the instruction of probability and statistics”, Elliot A. Tanis (Hope College) discussed ways to integrate the Computer Algebra System MAPLE into the instruction of probability and statistics. He also illustrated some procedures that helped to complete the statistical package in MAPLE.

Profile: GERALD JOSEPH PORTER

Jerry Porter's introduction to the MAA was pure serendipity. It occurred when David Rosen asked him to teach a seminar on algebraic topology at Swarthmore. That is how the two EPADEL stalwarts got to know each other. Rosen was the MAA governor at the time and he nominated Porter for the section's Executive Committee. The rest is, as they say, "history". In looking back over his 30 years of service to the MAA, Porter remarked, "I have a quote from Kundera on my wall that says, 'An individual transforms a fortuitous occurrence ... into a motif, which then assumes a permanent position in the composition of the individual's life.' (*The Unbearable Lightness of Being*) That pretty much describes my MAA experience."

And that pretty much describes the final EPADEL leader to be profiled.

Gerald Joseph Porter is a New Jersey native, born in Elizabeth on February 27, 1937, the son of Fred and Tillie Florence (Friedman) Porter. He attended Princeton University, graduating with an A.B. in mathematics in 1958. Then he enrolled in the graduate program at Cornell, earning a Ph.D. in 1963 for a dissertation on Whitehead products, the first written under the supervision of future AMS president William Browder. Algebraic topology and homotopy theory, especially homotopy operations, would dominate his research during the first part of his career.

Porter married Judith Deborah Revitch, who then transferred to Cornell. Today she is a professor of sociology at Bryn Mawr College. The couple has three children – Daniel, Rebecca, and Michael.

Upon graduation Porter went to MIT for two years as an instructor. Although he accepted an assistant professorship at Penn in 1965, he spent his first year on leave as a post-doctoral student at Brandeis on a fellowship from the Office of Naval Research. He has remained at Penn ever since, except for the year 1969-1970 spent at the Institute for Advanced Study. He was promoted to associate professor in 1969 and to full professor in 1975.

The year 1971 marked Porter's entry into administration, as he chaired the undergraduate affairs division of the mathematics department for the next two years. From 1981 to 1991 he was the associate dean for computing at Penn's School of Arts and Sciences. He was elected chair of the Faculty Senate in 1992, which meant that he served a three-year term in office (chair elect for one year, chair the next, and then past chair).

In 1983, Porter joined the MAA Investment Committee and this led to his election to the MAA Finance Committee in 1986 and his subsequent election as treasurer of the national association in 1992 and reelection in 1998. He will leave this position in January 2002. He has been a member of the Board of Governors since 1986. As a member of the Finance Committee and then as treasurer he has served *ex-officio* on the Audit Committee, Budget Committee, Building Committee, Publications Management Committee, Committee on Meetings and the Committee on Management Evaluation and Oversight (CMEO). He has chaired the Investment Committee since 1986 and the

Committee on Professional Development from 1995 to 2000 as well as the Budget Committee, Committee on Meetings, and CMEO. In 2000 Doris Schattschneider and he were awarded certificates of appreciation for their role "in the installation of a very special mathematical tiling in the front lobby area" of the MAA headquarters.

Jerry Porter has been a vital cog in EPADEL's leadership for the past 30 years, beginning as a panel participant at the section's 1970 meeting. He was elected to a three-year term on the Executive Committee five years later. In 1979 he was the program chair for the spring meeting held at Penn, and the following year he was elected to a three-year term as governor. In 1980 he also presented a perspicacious address on "The future of the MAA". Two years later he gave a 30-minute presentation on "Linear algebra in computer graphics" at the spring meeting and moderated a panel discussion on CUPM recommendations at the fall meeting. He has served on numerous nomination and program committees and is currently the EPADEL Webmaster.

The spring EPADEL meetings in 1993 and 1995 saw joint presentations with David Hill on interactive linear algebra texts. Sponsored by a FIPSE grant, this pair developed an interactive text that was published by Springer-Verlag in 1996 under the title *Interactive Linear Algebra*.

Porter's work on interactive texts is but one point in a long line of activity regarding the role of computers in undergraduate education. We pursue the outline of this line to show that life is really a journey rather than a sequence of isolated events. The journey began in the summers of 1955 and 1956, when Porter worked in a large insurance company that had just gotten its first computer, an IBM 650. This led to a summer job with IBM in 1957 writing subroutines to calculate trig functions and a part time job during the academic year at the Institute for Advanced Studies as the night operator of the Von Neumann computer. For his Princeton senior thesis his advisor, Harold Kuhn, proposed a set of initial states and wanted to know which one provided the best way to begin, so Porter used the Ford-Fulkerson algorithm to solve linear programming problems on an electronic computer. (In so doing, Porter may have been the first Princeton undergraduate to use a computer on his senior thesis.)

However, that was the end of Porter's involvement with computers or computing for another ten years. Then at a colloquium party in 1968, Herb Wilf and he decided that each of them would teach a section of computer calculus, a new undertaking for the Penn math department. Porter's goal was to use the computer not simply as a computational engine but as a tool to help students get a deeper understanding of the mathematics. That theme has persisted in his use of the computer in undergraduate mathematics.

By 1973 Penn's mathematics department had received an ILI grant that provided typewriter terminals to the computer, which was a major step forward. Even though the programs still ran in "batch mode" the turnaround was hours instead of days. Eventually it became minutes. It became clear to Porter that "printer graphics" were completely inadequate for showing the mathematics he wanted to show, so he applied for, and received, an NSF grant for graphic

terminals. This led him to organize, and speak at, the 1979 EPADEL spring meeting on computer graphics.

With the advent of the Apple II microcomputer the following year, Porter saw at once that educational uses on the mainframe were obsolete. He applied for an NSF grant to increase substantially the number of microcomputers on campus and to provide support for faculty to develop programs for their use in education, but by 1981 a change in presidential priorities essentially put NSF out of the education business. Nonetheless, Porter's involvement in the proposal led the dean to ask him to be the second associate dean for computing in the School of Arts and Sciences. Porter served in that position for ten years. This activity caused MAA president Lynn Steen to ask him to chair CCIME, resulting in a spate of talks around the country on the use of computers in undergraduate mathematics education. In 1989 he organized the EPADEL spring meeting on "The role of Computer Algebra Systems in teaching mathematics".

Porter left the dean's office after 10 years but he continued his involvement in this area with the MAA. One grant provided equipment and support for the Interactive Mathematics Text Project. This led to the interactive text with David Hill. Of course Porter's activities did not stop there. Since then he has helped the MAA begin the math digital library, MathDL, that now includes the journal he dubbed JOMA, the *Journal of Online Mathematics and Its Applications*.

Appendices

Appendix 1: Sketches and Profiles

(S = sketch, P = profile)

Name	Chap	
Albright	6	S
Allendoerfer	4	S
Amelotti	6	S
Anton	7	S
Ayoub	7	S
Baxter	6	P
Bedient	6	S
Benner	4	S
Bennett	2	P
Berard	7	S
Block	6	S
Botts	5	S
Brinkmann	4	S
Brooks	7	S
Brubaker	7	P
Caris	3	S
Charles	2	S
Clawson	4	S
Crannell	7	S
Crawley	3	S
Curry	6	S
Davis	5	S
Dennis	5	S
DeTurck	7	S
Doushkess	2	S
Dresden	3	P
Ensley	7	S
Everett	2	S
Filano	6	S
Fine	5	S
Finkel	1	S
Flesner	7	S
Foberg	2	S
Fort	3	S
Frantz	7	S
Geiringer	5	S
Gottschalk	5	S

Name	Chap	
Hagelgans	7	S
Hailperin	5	S
Harter	3	S
Hill	7	S
King	6	S
Kline	3	P
Klotz	6	S
Knebelman	2	S
Knedler	3	S
Koehler	5	S
Kolman	7	S
Lamson	2	S
Latshaw	6	S
Lawton	6	S
Lehr	6	P
Leinbach	7	S
Long	2	S
Manning	5	S
Marquard	2	S
Mayer	6	S
McDonough	2	S
McNeary	6	S
Meder	3	S
Miller	3	S
Mitchell	2	P
Morris	4	S
Murray	5	S
Nelson	5	S
Oakley	4	S
Owens	3	S
Oxtoby	5	P
Pepper	2	S
Pervin	6	S
Pitman	2	S
Porter	8	P
Rademacher	4	P
Rau	4	S

Name	Chap	
Raynor	5	S
Rees	5	S
Reid	2	S
Remage	6	S
Reynolds	2	P
Rosen	6	S
Saalfrank	6	S
Schafer, R.	5	S
Schafer, A.	5	S
Schattschneider	6	P
Sensenig	2	S
Shohat	4	P
Smail	4	S
Smith	4	S
Somers	7	S
Starke	5	S
Stromquist	7	S
Tartler	5	S
Tucker	5	S
Umoh	7	S
Wagner	7	S
Webber	5	P
Weida	3	S
Western	6	S
Wheeler	5	P
Whitman	5	S
Wilansky	6	P
Wilson	3	S
Wong	7	S
Wurster	6	S

Appendix 2. History of EPADEL

Willard Baxter, University of Delaware
Fall, 1990

I seem to have a habit of putting my foot in my mouth. This past summer I received a phone call from David Hill asking that I prepare a 15-20 minute talk in recognition of the 75th anniversary of the Association. I agreed. Thinking that it would be an easy task, I put it on the back burner till the middle of October. Knowing I could not procrastinate further I began to look for sources for the material for this talk. I thought for a moment of individuals who are older than I, and who were always present at annual meetings of the Section. I thought immediately of John Oxtoby, of Bryn Mawr and called him. He provided me with some information that I reconfirmed. I called Al Filano and talked with him. I then called Kay Somers, Secretary of the Section. She replied that the books of the section do not go back much beyond my tenure as Secretary. I don't know what that means! Did I lose the history of the section? Well, anyway, where do I turn? I called Jane Heckler, Executive Assistant of MAA. She supplied me with some remarks recorded in "The MAA: It's First Fifty Years". I finally turned to *The Monthly* and the major portion of this talk is taken from Reports of the Sections.

The history of the Section is shorter than the history of the MAA, and the history of the MAA is shorter than the history of *The Monthly*. The first issue of *The Monthly* was in January 1894. The first article in that issue was by Leonard Dickson, then a Fellow in Pure Mathematics at The University of Texas. The paper was titled "Lowest Integers Representing Sides of a Right Triangle."

The MAA was organized in Columbus, Ohio in 1915. There were 450 members present at that meeting. It was decided that anyone joining during that year would be considered as a Charter Member. 1045 individuals and 52 institutions were admitted as Charter Members. There were five sections: Kansas, Ohio, Missouri, Indiana, and Illinois. I looked at the charter member list. The first two names from this section of the country were Andrew Apple of F and M, and J. A. Bauman of Muhlenberg. I also noticed that the annual dues of MAA were 2 dollars, payable in advance.

On November 27, 1926, the Philadelphia Section was born. It was the thirteenth section and the second Eastern section of the MAA (The Maryland-D.C.-Virginia Section already existing). It is reported that Cairns and Slaught, national officers and from the Midwest, expressed concern about the "seeming apathy or lethargy" of the mathematicians of the Atlantic States. The Philadelphia Section was to attract members from Eastern Pennsylvania, southern New Jersey, and Delaware. The name (Philadelphia Section) caused a great deal of concern since all other sections had names of states, and to choose the name of a city broke all tradition. The Section countered. Pennsylvania had two population centers and by forming a section in the eastern portion of the state, one might prompt the forming of a Pittsburgh Section. The name was finally

granted. The section was admitted subject to the conditions of the By-Laws and promises of good behavior. In 1926, there were 7 members of the MAA listed for Delaware, and 105 individuals listed in Pennsylvania (not all members of the Section). At the first meeting, held at Lehigh, there were 20 individuals present. Present were individuals from F and M, Haverford, Lafayette, Lehigh, the University of Pennsylvania, and Princeton. The first chair of the section was H.H. Mitchell of the University of Pennsylvania, while A.A. Bennett of Princeton served as the first Secretary-Treasurer. It is noted that among the speakers at this first meeting was J.A. Foberg, the State (PA) Director of mathematical Instruction, who noted the attention given the secondary School curricula by MAA, the fact that mathematics was only required during the first nine-years of schooling and the fact that some universities and colleges were demanding 12 units of senior high mathematics. He called for a study to advise on appropriate curricula in the secondary school.

Following this theme for the moment one finds that in 1938, W.D. Carpenter, of Germantown Academy, stating "the thought of including elementary calculus and analytic geometry (in the high-school curricula) will only lead to a lack of thoroughness in the other subjects taught". He called for new high school texts along the line of the Joint Commission of MAA and NCTM.

In 1945, the concern was expressed that teachers are leaving the classroom for better jobs. The speaker expressed the need to mobilize a retraining program for secondary teachers. By 1955, we find H. Brinkmann of Swarthmore College reporting on the integration of high school and college mathematics (Admission with Advanced Placement) and in 1959, J. Brown of Delaware chairing a committee to act as liaison with state authorities on the curricula. That same year, V. Haag of F and M reported on SMSG. Thus, throughout its history, the section has undertaken to work cooperatively with teachers and administrators of pre-college mathematics.

Another long-tradition of the Section is the administration of "The American Mathematics High School Examination." Al Filano recalls the unusual circumstances of his assuming responsibility for this endeavor. Walter Lawton, then chairman of AHSME and of Temple University, disappeared in the woods of Eastern Pennsylvania just prior to the collection of data and so Al stepped in.

The undergraduate curricula have also been a concern of the section. In 1931, Professor Dresden spoke on the Swarthmore Honors Program. In 1951, Col R.C. Yates of West Point spoke on motivating freshmen, while in 1953, C.O. Oakley of Haverford addressed the topic of a new approach to freshman mathematics. In 1970 the program included a Panel Discussion on Computers in the first two years of College Mathematics. Participating were Gerald Porter of Penn and Carl Leinbach of Gettysburg. It is with special note that I call attention to the agenda of Morris Kline, of NYU who in 1956 took the view that the usual math taught freshmen (college algebra and analytic geometry) was meaningless, unmotivated, lacked in aesthetic quality and was incoherent. He proposed for freshmen: set theory, symbolic logic, Dedekind cuts, groups, fields, and the like!

Indeed in recent years, the Spring Meetings of the Association have had specialized curricular themes. I point to the periodic sessions on undergraduate student papers and the recognition given by the Section to outstanding performances in the Putnam Examination as activities consistent with the objectives of fostering undergraduate mathematics.

The strength of the November meetings over the years has been to provide the members of the Section with expository papers involving advanced or research topics. History shows that contrary to what we may think, we are affected by the world around us. To make the point, the first statistical talk occurred in 1940, when S.S. Wilks of Princeton talked on statistics related to The College Boards and again in 1948 when he spoke on random sampling, statistical control, statistical tests of significance, and the like. In 1951, one finds a talk on the use of finite fields in the design of experiment by David Gosslee of North Dakota Ag. College.

In 1942, H.B. Curry of Frankford Arsenal spoke on "Heaviside Operational Calculus" and G.E. Raynor of Lehigh "On External Ballistics – How Firing Tables Are Made." In 1949, A.D. Hestenes of the Franklin Institute spoke on "Some Observations Related to Mathematics in Research and Development", and by 1957 we have a session chaired by I.E. Block, then of Burroughs Corporation, one topic being "Desired Mathematical Training for a Mathematician Who Plans to Work in Industry". Henry Pollak of Bell Labs, in 1960 presented the CUPM Report: "Recommendations on the Panel for Physical Sciences and Engineering".

Let me speak briefly of another thread. In 1949, H.H. Goldstine of The Institute of Advanced Study, talked on "Some Problems in Numerical Analysis" related to truncation error, and round-off error. Again in 1955, and related to the Electronic Computer Project at IAS, he spoke on "Numerical Stability" and the estimation of error. In 1961, "ALGOL 60 - A Language for Students" is promoted. By 1970, as I noted earlier, a panel discussion on how to introduce the computer into the classroom is a part of the program at an annual meeting.

Very fortunately, the Section has had a wealth of good speakers and it only seems appropriate to name some. In 1929, J.F. Ritt of Columbia talked on "Liouville's Work." I note that Ritt's work has found renewed interest. Computer Algebra (*Maxima*, and *Mathematica* to name active computer packages in use today) uses his work. Among other visitors of note were Salomon Bochner of Columbia University, Richard Courant of NYU, who in a talk "Problems of Stability and Instability in Soap Film Experiments" alerted the Section of advances in Calculus of Variations. Marc Kac of Rockefeller Institute, in 1980, presented a memorable paper entitled "Recollections and Reflections on Fifty Years of Probability Theory" We even had speakers from Europe, for example, A.S. Besicovitch of Trinity College, Cambridge University addressed the Section.

The Section benefited before 1956, when the New Jersey Section was formed, by having expository talks by members of the Princeton faculty. Indeed, A.W. Tucker's presentation in 1948, "Geometric Approaches to The Theory of Games", was an extremely timely talk. R.H. Fox spoke twice. His titles were

"Homotopy Groups" and "The Logical Development of Knot Theory." Emil Artin, William Feller, and J.C. Moore also of that faculty presented papers at November meetings.

The litany can go on, I would remiss if I didn't mention some members of the section whose presentations deserve acknowledgment. Hans Rademacher of Penn talked several times. I believe that one can point to Professor Rademacher as the most famed of mathematicians of the Section. His colleague, I.J. Schoenberg, was an outstanding expositor. He presented talks on "Smoothing Operators" and "On Spline Interpolation." In 1947, Edwin Hewitt, then of Bryn Mawr, talked on "Generalizations of the Weierstrass Approximation Theorem", while Antoni Zygmund, then of the University of Pennsylvania, lectured on "On Some Unsolved Problems in the Theory of Trigonometric Series". He noted that the notion of function, the definite integral, and point set topology all developed in close connection with the theory of trigonometric series.

Other, who I remember, are W. Kuhn of Bryn Mawr, Curtis Greene of Haverford, J. Koch of Wilkes College who talked on his contribution to the solution of The Four Color Problem, R.D. Luce, a psychologist then at Penn, and known for his modeling "choice behavior", and the most talented lecturer, Herb Wilf. Each of these individuals shared their talents with the section. I certainly have missed many individuals. I do so, with a general salute of thanks.

Finally, I would comment that the Section, now known as EPADEL (the name change occurred in 1979), would not have survived without those individuals who were willing to give of their time and energy in the promotion of the section and in the organization of its many endeavors. As an aside, a catastrophe related to the 1967 Section Meeting was averted when S.S. McNeary of Drexel assumed the chair on the untimely death of E. Amelotti of Villanova. There are many others who go unnamed, but one in particular deserves mention. Professor P.A. Caris of The University of Pennsylvania served as Secretary-Treasurer of the Section from 1928 to 1941, a total of 13 years!

Finally, I found the following title of a talk at an annual meeting to be the most amusing and perhaps the most prophetic- "How do we tell them that they need us?"

Appendix 3. Officers

Chairs and Presidents

Name	Years
Mitchell, Howard H	1926-1927
Owens, Frederick W.	1927-1928
Wilson, Albert H.	1928-1929
Miller, John A.	1929-1930
Fort, Tomlinson	1930-1931
Dresden, Arnold	1931-1932
Kline, John R.	1932-1933
Smith, William M.	1933-1934
Morris, Richard	1934-1935
Clawson, John W.	1935-1936
Mitchell, Howard H.	1936-1937
Smail, Lloyd L.	1937-1938
Reynolds, Joseph B.	1938-1939
Shohat, James A.	1939-1940
Dresden, Arnold	1940-1941
Oakley, Cletus O.	1941-1942
Davis, James E.	1942-1943
Wheeler, Anna Pell	1943-1944
Nelson, Cyril A.	1944-1955
Caris, Perry A.	1945-1946
Rees, Carl J.	1946-1947
Starke, Emory P.	1947-1948
Raynor, George E.	1948-1949
Webber, George C.	1949-1950
Caris, Perry A.	1950-1951
Manning, Frank L.	1951-1952
Nelson, Cyril A.	1952-1953
Tartler, Alexander	1953-1954
Koehler, Truman L.	1954-1955
Oxtoby, John C.	1955-1956
Wilansky, Albert	1956-1957

Name	Years
Block, I. Edward	1957-1958
Lehr, A. Marguerite	1958-1959
Lawton, Walter S.	1959-1960
McNeary, Samuel S.	1960-1961
Western, Donald W.	1961-1962
Saalfrank, Charles W.	1962-1964
Remage, Russell	1964-1966
Amelotti, Emil	1966-1968
McNeary, Samuel S.	1968
Baxter, Willard E.	1968-1970
Albright, Hugh N.	1970-1972
Pervin, William J.	1972-1973
Mayer, Joerg P. M.	1973-1975
Klotz, Eugene A.	1975-1977
Schattschneider, Doris	1977-1979
Anton, Howard	1979-1981
Wong, Bing K.	1981-1983
Flesner, David E.	1983-1985
Kolman, Bernard	1985-1987
Brubaker, Marvin L.	1987-1989
Hill, David R.	1989-1991
Hagelgans, Nancy L.	1991-1993
Stromquist, Walter R.	1993-1995
Berard, Louise N.	1995-1997
Somers, Kay B.	1997-1999
Ensley, Douglas E.	1999-2001

Secretary-Treasurers

Name	Years
Bennett, Albert A.	1926-1927
Kline, John R.	1927-1928
Caris, Perry A.	1928-1941
Whitman, Philip M.	1941-1944
Gottschalk, Walter H.	1944-1947
Botts, Truman A.	1947-1948
Oakley, Cletus O.	1948-1951
Schafer, Richard D.	1951-1953
Webber, G. Cuthbert	1953-1958
Dennis, Foster L.	1958-1961
Latshaw, Voris V.	1961-1967
Filano, Albert E.	1967-1973
Bedient, Phillip E.	1973-1976
Baxter, Willard E.	1976-1982
Brooks, James O.	1982-1989
Somers, Kay B.	1989-1995
Wagner, Clifford H.	1995-2001

Governors

Name	Years
Starke, Emory P.	1947-1950
Raynor, George E.	1950-1953
Oakley, Cletus O.	1953-1956
Fine, Nathan J.	1956-1959
Wilansky, Albert	1959-1962
Western, Donald W.	1962-1965
Grosswald, Emil	1965-1968
Bissinger, Bernard H.	1968-1971
Baxter, Willard E.	1971-1974
Rosen, David	1974-1977
King, Jerry P.	1977-1980
Porter, Gerald J.	1980-1983
Anton, Howard	1983-1986
Schattschneider, Doris	1986-1989
Leinbach, L. Carl	1989-1992
Brubaker, Marvin L.	1992-1995
Hagelgans, Nancy	1995-1998
Hill, David R.	1998-2001

Members of the Executive Committee

(with year of election; until 1956 called the Program Committee)

Name	Year
Dresden	1927
Thomas	1927
Fort	1928
Kline	1928
Fort	1929
Kline	1929
Miller	1929
Clawson	1930
Frink	1930
Fort	1930
Dresden	1931
Smith	1931
Morris	1931
Caris	1931
Kline	1932
Caris	1932
Owens	1932
Raynor	1932
Brinkmann	1933
Clawson	1933
Morris	1933
Fort	1934
Shohat	1934
Smith	1934
Lehmer	1935
Oakley	1935
Brinkmann	1935
Morris	1936
Wilson	1936
Hedlund	1937
Nelson	1937
Smith	1937
Fort	1938
Kline	1938
Brinkmann	1938
Allendoerfer	1939
Clawson	1939

Name	Year
Dresden	1939
Shohat	1940
Smith	1940
Oakley	1940
Brinkmann	1941
Davis	1941
Shohat	1941
Brinkmann	1943
Fort	1943
Manning	1943
Dennis	1944
Oxtoby	1944
Wallace	1944
Clarkson	1945
Webber	1945
Murray	1945
Schoenberg	1946
Allendoerfer	1946
Pitcher	1946
Gottschalk	1947
Oxtoby	1947
Smail	1947
Dresden	1948
Fine	1948
Tukey	1948
Hailperin	1949
Lehner	1949
Allendoerfer	1949
Starke	1950
Tartler	1950
Tucker	1950
Nelson	1951
Webber	1951
Wilansky	1951
Goldberg	1952
Schafer, A.	1952
Western	1952

Name	Year
Kuhn	1953
Dennis	1953
Luxenberg	1953
Saalfrank	1954
Fine	1954
Grant	1954
Fine	1955
Koehler	1955
Tuckerman	1955
Saalfrank	1956
Mullins	1956
Western	1957
Epstein	1958
Jackson	1959
Brown, John	1959
Rosen	1960
Linton	1960
Filano	1961
Woodruff	1962
Kerr	1963
Maclasky	1964
Leser	1964
Hubley	1965
Kohlmeyer	1966
Baxter	1967
Beck	1968
Cunningham	1968
Jones	1968
Mamelak	1968
Bedient	1969
Brooks	1970
Wurster	1971
Tuckman	1971
Smith	1972
Wolfe	1972
King	1973
Plotkin	1973

Name	Year
Bragg	1974
Grant	1974
Denlinger	1975
Porter	1975
Arnold	1976
Babcock	1976
Schwartz	1977
Leinbach	1977
Wilf	1978
Wong	1978
Jessup	1979
Overdeer	1979
Scranton	1979
McAllister	1980
Murhpey	1980
Bolmarcich	1981
Getchell	1981
Maurer	1982
Miller	1982

Name	Year
Diano	1983
Growney	1983
Hill	1984
Temple/Belkin	1984
Salwach	1985
Ulrey	1985
Hagelgans	1986
Oeschele	1986
Berard, A.	1987
Stromquist	1987
Darken	1988
Ebert/Baker	1988
Grassl	1989
Tuckman	1989
Fry	1990
Stromquist	1990
Ayoub	1991
Crawford	1991
Sours	1992

Name	Year
Wagner	1992
DeTurck	1993
Umoh	1993
Dion	1994
Umble	1994
Butler	1995
DeVos	1995
DeTurck	1996
Umoh	1996
Crannell	1997
Hofmann	1997
Rossman	1998
Dunham	1998
Fink	1999
Hartmann	1999
Ahmad	2000
Ebersole	2000

Appendix 4. Newsletter Editors

Name	Institution	Years
Dorothy Wolfe	Widener	1976-1978
JoAnne Growney	Bloomsburg	1978-1979
Paul C. Cochrane	Bloomsburg	1979-1985
John Riley	Bloomsburg	1985-1988
Anthony D. Berard, Jr.	Wilkes	1988-1993
Charles E. Hofmann	LaSalle	1993-1996
Ming Lew	Wilkes	1996-2000

Appendix 5. Invited Lectures

Year	Speaker	Title
1926	Reynolds	The evolutes of a certain type of symmetrical plane curves
1926	Mitchell	The analogue for ideals of the Lagrange-Gauss theory of quadratic forms
1926	Smail	A new treatment of exponentials and logarithms on the basis of a modified Dedekind theory of irrationals
1926	Smith	The derivation and solution of certain ordinary differential equations
1926	Foberg	The state course of study in mathematics
1927	Crawley	Descartes' *Geometry*
1927	Owens	The Malfatti problem
1927	Dresden	On matrix equations
1927	Wilson	Space filling polyhedra
1927	Fort	Difference equations
1927	Morris	Positive integral solutions of an indeterminate equation
1928	Weida	Errors in computation
1928	Bennett	The geometry of the triangle
1928	Frink	An algebraic method of differentiating
1928	Miller	A mechanical theory of the solar corona
1928	Alexander	Knots
1929	Lamson	Wave mechanics
1929	Mitchell	Group characters
1929	Eisenhart	Dynamical trajectories and geodesics
1929	Ritt	Integration in finite terms
1930	Shohat	On orthogonal Tchebycheff polynomials
1930	Clawson	A polar reciprocation of the complete quadrilateral
1930	Sheffer	Some remarks on non-analytic functions
1930	Fort	Almost-periodic functions
1931	Rupp	Redundant co-ordinates
1931	Smail	On some fundamental conceptions in the theory of infinite processes
1931	Smith	Italy and geometry
1931	Knebelman	Different kinds of curvature
1931	Dresden	Swarthmore honors course in mathematics
1932	Raynor	Some boundary value problems in potential theory
1932	Kline	The independent arcs of a continuous curve
1932	Lehr	On curves with assigned singularities
1932	Frink	The problem of measure
1932	Mitchell	The life and work of Ramanujan
1933	Starke	Binomial congruences

Year	Speaker	Title
1933	Brinkmann	The interpretation of imaginaries in projective geometry
1933	Wilder	Connectivity of spaces
1933	Kasner	Polygons and groups
1934	Shohat	On some applications of Taylor's Formula
1934	Oakley	On successive approximations in differential equations
1934	Benner	Some geometry associated with $\lim_{N\to\infty}\left(1+\frac{1}{N}\right)^N$
1934	Moore	Mathematics and poetry
1935	Bailey	Collegiate curricula in mathematics in this section
1935	Witmer	Quantum mechanics
1935	Hedlund	A macroanalysis of some simple dynamical systems
1935	Rau	The teaching of mathematics in the Pennsylvania German schools
1935	Bochner	Almost-periodic functions
1936	Clarkson	Remarks on abstract spaces
1936	Cairns	Triangulations and related problems
1936	Wilks	Inverse probability and fiducial inference
1936	Murray	The undergraduate comprehensive exam
1937	Grant	Farey series
1937	Owens, F.	Some multiple perspective relationships
1937	Rademacher	On the Bernoulli numbers and the Von Staudt-Clausen theorem
1937	Wheeler, A.H.	Stellated polyhedra, illustrated with models
1938	Wheeler, A. P	Functions and sequences
1938	Tucker	Undergraduate courses in topology and other phases of geometry
1938	Carpenter	Meeting the challenge to secondary mathematics
1938	Yates	Linkages
1939	Lehmer	Mechanical aids in the theory of numbers
1939	Oakley	Equations of polygonal configurations
1939	Shohat	Orthogonal polynomials in relation to Lagrangian and Hermitian interpolation
1939	Johnson	Old mathematical books and instruments in the Schwenkfelder Library
1939	Owens, H.	Mathematics clubs, old and new
1940	Oxtoby	Transitive flows
1940	Vanderslice	Modern methods in differential geometry
1940	Rademacher	On Dedekind sums
1940	Wilks	Statistics involved in College Entrance Exams
1941	Bailey	The problem of the square pyramid
1941	Brinkmann	Cubic congruences
1941	Maker	Recent developments in the Cauchy theory of analytic functions
1941	Courant	Problems of stability and instability demonstrated by soap film

Year	Speaker	Title
		experiments
1942	Schoenberg	On a theorem of Jensen
1942	Raynor	Exterior ballistics
1942	Geiringer	On modern methods in the numerical solution of linear problems
1942	Curry	The Heaviside operational calculus
1943	Wallace	Fixed point theorems
1943	Bennett	Some modern viewpoints on Euclidean geometry
1943	Oxtoby	Distance sets
1943	van de Kamp	Photographic astrometry
1943	Webber	Transcendentality of certain continued fractions
1943	Rosser	On the many-valued logics
1944	Lehr	Mapping problems in aerial photography
1944	Dennis	Spherical triangles on a slide rule
1944	Gottschalk	Continuous flows and AP functions
1944	Murnaghan	The uniform tension of an elastic cylinder
1945	Fox	Homotopy groups
1945	Lehmer	Some graphical methods in the theory of numbers
1945	Zygmund	Some unsolved problems in the theory of trigonometric series
1946	Botts	Convex sets
1946	Allendoerfer	Slope in solid analytic geometry
1946	Hewitt	Generalizations of the Weierstrass approximation theorem
1947	Fine	On Walsh functions
1947	Cowling	Convergence criteria for continued fractions
1947	Murnaghan	Vector methods in the teaching of trigonometry and analytic geometry
1947	Wilks	A few concepts in modern statistical inference
1948	Hailperin	Recent advances in symbolic logic
1948	Wasow	On a problem in the theory of differential equations
1948	Tucker	A geometric approach to the theory of games
1949	Hestenes	Some observations relative to mathematics in research and development organizations
1949	Goldstine	Some problems in numerical analysis
1949	Oxtoby	Minimal sets
1949	Schoenberg	On smoothing operations
1950	Wilansky	The essential roughness of mathematical objects
1950	Firestone	Systems of axiomatic set theory
1950	Epstein	The coefficients of Schlicht functions
1950	Hu	Topological properties of spaces of curves
1951	Yates	The stimulation of interest
1951	Artin	Constructions with ruler and divider
1951	Epstein	An infinite-product expansion for analytic functions

Year	Speaker	Title
1951	Kiernan	Articulation of secondary and college mathematics
1952	Remage	Matrix inversion by partitioning
1952	Goldberg	Probability models in engineering and biology
1952	Fine	The Ramanujan identities
1952	Lewis	A. An in-service program in statistics; B. Some research opportunities in basic mathematics
1953	Kuhn	Linear equations and inequalities; solvability versus inconsistency
1953	Fox	Logical development of knot theory
1953	Tinbergen	Mathematical techniques used in economics theory
1953	Oakley	A new approach to freshman mathematics
1954	Snapper	Coordinates of algebraic varieties
1954	Besicovitch	Area and volume
1954	Goldstine	Some remarks on numerical stability
1955	Brinkmann	A report on the Ford Foundation study on the integration of high school and college mathematics
1955	Rademacher	Dedekind sums and classes of modular substitutions
1955	Wisner	Flexagons
1955	Feller	On differential operators
1955	Kline	Pea soup, tripe and mathematics
1956	Scherk	Integers
1956	Moise	How to tell that a simple overhand knot is really knotted
1956	Wilansky	On the Cauchy criterion for the convergence of an infinite series
1956	Rabin	Impossibility of computational algorithms for group-theoretic problems
1957	Hunter, S.	Experimental statistics - some of the concepts and mathematical requirements
1957	Schoenberg	Mass distributions on the circle and convex conformal maps
1957	Tucker, A. W.	A report on the recommendations of the Commission on Mathematics at the College Board
1957	Rosen	Mathematics at a National Science Foundation summer institute
1959	Luce	Probabilistic models in psychology for the study of choice behavior
1959	Besicovitch	On some extremal problems in geometry
1959	Epstein	College mathematics for the prospective graduate student
1959	Haag	Work of SMSG
1959	Linton	Liaison problems in collegiate mathematics today - with the high school
1960	Gulden	Some basic concepts in algebraic topology
1960	Lefschetz	Some non-linear aspects of differential equations
1961	Rademacher	Gaussian polynomials and pentagonal numbers
1961	Grace	ALGOL 60
1961	Pollak	Recommendations of the panel on physical sciences and engineering, Committee on the Undergraduate Preparation in

Year	Speaker	Title
		Mathematics
1962	Stengle	Some asymptotic problems in analysis
1962	Goldstein	On pseudo-gaussian sums and singular series
1962	Lisker	Musical practices in the light of modern algebra
1962	Manove	Quasinormal linear spaces
1962	Bartoo	Undergraduate mathematics: Problems posed by large enrollments
1962	Heilman	Progress report on teacher training in Pennsylvania
1963	Bing	Homogeneity
1963	Schoenberg	On spline interpolation
1963	Oakley	Curriculum from K to 14
1963	Brown	The search for delightful results
1963	Cunningham	Arzela's theorem
1963	Fine	Integrability of continuous functions
1963	Lehr	A little mathematics of the multiplication table variety
1963	Schub	Some mathematical crumbs
1963	Wilansky	How using nets simplifies proofs
1964	Moise	How to tell that a simple overhand knot is really knotted
1964	Feller	The nature of differential operators
1964	Hunter, J.	The freshman and sophomore mathematics program in Great Britain
1965	Wilder	The role of the intuition
1965	Oberhettinger	Relations which are equivalent with functional equations involving the Riemann zeta functions
1965	Pollak	CUPM general curriculum for colleges
1966	Moore, J. C.	Some aspects of homological algebra - background and recent developments
1966	Hammer	Components of mathematical systems
1966	Gulden	A brief trip through the affine plane
1967	Wilf	Counting finite graphs
1967	Brooks	Equivalence of matrices and modules over Dedekind domains
1967	Pervin	Algebraic topology for undergraduates
1968	Curtis	Characters of finite groups
1968	Diaz	A comparison of two uniqueness theorems for the ordinary differential equation $y' = f(x, y)$
1968	Richmond	SMSG - A second round of curriculum development
1969	Young	Topological methods in analysis
1969	Wolman	A problem of delay in communication systems - an application of topological methods
1969	Mordell	Reminiscences of an octogenarian mathematician
1970	Klee	Some unsolved problems from intuitive geometry
1970	Wilansky	What is an FK space?

Year	Speaker	Title
1971	Artzy	Analytic geometry stripped of all but incidence
1971	Nirenberg	Solvability of linear partial differential equations
1971	Willcox	England was lost on the playing fields of Eton: A parable for mathematics
1971	Baxter	Mathematical models in the biological sciences
1972	Entringer	Open problems in combinatorial analysis and graph theory
1972	Curry	Basic concepts of formalization
1973	Rosen	Mathematics and the behavioral sciences
1973	Davis	Ghosts of departed quantities
1973	McAllister	The use of computers in undergraduate mathematics teaching
1973	Goldman	Some mathematical operations research in government
1974	England	Bernoulli processes after the isomorphism theorem
1974	Gluck	Are closed surfaces rigid?
1974	Cunningham	In search of a modern understanding of differentials
1975	Pollak	Relations between the application of mathematics and the teaching of mathematics
1975	Wilf	How to choose *k* out of n
1975	Eisenberg	Uniformly distributed sequences, stationary processes and the ergodic theorem
1976	Koch	The proof of the four color theorem
1976	Max	Catastrophe theory and its applications
1976	Cronin	Mathematical aspects of periodic catatonic schizophrenia
1976	Plotkin	The sound of mathematics
1977	Schattschneider	Tiling the plane with pentagons: A perplexing problem
1977	Shatz	Algebraic curves: Confluence of algebra, geometry and analysis
1977	Rohde	Some mathematical aspects in the design of automotive components
1977	Thurston	Symmetry
1978	Bernstein	The role of applications in pure mathematics
1978	Saaty	Priorities, hierarchies, and behavioral systems
1978	Rorres	The application of linear programming to the optimal harvesting of a renewable resource
1979	Greene	Problems and results in unimodal sequences
1979	Baxter	Rings with involution - An overview
1979	George	Mathematical precocity - Identifying and developing that potential
1980	Kac	Recollections and reflections on 50 years of probability theory
1980	Whitt	Approximation for networks of queues (description of complex systems adequate for engineering purposes)
1980	Porter	Future of the MAA
1980	Anderson	Algorithmically defined functions
1981	King	Probability and the approximation of continuous functions
1981	Halmos	Does mathematics have elements

Year	Speaker	Title
1981	Appel	The proof of the four color theorem
1982	Wilf	Some bijective proofs in combinatorics
1982	Hilton	Descartes, Euler, and polyhedra
1982	Tucker, Alan	Mathematical sciences curricula
1983	Todd	Nonlinear equations and optimization: Quasi-Newton methods and abstract vector spaces
1983	Feit	The classification of the finite simple groups
1983	Wilansky	What matrices can do
1983	Ulam	Mathematical reminiscences and suggestions for the future
1984	Shatz	Mordell's conjecture: Ideas and the confluence of arithmetic and geometry
1984	Steen	Renewing undergraduate mathematics
1984	Zagier	Solution of Diophantine equations and the class number problem of Gauss
1984	Coughlin	Remediation: A waste or a gold mine?
1985	Golub	Strange attractors and chaotic motion
1985	Koblitz	The mythification of Sofia Kovalevskaya
1985	Newman	Addition chains when multiplications are free
1985	Leighton	Networks, parallel computation and VLSI
1986	Kurtz	Computing in the classroom
1986	Giordano	A two-tier approach to teaching mathematical modeling
1986	Rickey	The invention of calculus: Who, what, when, where, and why?
1986	Sandefur	Discrete dynamical systems: An alternative to calculus
1987	Devaney	Computer graphics experiments in complex dynamical systems
1987	Halmos	Non-commutative analysis
1987	Jacobson	Parallel processing architectures
1987	Wolfson	Newton: The calculus, the *Principia*
1988	Bressoud	Factorization and primality testing
1988	Gottlieb	Topology and the robot arm
1988	Edwards	Kronecker's views of the foundations of mathematics
1988	Siegel	Freshman mathematics for the modern age
1989	Weber	Problems from the theory of auctions
1989	Sward	*Everybody Counts*: From vision to reality
1989	Gluck	How can a drum change shape while sounding the same?
1990	Grace	Oil and uncertainty
1990	Lovasz	Algorithms using rubber bands
1990	Hoffman	Mathematics education reform: Our critical role
1990	Kennedy	Exotic topology in dynamical systems
1991	DeTurck	What problem are we trying to solve?
1991	Graham	Juggling drops and descents
1991	Banchoff	Computer graphics and surfaces in four-space: Visualizing

Year	Speaker	Title
		characteristic classes
1991	Rossman	Bayesian statistics in the courtroom
1992	Kreider	Roots of recursion in mathematics and computer science
1992	Dunham	Constructing the regular heptadecagon: Ingenuity or just a lucky Gauss?
1992	Conway	Polyhedra and their symmetries
1993	Gallian	The mathematics of identification numbers
1993	Pomerance	Polya lecture: “Fermat’s little theorem”
1993	Brakke	Soap films and covering spaces
1993	Rudin	The rationals and the irrationals
1994	Steele	Ruin and riches from Bachelier to Black-Scholes
1994	Thornber	Inference beyond logic
1994	Stallings	Portfolio and student self-assessment in an undergraduate calculus class
1994	Fink	Bifurcation, catastrophe, singularity, and all that
1995	Smith	Spreadsheets in first-year mathematics
1995	Wilf	Finding and proving identities with your computer
1995	Kannan	Tractable algorithms for phylogeny reconstruction
1995	Ascher	Tracings in the sand: An introduction to ethnomathematics
1996	Kalman	Sums of powers by matrix methods
1996	Gray	Justice by lot: Olympic gold medals, Rwandan prisoners and employment discrimination
1996	Gordon	Using symmetry in teaching group theory
1996	Harbater	Symmetry in algebra and geometry
1997	Hunt	Fractal dimensions, a Peano-like curve and some measure theory
1997	King	Real, complex, and metaphysical ideas of Karl Weierstrass
1997	Simion	The many lives of set partitions
1997	Ross	Random walks on Z
1998	Dobric	A fundamental model in mathematical finance
1998	Graham	Juggling permutations of the integers
1998	Zeilberger	Synopses of two textbooks: Levi Ben Gerson’s *Ma’asei Khoshev* (ca. 1320) and Shalosh B. Ekhad’s *Plane Geometry* (ca. 2050)
1998	Tattersall	Mathematical vignettes from Cambridge University
1999	Dunham	Euler’s sums and Euler’s crumbs
1999	Benjamin	Recounting Fibonacci numbers and continued fractions
1999	Crawford	Teaching calculus: A personal, institutional, and historical perspective
2000	Andrews	An old algorithm in a new era: Major MacMahon, you were born too soon!
2000	Higgins	Demonic graphs and undergraduate research
2000	Maki	Using mathematics to help computers pretend that they can see, hear, and talk

Appendix 6. Meetings

Spring Meetings

No.	Date	Location
	April 12, 1975	Lebanon Valley
	October 4, 1975	Rosemont
1	April 10, 1976	Gettysburg
2	April 23, 1977	Kutztown
3	April 8, 1978	Ursinus
4	April 28, 1979	Penn
5	April 26, 1980	Cedar Crest
6	April 4, 1981	Penn State - Ogontz
7	April 17, 1982	Albright
8	April 9, 1983	Millersville
9	March 31, 1984	Lehigh
10	March 30, 1985	Bloomsburg
11	April 5, 1986	West Chester
12	April 4, 1987	Moravian
13	April 9, 1988	Ursinus
14	April 8, 1989	Penn
15	April 7, 1990	Swarthmore
16	April 6, 1991	LaSalle
17	April 11, 1992	Messiah
18	April 3, 1993	Villanova
19	March 12, 1994	Harrisburg Area CC
20	April 8, 1995	King’s College
21	April 13, 1996	Millersville
22	April 19, 1997	Ursinus
23	April 18, 1998	Shippensburg
24	April 10, 1999	Villanova
25	April 8, 2000	Messiah

Fall Meetings

No.	Date	Location
1	Nov 27, 1926	Lehigh
2	Nov 26, 1927	Penn
3	Dec 1, 1928	Penn
4	Nov 30, 1929	Penn
5	Nov 29, 1930	Penn
6	Nov 28, 1931	Lehigh
7	Nov 26, 1932	Swarthmore
8	Dec 2, 1933	NJ Coll for Women
9	Dec 1, 1934	Penn
10	Nov 30, 1935	Lafayette
11	Nov 28, 1936	Penn
12	Nov 27, 1937	Haverford
13	Nov 23, 1938	Ursinus
14	Dec 2, 1939	Lehigh
15	Nov 30, 1940	Penn
16	Nov 29, 1941	Swarthmore
17	Nov 28, 1942	Penn
18	Nov 27, 1943	Penn
19	Dec 2, 1944	Penn
20	Dec 1, 1945	Penn
21	Nov 30, 1946	Penn
22	Nov 29, 1947	Bryn-Mawr
23	Nov 27, 1948	Penn
24	Nov 26, 1949	Haverford
25	Nov 25, 1950	Lehigh
26	Nov 24, 1951	Penn
27	Nov 29, 1952	Delaware
28	Nov 29, 1953	Drexel
29	Nov 27, 1954	Princeton
30	Nov 26, 1955	Penn
31	Nov 24, 1956	Muhlenberg
32	Nov 30, 1957	Haverford
33	Nov 29, 1958	Lehigh
34	Nov 28, 1959	Delaware
35	Nov 26, 1960	Swarthmore
36	Nov 25, 1961	Ursinus
37	Nov 24, 1962	F & M
38	Nov 23, 1963	Haverford
39	Nov 21, 1964	Drexel
40	Nov 20, 1965	West Chester
41	Nov 19, 1966	Villanova
42	Nov 18, 1967	Delaware
43	Nov 23, 1968	Drexel
44	Nov 22, 1969	Swarthmore
45	Nov 21, 1970	West Chester
46	Nov 20, 1971	Lafayette
47	Nov 18, 1972	Lebanon Valley
48	Nov 17, 1973	Drexel
49	Nov 23, 1974	Swarthmore
50	Nov 22, 1975	F & M
51	Nov 20, 1976	MCCC
52	Nov 19, 1977	Moravian
53	Nov 18, 1978	Millersville
54	Nov 17, 1979	Drexel
55	Nov 22, 1980	Delaware
56	Nov 21, 1981	Villanova
57	Nov 20, 1982	West Chester
58	Nov 19, 1983	Bryn Mawr
59	Nov 17, 1984	Swarthmore
60	Nov 23, 1985	Temple
61	Nov 23, 1986	Drexel
62	Nov 21, 1987	F & M
63	Nov 19, 1988	Penn State - Ogontz
64	Nov 4, 1989	Millersville
	Oct 13, 1990	Comm. Coll. Phila.
65	Nov 10, 1990	Delaware
66	Nov 9, 1991	Drexel
67	Nov 14, 1992	Muhlenberg
68	Nov 13, 1993	Cedar Crest
69	Nov 5, 1994	Mont. Co. CC
70	Nov 4, 1995	Penn State - Ogontz
71	Oct 26, 1996	Delaware State
72	Nov 1, 1997	Penn
73	Nov 7, 1998	Lehigh
74	Nov 6, 1999	Elizabethtown
75	Nov 4, 2000	Penn State - Abington