A COMMENTARY ON THOMAS FRANKLIN HOLGATE'S HISTORY OF THE NU DEPARTMENT OF MATHEMATICS

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Introduction. In 1941 Professor Thomas Holgate wrote *A History of the Department of Mathematics at Northwestern University, 1855-1905*. Holgate (who taught at Northwestern for 41 years, from 1893 to 1934) had been the Henry S. Noyes Professor of Pure Mathematics (1905—1934) at Northwestern, as well as the Dean of the College of Liberal Arts (1902—1919), and twice interim President of the University (1904—1906 and 1916—1919), so he was certainly well placed to write such a document, and its existence considerably simplifies the task of the departmental historian for this period. But why did Holgate stop his history in 1905, fully 36 years before he wrote? It turns out this was a natural stopping point for Holgate, the first of five periods in the growth and evolution of the current department.

Dividing the history of a department or any other entity into a succession of periods always involves an element of simplification, but used with suitable caution it provides a useful organizing framework in which to place a potentially confusing array of apparently unrelated facts. Keeping this in mind, there are five periods into which the history of the Northwestern Department of Mathematics can be divided.

1. The first of these five periods, the subject of Holgate's short, 34 page monograph, covered the initial history of the department, from 1855, the year Northwestern began offering instruction (with a grand total of two professors and ten students) to the departure of ***Henry Seely White*** (1861—1943) in 1905. White was one of the outstanding US mathematicians of that period, had chaired the department from 1892 to 1905, and during his tenure Northwestern began to teach the advanced courses in mathematics necessary for graduate students in a fledgling master's program.
2. The second period in the development of the department was the thirty year period from 1905 to 1935. During that time there was only a single chair, ***David Raymond Curtiss*** (1878—1953). Although a competent mathematician with a PhD from Cornell, Curtiss's strength lay in administration, both local and national, rather than advancing the frontiers of mathematical research. During his tenure the Department was stable, but grew in size, while at the national level Curtiss had considerable visibility, being at various times a Vice-President of the AMS and the AASS, and a President of the MAA.
3. The third period in the development of the department was marked by the chairmanship of ***Elton James Moulton*** (1887–1981) from 1935 to 1942, and ***Harold Thayer Davis*** (1892–1974) from 1942 to 1955. The major shortcoming of the Curtiss era from our perspective is that Northwestern remained a department focussed on undergraduate education and a graduate program confined to the master's degree (although a number of its graduates later turned out to be persons of considerable distinction), but had no doctoral program. This changed with Moulton and Davis. Under Moulton's relatively short tenure several faculty

with serious research interests began to be hired (notably H. S. Wall, Ernst Hellinger, and Moulton's successor Davis), and the first PhDs in pure mathematics at Northwestern began to be awarded in 1938. This process accelerated under Davis and by 1955, when Davis stepped down, Northwestern had a small but credible doctoral program in place.

4. The fourth period in the evolution of the Department was the chairmanship of ***Ralph Philip Boas, Jr***. (1912–1992) from 1957 to 1972. Boas was a mathematician with an international reputation (he wrote some 200 papers on real and complex analysis) and a Harvard PhD (1937, advisor D. V. Widder), had attended lectures by Hardy, Littlewood, and Besicovitch at Cambridge, and had been the Editor of *Mathematical Reviews* for several years after the war. During his tenure as chair the Department nearly tripled in size, many research mathematicians were hired, and there was a sharp increase in the number of PhDs awarded. (For example, just one in 1954 versus eleven in 1972.) Northwestern owes a great debt to Boas, and it is no accident that both its Mathematics Library and Instructorships are named after him.
5. In the sixty-seven year period from 1905 to 1972 the Department thus had a total of just four department chairs (Curtiss, Moulton, Davis, and Boas). All this changed in 1972 when the system of chairs radically changed: from this point forward a rotating chair was appointed for a term of three years; and although each of these of course had their own distinct personalities, their limited time in the office meant that a significant element going forward was the necessarily longer-lasting university administration, in particular the Dean of the College, and the Provost and President of the University.

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The following is a commentary on Holgate's history of the Northwestern Mathematics Department from 1855 to 1905. Holgate's history covers all the major events during this period, is carefully and systematically written, and is almost always accurate with a few minor exceptions. It is the natural starting point for any history of the department during this period. Its one weakness—if there is one—is a lack of context. Holgate had been at Northwestern for half a century when he wrote it, and—as twice acting President, long-time Dean of the College, and Noyes Professor, knew the Department, the College, and the University intimately, and cumulatively likely understood all three far better than anyone else at the time. This means that often Holgate will refer to persons or events with which he was quite familiar but few others were. (One particular example of this is the significant Methodist background of the University.) The purpose of this commentary is three-fold: to provide context, document events for which information may no longer be readily accessible, and to add some color to Holgate's sometimes terse presentation.

Sources: Sources are given for any fact not well-known, in particular if they are difficult to document. But some mention of general sources may be helpful here.

First there are the annual *Catalogues* of the University going back to 1856, available online via the HathiTrust up to 1927—28, and afterwards in the University Archives. These are an invaluable source of information, and it is apparent Holgate made considerable use of them. Second, there is Charles B. Atwell's *Alumni Record of the College of Liberal Arts*, published by the University in 1903 (cited below as *Alumni Record*). This gives—among other information—short biographies of every graduate of the College up to 1903. Third, there is Arthur Herbert Wilde's four-volume *Northwestern University, A History 1855—1905* (The University Publishing Society, NY, 1905, cited below as Wilde), which contains a wealth of information, much of it not readily available, about every facet of the University up to the year of its publication. Its one major weakness is that it sometimes verges on the hagiographic and is often polite to a fault. (Examples include its treatment of Randolph Sinks Foster, the second President of Northwestern, and the circumstances underlying the departure of Henry Wade Rogers, the sixth President of Northwestern.) Fourth, there is the *Mathematics Genealogy Project* (https://www.mathgenealogy.org/), an online database of mathematics PhDs throughout the world giving the institution, advisor, year, dissertation title, students, and "descendants" (that is, students, students of students, etc), with a variety of search functions. It is largely complete and usually quite accurate. Fifth, there are the *Find a Grave* (https://www.findagrave.com/) and *Ancestry* (https://www.ancestry.com/) databases, the latter available via the Northwestern Library, which sometimes provide obscure but occasionally useful information such as WWI and WWII registration cards, passenger manifests for entry into the US, etc. Finally, there is Google and other online search engines. There is a remarkable wealth of information available online such as PDFs of books and papers published up to 1929 (the current expiration of copyright). In addition to the above, there are also archival sources. These will be cited as occasion arises.

In addition to the ***Commentary*** proper, there are nine appendices at the end. These cover a) short biographies of the early instructors in the department; b) short biographies of then of the early graduate student in the department; c) a list of the Noyes Professors of Mathematics, together with some background about the Professorship; d) a short biography of Holgate drawn from the University Library website; e) short biographies of Henry Wade Rogers, President 1890—1900, under whose leadership the department expanded, and Daniel Bonbright, Dean of the College 1873—1902, both drawn from the University Library website; and several documents drawn from the Holgate papers in the NU Archives, viz. f) an explanation of the evolving connection of Northwestern with the Methodist Episcopal Church;

g) an evaluation of Holgate's mathematical contributions written in 1919 by Henry Seely White (chair 1892—1905); h) an annotated exchange of letters between White and Holgate in 1939 relating to the history of the department half a century earlier; and i) a short note by Holgate on the early history of mathematics in Chicago for the period 1893--1896. Appended to the commentary at the very end is a picture gallery of some of the main figures that appear throughout as well as books mentioned.

In giving short biographies of the individuals mentioned by Holgate, I have (except for well-known historical figures) tried to find and give the exact dates of both their birth and death, since I have found these to often be of considerable help in obtaining further information about a person, as well as verifying in some cases that a name mentioned in a source in fact refers to a given person of interest.

This *Commentary* should be regarded as a draft. In particular, given its length and amount of detail, it seems inevitable that some typographical and other errors have crept in. I would be grateful to learn of any that remain despite my best efforts to the contrary. Any remaining errors are entirely my responsibility.

Note on terminology: I follow Holgate in referring throughout to the "department" and its "chair", even though initially these precise terms were not used. All doctoral degrees are referred to as a "PhD", even though the actual title may take a number of forms (for example, "Dr. phil. nat.", etc.).

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ABBREVIATIONS:

AAAS	American Association for the Advancement of Science
AMS	American Mathematical Society
BAMS	Bulletin of the American Mathematical Society
BTM	Minutes of the Northwestern Board of Trustees (available in the NU Archives)
DSB	Dictionary of Scientific Biography
MAA	Mathematical Association of America
NAMS	Notices of the American Mathematical Society
NU	Northwestern University

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Holgate (pp. 1—2): "When Northwestern University was opened in 1855 the study of Mathematics in schools and colleges throughout the United States was at a low ebb and the field of such study in America was quite restricted; higher mathematics in the modern sense was practically unknown."

Commentary: Holgate begins with an almost apologetic statement of the state of mathematics in the US when Northwestern opened in 1855, pointing to the requirements for admission to Harvard and Yale, and the frequent consolidation of mathematics with other subjects such as astronomy or "natural philosophy" into a single department. This point had been made earlier by G. A. (George Abram) Miller in his vice-presidential address to the AAAS in 1923 on the 75th anniversary of the AAAS (Miller, 1924, pp. 3–4). Indeed Holgate's language is so close to Miller's (listing the specific mathematical requirements for entrance to Harvard and Yale, the mention of the Harvard mathematics professors Benjamin Peirce and Joseph Levering), the only difference being that Holgate refers to 1851 for the requirements (the year Northwestern was chartered by the state) and Miller to 1848 (the year the AAAS was founded), that one assumes Holgate drew on Miller for this point.

Holgate (pp. 2–3): The appointment of Henry Sanborn Noyes.

Commentary: **Henry Sanborn Noyes** (December 24, 1822—May 24, 1872) was a New England Methodist born in Landaff, New Hampshire, who prepared for college at the Newbury Seminary in Newbury Village, VT, graduated from Wesleyan University in Middletown, CT in 1848, and returned to Newbury 1850—55, initially teaching mathematics and Greek there, and later serving as Principal, until he moved to Northwestern in the summer of 1855 to take up his post there as professor. (The Wikipedia entry for Noyes places the Newbury Seminar in Montpellier, Vermont, but this is incorrect: the original Newbury Seminary—in Newbury—closed in 1868 and its subsequent connection with Montpellier and its later history is complex; see Wells, 1902, pp. 227—232.) All three institutions—Newbury, Wesleyan, and Northwestern—had been founded by Methodists. Clark T. Hinman (1819—1854), the first President of

Northwestern, who was responsible for Noyes's appointment, had been an instructor at Newbury 1839—44 and Principal 1844—45, and so had already known Noyes when he recommended him to the trustees of NU in 1854. Noyes was formally elected Professor of Mathematics by the Board of Trustees on June 24, 1854, along with Hinman as Professor of Moral Philosophy, Abel Stevens as Professor of Rhetoric and English Literature, and William D. Godman as Professor of Rhetoric and Greek. (Stevens ultimately did not accept the position.) For information on Hinman, see Wilde (1905, Vol. 1, Chapter 18) and Gildart (1961, pp. 50—54). *Hinman Avenue* in Evanston is named in his honor.

Perhaps due to overwork (selling so-called *perpetual scholarships* by riding throughout the Illinois countryside, see Wilde, 1905, volume 1, pp. 181–183), Hinman became ill and headed for home in his native New York, but died on the way of typhoid fever in Troy, NY, on October 21, 1854, less than a year in office. Noyes, who was one of the three original faculty appointed by Hinman, was appointed Acting President by the Trustees from 1854 to 1856, when a replacement for Hinman was found. This was to be a constant theme in Noyes's life from then on: his responsibilities as Professor of Mathematics were only a part of the various duties he voluntarily assumed on the behalf of Northwestern (see Willard, 1892, pp. 50—52). In particular, he was the Financial Agent of the University 1859—1870, secretary to the Board of Trustees 1861—1870, and Vice-President of the University 1860—1867.

Given the Evanston of today, the proximity of Chicago, and the many convenient sources of transportation, it is easy to overlook the challenges of living near Northwestern in those days. Mrs. Noyes (***Harriet Newell Verbeck Noyes***, October 31, 1827—May 26, 1908) much later gave an illuminating look at the early challenges:

> Housekeeping was difficult as there were no conveniences. Even the mail came only twice a week at first, brought by a man from Chicago on horseback. The first two winters were very severe. We landed in Evanston—Mr. and Mrs. Noyes, child, and nurse—near a small engine tank in a field, and went a mile up on "the other Ridge," as it was then called, for shelter. A month later we took a slightly built summer cottage for winter. There was no market, but a butcher came twice a week from Chicago. There were no paths, and, in places where the streets were laid out, the deep mud bore the placard "No bottom." There was a deep ditch through the wet land between the East and West Ridges, with one crossing. For two years I went up and down the other Ridge for family supplies—eggs, butter, milk, etc. We took in all of Dr. Kidder's family because they otherwise must have stayed in Chicago until they could build; also other members of the faculty until they could find a place. We built

> in the first year where Dr. Dyche's house now stands, expecting a college building soon in University row. We had no streets or paths, and Mr. Noyes walked down town to his work,—all his working life there. The cheap wooden building was school and chapel for Methodists, Presbyterians, Congregationalists, and I think, Baptists, in turn, until they settled. [Wilde, 1905, volume 1, pp. 225—6]

The East and West Ridges were at the site of the current day Chicago and Ridge Avenues, respectively. For information about the early history of Evanston, see Reeling (1928).

Holgate (p. 3): "Ten students were enrolled for the first year".

Commentary: The number ten is based on a list prepared by Noyes, but "according to the testimony of two who were connected with the University during the first year (Prof. Godman and W. E. Clifford) the number of students present was not limited to the list left us by Prof. Noyes. Both state that there were nearer twenty students in attendance" (Wilde, 1905, volume 1, pp. 167-8).

Holgate (pp. 3-4): The schedule in Mathematics for the Freshman, Sophomore, Junior, and Senior classes including Loomis's Algebra, Geometry, Plane Trigonometry, Analytical Geometry, Differential and Integral Calculus, Smith's Mechanics and Hydrostatics, and Olmsted's Astronomy.

Commentary: "Loomis" refers to **Elias Loomis** (August 7, 1811 – August 15, 1889), a mathematician and astronomer who taught at Western Reserve (1837—44), NYU (1844—60), and Yale (1860–89). He wrote many textbooks during his time at NYU including the ones noted above; his National Academy memoir (Newton, 1890) lists 164 papers, most of them on astronomy and meteorology. "Smith" refers to **Augustus William Smith** (May 12, 1802—March 26, 1866), a professor of mathematics and astronomy at Wesleyan from 1831, its fourth President 1852—57, and a professor of natural philosophy at the US Naval Academy from 1859 to his death in 1866. He wrote several textbooks, including *An Elementary Treatise on Mechanics, Embracing the Theory of Statics and Dynamics, and Its Application to Solids and Fluids* (1st ed. 1849, "Smith's Mechanics and Hydrostatics"). "Olmsted" refers to **Denison Olmsted** (June 18, 1791—May 13, 1859), a US physicist and astronomer. "Olmsted's Astronomy" refers to Olmsted's *Introduction to Astronomy* of 1839. For further information on

Olmsted, see T. R. Treadwell, "Denison Olmsted, an Early American Astronomer", *Popular Astronomy* **54** (1946), pp. 237–241.

Note: Holgate says "the faculty announced a full four-year program of studies for a bachelor's degree", not just that for mathematics. The full list can be found in the *Circular* for North-Western University for 1856, pp. 8—11. In addition to the mathematics courses listed by Holgate, there were also three years of Greek and Latin, two years of ancient history, four quarters of elocution, and a quarter each on rhetoric and logic, as well as one quarter courses on the modern sciences (anatomy and physiology, chemistry, geology, mineralogy, and natural philosophy), philosophy (intellectual, moral, aesthetic, and religious), political science, and the history of English literature, broken down by quarter. This was to be a set curriculum, taken by all students, although—as discussed later—this plan was soon changed. It represented a classical approach to the liberal arts, an updated version of the medieval university curriculum, which consisted of the *trivium* (grammar, dialectic, and rhetoric) and the quadrivium (arithmetic, geometry, astronomy, and music). See C. S. Lewis's *The Discarded Image*, 1964, pp. 185—197) for a remarkably erudite discussion of the teaching of the seven liberal arts in the Medieval and Renaissance periods, as well as the brief comments of Knowles (1962, pp. 73—75). Rashdall (1895) is the classical and arguably still definitive work on the medieval universities of Europe.

Holgate (p. 4): "In June, 1860, the University was again without a president".

Commentary: Holgate is being diplomatic here. The second President of Northwestern was **Randolph Sinks Foster** (February 22, 1820—May 1, 1903), President from 1856 to 1860. Foster was both underpaid and temperamentally unsuited for the position, and not surprisingly left after only a few years. Arthur Herbert Wilde, in his history of NU up to 1905, reported Foster "said that his resignation was caused by the fact that he must have money enough to get shoes for his children", and that although "Dr. Foster performed all the duties of his office with faithfulness, he had little taste for the drudgery incident to his position" (Wilde, 1905, vol. 1, p. 214). For further information on Foster, see Wilde (1905, vol. 1, Chapter 9). *Foster Avenue* in Evanston is named in his honor.

Holgate (pp. 4–6): "Professor Noyes was appointed Acting President [in 1860], a relation he continued to hold until he was compelled to relinquish it in 1867 by failing health."

Commentary: The period 1860—67 spanned the Civil War, and it is not surprising Northwestern experienced difficulty during this period finding a replacement for President Foster. Nevertheless the reader might wonder why the Trustees did not at some point simply make Noyes President outright. If so, they are not alone. At the time, "to many it has seemed unjust that he should not have been accorded the full honors of the presidential office when he performed the functions of the position" (Wilde, 1905, vol. 1, p. 230). Wilde suggests one reason was an aversion by Noyes for public speaking, but the other reason he mentions is undoubtedly the more significant of the two:

> It was the custom of the educational institutions of the Methodist Church at that time to secure a clergyman as president, for it was believed that they were better able than laymen to raise funds for the schools, and that they had a deeper interest in the religious welfare of the students—which was a main interest with patrons.

Indeed, it was only when Henry Wade Rogers (1853—1926) became the sixth President of Northwestern (1890—1900) that NU was finally headed by a layman.

In his later years, Noyes suffered from kidney disease (*The [Indianapolis] Evening News*, May 25, 1872, p. 1). This became apparent in 1866 (Wilde, 1905, vol. 1, p. 235), and led to his resigning as acting president of the university in 1867. (Note: His formal title from 1860 to 1867 was Vice President; see BTM for June 27, 1860, p. 186.) He died five years later. Wilde (1905, vol. 1, Chapter 10) discusses his administration. *Noyes Street* in Evanston is named in his honor.

Holgate (pp. 6—7): The chairmanship of Julius F. Kellogg.

Commentary: ***Julius Field Kellogg*** (February 4, 1830—June 22, 1894) was the second professor of mathematics and chair of the department at NU, and the first Noyes Professor of Pure Mathematics.

Holgate briefly sketches Kellogg's career prior to moving to Northwestern. Kellogg "entered Brown University as a freshman in 1851" and left two years later when he was successively a teacher of Mathematics at the Providence Conference Seminary (East Greenwich, RI) 1853—1859; instructor at Clark Seminary (Aurora, IL) 1859—1863; and taught at Lawrence University (Appleton, WI) 1863—1868, which had earlier awarded him an honorary A.M. in 1859. In 1868 Kellogg left Lawrence when he became an actuary at the Northwestern

Mutual Life Insurance Company (Milwaukee, WI) shortly before joining the Northwestern faculty in 1869, where he remained until his death in 1894.

All three of the schools Kellogg taught at before Northwestern were Methodist affiliated institutions. The **Providence Conference Seminary** (originally the *Kent Academy*, founded in 1802) was a private Methodist boarding school acquired by the Providence Conference (the regional governing body for the Methodist Episcopal Church) in 1841; it trained a substantial number of Rhode Island teachers. Later renamed the East Greenwich Academy, it closed in 1943. The **Clark Seminary** in Aurora was named after the Reverend John Clark (July 30, 1797—July 11, 1854), a Methodist clergyman for whom Chicago's Clark Street is also named. It opened in 1858. When it was acquired by the Rock River Conference of the Methodist Church, it was renamed the *Jennings Seminary* in recognition of a $15,000 gift by Elza Jennings. It later became an all-girls school in 1898 and closed in 1942. **Lawrence University** in Appleton, WI, is a private liberal arts college. Founded in 1847, it is named after Amos A. Lawrence, a Boston merchant, who donated $10,000 towards its original endowment, the Methodist Church contributing an equal matching amount. It began offering classes in 1849 and was the second co-educational college founded in the US (Oberlin College being the first).

Holgate's synopsis of Kellogg's pre-Northwestern career is clear enough, but raises a number of questions: Why did Kellogg leave Brown after only two years without a degree? (Clearly Providence Seminary did not require a degree for the job, and perhaps Kellogg preferred to take advantage of an attractive position that might not be available two years later. The *Syllabus,* the Northwestern yearbook, Volume 6 for 1889, pp. 43—44, says Kellogg left "on account of financial considerations", so perhaps it was a simple matter of inadequate funds.) Why did Lawrence, an institution in the Midwest, award Kellogg a honorary A.M. in 1859, his only academic experience after Brown having been teaching for six years at a seminary in an East Coast school a thousand miles away? (The minutes of a Lawrence faculty meeting for June 25, 1859 merely says "Mr. Kellogg recommended for the degree of A. M.", and the minutes of the Trustees for June 29 that "The degree of Master of Arts was conferred on …. Julius Field Kellogg of Prov. Conf. Academy R.I. … having been duly recommended by the faculty for that degree", but neither state the reason why the degree was conferred. The *Syllabus*, 1889, p. 44, credits "his scholarly attainments and ripe scholarship" as the reason, but if so this would only be in the broadest sense, see below.) And why, after some fifteen years of teaching, did he apparently abruptly change course and become an actuary at Northwestern Mutual for a short period? (Perhaps here too money was the deciding factor.)

Kellogg's appointment at NU was initially as a Professor of Civil Engineering; this reflected a change in 1869 in the structure of undergraduate studies at Northwestern. The 1868—69 *Catalogue* says "The studies in the University are arranged in two Courses, the

Classical and the Scientific, each occupying four years"; in contrast, the next year's *Catalogue* (1869—70) refers instead to *three* Departments (Science, Literature and the Arts, Medicine and Surgery, Law), the Department of Science, Literature, and the Arts in turn embracing "three courses of study, the Classical Course, the Scientific Course, and the Civil Engineering Course". (The differences between the three were limited: in the scientific course Greek and Latin were omitted but more mathematics and science was required; while the civil engineering course differed from the scientific course primarily in that every quarter a course in engineering was required, with less coverage of other areas.)

In the academic year 1872—73 Kellogg became the Professor of Mathematics ("On motion of President Haven Prof. Julius F. Kellogg was at his own request transferred from the chair of Civil Engineering to that of Mathematics", BTM June 25, 1872, p. 30). As noted earlier, Noyes's health had been beginning to decline by 1866; and in 1870—71, the year after Kellogg arrived at NU, Noyes was on leave, traveling at one point through Europe in an attempt to regain his health, and Kellogg took on his teaching responsibilities in Mathematics in addition to his own in Civil Engineering. (Holgate says this happened in 1869—70, but he is surely mistaken: Noyes's passport was issued on April 9, 1870, and he appears on the passenger manifest of the *Samaria*, which departed from Liverpool, England, and arrived in Boston on August 15, 1871. Willard, 1892, p. 51, reports she met him in Paris in the Spring of 1870.) Sadly, this was only a temporary respite: as President Erastus O. Haven's report to the Trustees relates (BTM, June 25, 1872, p. 134):

> Our lamented Prof. Noyes after an absence of a year, which he spent in Europe, returned with an appearance of increased strength; and resumed his labors with his usual fidelity, and for the most of the year met his classes regularly. His extraordinary energy was overcome at last, and reluctantly he was compelled by physical inability to remain away from his class room, to cease his work. A few days afterwards he was called away from these scenes of his earthly labor [and died on May 24, 1872].

As a result Kellogg became the Professor of Mathematics the next year 1872—73, as well as the Noyes Professor of Mathematics after its inception in 1876 (as a tribute to Noyes, see Appendix C for some details regarding the Professorship).

Kellogg appears to have a popular and successful teacher, but even at this remove it is surprisingly difficult to gain a detailed picture of his personality and character. The best resource here is a memorial address by Herbert Fisk, the longtime Principal of the Northwestern Preparatory School. Recognizing the challenge that faced him ("my lack of

various and definite knowledge concerning his personal traits and the special characteristics of his work"), Fisk contacted a number of Kellogg's former colleagues at earlier institutions and former students at Northwestern, letters from the latter being in some sense like a nineteenth century version of the CTEC. Based on these Fisk identified six reasons Kellogg was an effective teacher:

1. "Thorough and somewhat extensive scholarship, gained not without long years of laborious toil".
2. "His enthusiasm for the work of teaching".
3. "The spirit of kindness". (But he was no pushover: "there was also … on due occasion the manifestation of severity".)
4. "He was habitually generous in his prompt recognition of good work".
5. "He had a personal interest in his students [even] outside of the work of the recitation room". (For example, by attending student sports events.)
6. "The hospitalities of his home" shared with Mrs. Kellogg.

"Scholarship", the first item on this list, has to be understood in a somewhat different way from the modern usage, as Fisk himself acknowledged ("I have no direct evidence to show what his attainments were in scholarship. He left no published works evidencing original research".) Scholarship here refers instead to the breath of Kellogg's knowledge and the way it informed his teaching; presumably this was the same thing the *Syllabus* had in mind when it referred to Kellogg's "scholarly attainments and ripe scholarship".

Fisk also noted that Kellogg took "an active part in municipal and national politics" but gave no details; the only specific instance we know of is that in 1875 Kellogg was appointed a member of the West Point Board of Examiners by President Ulysses S. Grant, "a recognition which he greatly appreciated" (Holgate, p. 7).

Kellogg headed the department for nearly two decades. His end was sadly reminiscent of Noyes's: "Failing health caused him to reduce his activity in the University early in 1890 and after a lingering illness he died on June 22, 1894" (Holgate, p. 7). (Fisk, p. 14, similarly reports that "Four years before his death ill health caused occasional interruptions in his work. During the last two years he was unable to do but little".) It seems likely that the newly arrived E. H. Moore (of whom much more shortly) took over at least some of Kellogg's teaching and administrative responsibilities from 1890 to 1892, but throughout this final period Kellogg remained on the books as Noyes Professor of Mathematics. (Although the precise nature of his illness does not appear to have been reported, the immediate cause of death was: after suffering a concussion as the result of a fall, he went to John Dowie's, a faith healer in Chicago, where he died shortly after. There was an inquest which gave a verdict of accidental death.)

Sources: https://www.findagrave.com/memorial/167252798/julius-f-kellogg; Andreas (1884, p. 448); Northwestern *Syllabus* for 1889, pp. 43—44; Fisk (1894); *Chicago Daily Tribune*, June 24, 1894, p. 11 ("He dies at Dowie's"). My thanks to Ms. Claire Cannell, the Lawrence University Archivist, for providing information about Kellogg's MA from Lawrence, as well as documenting the exact years Kellogg was at Lawrence and the positions he held while there.

It is illustrative of the sometimes tenuous way records from this period survive to and come down to us that we only have a copy of Fisk's informative memorial address because fifteen years later (May 15, 1909), while "looking over old papers today", Fisk came across a copy of it and sent it on to *Walter Lichtenstein* (1880—1964), the then newly appointed University Librarian.

Herbert Franklin Fisk (September 25, 1840—December 20, 1916) was the Principal of the Preparatory School from 1873 to 1904 (as well as holding a concurrent appointment as a Professor of Pedagogy, later Education, in the College), but continued to teach at Northwestern after his stepping down as Principal until his retirement at the end of the 1915–1916 academic year, a total of 43 years of service to the University. He died less than a year later. His papers are housed in the University Archives. *Fisk Hall* is named in his honor.

Note: It is unclear when Kellogg formally became the head of the NU department prior to the arrival of Moore; it hardly makes sense to be the head of a department consisting of just one person (unless one includes the instructors in the Preparatory School). Holgate says (p. 13) Kellogg was the "titular head of the department" in 1892-93 (the year after Moore left and Henry Seely White arrived), and that for most of that year and the next "Kellogg was on leave of absence". It is clear from the circumstances under which White was hired (see below), that he was intended to serve as de facto chair, replacing Kellogg, from the start.

Holgate (pp. 7—8): "During the first thirty years of the University's history but little change was made in the courses offered in Mathematics."

Commentary: Initially there was a uniform set of courses taken by *all* students: algebra and geometry in the Freshman Class, plane and spherical trigonometry, and analytic geometry in the Sophomore, differential and integral calculus, and mechanics and hydrostatics in the Junior, and astronomy in the first two quarters ("terms") of the Senior, all this taught by a single

person (Professor Noyes). But “no plan survives first contact with the enemy” (von Moltke), and two years later (1857—58), students were divided into two courses of study, classical and scientific, with the scientific course replacing Greek and Latin by English and modern languages (French and German), along with a number of other changes. By 1889—90, the last year Kellogg was chair of mathematics in any but title, there were four courses of study (classical, philosophical, scientific, and modern literature), but the courses offered in mathematics still did not go beyond the calculus. It is only in the 1890—91 *Catalog* that “electives” beyond the differential and integral calculus are mentioned (analytic geometry of space and projective geometry) that will be “offered to duly prepared students”.

Holgate (p.8): The appointment of George Washington Hough as Professor of Astronomy.

Commentary: The original (“Old”) University of Chicago was founded in 1856 by Midwestern Baptists, the Baptist counterpart to Methodist Northwestern. The Chicago Fire of 1871 and the Panic of 1873 resulted in financial stresses that ultimately ended with it closing in 1886 and its main building being torn down in 1890. At the final meeting of its Trustees in 1890 its name was changed to the **Old University of Chicag**o, freeing up the name and enabling the new Baptist institution established two years to call itself the University of Chicago.

Some of the Old University’s faculty subsequently moved to Northwestern, including **George Washington Hough** (October 24, 1836 – January 1, 1909), the Old University’s Professor of Astronomy and at that point already an established figure in astronomy. As result courses in astronomy were offered in a new Department of Astronomy, as opposed to Mathematics, where they had been taught up to that time. For further information on Hough, see Hough (1909) and T.L. (1910).

Holgate (p. 8): The Dearborn Observatory.

Commentary: At the same time that Hough moved to Northwestern, the Dearborn Observatory at Chicago moved to a new building on the Northwestern campus, with Hough remaining as its Director.

The heart of an observatory is its telescope, and the history of the Dearborn Observatory’s 18.5 inch refracting telescope is both complex and interesting. In the latter half of the 19th century the best known telescope maker in the US was **Alvan Clark** (March 8, 1804—August 19, 1887); the telescope’s 18.5 inch lens was ground by his firm, Alvan Clark & Sons in Cambridge, MA. (The firm later also ground the lenses for the famous 36-inch Lick

Observatory and 40-inch Yerkes Observatory refracting telescopes.) Originally commissioned in 1856 by the University of Mississippi, the Civil War intervened before the telescope could be delivered, and it initially languished in Clark's workshop. Although there was some thought Harvard would acquire the telescope, Thomas Hoyne, a founding member of the Chicago Astronomical Society (CAS), purchased it and it was housed in a building on Chicago's South Side, managed by the predecessor of the current University of Chicago (the "Old University of Chicago" mentioned above). Due to the financial difficulties of that earlier University, the telescope eventually reverted to the CAS. In 1887 the CAS came to an agreement with Northwestern to house the telescope in a new building to be built by NU on its campus, completed in 1889; both the old and new buildings were called the Dearborn Observatory. In 1911 the original tube and mounting for the telescope were replaced by Northwestern; the old pieces were later transferred to the Adler Planetarium (in 1929), where they remain today. In 1939 the Observatory was moved 660 feet to make room for NU's newly constructed Technological Institute.

The first Director of the Dearborn Observatory was **Truman Henry Safford** (January 6, 1836—June 13, 1901); his papers from this period can be found in the NU Archives. The NU Archives (https://findingaids.library.northwestern.edu/agents/people/1575) summarizes his life thus:

> Truman Henry Safford was born January 6, 1836 in Royalton, Vermont, the son of Louisa Parker and Truman Hopson Safford. A child mathematical prodigy known as "the Vermont boy-calculator," he performed remarkable feats of computation, often jerking and muttering as his mind raced. He entered Harvard College in 1852 and, at the age of 18, graduated with honors two years later. Safford soon went to work in the Nautical Almanac Office and the Harvard College Observatory. He was associated with the Observatory first as assistant observer and then as acting director, until late in 1865, when he took a joint position as professor of astronomy (and mathematics) at the old University of Chicago and as the first director of the Dearborn Observatory. Safford's primary research interests at the Dearborn Observatory were the positions, motions, and orbits of stars. He discovered several nebulae and participated in the Astronomische Gesellschaft's cooperative star mapping project.
>
> The Chicago Fire in 1871 left the University of Chicago in financial disarray. Safford departed Chicago in 1871 or 1872 on a leave of absence to work for the

> Army Corps of Engineers and remained there until possibly as late as 1876 (in light of the sparse surviving records, however, this period in Safford's life must remain somewhat conjectural). It is certain that in fall, 1872, and spring, 1873, he assisted Lt. E. H. Ruffner in a reconnaissance of the Ute Territory in Colorado, while later in 1873 Safford was an astronomical observer assisting Lt. G. M. Wheeler overseeing the determination of coordinates at various astronomical stations in the West. Subsequently, Safford did consulting work for various government bureaus until as late as 1876, when he secured an appointment as Field Memorial Professor of Astronomy at Williams College. He remained at Williams until his death in 1901, though disabled during the last three years of his life by a paralytic stroke.

For further information on Safford, see Searle (1902).

Safford is unusual in that he is one of the few childhood calculating prodigies to go on to enjoy a serious scientific career in later life. One of his feats as a child was amusingly recorded by a visitor:

> I then asked his parents if I might give him a hard sum to perform *mentally*. They said they did not wish to tax his mind too much, nor often to its full capacity, but were quite willing to let me try him once. Then said I, "Multiply, *in your head*, 365, 365,365,365,365,365 by 365,365,365,365,365,365 !" He flew round the room like a top, pulled his pantaloons over the top of his boots, bit his hand, rolled his eyes in their sockets, sometimes smiling and talking, and then seeming to be in agony, until, in not more than one minute, said he, "133,491,850,208,566,925,016,658,299, 941,583,225 !" The boy's father, Rev. C. N. Smith, and myself, had each a pencil and slate to take down the answer, and he gave it to us in periods of three figures each, as fast as it was possible for us to write them. And what was still more wonderful, he began to multiply at the left hand, and to bring out the answer from left to right, giving first "133,491," &c. Here, confounded above measure, I gave up the examination. The boy looked pale, and said he was tired. He said it was the largest sum he had ever done!

As reported in *Chambers's Edinburgh Journal* 8 (1847, p. 265); see Smith (1983, Chapter 26) for a modern discussion.

Holgate (p. 8): The Preparatory School.

Commentary: The **Preparatory School** was supervised and governed by the faculty of the University, aided by a Principal and one or more assistants; it was intended to prepare students to enter the Freshman Class of the University. It had a long history.

The *Preparatory Department* of Northwestern University (later renamed the *Preparatory School*) was opened in 1859. The creation of the department was proposed by the Faculty of the College of Liberal Arts and approved by the Trustees of the University in 1857. In the absence of many quality secondary schools in the Chicago area and Midwest, a preparatory department was felt essential in ensuring that Northwestern would receive students prepared to do college work.

The first male students entered the department in 1859, and the first female students were admitted in 1869. The first principal was Warren Taplin. The Preparatory Department originally consisted of a three-year pre-secondary school and a four-year secondary school. The original age requirement for entrance to the Preparatory Department was ten, but it was later raised to eleven, then twelve, and finally thirteen. The Trustees of the University directed the administration of the Preparatory School, while faculty of Northwestern's College of Liberal Arts formed its curriculum.

The Preparatory School initially shared facilities with the University. In 1871, the original Northwestern building, called Old College, was enlarged and turned over completely to the use of the school, which occupied the facility until 1899. In that year, the Preparatory School, which had been renamed the *Academy* in 1892, moved into a much larger building, Fisk Hall, which it occupied until its closing (Fisk still serves as a Northwestern University classroom building). A boarding facility, Hatfield House, was opened in 1906.

In its early years, the school featured a classical curriculum that emphasized Latin, Greek, history, and mathematics. Gradually the curriculum was expanded to include modern languages and natural and physical sciences, and English became a major course requirement. In later years, manual training, mechanical drawing, bookkeeping, commercial law, stenography, and typing were added.

In 1873, Herbert Franklin Fisk (1840-1916) was named principal, and under his leadership for the next thirty-one years the Preparatory School grew and prospered. Fisk was an ardent campaigner against the use of tobacco, and required his students to sign pledges to abstain from its use. Fisk stepped down as principal in 1904, but remained on the Northwestern faculty as Professor of Education until his death.

In 1905 the Academy, which was known popularly as the Northwestern Academy, was renamed once again and became the *Evanston Academy*. During World War I, Northwestern University, citing decreased income and the prospect of receiving fewer students to the Academy, decided to close the institution at the end of the 1916-1917 school year. President Thomas F. Holgate of Northwestern explained that the growth of nearby high schools (presumably Evanston Township and New Trier High Schools, founded respectively in 1883 and 1901) made the need for a Northwestern preparatory school less important.

The above is taken from https://findingaids.library.northwestern.edu/agents/corporate_entities/1674; see also Greenlaw (1905).

Holgate (pp. 8—9): Instructors, Tutors, and Assistants up to 1890.

Commentary. Holgate gives the following list of the Assistants, Tutors, and Instructors in Mathematics for the years from 1860 to 1890:

1860—64	Alfonso C. Linn,	AB	1860			
1866—68	Edgar Frisby,	AM				
1868—69	Wilbur F. Yocum,	AM				
1869—70	John W. Ravel,	AB				
1870—71	Amos Williams Patten,	AB	1870			
1875—79	Edward Lamay Parks,	AB	1873			
1879—80	Charles M. Ellinwood,	PhB	1876			
1879—81	George Henry Horswell,	AB	1879			
1880—83	Charles Beach Atwell,	PhB	1879	(Syracuse)		
1883—84	William E. Wilkinson,	AB	1883			
1884—86	Merritt E. Taylor,	BS	1883	MS	1884	
1886—87	Eliakim Hastings Moore, Jr.	BA	1883	PhD	1885	(Yale)
1887—90	Alonzo J. Howe	AM				

He remarks that “as far as the records show, it would seem that their classroom teaching was for the most part in the Preparatory School of the University which was opened in 1860”. It appears to have been compiled by going through the annual Northwestern *Catalogue*.

One name, of course, stands out here above all others (Moore, see below); but what is remarkable is just how much one can recover about most of these individuals, many of whom went on to highly successful careers, although most *not* in mathematics. ***Frisbie*** (not Frisby)

went on to become a Professor of Mathematics in the Navy, working at the US Naval Observatory and retiring at the rank of Commander; ***Yocum***, after teaching in the Midwest for two decades, moved to Florida and became an important figure in the state educational system there; ***Patten*** became a Trustee and later Professor of Biblical Instruction at Northwestern; ***Parks*** became a Professor of Economics at Howard, as well as its Treasurer and Register for a decade, and Dean of Men for seven years after; ***Atwell*** became a Professor of Botany at Northwestern for 34 years; ***Horswell***, after teaching at Northwestern for twelve years, became a Professor of the English Language and Literature in the English College, Tokyo; and ***Wilkinson*** was a Methodist pastor in seven cities. Of the remaining five, four had some unusual aspect to their later life, although in very different ways: ***Linn*** died young of typhoid fever, a few months after he enlisted in the Union Army during the Civil War; ***Ellinwood*** was fired as Acting Chancellor of Simpson College and expelled from the Methodist Episcopal Church after he was found to be misappropriating college funds; ***Taylor*** was an Assistant Professor of Physics at Stanford for nine years starting the year after it opened, but then decided to become a rancher and irrigation engineer in nearby Ceres; ***Howe*** was a "refugee", coming to Northwestern as an Instructor late in his career after the Old University of Chicago closed. Only ***Ravel*** remains a cipher, who vanishes without a trace except for a brief mention in a Yale student paper.

Appendix A gives *kurzbiographien* (short biographies) of the above.

Note: It would appear that in compiling his list Holgate did not have access to the *Catalogues* for 1872—73 or 1873—74. (*Catalogues* were not issued for 1871—72 and 1874—75.) In addition to the individuals mentioned by Holgate, the 1872—73 *Catalogue* (p. 10) also lists ***Wilbur O. Peet*** as an Assistant in Mathematics, and the 1873—74 Catalogue (p. 13) both Parks (see above) and ***Edwin C. Arnold*** as Instructors in Mathematics, and ***Harriet E. Reed*** as an Assistant Instructor in Mathematics. Both Peet and Arnold were alumni of the College and therefore appear in the *Alumni Record* (Peet #103 on p. 89, Arnold #110 on p. 91); both became clergyman in the Methodist Episcopal Church. Harriet E. Reed is more elusive; she is presumably the same person as the one briefly referred to by Francis Willard in her autobiography *Glimpses of Fifty Years* (Willard, 1889, pp. 214 and 240); it would be intriguing to know more about her.

Thus twelve of the thirteen names on Holgate's list. But the penultimate name on the list stands out apart from the rest, so much so that Holgate singles him out for special mention.

Holgate (pp. 9—11): Professor Eliakim Hastings Moore.

Commentary: **Eliakim Hastings Moore** (January 26, 1862 – December 30, 1932) is too well-known a figure in the history of US mathematics for this period to require more than a cursory notice of his career apart from Northwestern. After receiving both his B.A. 1883 and Ph.D. 1885 from Yale, he continued his studies in Germany for the year 1885—86. On his return to the US he was an instructor at the NU Preparatory Academy 1886-87 and then a tutor at Yale 1887-89, prior to returning to Northwestern 1989—1992, first as an Assistant Professor and then Associate Professor in 1891, before moving to the newly reconstituted University of Chicago in 1892, where he remained until his death in 1932. The rest was history: the Mathematical Genealogy Project shows Moore (as of July 29, 2024) as having 31 students and 30,721 descendants. His first ten students, directed during the 15 year period from 1892 to 1907, included Dickson, Lehmer, Veblen, R. L. Moore, and Birkhoff, towering figures in the next generation of US mathematics at, respectively, Chicago, Berkeley, Princeton, the University of Texas at Austin, and Harvard. There are many sources of information about Moore: aside from his National Academy of Sciences *Biographical Memoir* (written by his Chicago colleagues Bliss and Dickson), see Parshall and Rowe (1994, Chapters 6 and 9), Zitarelli (2019, pp. 316—325, 346—355), and Roberts (2001).

Holgate (pp. 10—11): "With the return of Professor Moore to Northwestern university in 1889 the program in mathematics was greatly enriched."

Commentary: This took two forms: the introduction of upper-level elective courses, and a Major in Mathematics. The change reflected a more general development in the College as a whole. To appreciate the magnitude of the change, it is instructive to compare the relevant sections in the 1891—1892 Catalogue versus the corresponding ones in the Catalogue for the preceding academic year 1890-91. The 1891—1892 Catalogue (pp. 69—71) says (for the first time):

> *Major Work*.- At a date not later than the registration at the beginning of the Junior year, every candidate for the Bachelor's degree shall elect at least one department in which to do Major work.
>
> The specific courses constituting Major work will be found under each department; they will involve from seven to ten year-hours given to work in the department, and distributed

over at least two years of the general program. The election of department for Major work will enter into the registration of the Junior year.

What this meant in particular for the program in mathematics is discussed below.

Holgate (pp. 11—12): "In 1891—92, Henry Benner, M.S. was Instructor in Mathematics in the Preparatory School and Monroe Vayhinger, A.M., a student in Garrett Biblical Institute, was Instructor in the College."

Commentary: ***Henry Benner*** (October 13, 1861—August 12, 1901) B.S. 1885 and M.S. 1887, West Chester Normal School, M.S. 1889, University of Michigan (his Master's thesis, *Hyperbolic Functions*, is available on the HathiTrust website). Benner was a Fellow/Scholar at Clark University in 1889—1890 (the first year it admitted students), and then (contrary to what Holgate states) became an Instructor in the Preparatory School 1890—91. He subsequently moved to the Chicago Manual Training School, remaining there until 1895, and then spent two years in Europe, studying in Berlin and Erlangen, and traveling during his vacations to England, Germany, Italy, France, Switzerland, Holland, and Belgium. He received his PhD from the Friedrich-Alexander-Universität Erlangen-Nürnberg in 1897 (July, magna cum laude, the MGP lists no advisor), and returned to the US to become the Brockway Professor of Mathematics at Albion College (a small private liberal arts college in Michigan), from 1897 to 1901. He was elected to the AMS in December 1897 and gave a paper at the meeting of the Chicago Section that month. He tragically drowned in Lake Orion in the summer of 1901 (some details are given in the *Detroit Free Press* for August 14, 1901, p. 2). The *Albion College Pleiad* (17:1, September 25, 1901, pp. 2—3) gives a short biographical sketch, together with a photograph of Benner on p. 1. (The *Pleiad*'s account is presumably accurate for the period when Benner was at Albion, but contains some minor inaccuracies for the period before.) He was well-liked at Albion and a considerable sense of loss was expressed in the subsequent memorials.

Monroe Vayhinger (May 28, 1855—October 31, 1938) A.B. 1883, A.M. 1886 (mathematics), Moores Hill College (Dearborn County, Indiana); B.D. 1903, Garrett Biblical Institute; honorary D.D. from both Moores Hill College and Taylor University, 1908. After being a professor of mathematics at Moores Hill College 1883—90, and an instructor in mathematics, Northwestern University 1891–93, followed by returning to Moores Hill as professor 1894—1904 and vice-president 1896—1904, Vayhinger became a pastor 1904—08 before serving as President of Taylor University 1908—1921. (Biographical sources: *Who's Who*, 1924; *The Gem,* the Taylor

University student yearbook, for 1922, pp. 6—7.) As an influential Methodist leader of his era, Vayhinger still attracts interest today in some circles; see, e. g., Lay (2008).

Holgate (pp. 12—13): Professor Henry Seely White.

Commentary: **Henry Seely White** (May 20, 1861—May 20, 1943) succeeded Moore as chair, and ran the department for thirteen years until he left for Vassar. After graduating from Wesleyan A.B. with honors in 1882, he spent five years working all but one of these at Wesleyan before going to Göttingen 1887—1890 to study under Felix Klein, receiving his PhD in 1891. These were golden years: as White wrote many years later (White, 1946, pp. 22-23),

> Klein received me kindly and admitted me to his seminar course, then just beginning, in Abelian Functions. Other Americans working with him at the time were Haskell, H. D. Thompson, H. W. Tyler, Osgood of Harvard, and a year later Maxime Bocher, all friendly and helpful to the less experienced neophyte. Bolza, Maschke, and F. N. Cole, all whose names are now classic in American mathematics, had left the year before. Klein expected hard work, and soon had in succession Haskell, Tyler, Osgood, and myself working up the official Heft or record of his lectures, always kept for reference in the mathematical Lesezimmer [reading room]. … Within six months we were each set to work on special topics and reading related papers, all in close connection with the seminar and lecturing on our findings before the whole seminar group. After my second year, results proving plentiful, Klein set me to formulation for publication and to reviewing for examination. … Meantime I had followed lectures by H. A. Schwartz, his regular course on function-theory; by Schonflies on protective geometry and curve-theory; by Georg Elias Müller on psychology and *naturphilosophie,* and Baumann on history of philosophy.

White's US compatriots at Göttingen all went on to distinguished careers in mathematics: *Mellen Woodman Haskell* (1863—1948) taught at the UC Berkeley Department of Mathematics and was its chair from 1909 to 1933; *Henry Dallas Thompson* (1864—1927) was Professor of Mathematics at Princeton from 1894 to his death; *Harry Walter Tyler* (1863—1938) was the head of the Department of Mathematics at MIT from 1901 until he retired in 1930; William Fogg Osgood (1864—1943) and Maxime Bôcher (1867—1918) taught at Harvard and later

became—like White—Presidents of the AMS and members of the National Academy of Sciences.

After his return to the US and two years at Clark (1890—1892), White came to Northwestern as an Associate Professor in 1892 just as Moore left, succeeding him as chair, and was promoted to Professor in 1894. His departure for Vassar in 1905 did not signal unhappiness with Northwestern, but was occasioned by his desire to be close to his mother, who was ailing.

Moore's resignation appears to have caught Northwestern by surprise. Its *President's Annual Report* for 1891-2 (pp. 13—14) gives enough insight into White's appointment to warrant quoting in full:

> Eliakim H. Moore, Ph.D., having been elected a professor in another institution, tendered to the Executive Committee his resignation as Associate-Professor of Mathematics in this University, the same to go into effect at the close of the academic year, and the resignation so tendered was accepted. There were urgent reasons making it desirable to at once secure his successor. The Executive Committee therefore appointed Henry S. White, Ph.D., Acting Associate-Professor of Mathematics and fixed his salary the same as that which was paid to his predecessor. The Executive Committee has no power to appoint professors, but it was considered to be within its power to make temporary appointments of acting-professors. Unless it is possessed of power to make these temporary appointments, there will be times when the work of the institution cannot be carried on without serious embarrassment. Henry S. White was graduated from Wesleyan University at Middletown, Conn., where he was afterwards appointed instructor in Mathematics. He resigned this position and went to Germany where he carried on his mathematical studies under the most eminent specialists in that department in Europe, Professor Felix Klein and Professor H. A. Schwarz. He received the degree of Ph.D. from the University of Goettingen. For the last two years he has been employed in giving instruction in Mathematics at Clark University, Worcester, Mass. The Board is recommended to confirm the action of the Executive Committee, and to relieve the appointment of its temporary character.

Holgate (p. 12): "Returning to America in the spring of 1890, White spent a few months at Northwestern University."

Commentary: As a temporary replacement for Alonzo J. Howe, who had died in February.

Holgate (p. 13): "Mr. Vayhinger and Dr. Samuel Weir, a graduate of 1889, served as instructors" during the academic year 1892—93.

Commentary: We have already been introduced to Vayhinger. For Dr. ***Samuel Weir*** (April 15, 1860—April 17, 1943), see the *Alumni Record*, p. 204, Entry 560; Coursey (1913); and Weir's entry in *Ancestry.* Subsequent to 1903, he taught successively at Dakota Wesleyan, Simpson, and the College of Puget Sound for extended periods of time. *Note*: Coursey may not be reliable as to details; for example, his dating of Weir's birth to 1861 is most certainly incorrect.

Holgate (pp. 13—14): "In May 1893, two new instructors, Burleigh S. Annis, A. M. and Thomas F. Holgate, Ph. D., were appointed to begin work in the autumn."

Commentary: Thus Holgate modestly introduces himself. The sentence illustrates the sometimes understated nature of Holgate's narrative, since Annis and Holgate had very different careers.

Burleigh Smart Annis (January 27, 1859—January 23, 1930), Berwick Academy (South Berwick, ME), 1880; A.B. 1885, A.M., 1888, Colby College. Principal of the Richmond (Maine) High School, 1885—86; Professor of Mathematics, Wesleyan Academy, Wilbraham, MA, 1886—1890; graduate student, Johns Hopkins, 1890—1893; Instructor in Mathematics, Northwestern, 1893—1896; taught mathematics and astronomy at Hartford High School, CN, c. 1896—1904. In 1904 Annis abandoned teaching as a career and moved to Tennessee; of this time his obituary in the *Chattanooga Times* (January 24, 1930) tells us: "When Mr. Annis first came here he organized the Chattanooga Roofing and Foundry company. His brother, J. E. Annis, was his partner. He later sold his interest in the company and entered the real estate business and continued in this activity until two years ago, when he was forced into retirement as a result of ill health."

From early on Annis had a strong interest in astronomy: he had been awarded a fellowship in astronomy at Johns Hopkins, taught spherical astronomy at NU, and continued to teach it during his time in Hartford. This involvement continued even after he moved to Chattanooga and went into business: he was a part-time Lecturer in Astronomy at the University of Chattanooga 1907—1918, and the founder of the Barnard Astronomical Society in

Chattanooga (named after the recently deceased distinguished Tennessee astronomer Edward Emerson Barnard, 1857—1923), organizing its first meeting on November 15, 1923, and chairing its first fifty-eight meetings right up to the time of his death. The Barnard Astronomical Society relates the following charming story of the origin of Annis's interest (https://barnardastronomy.org/menu/our-history/the-prime-movers/):

> [This is always the result] of some profound childhood experience. … In so far as can be deduced from the minutes of the Barnard Astronomical Society it was an experience in Norfolk, Virginia some twenty eight years prior to his coming to Chattanooga that cultivated [Annis's] life as a teacher and astronomer. He related meeting professional astronomers observing a total solar eclipse. Among those present were Professors Pickering and Goodwin from Harvard University. Also present were Judge Oliver Wendell Holmes (son of the poet) and Mary Proctor the distinguished and gifted daughter of Professor Richard Proctor the astronomer.

Unfortunately it seems clear from the account in *The Philadelphia Inquirer* for Tuesday, May 29, 1900 that this refers to the total eclipse of the sun that took place the preceding day (which was visible in Norfolk, and observed by Goodwin and Holmes). Perhaps the twenty-eight years being referred to is from when Annis related the story.

The primary sources for Annis's life include the *Colby College Catalogue* (Centennial Edition for 1820—1920, Colby College, 1920), the Barnard Astronomical Society (in particular, https://barnardastronomy.org/menu/our-history/the-prime-movers/), and his *Chattanooga Times* obituary (not entirely reliable as to matters of detail, but presumably quite accurate regarding the immediate circumstances of his death).

Thomas Franklin Holgate (April 8, 1859—April 11, 1945). Holgate very modestly limits himself here to his academic background prior to coming to Northwestern. He was a late starter: born in Canada, he attended Albert College in Belleville, Ontario (a small private high school) and then taught in the public schools of Canada for five years before receiving his A.B. from the University of Toronto, Victoria College in 1884, followed by teaching at Albert College 1884—1890, and attending Clark University 1890—1893, receiving his Ph.D. from Clark in 1893. This gives little sense of just how important a role he was to play later in our University. Appendix D reproduces his NU Archives biography as it appears on their website.

All three of the schools Holgate attended are of interest. **Albert College** is Canada's oldest co-educational boarding and day school. Founded in 1857 by the Methodist Episcopal

Church as the *Belleville Seminary,* it was renamed *Albert University* in 1866, an affiliate of the University of Toronto, and authorized to offer university credits. In 1884 it federated with the University of Toronto's Victoria College, became purely a high school, and its name again changed, this time to *Albert College*; see https://www.albertcollege.ca/about/our-history (accessed August 31, 2024). **Victoria College** was initially founded in 1836 as the *Upper Canada Academy* by the Wesleyan Methodist Church of Canada, and later incorporated as Victoria College in 1841; it is part of the University of Toronto.

Clark University (in Worcester, MA) deserves discussion under a separate head. It was founded in 1887 as one of the first modern US research universities, funded by a large donation (eventually two million dollars) from Boston businessman Jonas Gilman Clark. When it opened two years later on October 2, 1889, it was the first US university that was exclusively all-graduate; it only began to admit undergraduates in 1902. It was modeled in part on other US research universities such as Johns Hopkins and Cornell, only a few of which existed at that time. For discussion of Johns Hopkins from this perspective in terms of mathematics, see Parshall and Rowe (1994, Chapters 2—3), for Clark and Cornell, Parshall and Rowe (1994, pp. 269—275).

Holgate (p. 14): New courses.

Commentary: Except for the introduction of a new sophomore course on determinants and graphic algebra in 1888-89, the courses offered up to 1890 in mathematics remained the same: mathematics was essentially a service department offering a limited menu of first and second year courses up to calculus, some or all of which were required depending on the particular *course of study* (in 1888-89, these were the classical, philosophical, scientific, and modern literature). For example, in their *first year* all students had to take solid geometry, algebra, and trigonometry; in the *second year*, those in the scientific course had to take determinants and graphic algebra in the Fall, analytic geometry in the Winter, and calculus in the Spring, the classical and philosophical courses just analytic geometry in the Winter, and those in modern languages were spared the indignity of having to take any mathematics at all; in the *third year*, those in the scientific course had to take integral calculus in the Fall, but there were no required mathematics courses for the other courses of study; and in the fourth year there were no required mathematics courses for anyone (although students in any course of study could take additional mathematics courses as electives in their last two years if so desired).

This condition of stasis began to change radically starting in 1891—92. The 1891-92 Catalogue hints at the coming changes (p. 71):

> In the higher courses, undergraduates of special ability, and post-graduate students are made acquainted, as far as possible, with the results of the most recent mathematical investigations.

This was really more an aspirational statement, lacking any specifics as to what would actually be offered. In contrast, the 1892–93 *Catalogue* is more specific and lays out the new courses:

> Determinants and Infinitesimal Analysis of Curves
>
> Advanced Calculus and Differential Equations
>
> Theory of Equations and Modern Theory of Conic Sections (not offered in 1893–94)
>
> Advanced Analytical Geometry of two-dimensional and three-dimensional space

The year after (1893—94) advanced courses are not only listed but the instructors are designated for each one: White taught the first two, Holgate the last. as well as a course on Projective Geometry of the Plane, and two on Analytical Mechanics.

Graphic algebra, part of the new course the NU mathematics department introduced in 1888-89, refers to a method of presenting the theory of equations in one variable using graphical and diagrammatic methods. One classical textbook employing this approach was A. W. Phillips and W. Beebe's 1882 *Graphic Algebra, or Geometrical Interpretation of the Theory of Equations of One Unknown Quantity.* Phillips and Beebe were both Assistant Professors in Mathematics at Yale in 1882, when E. H. Moore was an undergraduate there, so Moore would likely have known of the book, and may have brought it to Kellogg's attention when Moore was an instructor in mathematics at Northwestern in 1886—87. ***Andrew Wheeler Phillips*** (March 14, 1844—January 20, 1915), and ***William Beebe*** (September 4, 1851—March 11, 1917) were long-time members of the faculty at Yale; for Phillips, see Wright et al. (1915) and Burgess (1916).

Although the term graphic (or graphical) algebra is now forgotten, it had a good run, subsequent textbooks on it including Nipher (1898), Hall (1902), and Schultze (1908); its merits were discussed as late as 1928 in a publication of the MAA (Maddox, 1928).

Holgate (p. 14): "In the spring of 1894, President Rogers conceived the notion of creating two professorships in Mathematics".

Commentary: White had come to NU as an Associate Professor in 1892, Holgate as an Instructor in 1893. Both had PhDs and, given the recent loss of Moore, it may have been judged risky not to promote both to the rank of Professor as soon as possible. Because at this stage departments ordinarily had just one Professor per subject in a department, the Solomonic decision was made in 1894 to promote *both* White and Holgate, White to Professor of Pure Mathematics and Holgate to Professor of Applied Mathematics, even though, as Holgate observed, the department continued to operate as a single unit with While as head. Two years later (1896), after a prudent length of time had elapsed, White was then named Henry S. Noyes Professor of Mathematics while Holgate remained Professor of Applied Mathematics, a situation which continued until White left for Vassar in 1905, after which Holgate was immediately named Noyes Professor (a position he continued to hold for nearly four decades until his retirement in 1934).

It is interesting that this is the sole place in his history where Holgate specifically refers to a president of the University by name (other than Noyes of course). ***Henry Wade Rogers*** (1853—1926) was the sixth president of Northwestern, from 1890 to 1900. He was an important and transformative figure in the history of the University: he expanded the programs in the College to include modern fields such as economics and political science, made research an important factor in hiring new faculty, brought graduate studies to the University, strongly supported coeducation at Northwestern (his wife, Emma Winner Rogers, was a suffragette), and unified the professional schools. He made it clear from the start that significant change was necessary (in his inaugural address he said the University "must not hesitate to make changes in the established order of things"). He was perhaps *too* progressive for the Trustees; the Archives (https://findingaids.library.northwestern.edu/agents/people/2085) says that in 1900 he "came under pressure from the Board of Trustees to leave the University" although he appears to have been too diplomatic to broadcast this, the Archives adding "the specific reasons for Rogers' resignation remain unknown". See Morledge (1976), who discusses the circumstances, based in part on material in the Northwestern Archives as well as newspaper articles of the time. Afterwards, Rogers went on to continue a highly successful career as Dean of the Yale Law School 1903—1916, and Judge of the US Court of Appeals (2nd Circuit) 1913—1926. The Archives biographical entry on him is given in Appendix E; see also Locy (1905) for a specific discussion of his Presidency. (Locy's chapter illustrates a weakness of Wilde's book, which sometimes avoids washing dirty linen in public and in this case smooths over the circumstances of Rogers's departure from NU.)

White, in his autobiographical memoir White (1946, p. 25), paid tribute to Rogers and his impact on Northwestern:

> The new president of Northwestern University, Henry Wade Rogers, had called a number of younger scholars to important chairs, all of about the same age, men with the Ph.D. degree, trained at Johns Hopkins or Harvard or in German universities; and the "atmosphere" was favorable to research and writing. Most of the older professors were of similar fiber, and the college enjoyed an era of marked growth.

Holgate (pp. 14—15): Graduate courses and graduate students.

Commentary: Graduate courses in mathematics were first offered at NU in 1894—95, White teaching courses in the Theory of Functions and Substitution Groups, Holgate in Modern Higher Algebra, Higher Plane Curves, and an Advanced Course in Synthetic Geometry, reflecting the *nouvelle régime* of President Rogers.

Graduate courses of course mean graduate students, and among the new graduate students Holgate singles out for particular mention ***Fanny Cook Gates*** (April 26, 1872—February 24, 1931), who after receiving her B.S. from Northwestern in 1894 was awarded the first fellowship given by Northwestern in Mathematics, and wrote a master's thesis (1895) on the construction of curves. Ms. Gates went on to have a high successful career in experimental physics: after studying at Bryn Mawr 1895—97, and Göttingen and Zurich 1897—98, she taught at Goucher University 1898—1911 (while spending 1902—03 working with Rutherford at Montreal, 1905 with J. J Thompson in Cambridge UK, and earning a Ph.D. in physics from the University of Pennsylvania in 1905). After leaving Goucher in 1911, she went to the University of Chicago 1911—1913, Grinnell 1913—1916, and the University of Illinois 1916—18. After that she largely left academia, working primarily at other institutions as well as continuing her research until her death in 1931. See Rayner-Canham (1997a and 1997b).

Just because the department only began to offer graduate courses as late as 1894 does not mean the University did not award a master's degree before this. The *Catalogue* for 1860—61 states (p. 22):

> Every Bachelor of Arts, of three years standing, who has sustained a good moral character, may, on payment of the fee of five dollars, receive the Degree of Master of Arts.

This curious practice (the "Oxbridge MA") was not in fact uncommon in the 19th century and persists even today at Cambridge, Oxford, and Dublin; see, for example,

https://www.hepi.ac.uk/2024/08/14/a-brief-history-of-the-honorific-oxbridge-m-a-degree/

https://www.cambridgestudents.cam.ac.uk/your-course/graduation-and-what-next/cambridge-ma

(accessed September 8, 2024). The practice at Northwestern was changed in the 1873—74 academic year, when the *Catalogue* (pp. 131–132) was changed to read:

> The Degree of MASTER OF ARTS will be conferred on Bachelors of Arts of three years' or longer standing who have sustained a good character. But students receiving the Bachelor's degree after 1874, in applying for this degree must furnish proof of having pursued Professional or other advanced studies. Application should in all cases be made to the President before Commencement, accompanied with a fee of five dollars to pay for the diploma.

The requirement that a student pursue "professional or other advanced studies" did not mean the student need pursue graduate studies in the current sense or that it be at Northwestern. A case in point is Charles Slichter who received his B.S. from Northwestern in 1885. After being an instructor at the Athenaeum in Chicago 1885—86, he moved to the University of Wisconsin in Madison in 1886, where he remained until his retirement 48 years later. Yet despite the fact that he was no longer affiliated with Northwestern, he was awarded an M.S. by Northwestern in 1888 (i. e., three years after his graduation from there), presumably on the strength of his being an Instructor in Mathematics at the University of Wisconsin.

Holgate (pp. 15—16): New instructors: Keppel, Stecker, and Smith.

Commentary: ***Herbert Govert Keppel*** (April 7, 1866—October 5, 1918). A.B., Hope College, 1889; Ph.D., Clark University, 1901. Initially a graduate student at Clark University, 1893—1895, Keppel became an Instructor of Mathematics at Northwestern University, 1896—1900, and then spent a year on leave 1900—01, going back to Clark and finishing his Ph.D. If he thought this would result in his being promoted to Assistant Professor when he returned to Northwestern in 1901, he was mistaken: he remained at the level of Instructor for the next six and a half years 1901—1908, leaving when he was appointed Professor of Mathematics and Astronomy, and Chair of the Department of Mathematics at the University of Florida at Gainesville 1908—1918. He died in Gainesville in 1918, a victim of the 1918—20 flu pandemic.

Paul Ewing Erlich's 1996 history of the Florida department (Erlich, 1996) contains extensive information about Keppel during his time there, including details of the appointment.

Henry Freeman Stecker (June 3, 1867—October 29, 1923). Born in Sheboygan, WI, Stecker received his B.S (1893), M.S. (1894), and Ph.D. (1897) from the University of Wisconsin; he was the first person to be awarded a Ph.D. in Mathematics at Wisconsin. He was an Instructor in Mathematics at Northwestern 1897—1900; after studying abroad at Göttingen and Berlin 1900—1901, and being an Instructor in Mathematics at Cornell 1901—1903, he moved to Penn State in 1903—1923, initially as an Instructor and then rising through the ranks to Professor, remaining there until his death in 1923. He worked in differential geometry. The H. Freeman Stecker Award at Penn was established in 1950 using a bequest from his wife Ormelle Stecker in honor of her husband. His *Science* memorial tribute, (Tudor, 1923), is a useful source of information about his career (although its claim that he was "one of the leading mathematicians of the world" can scarcely be credited unless "leading" is given an unusually broad definition, let alone the bizarre claim in the brief obituary notice about him in the October 31, 1923 issue of the *New York Times* that he was "reputed to be one of the seven greatest mathematicians in the world"). See also his entry in the 3rd, 1921 edition of *American Men of Science*.

Burke Smith (March 26, 1878—January 14, 1964) B.S., University of Washington, 1899. Smith was an Instructor in Mathematics at Northwestern, 1900—01, before moving to Yale for graduate studies, receiving his Ph.D. from Yale in 1904. (Dissertation: "Surfaces which may be deformed with preservation of a conjugate system of curves", no advisor listed; see BAMS 11 (1905), 187–191, 12 (1906), 164—171 and 342—346.) After graduating from Yale he became an Instructor in Mathematics at Purdue 1904–06, but then shifted to the commercial sector and joined the Illinois Bell Telephone Co. in Chicago, where he remained until his retirement several decades later. (Although the exact years he joined Bell are presently unclear, the census records for 1910, 1920, 1930, and 1940, as well as his 1942 draft registration card establish he was at Bell for at least the period 1910—1942.) Although his position is variously given as an electrical and transmission engineer, this would have been a fairly high-level position: he was an Associate of the American Institute of Electrical Engineers, and the co-author of a paper in the Institute's journal (Smith and West, 1928). He retired in 1943 due to a mandatory retirement policy at Bell.

Interestingly, after his retirement Smith led a later, second life as a stellar spectroscopist affiliated with the Yerkes Observatory (located in Williams Bay, but administered by the University of Chicago), perhaps beginning even before he retired from Bell. Over the period 1942—50 he was the author or co-author of ten papers in the *Astrophysical Journal*, five of

these co-authored with Otto Struve (1897—1963), the Director of the Yerkes Observatory (1932—47) and one of the foremost astronomers in the world at the time. The results of their first paper together (Smith and Struve, 1942) were reported in both *Science* and *Time,* as well as the University of Chicago's *Daily Maroon* (`Finds a New Type of Star", October 8, 1941, p. 4). Smith also joined the later Nobel prize winner Subrahmanyan Chandrasekhar and W. A. Hiltner in July 1945 in Manitoba to assist them in setting up photographic telescopes to be used during the total eclipse visible there.

The identification of the stellar spectroscopist with the Bell electrical engineer is certain, thanks to a brief obituary in the *Chicago Tribune* for January 16, 1964. Smith appears in a group photograph taken at the American Astronomical Society meeting in December 1942 (*Popular Astronomy* vol. 6, number 2), as well as one of the staff of the Yerkes observatory in 1945 (https://photoarchive.lib.uchicago.edu/db.xqy?one=apf6-00487.xml).

It is interesting to compare the career of Burke Smith with that of his better-known younger contemporary ***Thornton Carle Fry*** (January 7, 1892—January 1, 1991). Fry (A.M., the University of Wisconsin-Madison, 1913 and Instructor in Mathematics at Madison 1913–1916) joined the Western Electric Company in 1916. While at Western Electric he received his Ph.D. from Madison in 1920, based on work done at Western Electric in 1918 (thesis "The Application of Modern Theories of Integration to the Solution of Differential Equations", advisor Charles Slichter, discussed below). When parts of AT&T and Western Electric were merged to form Bell Telephone Laboratories (BTL) in 1925, Fry transferred to BTL, continuing to head the (then) small Mathematics Consulting Department formed at Western Electric in 1922. He retired from Bell in 1956 due to BTL's mandatory retirement policy (just like Burke Smith had done at Illinois Bell), but again like Smith he had no real interest in retiring, and served as a consultant in many capacities until his actual retirement in 1968 (in particular, he was consultant to the Director of the National Center for Atmospheric Research in Boulder, from 1961 to 1967).

Curiously, in yet another commonality with Burke Smith, one of Fry's later interests was astronomy, joining the American Astronomical Society in 1974. Sources of information about Fry include his MAA citation for Distinguished Service (Price, 1982), a Bell history (Millman, 1984), and Firor and Trimble (1997).

Holgate (p. 16): Robert Edward Wilson.

Commentary: **Robert Edward Wilson** (August 12, 1872—December 30, 1923) was a lifelong Northwestern man: after first attending the Northwestern Academy and then graduating from the College (Ph.B. 1898), he briefly taught in Illinois public schools 1898—1900 before

permanently returning to Northwestern: as a graduate student (Ph.M., Mathematics, 1901); Instructor in Mathematics 1900—1909 (1900—1902 in the Academy, 1902—1909 in the College); and Assistant Professor of Mathematics 1909—1923. Wilson spent the two years 1903—05 on leave studying in Göttingen; when he returned to NU in 1905 he also assumed a number of important administrative roles on campus, including serving as Registrar 1906—09. In 1923 he received a Ph.D. from the University of Chicago (thesis "Representations by certain functions of two variables by Stieltjes Integrals", advisor E. H. Moore) and was promoted to Associate Professor, but died at the end of the year.

In an unpublished report in the NU Archives, *Northwestern University in the Great War* (undated, perhaps written in 1919) Holgate touched on Wilson's wartime service:

> An interesting development alongside of the S.A.T.C. [Student Army Training Corps, a form of wartime ROTC at NU] but in no way connected with it was what came to be known familiarly as Wilson's Navy to distinguish it from the Naval Company in the Corps.
>
> On the Municipal Pier in Chicago, the United States Navy was conducting a School for Ensigns under the direction of Captain (now Admiral) Edward A. Evers. Many young men assigned to this school were in the vicinity waiting for an opportunity to enroll and it occurred to Professor Robert E. Wilson of the Department of Mathematics that preliminary instruction in Trigonometry, Surveying, and certain principles of Navigation would be helpful to them as a preparation for the school to be entered later. Accordingly, he offered his services to any who might come to his classroom on the Campus. Soon his classes were overflowing and Professor Wilson called in the assistance of other members of the faculty, among them Professor William H. Berger of the School of Engineering who rendered valuable aid. Captain Evers freely advised men to take this training while waiting and the records show that 624 men availed themselves of the opportunity. [Holgate, 1919, pp. 20—21]

Wilson was a member of the department during a period of unusual stability starting in 1905: D. R. Curtiss, who had just arrived, was effectively chair for the next thirty years 1905—1935; Holgate, the senior member of the department and then Dean of the College, remained as Dean until 1919 as well as Noyes Professor until his retirement in 1934; Wilson continued as an active member of both the department and the university until his premature death in 1923. Indeed, except for E. J. Moulton (who arrived in 1911, initially as an instructor, but was then

successively promoted up to Professor in 1921), instructors might come and go, but other long-term members of the department only started being hired two decades later in the late 1920s.

Holgate (p. 17): "In Mr. Wilson's absence in Germany, 1903–1905, Dr. John Wesley Young, a graduate of Ohio State University with a doctor's degree from Cornell University was instructor in Mathematics."

Commentary: **John Wesley Young** (November 17, 1879—February 17, 1932), Ph.B. 1899 (Ohio State), A.M. 1901, Ph.D. 1904 (Cornell). After teaching at Northwestern 1903—05, Princeton 1905—08, Illinois 1908—10, and Kansas 1910-11 (the last as professor and chair), he moved to Dartmouth 1911—32, where he remained for the rest of his life. He was active in both the AMS (Council 1907—25 and Vice-President, 1928—30) and MAA (Vice-President 1918, President 1929—31). His research was largely confined to the eight year period 1903—11 before he moved to Dartmouth, but was highly productive. He is best known for his work in projective geometry, including the *Veblen-Young theorem* (an abstract projective space of dimension three or greater is isomorphic to the projective space of lines in a vector space over a division ring), and his book *Projective Geometry, Volumes 1 and 2* (1910 and 1917), co-authored with Veblen and presented in more popular form in his 1930 Carus Mathematical Monograph 4, *Projective Geometry*. For further biographical information, see his entry in the DSB, and notices in BAMS, 38 (1932), pp. 603—610 and AMM 39 (1932), pp. 309—314.

Holgate (p. 17): "Mr. Walter Wiley Davis, graduate of Ohio Wesleyan University with a long missionary tradition in China was instructor in 1904–05."

Commentary: **Walter Wiley Davis** (December 4, 1882—October 11, 1947) A.B. 1903, Ohio Wesleyan University (Physics, Analytical Chemistry, Mathematics). Professor of Science and Mathematics, Greenville College, Greenville, IL, 1903—04; Tutor (not Instructor) in Mathematics, Northwestern College of Liberal Arts, 1904—05; Assistant in Mathematics, University of Michigan, 1905–06; Instructor in Mathematics, Syracuse University, 1906—1907; Professor of Geography and Geology, Peking University, 1907 to at least 1922. Thus *The Educational Directory and Year Book of China 1920* (all of which can be independently verified, although the *Educational Directory* seems to be the most accurate in terms of years and titles), but there is additional complexity: the *Epworth Herald* for November 2, 1907, pp. 581—2, lists Davis among the "missionaries sent out by the Board of Foreign Missions … of the Methodist

Episcopal Church during the year", so presumably Davis combined both teaching and missionary activities in China. Davis also earned an M.S. from the University of Chicago in 1917 and was elected to the Chicago Chapter of Sigma Xi, April 27, 1917 ("Is studying Mississippian Drift Fauna"), so he may have been on leave in the US that year; see W. W. Davis, "Evidence bearing on a possible northeastward extension of Mississippian seas in Illinois", *The Journal of Geology*, Vol. 25, No. 6 (Sep.—Oct., 1917), pp. 576–583, presumably reporting on his master's thesis research. For further personal information, see https://www.findagrave.com/memorial/116181872/walter-wiley-davis.

Holgate (pp. 17—18): Advanced students.

Commentary: Holgate lists ten graduate students, most of whom had successful careers in a variety of fields:

Jesse N. Gates	B.A. '97,	Ph.D. Clark University
Clarence M. Thorne	B.S. '99,	Fellow and Instructor 1899—1900
William H. Bussey	B.A. '00	Professor of Mathematics, University of Minnesota
Elda Louise Smith	B.A. '01	Graduate Student 1901—02
Carey Eyster Melville	B.A. '01,	Professor and Registrar at Clark University
John C. Lymer	M.A. '03,	Professor of Mathematics at Lawrence College
George Weston Briggs	B.A. '02,	Missionary; later Professor at Drew University
Mabel M. Heren	B.A. '04,	Professor of Mathematics at Knox College
George Erle Beggs	B.A. '05,	Professor of Civil Engineering at Princeton
Lloyd L. Dines	B.A. '06,	Professor of Mathematics at Carnegie

It is impressive how many of these became professors at well-regarded universities, some pursuing highly productive research careers in mathematics (Dines), others doing research in other fields (Briggs and Beggs), others spending their entire career at a single research institution but focused on teaching (Bussey and Melville), and still others spending decades at a single, smaller, primarily undergraduate institution (Lymer and Heren). Aside from Gates, Thorne, and Smith, these all had interesting lives in one way or another. For short biographies of the ten, see Appendix B.

Holgate (p.18): "Among the early students who later attained prominence in mathematical and allied studies mention may be made of: Merritt Eugene Taylor [and] Charles Sumner Slichter."

Commentary: It is curious Holgate should thus group Taylor and Slichter. Taylor (whom we have already met) worked as an electrician for the Incandescent Lamp Co. before becoming an Assistant Professor of Physics at Stanford 1893—1900 and then turning to ranching; Slichter was an entirely different kettle of fish.

Charles Sumner Slichter (April 16, 1864—October 4, 1946) B.S. 1885, M.S. 1888, Northwestern; Sc.D. 1916, Wisconsin (honorary). After teaching at the Athenaeum in Chicago 1885—86, Slichter moved to Wisconsin in 1886, where remained until his retirement 48 years later. At Madison he was successively Instructor 1886—89 and Assistant Professor 1889—92 of Mathematics, Professor of Applied Mathematics 1892—1920, and Dean of the Graduate School 1930—34. Slichter Hall at UW Madison is named in his honor. Apart from teaching at Madison for 48 years, Slichter was also a consulting engineer for the U.S. Geological Survey and later engineer in charge of investigating underground waters for the U.S. Reclamation Service, as well as president of the Wisconsin Academy of Science, Arts, and Letters (1900—03). He was a prolific author, including many technical monographs, mathematical textbooks, and popular writing (such as *Science in a Tavern*, 1938). Sources include Ingraham (1972), Wang (1987), and *Alumni Record* Entry 438.

Slichter had many distinguished relatives: his children included the economist Sumner Slichter and the geophysicist Louis B. Slichter, and his grandchildren the physicist Charles Pence Slichter and the Bell Labs executive William P. Slichter (the sons of Sumner), and the musician Jacob Slichter (the son of Louis).

Holgate (pp. 18—19): Classrooms and buildings.

Commentary: Mathematics at Northwestern has been housed in several buildings of considerable interest in the history of the university. **Old College** was the first building to be erected on campus and was ready for the start of classes on November 5, 1855. Initially intended as a purely temporary structure, it was located at the northwest corner of Hinman and Davis. Since it was not only the first but the *only* building at that point, all university activities including mathematics took place there: classes, library, chapel, student activities, even a few dormitory rooms. Even after other, more permanent structures were built, it continued to be used for a variety of activities including the Preparatory School, *a weather observatory in the 1870s*, a naval training program in WWI, and even at one point the offices of the College. The building seemed to have as many lives as a cat: moved in 1871 to the location of the present-day Fisk Hall, serving as the home of the Preparatory School, it was then moved in turn in 1899 to the location of the current McCormick-Tribune Center in order to make way for Fisk Hall, the

new and much larger home for the Preparatory School. Nature finally had to intervene: on July 24, 1973, the building was struck by lightening, triggering the sprinkler system and flooding the building. Determined to be both unsafe and too expensive to repair, it was finally razed. The "Old College" sign above its entrance, however, can still be seen to today, on the west side of University Hall.

When **University Hall** (the second building to be constructed on campus) was completed in 1869, most university functions were transferred to it, including—as Holgate describes—the teaching of mathematics classes and offices for its faculty. But NU continued to grow and **Swift Hall** (the result of a generous gift from Edward Swift and his mother) was built in 1909 to house Engineering, Physics, and Mathematics. This remained the home for Mathematics until 1950 (except during the disruptions of WWI and WWII), when it made its final move, to its current home in **Lunt Hall**.

How Mathematics came to end up in Lunt is a complex story. In 1869 the university library was transferred from Old College to University Hall, but Northwestern's rapidly growing library soon outgrew it. As a result, the **Orrington Lunt Library** was constructed in 1894 to serve as a separate library building. It is named after Orrington Lunt (1815—1897), one of the founders of the University, who (together with John Evans) helped to purchase Northwestern's land and obtain the granting of its charter from the State. Lunt subsequently served at various times as Treasurer, Vice-President, and President of Northwestern's Board of Trustees. In 1892 he donated $50,000 to Northwestern (approximately $1.728 million in 2024) to construct the needed library. Lunt Hall served as Northwestern's main library from 1894 to 1933, when in response to a shortage of space and Lunt's dilapidated conditions the new Charles Deering Library was built to house the collection. Deering in turn was the main library from 1933 to 1970, when the present-day Main Library building was built. From 1933 Lunt Hall served a variety of functions until 1950, when it became the current home of the Department of Mathematics.

Holgate (p. 19): Professor Holgate appointed Dean.

Commentary: Holgate became the Dean of the College of Liberal Arts in 1902, a position he held for seventeen years, until 1919. His administrative skills must have evident from the start, because two years later in 1904 he was appointed acting President of the University (1904-06) after the precipitate resignation of President ***Edmund J. James*** (President 1902-1904); later on he was again called to serve as acting President (1916–1919) after the retirement of President ***Abram W. Harris*** (President 1906-1916). (James left NU after only two years

because of fundamental differences with the Trustees regarding university finances—the Trustees were even then fiscally very conservative—but went on to be a highly successful President of the University of Illinois.)

Holgate's header for this section refers to his appointment as Dean, and it is almost as an afterthought that he adds at the end that "he was obliged to forgo all teaching" for the years 1904—1906 because he was also serving as Acting President then!

Holgate (pp. 19—20): Professor David Raymond Curtiss.

Commentary: When Henry Seely White left for Vassar in 1905, ***David Raymond Curtiss*** (January 12, 1878 – April 29, 1953) arrived, presumably as a replacement for White as chair. Curtiss came with outstanding credentials: a PhD from Harvard (1903, advisors Osgood and Bôcher), he had been a postdoctoral student at the École Normale Supérieure (1903-4) and an instructor at Yale (1904-5) before coming to Northwestern in 1905. His rise in the department was swift: appointed Assistant Professor in 1905, he was promoted to Associate Professor in 1907, and Professor in 1909. Given Holgate was both acting President as well as Dean of the College when Curtiss arrived, Curtiss was de facto in charge of the day-to-day running of the department from the start; at some point this was made official and ultimately Curtiss served as chair for 30 years, only stepping down in 1935. Curtiss (1946, p. 190) in his obituary for Holgate in the *Notices*, later wrote:

> In 1905 Professor White resigned his headship of the department of mathematics to go to Vassar. These cumulating responsibilities led Dean Holgate, with great regret, to give up the secretaryship of the Chicago Section … . He retained, however, his titular headship of the department of mathematics for nearly twenty years. The writer, as acting head during that period, found the relation an ideal one, terminated only at Dean Holgate's request that he be allowed to drop the title.

It is not entirely clear how to interpret this. On the one hand, Curtiss may have resented Holgate remaining "titular" chair for two decades while he, Curtiss, did the actual work; and the above may have been written to draw attention to this in a diplomatic way. On the other hand Curtiss may actually have meant what he wrote: there are certainly advantages to having the outward-looking face of the department, tasked with dealing with capricious faculty within the university and potential donors outside, be the Dean!

Curtiss was a person of remarkable energy and diligence. Quite apart from his decades of institutional service to Northwestern, his service to three professional organizations—the AMS, MAA, and AAAS—was extensive: he was a member of the Council and Vice President of the AMS (1918), and the editor of both its *Transactions* (1914-9) and the *Bulletin* (1928-38); he

was the President of the MAA (1935-6), and served on both its Board of Governors and the Carus Monographs Editorial Committee (the latter for two decades); and he was a Fellow, Vice President (1921), and member of the Executive Board (1929—1931) of the AAAS. His research record was respectable (although necessarily limited in light of the above): he wrote some 20 papers, mostly from 1902 to 1922, appearing in journals such as the *Bulletin*, *Transactions*, *Annals*, *Mathematische Annalen*, and *Science*. He also wrote a short book, *Analytic Functions of a Complex Variable* (1926) in the Carus Mathematical Monographs series, which went through several printings, as well as eight text books on analytic geometry and trigonometry (with E. J. Moulton, his successor as chair).

Holgate (pp. 20—22): The Evanston Colloquium.

Commentary: As part of the 1893 Columbian Exposition in Chicago, an International Mathematical Congress was held in Chicago August 21—26, 1893; see Parshall and Rowe (1994, Chapter 8) and White (1886) for details of the Congress. Afterwards the thirty-nine papers presented at the Congress were published under the editorial auspices of the Committee of the Congress, consisting of Moore, Oskar Bolza, and Heinrich Maschke (Moore's colleagues at the University of Chicago), and White, a volume readily available today online (Moore et. al, 1896). (Although the International Mathematical Union includes the Chicago Congress on its list of ICMs (see https://www.mathunion.org/icm/proceedings), strictly speaking the first official ICM was held four years later in Zurich, in 1897.)

The head of the German delegation to the Congress was the famous mathematician **Felix Klein** (1849—1925), who was given the impressive title of Imperial Commissioner. Klein had several connections with members of the Chicago and Evanston mathematical community (he was both Bolza and White's *doktorvater,* and likely knew both Maschke and Moore), and agreed to give a two week series of lectures after the Congress had concluded. This meeting was hosted by Northwestern August 28—September 9, 1893, and termed "The Evanston Colloquium"; twenty-three US mathematicians attended as well as Eduard Study of Marburg; Klein was put up by his former student White at his home at 616 Foster Street. The lectures were later published as *The Evanston Colloquium: Lectures on Mathematics* (Klein, 1894), and are (as is the case with many of Klein's books) still quite readable today.

Both the International Mathematical Congress and the Evanston Colloquium had important consequences, at once raising US mathematical visibility internationally, and shifting the center of mathematical research in the US to the Midwest; see Parshall and Rowe (1994,

Chapter 8). The Evanston Colloquium also led, under White's leadership, to a series of regular mathematical colloquia hosted by the AMS.

Holgate (pp. 22—23): The Chicago Section of the American Mathematical Society.

Commentary: The New York Mathematical Society was founded in November 1888, but—as a direct result of the mathematical activities in Chicago and Evanston in 1893—reorganized as the American Mathematical Society as of July 1, 1894, with a corresponding change in the name of its *Bulletin*. This in turn led to the formation of the Chicago section, as can be traced in the pages of the *Bulletin*: the February 1897 issue reported

> In response to a call issued by several members of the American Mathematical Society, resident in or near Chicago, a mathematical conference was held in the University of Chicago, December 31,1896, and January 1, 1897. … A resolution was adopted that, in the opinion of the Conference, it was desirable for the members of the American Mathematical Society to hold in Chicago at least two meetings a year for the reading and discussion of mathematical papers, one during the Christmas vacation and one in the spring.

The June issue of the *Bulletin* then went on to report

> The second conference of members of the American Mathematical Society was held in Chicago Saturday morning, April 24 [1897], at ten o'clock. There were thirteen members present. Professor E. H. Moore was elected temporary chairman. Under authorization by the Council, the conference proceeded to organize as a Section of the Society. The following officers were elected : Chairman, Professor E. M. Moore; Secretary, Professor Thomas F. Holgate.

Holgate (p. 23): "Professor Holgate was elected first Secretary of the Section and continued in that capacity until 1905, when pressure of other duties made it necessary for him to relinquish that service."

Commentary: The "other duties" were that at the time he was both Acting President of the University and Dean of the College! The "until 1905" is ambiguous: the report of the meeting of the December 1905 meeting of the Chicago Section documents that Holgate resigned at the end of 1905, not 1904: "By vote the Section expressed its appreciation of the services of

Professor Thomas F. Holgate, the retiring secretary, who had served the Section since its organization", a total of nine years. This meant that at a minimum Holgate, as Secretary of the Section, was responsible for writing the reports of the two meetings that took place each year (so eighteen in total) and—if later practice was followed—processing the papers submitted for reading at each meeting and otherwise setting the meeting agenda.

Holgate (pp. 23—24): New mathematical journals.

Commentary: For the role of the *American Journal of Mathematics* and the *Annals of Mathematics*, and the birth of the *Transactions*, see Parshall and Rowe (1994, pp. 411—414). The reluctance or active opposition of some in the AMS to the publication of the *Transactions* reported by Holgate was mirrored later in the opposition to the AMS assuming responsibility for the *American Mathematical Monthly*. The *Monthly* was founded in 1894 as an independent journal, but when it came on hard times in 1914, it was proposed that the AMS take over responsibility for the publication of the journal. Although the Chicago Section of the AMS unanimously supported this, the proposal was rejected by the Council of the AMS, leading directly to the establishment of the Mathematical Association of America, one of whose functions was to ensure the continued publication of the *Monthly*; see Parshall and Rowe (1994, p. 419).

Holgate (pp. 25—28): The Schulze-Greenleaf Collection

Commentary: **Johannes Schulze** (January 15, 1786–February 20, 1869) was a German educator and administrator who held important positions in the Prussian Ministry of Education in Berlin for forty years (1819—1858). At the time of his death in 1869, he had one of the largest private libraries in Germany, more than 20,000 volumes. The library was acquired by Northwestern in 1870 (not 1869 as Holgate says), thanks to the efforts of Daniel Bonbright, the Professor of Latin at Northwestern, who was traveling in Europe at the time and had learned of the collection's availability, as well as the speedy approval of then Northwestern President Erastus Haven, and a generous donation by NU Trustee Luther L. Greenleaf financed through the sale of land. It dramatically increased (by an order of magnitude) the size of the NU Library, and later German scholars in the 20th century were to bemoan its loss. The episode is discussed in Jeffrey Garrett's "A Tale of Two Cities: A Brief History of Northwestern's Greenleaf Library" (unpublished paper in the NU Archives, but available in the appended documents repository along with a brief biography of Schulze by Garrett). Holgate lists some of the items

in the collection of mathematical interest, many of them presumably quite difficult to find in the US at the time. For further information on Schulze, see the German Wikipedia page on him, https://de.wikipedia.org/wiki/Johannes_Schulze_(Theologe,_1786), which is much more informative than its English counterpart. (Not an infrequent occurrence for German topics.)

Holgate (pp. 29—31): Further growth of the mathematics library.

Commentary: In an era of JSTOR (and, for older books and journals, Google Books, Project Gutenberg, the HathiTrust, and the Internet Archive), it is easy to overlook today the challenge a newly established institution or organization used to face in acquiring an adequate research library. The fact that this process only started for Northwestern in the 1890s ("the effective growth of the [Mathematics] Library" only began … in January 1891") is a striking illustration that prior to this mathematical research was not viewed as a mission of the department.

The "collection of models" referred to on p. 31 regrettably no longer exists, although until relatively recently some of them could still be seen in glass cases in the department. But software such as Mathematica has made them no longer of anything other than antiquarian interest.

Holgate (pp. 31—34): "Following is a list of publications by members of the mathematics faculty while resident in Northwestern University or shortly following their withdrawal".

Commentary: Holgate gives a list of publications by the mathematics faculty up to 1905, including some published after they left. For example, Moore published two papers in 1888, after he had left Northwestern for the first time, but only one is listed, because his address in one (Moore, 1888a) is given as Evanston, but in the other (Moore, 1888b) as New Haven. These publications comprise papers written by Moore (3), White (17), Holgate (7), Stecker (1), and Young (1), appearing in the *American Journal of Mathematics* (7), *Annals of Mathematics* (3), *Bulletin of the American Mathematical Society* (12), *Mathematische Annalen* (1), *Rendiconti del Circolo Matematico di Palermo* (1), and *Transactions* (3), as well as two books by Holgate (one a translation of Part 1 of the 3rd edition of *Reye's Geometrie der Lage*, the other a textbook on elementary geometry, Holgate 1901). The fact that well more than half of these were written by White illustrates how he stood out from the rest of the department in terms of research (of course, Moore and Young were only at NU for a short time).

Holgate (p. 34): "The resignation of Professor White to accept appointment at Vassar College, which took effect in September 1905, marked the close of the first half century of the work of the department and a new epoch began with the appointment of Professor D. R. Curtiss of which the record will be written in due time."

Commentary: The 67 year period from 1905 to 1972 marks what might be termed "The Era of the Four Chairs", since a total of just four chairs headed the department during that period: David Raymond Curtiss (1905—1935), Elton James Moulton (1935—1942), Harold Thayer Davis (1942—1955), and Ralph Philip Boas Jr. (1955—72).

APPENDIX A: Short biographies of the instructors on Holgate's list (other than Moore).

Sources: Charles Beach Atwell's *Alumni Record of the College of Liberal Arts* (Evanston: The University, 1903) is a useful resource for those instructors who were Northwestern alumni; and several instructors have entries in *Who's Who in America*. In many cases, however, information is scattered over a wide variety of college catalogues and other—often obscure—documents (many of which however are available on online). "Garrett" in all cases refers to the Garrett Biblical Institute.

Alphonso Clark Linn (September 4, 1836—July 10, 1864) entered NU in 1856, graduating A.B. 1860 and A. M. 1863. He was a Tutor in Mathematics and Latin in the Preparatory Department 1860—64 and Captain of the University Guards (a company of twenty-five NU students which served in the Union Army at the end of the Civil War, see Atwell, 1905, in particular pp. 365—366). Linn enlisted for One Hundred Days' National Service on May 2, 1864, but died of typhoid fever little more than two months later. (Holgate says that Linn "was killed in action", but he errs here; Linn's typhoid death is well attested by multiple sources.) For further information on Linn, see the *Alumni Record*, pp. 60—61, Entry #6; Willard (1892, pp. 180, 195); https://www.findagrave.com/memorial/15411029/alphonso-clark-linn (visited August 3, 2023); and https://freepages.rootsweb.com/~fesschequy/genealogy/CaptAlphonsoCLinn.html (visited July 13, 2024).

Edgar Raymond Frisby (May 22, 1837—January 7, 1927) became an astronomer. Born in Great Easton, Leicestershire, England, he graduated from the University of Toronto in 1863 and initially taught in Canada before becoming an Instructor in Mathematics at Northwestern during the years 1866—68. He joined the US Naval Observatory as an Assistant Astronomer in 1868 and was subsequently promoted to Professor of Mathematics, USN at the Observatory, where he remained until he retired from the Navy in 1899 holding the rank of Commander. Administratively, he was immediately under the Astronomical Director of the Observatory, and was in charge of its 12-inch equatorial refractor, continuously making observations of asteroids, comets, occultations of stars by the Moon, and eclipses of Jupiter's satellites, many of which were reported in the *Astronomical Journal* (Skinner, 1899, pp. 14—15).

Wilbur Fisk Yocum (July 20, 1840—October 10, 1924), A.B. 1860 and A.M. 1863, Lawrence University, B.D. 1869, Garrett Biblical Institute, was an educator, university professor, and Methodist minster with a varied career: after spending his initial academic life in the Midwest

(Professor of Mathematics 1869—74, Natural History 1874—78, Lawrence U.; President Fort Wayne College, 1877—88), he moved to Florida, holding a variety of positions at the Summerlin Institute in Bartow (Principal, 1888—92 and 1895–96), Florida Agricultural College (President, 1892—93, Vice-President and Professor of Philosophy, 1893-94, President and Director of its Experimental Station, 1896—), Gainesville school system (Superintendent of Public Schools, 1894—95), U. of Florida (Professor of Latin, Greek, and Philosophy, 1901-05), U. State of Florida (Professor of Education, 1905—09), even continuing to teach at two smaller institutions after this until 1917, and as late as 1917—18 was the Chairman of the State Board of Examiners of Teachers (the above summarizing his entry in *Who's Who in America*, Volume 12, for 1922—23). Proctor (1958, pp. 262—3) gives some background about Yocum's easy years and Methodist background. Involvement with a state school system can be challenging, although Yocum, the author of *Civil Government in Florida under Federal and State Constitutions* (E. O. Painter. Demand, FL, 1904) seems to have been politically astute in navigating it: see Proctor (1958, *passim*), Ness (2023). The *Miami Daily News and Metropolis* for October 18, 1924, p. 4 contains a brief obituary.

John W. Ravel is listed in the 1869-70 NU *Catalogue* as an "Assistant in Mathematics". Aside from a brief comment in the Yale *College Courant* for December 4, 1869 (p. 334, "John W. Ravel, A.B., Assistant in Mathematics, a graduate of the University of Victoria College, Ontario, a man of experience and success as a teacher"), I have been—unlike every other name on Holgate's list—been unable to find anything else about him.

Amos Williams Patten (February 11, 1848—June 13, 1924), became a Professor of religious studies at Northwestern(1899—1918, emeritus 1918—1924). *The Biblical World* reported in 1899 "Northwestern University has made an important addition to its work in establishing a chair of biblical instruction, which will provide courses in the English Bible and in biblical archaeology; it will also direct the religious interests of the university. The first incumbent of the new chair is Rev. Amos W. Patten, D.D., lately pastor of the Hyde Park M. E. Church, Chicago, who will enter upon his duties in September. Dr. Patten is an alumnus of the college department of the Northwestern University, and also of its divinity school, the Garrett Biblical Institute. He has studied and traveled extensively. His scholarship, together with his pastoral experience, will enable him to influence strongly the religious thought and life of the students at the institution." He was a Trustee of Northwestern University 1887—99. See the *Alumni Record*, p. 78, Entry 68; https://www.findagrave.com/memorial/226704269/amos-williams-patten.

Edward Lamay Parks (January 26, 1851—May 24, 1930), became the President of Simpson College, Indianola, Iowa 1880—86 and Professor of Systematic Theology, Gammon Theological Seminary, Atlanta, GA 1886—1904 before becoming Professor of Economics at Howard 1907—28, as well as Treasurer and Register 1909—19 and Dean of Men 1919—26. Holgate gives him as Instructor in Mathematics 1875—79, but he appears in the NU Catalogue as early as 1873—74. See the *Alumni Record*, pp. 94—95, Entry 124; *Who's Who in America*, Volume 16, 1928—1929; Howard University Catalogues at https://dh.howard.edu/hucatalogs/ (last visited August 3, 2024). (√ Inst. 1872, Prof. of Pol. Sci., Treasurer and Registrar overlap.)

Charles Marvin Ellinwood (June 10, 1855—May 16, 1923). Ph.B 1876, Ph.M. 1885, Northwestern; Instructor in Chemistry and Physics 1876–78, Mathematics and Physics 1879—80, Northwestern; Simpson College, IA 1880—88; Nebraska Wesleyan University 1888-98 (head, Department of Natural Science, 1888-1886, Acting Chancellor, 1886-98). See Alumni Record, pp. 111—112, Entry 194.

Unfortunately, this story does not have a happy ending. As Ethel Booth relates in her *Where Sunflowers Grew: the Story of Nebraska Wesleyan* (1962),

> In August of 1896 Professor C. M. Ellinwood was made acting chancellor. He had been on the faculty since the opening day and had demonstrated his ability in many areas. He was an expert accountant and clever businessman. The selection seemed wise, for he was willing to accept the additional responsibility with no increase in salary over that which he had been receiving. In the financial stringency it seemed important to save the money that would be needed to pay a chancellor salary.
>
> For a time there seemed to be no indication that trouble was in store. Various news items showed that Professor Ellinwood was active in the affairs of the school… From available sources it is not possible to discover when suspicion became aroused concerning the financial integrity of professor Ellinwood; under the circumstances it would have been most difficult to take action. Early in 1898, however, it appeared that he had been misappropriating funds in such a way that he had escaped detection, not only by the trustees but also by various banks. According to David Marquette, *A History of Nebraska Methodism*, he was

tried by the church and was expelled from its membership, but he was not prosecuted by the state. Evidently he made restitution of whatever he could.

See also Marquette (1904, pp. 492—3).

George Henry Horswell (January 15, 1854—December 3, 1934). The *Alumni Record* (p. 134, Entry 285) is very helpful here—up to a point: A.B. 1882 and A.M. 1883, Northwestern, B.D. Garrett, Ph.D. Boston University. Teacher in the Academy 1879—87, Instructor and Assistant Professor in Latin, College of Liberal Arts, Northwestern, 1879—87 and 1887—91 respectively, Professor of the English Language and Literature in the English College, Tokyo, Japan. A newspaper obituary says he taught at NU for twenty-five years and in Japan for six years. Presumably Horswell was in Tokyo in 1903, but it is unclear when he returned to the US, or what he did after his return (he died in Marion, Indiana).

Charles Beach Atwell (April 11, 1855—September 12, 1937) received his PhB (1879) and PhM (1882) from Syracuse University. After being an Instructor at Northwestern in mathematics and physics (1880—82), natural science (1884—88) and biology (1888—91), he became first a Professor of Biology (1891—94) and then Botany (1894) at Northwestern from 1894 until his retirement in 1928. He was also the first president of the University Club of Evanston, and the Editor of the Northwestern University *Alumni Record of the College of Liberal Arts* (Evanston: The University, 1903), an invaluable source of information about the alumni of the College up to 1903.

William Edward Wilkinson (March 28, 1857—September 21, 1901) A.B. 1883, A.M. 1886, Northwestern; B.D. 1886, Garrett. After graduating from Garrett, Wilkinson spent his entire life as a Methodist Episcopal clergyman, serving as a pastor in seven different cities. Married on September 21, 1886, to Mary Benedict Swail (NU class of 1886), he had three children, all of whom died young. See the *Alumni Record* p. 165, Entry 402. After his wife Mary married a second time, to Marcus Lorenzo Taft on July 5, 1905, and had two more children by him, Marion L. Taft and Louise Swail Taft. She died on her birthday at the age of 101 (July 5, 1864—July 5, 1965); https://www.ancestry.com/genealogy/records/mary-b-swails-24-1fqfwd .

Merritt Eugene Taylor (June 24, 1857–June 13, 1939) B.S. 1883, M.S. 1884, Northwestern. After being an Instructor 1884—86 (Mathematics) at Northwestern, and studying in Berlin 1886-87, Zurich 1887–88, and Johns Hopkins 1888–89, Taylor worked as an Electrician for the Incandescent Light Co. in Chicago, 1889—92. But he had not lost his interest in academia, and

moved to California in 1892 to teach at Stanford (it had opened the previous year), first as an Instructor in Physics 1892—1893 and then Assistant Professor of Physics 1893—1900. The Northwestern *Alumni Record* (p. 164, Entry 400) reports that beginning in 1900 Taylor became a "rancher and irrigation engineer" in Ceres, Stanislaus County, CA (some two hours inland from Stanford going East by car), an interesting if mysterious chapter in his life. He apparently remained in Stanislaus from then on; the California Death Index for 1900—1939 indicates he died there on June 13, 1939.

Alonzo Jonah Howe (June 19, 1831—February 7, 1890) was a Professor of Mathematics at the Old University of Chicago (OUC) from 1857 to 1886 (when it closed), as well as the Dean of its faculty for many years. The year after the Old University close Howe was hired by Northwestern as an Assistant Professor of Mathematics, teaching in the Preparatory School 1887—1890. Information about him seems relatively scanty. He had been a graduate of the University of Rochester, NY, and after his death *The Campus* (the Rochester student newspaper) ran a short obituary (Volume XVI, No. 8 (February 28, 1890), p. 92):

> "In the death of Alonzo J. Howe, the city of Chicago has lost an honored citizen and the cause of education one of its ablest advocates."—Chicago *Standard*, February 20th. Professor Howe was a native of this state and a graduate of this university. After graduation he taught in the Collegiate Institute at Brockport, and was principal of the Penfield Seminary from which, after four years of successful administration, he was called by the trustees of the Chicago University to the chair of mathematics. But he preferred to accept a position on the faculty of his alma mater at Rochester. In 1863, however, he accepted the position offered at Chicago, and remained until that institution closed its doors. After this event he labored in the University Academy until called to the Northwestern University at Evanston. He was still identified with that institution at the time of his death. The funeral took place at Chicago on the 11th inst.

Howe's son, Herbert A. Howe (1858-1926) was Professor of Astronomy and Applied Mathematics, Director of Chamberlin Observatory, Dean of College of Arts and Sciences, and Dean of the Graduate School at the University of Denver, Denver, Colorado.

Note: Alonzo Howe's status at Northwestern during the 1889—90 academic year is unclear. The *Catalogues* for both 1897—88 and 1888—1889 list him as an Assistant Professor in the

Preparatory School, but the 1989—90 *Catalogue* only as an Instructor in the School. It may be he was already incapable of teaching by that point; see White's letter to Holgate in Appendix X below.

APPENDIX B: Short biographies of the ten early graduate students noted by Holgate.

William Henry Bussey, Jr. (October 24, 1879—June 6, 1962). A student of Dickson's (Ph.D. 1904), after teaching as an instructor in the Evanston Academy (1904—05) and tutor at Barnard (1905—07), he moved to Minnesota where he was successively Assistant Professor (1907–14), Associate Professor (1914—20), and Professor (1920—1948) before retiring. He was Editor-in-Chief of the *Monthly* (1927—31), a member of the Council of the AMS (1923—25), and a Fellow of the AAAS. The University of Minnesota Senate Docket for February 7, 1963, pp. 3—4 gives a detailed obituary.

Carey Eyster Melville (April 4, 1878—April 8, 1963), A.B. Northwestern, 1901. After teaching as an Instructor in the Evanston Academy 1901—02, studying at Hopkins 1902—03, and teaching at Case 1903—06, Melville moved to Clark in 1906, where he taught for the next 42 years in its Mathematics Department (Assistant 1906—09, Instructor 1909—11, Assistant Professor 1911—18, Associate Professor 1918—43, and Professor and Head of the Department 1943—48), as well as serving as Registrar of the University 1914—32, until his retirement in 1948. His obituary in the *Boston Globe* (April 10, 1963, p. 29) noted that he "had one of the longest teaching careers at Clark".

In addition to his long career at Clark, there is another and very different aspect to Melville's life. In 1904 Melville married Maud Seaman (1880—1978); they had three children. Beginning in 1927 the Melvilles became interested in Hopi culture; their collection of pottery, other artifacts, and documents forms the "Melville Collection" at Wesleyan University, see https://archaeologycollections.site.wesleyan.edu/2016/09/30/archiving-the-melville-collection/:

> In 1927 the Melville family – Carey, Maud, and their three children (ages 15, 13, and 9) – got into their Ford Model T, "Hubbub," and left Massachusetts. They were embarking on a very early version of what has become a famous American activity: the cross-country road trip. Carey E. Melville was a professor at Clark University and the trip was his sabbatical, inspired by his desire to see the geological sites of the Southwest. The family circled the entire country – often driving hundreds of miles in a day.

Despite spending most of their months on the road, moving every few days, the Melvilles spent a few weeks in Polacca, a Hopi community in Arizona, staying with friends who were missionaries in the town. After returning back East, the Melvilles stayed in touch with some of the people they met while in Polacca, especially the artists who made many of the objects they purchased and brought home.

Today the Melville collection of Hopi and Tewa objects, most notably pottery, is part of the Wesleyan Archaeology and Anthropology Collections. In addition to the objects we also have nine boxes of documents, letters, bills of sale, magazines, newspaper clippings, photographs, and various other ephemera. Taken together the contents of these boxes paints a picture of the Melville family, their sustained connection with people they met on their travels, and their interest in American Indian life and rights in the 1930s.

The trip is described in the book *Hopi Summer: Letters from Ethel to Maud* (Davis, 2007). ***Sources***: *American Men of Science; A Biographical Directory*, 8th ed. (1949); https://www.findagrave.com/memorial/229767179/carey-eyster-melville.

John Charles Lymer (January 25, 1876—June 19, 1946) Graduated from Amity College 1898; S.T.B. Garrett, 1901. After serving as a Methodist pastor in Brighton CO 1901—2, he returned to Evanston to do graduate studies in mathematics at Northwestern 1902—03 (A.M. 1903), followed by being an Instructor in the Northwestern Academy 1903—04. In 1904 he moved to Lawrence University in Appleton, WI, initially as Acting Professor of Mathematics (and was still so in 1909) as well as Director of the Underwood Observatory there. He became Child Professor of Mathematics by 1914, and remained at Lawrence until his retirement in June 1941. The Appleton *Post-Crescent* for March 27, 1931, p. 10 contains a brief but amusing sketch of his life and career up to then.

George Weston Briggs (September 21, 1874—April 18, 1966) Prepared in Northwestern Academy; B. S. 1902, M.S. 1905, Northwestern (dissertation “Pluecker's Line Geometry and Lie's Sphere Geometry, an Example of Generalized Duality”); Instructor in Algebra, Northwestern Academy, 1902—03. Briggs had a very distinguished career, but not in mathematics: in 1903 he moved to India, combining work in a Methodist mission with the

study of Hinduism; many years later put this to good use when, in 1925, he moved to Drew University, first as Professor of Sanskrit Language and Literature, and then Professor of the History of Religion 1929—44. He retired from Drew University in 1944, but even after his retirement he continued to lecture on Hinduism at Columbia University's Graduate School. He wrote a number of books on Indian religion and philosophy, including *The Chāmars* (1920), *Gorakhnāth and the Kānphaṭa Yogīs* (1938), and *The Doms and Their Near Relations* (1953). ***Sources***: *Alumni Record*, entry 1828; *New York Times* obituary, April 19, 1966, p. 41; Find a Grave, https://www.findagrave.com/memorial/28070775/george-weston-briggs.

Mabel May Heren (March 11, 1883—February 19, 1967) BS 1904, MS 1907, Northwestern University (master's thesis: "Families of a conic orthogonal to a given conic"). In 1907, after receiving her master's, Heren began to teach at Knox College; in 1937, in honor of thirty years service there, she was appointed to the Henry M. Hitchcock Chair of Mathematics (AMM 44, 1937, p. 408). She retired as head of the Department in 1945, but continued to teach. (*Note*: The dates of birth and death are based on the death certificate; different dates are sometimes given elsewhere.)

George Erle Beggs (April 23, 1883—November 23, 1939) BA 1905, Northwestern; graduate degree in Civil Engineering 1910, Columbia. Beggs joined the Department of Civil Engineering at Princeton in 1914, where he was successively Assistant Professor 1914—1921, Associate Professor 1921—1930, Professor 1930—39, and Chair of the Department 1937—1939. Leitch's *Princeton Companion* (1978, p. 98) describes him as "the mainstay of the departmental program in structural engineering", and "known for his pioneering work in the model analysis of bridges and other structures". This work was of a highly practical nature:

> [He] was internationally known for his invention of means of predetermining the stress resistance of bridges, dams, and similar structures. This method, which involves making celluloid scale models, placing test weights on them, and measuring the strains with Instruments he devised, was used by him when a consultant for the Arlington Memorial Bridge, the Stevenson Creek Dam, the San Francisco-Oakland bridge, and the towers of the Golden Gate Bridge. The Beggs deformeter gauges have been used by engineers throughout the world for the solution of problems relating to indeterminate structures.

(Leitch, 1978, pp. 48—49). *Beggs Hall*, part of the Engineering complex at Princeton, is named after him. Among his professional honors, he was the recipient of the Wason Medal of the American Concrete Institute (1922) and the Howard N. Potts Medal of the Franklin Institute (1927). For the *Beggs Deformeter*, see Espion and Addis (2021, Section 13.5). Further sources of information include his obituary in the *New York Times* (November 24, 1939, p. 23) and his German (!) Wikipedia page https://de.wikipedia.org/wiki/George_Erle_Beggs.

Lloyd Lyne Dines (March 29, 1885—January 17, 1964) BA 1906 and MA 1907, Northwestern University; PhD 1911, University of Chicago (dissertation: "The Highest Common Factor of a System of Polynomials, with an Application to Implicit Functions", advisor G. A. Bliss). After teaching at Columbia and Arizona (Tucson), Dines became a member of the Mathematics Department of the University of Saskatchewan 1914—34; in 1928 he was elected to the Royal Society of Canada, and in 1932 was an invited speaker at the Zurich ICM. In 1934 he left Saskatchewan to become chair of Mathematics at the Carnegie Institute of Technology 1934—45. Even after his retirement from Carnegie in 1945 he was a visiting professor at several universities (Saskatchewan, Smith, and Northwestern). His research was primarily in the field of linear inequalities to which he made fundamental contributions. MathSciNet lists 22 papers of his, including 7 in the *Annals of Mathematics*, 5 in BAMS, 5 in TAMS, and 2 in the *American Journal of Mathematics.*

Finally there are Gates, Thorne, and Smith. All three have entries in the *Alumni Record* (956, 1181, and 1300). ***Jesse Kevin Gates*** (January 26, 1875—August 13, 1936) initially appeared destined to go into mathematics: after receiving his A.B. from Northwestern in 1897, he continued on as a graduate student in mathematics at NU 1898—99, and then taught as an instructor at Parker College (a small private college and preparatory school in Minnesota) for a year, before studying at Clark for four years, receiving his Ph.D. in 1904 (dissertation: *Cubic and Quartic Surfaces in 4-fold Space*; advisor W. E. Story). But the 1910 decennial census records him as a lawyer residing in Lena, IL, as does his 1918 WWI registration card, and when he died 17 years later in 1931, it was also in Lena. So it would appear that within a few years after he received his doctorate from Clark he switched into the practice of law and continued to do so until his death. ***Clarence Manly Thorne*** (June 25, 1875—December 29, 1914) began the switch to the law even earlier. After doing graduate work in mathematics at Northwestern 1899—1900, and teaching mathematics and manual training at Evanston High School 1900—01, he enrolled in the Harvard Law School 1901—03. His career after this is unclear: he does not appear to have received a degree from Harvard, but the 1905 *Syllabus* lists him as LL.B.,

and the 1907 *Monthly* indicates that that year he resigned a position as an instructor in mathematics at the University of Iowa; perhaps this was a part-time position. The 1913 H*arvard University Directory* gives his place of employment as the Bank and Insurance Building in Dubuque, Iowa; he died young (39) in Dubuque the next year. ***Elda Louisa Smith*** (May 3, 1880—September 13, 1942) remains, like John W. Ravel earlier, largely a cipher. She was a graduate student in mathematics at Northwestern in 1901—02, and the *Alumni Record* lists her as a Teacher of Mathematics in the Springfield IL High School in 1903, but all the subsequent decennial censuses indicate she was single, unemployed, and living at home with relatives. There is a brief obituary of her in the *Decatur Daily Review* for September 14, 1942, p. 19. Her father, Judge Elbert S. Smith, was a distinguished state senator, circuit judge, and "dean of the Sangamon county bar"; see https://www.findagrave.com/memorial/62309290/elbert_sidney_smith.

APPENDIX C: The Noyes Professorship

The Noyes Professorship of Mathematics was named in honor of the first Professor of Mathematics at Northwestern (as well as its twice interim President), Henry Sanborn Noyes. On May 22, 1875, Trustee John Evans wrote to his fellow Board members:

> There is another matter to which, as an act of grateful and affectionate remembrance of one of the most devoted and efficient friends of the University, I desire to call your attention. It is the propriety of at once and without further delay naming the chair of mathematics the "Noyes Professorship", as a slight token of appreciation of him who with great ability and faithfully administered the affairs of the Institution as president pro term, agent and Professor, through the dark days of its history, and with unparalleled devotion, filled that chair from the opening of the Institution to the day of his death, and who at last left the care of his estate to the Institution, and made it his residuary legatee. [BTM, June 22, 1875, p. 336]

Accordingly, on June 22, 1875 the Board of Trustees so voted:

> On the motion of T. C. Hoag the chair of Mathematics was named the "Noyes Professorship of Mathematics" in honor of the late Professor of Mathematics, Henry S. Noyes. [BTM June 22, 1875, p. 348]

The following is a list of the Noyes Professors in Mathematics:

1875—1894: Julius Field Kellogg
1894—1905: Henry Seely White
1905—1934: Thomas Franklin Holgate
1935—1943: David Raymond Curtiss
1944—1957: Harold Thayer Davis
1962—1980: Ralph Philip Boas, Jr.
1984—1985: Avner Friedman
1988—1997: Mark Edward Mahowald
1999—2008: Eric Mark Friedlander
2008—2019: John M. Franks
2019—2020: Laura Grace DeMarco
2022— Eric Zaslow

After Curtiss retired in 1943, he wrote to Dean Addison Hibbard from Redlands, California on February 14, 1945 regarding the recent appointment of Davis as Noyes Professor:

> Dear Dean Hibbard:
>
> I have just heard by "grapevine" that Davis has been appointed Henry S. Noyes Professor of Mathematics, which was my title until recently. Where do I stand now: am I Noyes Professor Emeritus or just plain Professor Emeritus? It might cause me some embarrassment to use the wrong title. Incidentally, if I have been deposed from the title I would feel aggrieved not to be notified of it by the proper authorities.
>
> Although Moulton probably would not wish me to write about the matter, I must still record my feeling that it was a mistake not to pass on this title to the senior member of the department as has been the case so far as my memory runs. It has not been a perquisite of the head of the department as such. Professor Holgate retained the title while I was head of the department, and I had it under Moulton's headship. As to the qualifications of the two men, you may not know that Davis is not even a member, or was not two months ago, of the American Mathematical Society, and is no more distinguished in mathematical circles than is Moulton. The latter is just returned from a period of national service. To snub

him now so pointedly may confirm the fears of men who went into service that as far as academic recognition is concerned, the stay-at-homes will be preferred.

Sincerely yours,

D. R. Curtiss

The first part of the letter is a little surprising, since Curtiss was still Chair in 1934 when Holgate retired, and so one would have thought he knew what was the practice regarding the title after retirement. As to the second paragraph, it is easily understood: Curtiss and Moulton were close colleagues (they wrote a number of high-school textbooks together) and Moulton had been in the Department since 1912; on the other hand, Davis was certainly the more nationally visible.

Note: After Davis retired in 1955, Boas became chair in 1957 (Walter Scott served as interim chair 1955—56 and a committee acted in place of a chair in 1956–57) but only became Noyes Professor five years later. There may have been no monetary stipend attached to the title at that time; it is interesting neither Davis nor Boas mention becoming Noyes Professor in their autobiographies. After Boas retired in 1980, it was only four years later that Dean Rudolph Weingartner pointed out to the President the position was vacant and advanced Avner Friedman's name. (Source for the last: records in the Dean's Office.)

APPENDIX D: Biography of Thomas F. Holgate on the Northwestern University Library website (https://findingaids.library.northwestern.edu/agents/people/1587)

Thomas Franklin Holgate was born on April 8, 1859, in Hastings County, Ontario, Canada, the son of Thomas and Eleanor Wright Holgate. He received a Bachelor of Arts degree from Victoria College, University of Toronto, in 1884, and a Master's degree, in absentia, from the same institution in 1889. Holgate came to Northwestern University in 1893 as a mathematics professor. He served as Dean of the College of Liberal Arts for 17 years and two terms as acting president of the University.

Holgate began his professional teaching career in 1874, teaching in the public school system of Ontario. Upon graduation from college in 1884, he became a mathematics master

(instructor) at Albert College, Belleville, Ontario. He remained in this position until 1890 when he became a fellow at Clark University in Worcester, Massachusetts. He received a Ph.D. from Clark University in 1893. He joined the Northwestern University faculty in 1893 as an instructor in the Mathematics Department. During the year, he became involved in the activities of the first International Congress of Mathematicians held in conjunction with the Chicago Columbian Exposition of 1893. He also devoted considerable attention to the preparation of a series of Colloquium Lectures by Felix Klein held in Evanston following the Congress.

In 1894, after only one year at Northwestern, he was made a full professor. In 1897, he played an instrumental role in the formation of the Chicago section of the American Mathematical Society and served as Secretary from 1897 to 1905. In 1902, he was appointed Dean of the College of Liberal Arts, a position he held for the next seventeen years.

In 1904, following the resignation of President Edmund James, Holgate was appointed President Ad Interim of Northwestern University. He served in this capacity until the selection of Abram Harris as President in 1906. During his first two-year term as acting president, the Norman Harris Lecture Foundation was established, a department of education was added to the College of Liberal Arts, a training school for nurses was established, the geology, zoology, and romance language departments were enlarged, the athletic field on Central Street was opened, and the University was able to pay off a quarter-million-dollar debt. Additionally, he served as Secretary for the Louisiana Purchase Exposition held in St. Louis in 1904.

Between 1906 and 1916, Holgate held the Noyes Professorship of Pure Mathematics, secured legislation for revision and codification of the Illinois school laws, traveled to Rome where he was Secretary/Delegate to the International Congress of Mathematicians in 1908, and was a member of a commission to reorganize the Chicago Public Library.

In 1916, with the resignation of Abram Harris, Holgate was once again called upon to serve as acting president of the University. As acting president from 1916 to 1919, Holgate instituted democratic reforms in the selection of deans; Northwestern was elected to membership in the Association of American Universities; the Law School's course of study was lengthened to four years; degree courses in physical education and public speaking were installed; student military training was established on campus; and 3,600 soldiers and sailors were trained in mechanical subjects as part of the University's commitment to the United States' war effort.

During World War I, Holgate assisted Walter Dill Scott in personnel work for the War

Department. He was also influential in the formation of the North Central Association of Colleges and Secondary Schools and served as President from 1917 to 1918.

In 1919, with the selection of Lynn Harold Hough as President of the University, Holgate retired from his major administrative duties and was made Dean Emeritus of the College of Liberal Arts. He continued, however, to teach mathematics for the next fifteen years, retiring in 1934. He spent the 1921-,22 academic year in China as a visiting professor at the University of Nanking. His experiences in China served to reinforce an interest in foreign students and he acted as their advisor upon his return to Northwestern.

Holgate's research interests were in the fields of pure geometry and ruled surfaces of the fourth order. His translation of Theodore Reye's Geometrie der Lage (Geometry of Position) was published in 1898. His other published works include Elementary Geometry (1901) and Projective Pure Geometry (1930). He also wrote a “History of the Mathematics Department at Northwestern University, 1855-1905,” and a thirty-page summary of Northwestern University's activities during World War I, “Northwestern in the Great War.”

Holgate received honorary Doctor of Law degrees from the University of Illinois in 1905, Queen's University in 1919, and Northwestern University in 1937. He was a fellow of the American Association for the Advancement of Science and a member of the University Club of Evanston, the University Club of Chicago, Phi Beta Kappa, and Sigma Xi.

In addition to his university activities, Holgate was prominent in civic and religious affairs and was particularly concerned with administrative problems of the Methodist Episcopal Church. He served five terms as a member of the Methodist Church's General Conference; was a member of its Board of Education for Negroes; and from 1924 to his death in 1945, was a member of the church's Board of Education, serving as its treasurer from 1934 to 1938. From 1923 to 1925, he was president of the Chicago Church Federation. In recognition of his support of educational opportunities for black students, the library at Bennett College in North Carolina was named for him.

Dean Holgate was married twice. On August 2, 1885, in Bath, Ontario, Canada, he married Julia Caroline Sharp, the daughter of a local farmer, John Sharp. She died in 1887. His second marriage to Georgina Angela Burdette, the daughter of Daniel Burdette, a. manufacturer, took place in Newburgh, Ontario, Canada, July 23, 1890. The Holgates had four children: Eleanor, born in 1894, who later married the noted scholar, Owen Lattimore; Robert Burdette, born in

1895; Barbara (Mrs. George H. Young), born in 1899, and Frances Burdette, born in 1902.

Thomas Franklin Holgate died of a heart ailment in Evanston at the age of 86 on April 11, 1945. Funeral services were held on April 13, 1945 at the First Methodist Church of Evanston.

Despite the fact that his formal title was that of President Ad Interim, Holgate was one of the most accomplished, significant, and influential administrators in Northwestern's history, and enjoyed an extraordinarily long and productive academic career, while maintaining an avid interest in foreign, civic and religious affairs.

APPENDIX E: Further biographies on the NU Archives webpages

1. ***Henry Wade Rogers***.

Henry Wade Rogers was born October 10, 1853 in the small town of Holland Patent, New York. After serving as a law professor for 2 years and Dean of the Law School at the University of Michigan for 5 years, Rogers became President of Northwestern University in 1891. As President, Rogers instituted many changes that shaped the future of the University, including uniting all professional schools under the power of the Board of Trustees, pushing for co-education, and insisting on supporting research in addition to teaching objectives on the part of faculty.

He attended the University of Michigan, receiving a B.A. in 1874 and an M.A. in 1877 (he also took law courses at Michigan's Law School during the 1876-77 academic year). He married Emma Ferdon Winner in 1876. After practicing law in Minnesota, Rogers returned to the University of Michigan as Professor in the Law School in 1883. From 1885-1890 he served as Dean of the Law School. He is generally credited with making it the largest law school in the country at the time.

Rogers was asked to become President of Northwestern University in the fall of 1890, at the age of thirty-seven, after an extensive nationwide search. He was selected for his academic credentials and his administrative abilities, two traits that the University Board of Trustees had identified as key to the successful growth of the University. At the time, Rogers was not only known for his work building the program at Michigan but for his books and speeches, his involvement in the Methodist Church, and his progressive politics. Rogers made it clear from

the beginning that he would make changes at Northwestern. At his February 18, 1891 inaugural, responding to University founder Orrington Lunt's remark that “wise conservatism” was needed in running a university, Rogers offered the sentiment that the University “must not hesitate to make changes in the established order of things.”

The changes that Rogers had in mind altered Northwestern University significantly and in many ways built it into a more modern and progressive institution. Rogers expanded the University's liberal arts programs to give students access to a broader program of learning, including the fields of political science and economics. He worked to unify the various professional schools under the authority of the University's Board of Trustees so that all programs would be governed as one. He hired new faculty for all the schools and insisted that they be given time and facilities for research as well as teaching. He strongly supported coeducation at Northwestern, at a time when there was talk that including women students weakened the University. In all of his efforts he insisted that Northwestern should match or exceed the standards of more prestigious universities. His leadership lead to a dramatic increase in enrollment, and a recognition of the school as one of the top universities in the country.

In 1900, Rogers came under pressure from the Board of Trustees to leave the University. Although the specific reasons for Rogers' resignation remain unknown, they most likely included the Board's general disagreement with his political views, including his opposition to the 1898 annexation of the Philippines by the U.S. government; his lack of comprehensive fundraising initiatives; and his longstanding conflict with the Board on issues of coeducation. Rogers left Northwestern and immediately began teaching in the Yale University law school. He taught at Yale from 1900 until 1921. He served as Dean of the Law School from 1903 until 1916. During his time at Yale, Rogers was appointed Judge of the U.S. Circuit Court of Appeals (2nd district) by President Woodrow Wilson. He retained this position until his death in 1926.

2. **Daniel Bonbright**.

Born on March 10, 1831, in Youngstown, Pennsylvania, Daniel Bonbright’s first two years in higher education were spent at Dickinson College, and he transferred in 1848 to Yale, receiving his A.B. there in 1850 and his A.M. in 1853. After a stint teaching in Georgia and Pennsylvania, he returned to Yale in 1854 to enter the Theological Seminary and act as a tutor before accepting appointment to the Northwestern University faculty two years later. In the course of his many years at the university he was the Professor of Latin Language and Literature (1856-1888), the University Librarian (1855-1865) the John Evans Professor of Latin Language

and Literature (1888-1912), the Dean of the College of Literature and Science (1873-1878), Dean of the College of Liberal Arts (1878-1902), Dean Emeritus (1902-1912), as well as the President *ad interim* from 1900-1902. Also at Northwestern, he was granted an honorary LL.D. in 1908. Bonbright was a founder of the Evanston Philosophical Society (1866), and received an honorary LL.D., from Lawrence University in 1873.

Bonbright wanted to further burnish his academic credentials, so before settling in at Northwestern, he performed two more years of further study among the elite scholars of Germany. In 1858, after attending the Universities of Berlin, Bonn, and Gottingen, and with some trepidation at the prospect of leaving the more refined precincts of Europe and the East Coast, he installed himself in Evanston. He remained there for fifty-four years, a pillar of the university and the broader community. In addition to his tenure as president, he was esteemed for shaping the early curriculum; for setting the university's standards with what one commentator called "a fine Greek sense of proportion"; and for what used to be called "moral formation." In keeping with his utter devotion to the university's best interests, in 1890 he wed Alice D. Cummings (1856-1932), the daughter of former Northwestern president, Joseph Cummings. The Bonbrights had two children; their first child, James C. Bonbright, was born in 1891, graduated from Northwestern in 1913, and died in 1985; and their second child, Dora Bonbright, was born in 1893 and married Major Augustus Gurney.

Bonbright also had a hand in the conception of Northwestern’s University Hall, establishing its overall design for its architect to translate into stone, and was responsible for the definitive version of the University Seal. He was instrumental in forming the University Library, acting as librarian for the fledgling university, while later, back in Germany for his health in 1869, he secured for Northwestern the coveted Schulze collection, which became a prized nucleus for the growing library. Bonbright was also preoccupied with finding ways to bolster enrollment so as to ensure momentum in the university’s expansion. He persuaded the trustees to institute one-year tuition scholarships for Illinois's most promising high school students and, concomitantly, recommended a veritable publicity campaign, with representatives in the field informing students and parents of the University's merits.

When in March, 1902, the University retained Edmund Janes James to succeed him, Bonbright returned gratefully and with relief to the classroom, where he continued to flourish for another decade. When James left Northwestern in 1904 to assume the presidency of the University of Illinois, the trustees again turned to Bonbright, but this time he declined, preferring to devote his remaining years to his students. Bonbright died at the age of 81 on November 27, 1912 in

Daytona, Florida where he had taken a vacation for his health. He is buried in Rosehill Cemetery in Chicago, Illinois. A memorial plaque presented to the University as a gift from the Class of 1913 and commemorating the life of Daniel Bonbright hangs today in the lobby of University Hall.

APPENDIX F: Holgate on Northwestern and the Methodist Episcopal Church

At the time of its founding, and for many years thereafter, Northwestern University was closely affiliated with the Methodist Episcopal Church, and yet at the same time it has never been a sectarian institution. Such a state of affairs might seem paradoxical but thanks to a correspondence on the part of Thomas Holgate with the Carnegie Foundation in 1905, while he was the interim president of Northwestern, it is easy to understand the actual state of affairs. The NU Archives contain two related documents relevant to the matter in the Holgate papers.

One is “A Statement Concerning the Organization and Work of Northwestern University submitted to the Trustees of the Carnegie Foundation, September, 1905”. It reads in part:

Relation to religious denominations.

> Like most institutions founded at the time, this University originated from the activities of a religious denomination,—the Methodist Episcopal Church,—or, more specifically, through the efforts of certain members of that Church, but it has never been conducted as a sectarian or denominational school. Its charter provides that “no particular religious faith shall be required of those who become students in this institution", and no denominational restrictions are placed by the charter, or have ever been placed by the Board of Trustees, on the selection of President or members of the faculty. These have always been chosen with reference to their educational and personal qualifications for the duties which they were to perform. As evidence of the freedom from denominational bias with which members of the faculties have been chosen, it may be cited that at the present time the Deans of the six departments of schools of the university represent five religious denominations, one being a Methodist; and of the Principals of the three academies [preparatory schools], one is a Methodist. Of the full teaching staff of the College of Liberal Arts nineteen out of fifty-four members are Methodists, a proportion not very different from that of the general rural population in the middle west.

> Under the [1851] charter of the University the Board of Trustees was to the consist of thirty-six members, twenty-four to be elected by six annual conferences of the Methodist Episcopal Church, and twelve to be elected by the Board, but all amendments to the charter have tended to make the Board more nearly self-perpetuating. An amendment made in 1861, reduced the number of members to be elected by a conference from 4 to 2, and a later amendment, in 1867, increased the number to be elected by the Board from twelve to thirty-six, at the same time removing all restrictions as to residence, but providing that a majority of the whole Board should be members of the Methodist Episcopal Church. Since 1875 never more than eight out of forty-four trustees have been elected otherwise than by the Board itself.
>
> While the University is historically associated with the Methodist Episcopal Church, no contributions towards its support are received from the Church, and with the exception of the restriction in the composition of its Board of Trustees, it is entirely free in its management.

The impetus for this document was a gift from Andrew Carnegie in 1905 to provide for retirement allowances for college professors, one of the conditions of which was a stipulation that a recipient institution should be without sectarian bias. The second document is a letter from Holgate to Frank A. Vanderslip, a prominent New York banker who was a member of the board of directors for the fund (see *Science,* New Series, Vol. 21, No. 543 for May 26, 1905, at p. 836), arguing that Northwestern was eligible. It is apparent that it was an initial version of the statement quoted above. After listing a number of the members of the NU Board of Trustees who would likely be known to Vanderslip, Holgate wrote:

> While the institution is historically associated with the Methodist Church, the charter provides that no particular religious faith shall be required of students, and the institution has always been conducted on the most liberal lines. No restriction is placed in the charter on the selection of a president or professors, and men are chosen solely with regard to their ability and character. A canvas of the faculties would show great variety with respect to church relationship, and of the student body the percentage of Methodists is perhaps no higher than in some of the state universities of the middle west.
>
> I do not wish to convey the idea that this is not in its history and association a Methodist institution, but I do mean to say that it is in no sense sectarian or narrow. It is on its own foundation, draws no funds from the church, and welcome as

students all persons of earnest purpose and good character of whatever religious faith or creed.

APPENDIX G: An Appreciation of Holgate's mathematical work by H. S. White

Written by White for an unknown purpose on June 27, 1919, just as Holgate had stepped down as Acting President and Dean, the letter provides a useful summary of Holgate's mathematical work up to 1919.

> Dear Sir,
>
> Dean Holgate came to Northwestern direct from his graduate study at Clark University, having received in June, 1893 the degree of Ph.D. from that institution. He had begun early to write, and published during his second year at Clark a brief but elegant synthetic discussion of the nine-point circle, in the American Journal of Mathematics. The same journal accepted and published his doctoral dissertation. This was a complete study of those ruled surfaces of the fourth order which can be derived projectively from the tangent planes of two cones of the second order or from the points of two conic sections in different planes. The work had been done before, for the most part, by the renowned geometricians Cayley, Cremona, and Salmon; but Holgate proceeded with greater rigor and thoroughness, and discovered at least one type of quartic which his predecessors had overlooked. Later he even corrected his own work, in 1898, and added a final new type to the list.
>
> Geometry was the field that attracted him most at that time, together with its closely related field of Mechanics. You will remember that his chair was at first that of Applied Mathematics. And the best textbook at that time was in German, by Professor Reye of Strassburg. This Holgate translated, with considerable rearrangement, and published with a valuable preface in 1898, from the Macmillan press. At once it became the standard English text for that subject. At present certain others are used, because of Holgate's conscientiousness in refusing to allow a second edition without the extensive additions and revision which were needed to bring it fully up to date. Many have hoped and expected that he would yet find leisure to add a second volume, which should include all the additions made in the most recent German edition.

A Plane and Solid Geometry for Schools and Colleges (1903) was his next extended work, justly popular and widely used. It is one of the earliest of several good treatises now current, which endeavor from the outside to make the student an investigator rather than a docile memorizer. Attractive candor and didactic energy are equally its marks.

Besides these laborious tasks, Holgate found time to carry through certain researches on special topics. In 1897 at Toronto, and in 1898 at Boston, he presented before the American Mathematical Society papers on an interesting two-and-two correspondence. All the circles through two fixed points and all the lines through one point exhibit what may be called tangential selection: every line is tangent to two of the circles, and every circle is tangent to two of the lines. If further the point where all the lines converge is suitable chosen, the lines fall themselves into sets of three, or into sets of four, or of higher numbers. For example, the first and second lines of a set make touch one circle, the second and third another, while the third and first lines touch a third circle. If so, the point is called a point of period 3. The locus of points of. period 3, or of period 4, etc., is a problem of much complexity and difficulty. But Holgate has both scientific enthusiasm and the grit of a bulldog, and in two long and torrid summer vacations he worked through the loci for periods 3 and 4. One who reads the finished papers will understand both what a mass of tedious computations are represented, and what skillful technique seized the mass at the climactic moment and shook out from its complexity the simple factors. The resulting loci were in the one case of order 2, in the other case of order 6. These constitute novel and permanently valuable contributions to geometry.

When the Mathematical Society held its summer meeting at Evanston in 1902, Dr. Holgate took from his increasing administrative duties the time for another short research, which he presented to the Society but has never published. This was in furtherance of his desire to accomplish by pure geometry whatever had been done by algebra. It was to give a geometric construction, or definition of mutually apolar triads of points on a line, or what is the same thing in effect, on a conic section. The construction was certainly ingenious and interesting, and deserves to be edited and published if leisure shall ever allow it. Since that time, the labors of the Deanship and the Presidency seem to have eclipsed the star of pure geometry; save for a minor production, a condensed encyclopedic article on synthetic geometry in the series edited by Dr. J. W. A. Young.

During all these years, Dr. Holgate's work as a teacher has held of course first place in his schedule of duties, and the things which interested in most are by this time equally significant to a whole generation of younger students. From some of these should come eventually the pure scientific work which he has had opportunity only to sketch out and initiate.

APPENDIX H: HOLGATE AND WHITE ON THE HISTORY OF THE DEPARTMENT

In the Summer of 1939 the Archives Department of Northwestern asked Holgate to prepare a history of the Mathematics Department. As part of this task, Holgate contacted Henry S. White, Chair of the Department from 1892 to 1905; the three letters between the two that have survived are of considerable interest. They are reproduced below with only minor editing, each letter followed by some explanatory comments.

Letter 1. White to Holgate, Poughkeepsie, N.Y., Sept. 4, 1939.

Dear Holgate,

Glad to hear you are working up a history of the Math. department. It would be interesting to go back to the times that you and I remember. Of course I knew Kellogg somewhat. His main interest seemed to be in Insurance. I remember that he was working for the Northwestern Mutual Life, before he came to N.W.U., I think, and that he left college work for a time (indefinite) at their earnest request, to resume actuarial work for that Company. He used to relate that it was with them that he learned the rule, which he afterward always observed in such college business as came before him: "*Always proceed on the basis of the documents*". That matched the injunction of the classicist, whoever he was, in Berlin, who would interrupt his pupils in Seminar discussions (Karl Harrington's experience) with: "Wollen See das alles, bitte, auf Papier bringen"! [Would you please put all this down on paper] Kellogg was always proud to tell of the year when he was appointed to the annual Examining Committee, for West Point. He liked the formality and precision that ruled there.

The first time I went to Evanston (1890), it was to replace for the third term in the Academy a man whose name may have been *Howe*, who was found one morning wandering along the South border of the Campus, muttering to himself and making wild gestures and capers. I wish I knew more of his career.

The most pleasant extra feature of the years that I remember there was the advanced study that was constantly going on among the staff. That first spring term, it was the

Substitution Group reading that Moore instituted with me, two days every week. Then later it was Lamb's *Hydrodynamics* with Creer, and the Synth. Geom. constructions that you were driving at while editing *Reye*; and later a Diff. Eq. circle with Weir and ( ); and the studies with A.M. candidates, as Plucker's Line-Geometry with Jess Gates, Chasles's *Apercu Hist*. with Thorne. But most stimulating was the circle that we had in 1899—00. Weren't you, and Stecker, and Wilson, and possibly one or two others, reading Picard & Simart, *Fonctions de deux variables*? I am re-reading that now, and of course remember the hard work we did on that in the old S. W. corner room of University Hall.

It was that particular study that impelled me to ask for leave of absence and go to Göttingen and Turin the following year, – as mentioned in the preface to my Cubic Curves; and secondarily led to my being invited to give part of the Boston Colloquium lectures.

Of course you will remind the Trustees how it was you who proposed to them that they publish the Evanston Colloquium lectures, and that they missed a rare chance to make a forward move before such extracurriculum activities became common. Dr. Bragdon must have favored undertaking it, I imagine, since he personally did for your *Reye* what the Trustees today were afraid to venture for Klein's (now) classic. Your *Geometry* must have been the first *book* published by a member of the department. Has anyone since followed your precedent?

My *Cubics* was mostly written there, but failed to interest the two firms to whom I offered it; and finally Vassar and the Research Council divided the honor, the profit going to the Revolving Fund.

By the way, the 1st ed. of *Klein's* lectures brought a profit of between $2 and $3; so it was not a very unsafe venture even in a mercenary view!

If you want to feel a sympathetic glow of appreciation, read (as probably you have done, though to me it is new) the first part of §3 in Sir Wm. Osler's address on *Teaching and Thinking* (McGill 1894), in his *Aequanimitas with other Addresses*; Philadelphia, Blakiston.

Certainly N.W.U. bore her part in the earlier and later work of building up the Amer. Math. Society. And our Depart. did more than could be foreseen when it brought you to Evanston. What looked to you like a mile-stone proved to be really a foundation-stone set, solid and lasting. – Pardon this long holiday screed. Perhaps by next holiday (Roosevelt's date!) you will read it.

Your sincerely, Henry S. White

Comments: The most interesting aspect of the letter is White's description of the study groups of faculty and advanced students during his time at NU. This was a very different

department from the one up to 1889, when until then there had only been two Professors of Mathematics, neither of whom had a PhD or published any mathematical research, and the department only offered service courses up to the level of the calculus.

The books White refers to were all advanced monographs dealing with subjects under active investigation. “Substitution Group reading” will have been **Eugen Netto** (1846—1919), *Substitutionentheorie und ihre Anwendung auf die Algebra* of 1882, which may have been the basis of the graduate course White taught in 1894—1895. “Lamb’s *Hydrodynamics*” refers to Sir **Horace Lamb** (1849—1934), an English applied mathematician who wrote several influential textbooks on physics including his *Hydrodynamics* of 1895 (many later editions); “Crew” refers to **Henry Crew** (1859—1953), Fayerweather Professor of Physics at Northwestern 1892—1933, and a member of the National Academy of Sciences from 1909; see Meggers (1964). “*Reye*” is **Karl Theodor Reye** (1838—1919), a German mathematician working in projective and synthetic geometry (Holgate’s fields) who taught at Zurich and Strasbourg. Part 1 of the third edition of his *Geometrie der Lage* (Geometry of Position, three volumes, 1886—92) was translated by Holgate in 1898. “Plucker” is **Julius Plücker** (1801—68), a German mathematician who taught at Bonn; his entry in the DSB provides an excellent entry into the literature on him. His “Line-Geometry” refers to his *Neue Geometrie des Raumes, gegründet auf der geraden Linie als Raumelement* (New Geometry of Space, Based on the Straight Line as a Spatial Element, 1868–1869), the second part of which was completed by Felix Klein after Plücker’s death. “Chasles’s *Apercu Hist*.” refers to **Michel Floréal Chasles** (1793—1880), a French mathematician who studied under Poisson. His *Aperçu historique sur l'origine et le développement des méthodes en géométrie* (Historical overview of the origin and development of methods in geometry, 1841) made him famous; he subsequently became a Professor at the *École Polytechnique* and was later awarded a chair at the Sorbonne. “Picard & Simart, *Fonctions de deux variables*“ refers of course to **Émile Picard** (1856—1941), too well known to require introduction; Picard’s Royal Society of London obituary provides a good entry into the literature on him. His co-author **Georges Simart** (1846—1921), who worked in the *Service hydrographique et océanographique de la Marine* in Paris is far less known. (True, he has a Wikipedia page, but only in French and German.) The first volume of their treatise *Théorie des fonctions algébriques de deux variables indépendantes* appeared in 1897. Of the other participants in the reading groups that White names (besides Holgate and Creer), Weir, Stecker, and Wilson were members of the faculty, Gates and Thorne graduate students; all are briefly discussed in the *Commentary*.

Some other matters of detail: "Karl Harrington" is presumably Karl Pomeroy Harrington (1861—1953), who was at various time Professor of Latin at Chapel Hill, Maine, and Wesleyan, and studied in Berlin 1887—1889 (overlapping White's time in Germany at Göttingen 1897—1890).

"Howe" was Alonzo J. Howe, who had died in February 1889, and is briefly discussed in the *Commentary*. Howe had come to Northwestern late in life from the Old University of Chicago after it closed in 1886, and White's comment suggests that as a result of its financial collapse Howe had become mentally disturbed. A contemporary account relates:

> Professor Howe, who had been professor of mathematics through almost [the Old University of Chicago's] entire history and for many years dean of the faculty, lay dead in his home across the street. Dispirited, broken hearted, brooding over the calamities of that institution, the upbuilding of which he had made his life work, there is no doubt that its downfall directly contributed to, if it did not cause, his death. [Buzzell, 1895, p. 4]

"My Cubic Curves": White's *Plane Curves of the Third Order* (Harvard University Press, 1925); the "Boston Colloquium lectures": White's lectures "Linear systems of curves on algebraic surfaces", delivered in Boston, September 2—5, 1903, in conjunction with the Summer meeting of the AMS at MIT and published in Fiske and Osgood (1905).

"the Evanston Colloquium lectures": The lectures given by Felix Klein in conjunction with and immediately after the 1993 Columbian Exposition.

"Dr. Bragdon must have favored undertaking it": In his translator's introduction to Reye, Holgate wrote:

> I desire to acknowledge my indebtedness to my colleague Professor Henry S. White for valuable assistance; my thanks also and the gratitude of all who may profit by the use of this translation are due to Dr. M. C. Bragdon of Evanston whose interest and generosity made its publication possible.

And who is the mysterious Dr. Bragdon? Francis Willard comes to our rescue here: she tell us in her *A Classic Town: The Story of Evanston* (1892, p. 375):

> M. C. Bragdon, M. D., one of Evanston's popular physicians, was born in Auburn, N. Y., 1850, and removed with his parents to Evanston in 1858. Dr. Bragdon graduated from Northwestern University in 1870, and from Hahnemann Medical College, Philadelphia, 1873. After studying a short time abroad, he returned to Evanston, since which time he has been most successful in the practice of his chosen profession. Dr. and Mrs. Bragdon have just completed a tour around the world.

"Your *Geometry* must have been the first *book* published by a member of the department": Perhaps Holgate's *Projective Pure* Geometry, published by Macmillan in 1930 is meant (rather than his translation of Reye), but either way, the passage curiously overlooks Curtiss's 1926 *Analytic Functions of a Complex Variable* in the Carus Mathematical Monographs series.

"Osler, *Aequanimitas*": Sir **William Osler** (1849—1919) was a Canadian physician who after receiving his medical degree from McGill in 1872 and studying under Virchow in Berlin was successively Professor at the McGill University Faculty of Medicine (1874—1884), Chair of Clinical Medicine at the University of Pennsylvania (1884—1889), Physician-in-Chief of the Johns Hopkins Hospital (1889—1905), and Regius Professor of Medicine at Oxford. *Aequanimitas* was his valedictory address when he left Philadelphia in 1889; it was later reprinted in *Aequanimitas, with Other Addresses to Medical Students, Nurses and Practitioners of Medicine* in 1904, by P. Blakiston's Son & Co., Philadelphia.

"Roosevelt's date": November 11, Veterans Day. The year before (May 1938) Congress had made it a legal holiday (then called "Armistice Day") which President Roosevelt signed into law.

Letter 2. Holgate to White, Nov. 28, 1939.

Dear Professor White:

You will recall that during the summer I wrote you about the request coming to me from the Archives Department of the University to prepare a history of the Department of Mathematics, stating that I had made a beginning and needed help. You kindly replied on September 4, giving a good bit of information, which I read with interest and will make full use of. Many things have intervened to take me away from this task, and I am only now getting back at it again.

Except for the personal sketches of Professor Noyes and Professor Kellogg, I am inclined to think the history of the department can be written in few words after the time of

Moore's arrival and yours. It is at that point that the significant history begins. I can not hope to get into all phases of it without a good bit of help, and you are the one to whom I must turn for many things. Specifically, I wonder if you can help me with the following – –

1. The publication of Klein's lectures. You mention that I took the question up with our trustees, asking if they would not underwrite the expense. That may be true, but I had forgotten it. Am I correct in thinking that you and Ziwet underwrote that expense with the Macmillans? If not, who carried the responsibility? Did not the Mathematical Society have a financial interest?

2. When the *Transactions* began publication, Northwestern along with other universities granted a subsidy, as I recall, for ten years. That was done, of course, at your request. How much longer, if any, was the subsidy continued? Was there not a similar subsidy for the *Annals* and perhaps also for the *Monthly*?

3. In the days of the old Science Clubs, I recall that at one time the Mathematics Department put on an exhibition [of] selected books from the library; among them there was an old copy of Descartes of 1655, as I remember, in white leather binding, perhaps an Elzevir. There was also an old geometry, the name of which I have forgotten, but I remember the frontispiece, which represented the discovery on a seashore of geometric figures drawn in the sand, circles, conic sections, and the like, and the astonishment of the discoverer at these marks of human intelligence. In trying to list the mathematical works in the old Greenleaf-Schultze [sic] Library, I could get no trace of these books. Apparently they have been lost or carried away; however, a library book misplaced is always lost, and I may find them yet. As I stated, however, the name of the second book has been forgotten and I am badly handicapped. Can you help me?

The Mathematics Department is now housed in the west wing of the old Willard Hall, and through the influence of some newer men, H. T. Davis among them, all mathematics books have been taken over there, and I find it very inconvenient. I am trying to list the journals and learn the dates at which many were acquired, but it is some task. I may be able to get help from the young woman who now supervises the library. Any help you can give me by recalling the events of the thirteen fruitful years you were here will be a godsend.

You know, of course, that we have a new president, and that he was installed ten days ago with much dignity, but with a rather simple service. Everything promises well for the future except the war. I hope you and your family, the Perezes, are well, and that the crop of McIntoshes was abundant. With sincere regards,

Yours fraternally,

TFH/a T. F. Holgate

Fortunately I have a stenographic help today and I am taking advantage of it.

Comments: The financial questions Holgate raises are discussed in White's answering letter. Otherwise:

"Ziwet was about to assume sole responsibility": **Alexander Ziwet** (1853—1928) was a long-time member (1888–1925) of the Department of Mathematics at the University of Michigan and very active in the AMS (a member of the editorial board of the BAMS 1892—1920 and Vice President 1903), as well as an editor along with White of the Evanston Colloquium Lectures; see Cross (1929) and Karpinski et al. (1929).

"an old copy of Descartes of 1655": Holgate's list does include a Latin edition Descartes's La *Géométrie* of 1837, dated 1659—61, but even if he did see it in 1939, it no longer appears in the NU Library's listings.

"perhaps an Elzevir": The *House of Elzevir*, a family of Dutch publishers, printers, and booksellers active from 1583 to 1712, not to be confused with the present-day Elsevier company (which adopted its name from, but in fact had no connection with—other than being inspired by—the Elzevirs).

"the old Willard Hall": Constructed in 1874, it was the home of the Evanston College for Ladies, designed by Gurdon P. Randall (the same architect responsible for University Hall). Originally called the Woman's College Building, the Second Empire style structure was later renamed Willard Hall in 1901 in honor of Frances Willard, who was president of the Evanston College for Ladies and the first dean of women at Northwestern. It served as a women's dormitory. When the current-day Willard Hall was constructed in 1938, the old building was renovated and became the Music Administration building in 1940, continuing on as such until 2015 and the new Bienen School building. It is currently the second-oldest building on campus, located at 211 Elgin Road, just west of Rebecca Crown Center.

"H. T. Davis among them": **Harold Thayer Davi**s (1892—1974) joined the department in 1937 and was later its chair 1942—55.

"we have a new president": **Franklyn Bliss Snyder** (President 1939—1949).

"the Perezes", "the crop of McIntoshes": White and his wife, ***Mary Willard Gleason White*** (1861—1933, married 1890) had three daughters: Charlotte, Martha, and Mary, the last of whom married Robert Perez in 1921. According to the *Vassar Encyclopedia*, after the death of his wife in 1933 "White was granted a retirement allowance by the Carnegie Foundation. He left Poughkeepsie and moved in with his daughter Mary Willard Perez and her family. He spent his retirement helping with the Perez's apple orchard business, and died May 20th, 1943 from heart trouble".

Letter 3. White to Holgate, Poughkeepsie, N.Y., Nov. 30, 1939.

Dear Dr. Holgate,

If I start immediately, your letter (28th Nov.) will have a reply this year. If not, when?

As to Klein's lectures: I know that he suggested publishing under the imprint of the University, and that the proposal was submitted in haste to Trustees or Exec. Com., and it is clear to me that you took up the question with them. Yet that was singular, since you were just then taking office there! Yet I think there must have been some reason. Similarly later, about subvention of the *Transactions*. Probably it was just that you had more business talent than I, witness your own two books.

Ziwet was about to assume sole responsibility, but I thought it would comport better with the dignity of the sponsoring institution to have some apparent part in the publication, and he conceded the point. At the end of a year, there was profit of about $3 to be divided. You know also that the Am. Math. Soc. took over the copyright and brought out the second edition.

It was the Math. Congress Proceedings (Columbian Exp.) that the Math. Soc. guaranteed. I think a dozen of us subscribed $25 each, and that then the Society backed it to $600 further. The guarantors were never called on for funds. [In the margin there is a note: "See Preface: $1000 = 400 + 600"]

After 1910 I think a few institutions continued stipends to the *Transactions*. (Van Vleck did, for Wesleyan, but Harvard and others thought it should stand or fall on its merits after so long a trial run.) After 1912 or 13, I think, there was no more subvention.

The *Annals*, after Stone ceased issuing it, was backed by Harvard alone, then later by Princeton alone. As to present status, Archibald's history gives details. So also for the Amer. Journal. Funds came through but not from the Society, I believe.

As to the old books, I have forgotten what they were. In the D.E. Smith histories (vol. I & II) there are some old pictures; as in II at ca. p. 180 and p. 360. Too bad if you can't resurrect them. Have you any old Euclids?

Of the sets of journals, I remember especially the *Crelle*, purchased soon after the Lunt library was built. I tried to get money for it from two or three men of means, with no result. Finally I think it was Dr. Rogers who had induced the trustees to pick up a bargain (perhaps $4 a volume), buying about 110 vols. then published. If I am right in my recollection, we secured the set left by *Richard Baltzer* (died 1887), and probably his autograph or stencil is in some of the volumes. —They were mostly unbound, and Dr. Bonbright as Librarian orders for red Russia leather backs, gilt titles, for the binder. But they came back with *black* leather backs, Miss Ambrose (Ass't Libr.) explaining that black was more durable! *And* she added, that of course, as they were principally in the German language, they would be shelved in the *German Literature* department.

Moore must have come to Evanston in 1889, if the *Yale* register is correct. He (and the Stuarts) lived with Mrs. Simpson on Church Street, near Orrington. Then we read Netto in 1890, Spring; and he went about showing all his friends how the roots of the quintic, (his five fingers *under* the table, left) when permuted, *induced* the isomorphic group on the roots of a resolvent sextic, denoted rather lamely by his right-hand fingers *over* the table. But in two years he was far beyond that, and staking out his Galois Field theory for the '93 Congress.

Probably the golden haze of time shows us a roseate picture of those bright early years. But there was a *something*! Those were the years of Field and Higinbotham and Russell and the Auditorium and Theodore Thomas, Burnham, and the Exposition and the Sheridan Road and the new Univ. of Chicago. Of course there was something; but much has happened since; to me at least the city looks different, and the later Exposition has been held for its new ground in the old Harbor and the N.W.U. has outgrown all the old plans. *And* it seems to me that Curtiss and Garabedian have done at least as much as *our* contemporaries. *Nec minime tempora nova*!

[Note on side: "Paper exhausted; and you, and yours sincerely, Henry S. White"]

Comments:

"Archibald's history": **Raymond Clare Archibald**'s *Semicentennial History of the American Mathematical Society*, 1888-1938 (published by the AMS in 1938). Archibald (1875—1955) was a Canadian-American mathematician who received his PhD from the University of Strassburg under Karl Theodor Reye (whose book Holgate had translated) in 1898. He was well-known as a historian of mathematics and editor of a number of journals.

"the *Crelle*": The *Journal für die reine und angewandte Mathematik* (Journal for Pure and Applied Mathematics), founded by **August Leopold Crelle** (1780–1855) in 1826. It was often referred to as "Crelle's Journal" or just "Crelle".

"Dr. Rogers": **Henry Wade Rogers**, President of Northwestern (1880—90).

"the set left by *Richard Baltzer"*: **Heinrich Richard Baltzer** (1818—1887), a German mathematician who received his PhD from Leipzig in 1841 under Drobisch and Möbius. He was a Professor at the University of Giessen from 1869 until his death in 1887.

"Dr. Bonbright as Librarian": **Daniel Bonbright** (1831—1912), like Holgate a long-time fixture of the University: Professor of Latin Language and Literature at Northwestern 1856—1912, as well as at various times University Librarian (1855—65), Dean of the College (1873—1902), and acting President (1900—1902).

"his Galois Field theory for the '93 Congress": Moore's characterization of finite fields: for every prime p and positive integer n, a) there exists a field field with p^n elements, b) any two finite fields having p^n elements are isomorphic, and c) any finite field is of this form.

White's letter concludes with nostalgic allusions to some of the great figures and additions in Chicago five decades earlier. These include **Marshall Field** (1834—1906), who needs no introduction to a Chicagoan; **Harlow N. Higinbotham** (1838—1919), a Chicago business man and philanthropist, the President of the 1893 Chicago World's Fair; "Russell" is possibly **Charles Edward Russell** (1860—1941), a US journalist, newspaper editor, and muckraker whose reports on the Chicago stock yards inspired Upton Sinclair's novel *The Jungle*; **Theodore Thomas**, a famous German-American conductor of that period, the first music director of the Chicago Symphony Orchestra (1891—1905); **Daniel Burnham** (1846—1912), a celebrated US architect and urban planner, a business partner of Lous Sullivan; "the later Exposition", the 1933—34 Chicago Century of Progress International Exposition.

"Curtiss and Garabedian": **David R. Curtiss** and **Henry L. Garabedian** (1901—1992), the latter a Professor at Northwestern in the Mathematics Department in 1939.

It was in August 1893 that I came to Evanston as an Instructor in Northwestern University. Professor Henry Seely White had preceded me by one year. The University of Chicago had opened in October 1892 with Professor Eliakim H. Moore, formerly of Northwestern University, in charge of the Department of Mathematics and with him among others were associated Professor Oscar Bolza and Dr. Heinrich Mäschke.

The year 1893 will be remembered as the year of the World's Columbian Exposition at Chicago, in connection with which there were held many Congresses, scientific, educational, sociological, and religious. Among these a Congress of Mathematics and Astronomy had been arranged under the direction of a local committee, and was held during the week August 21-26 in the Hall of Columbus in the then unfinished Art Institute of Chicago.

The first session of this Congress was presided over by Professor George Washington Hough, Director of the Dearborn Observatory of Northwestern University but after the first day the Congress divided into two sections, Astronomy on the one hand and Mathematics on the other, the latter presided over by Professor W. E. Story of Clark University with E. H. Moore as vice-president and Harry W. Tyler as secretary.

The leading spirit in this Mathematical Congress, without question, was Professor Felix Klein of Gottingen who had been commissioned by the Minister of Education of the German Government to accompany and demonstrate the educational exhibit sent to the Exposition by Germany. Other foreigners attending the Congress were Herz of Vienna, Palidini of Pisa, Study then professor in Marburg. In all forty-five persons were registered; forty papers were read of which thirteen were by Americans, seventeen by Germans, three by Italians, three by Frenchmen, two by Austrians and one each by a Russian and a Swiss. The papers presented by German Mathematicians for the most part were in response to invitations extended by Professor Klein, the collection giving a fairly complete account of contemporary mathematical activity in their country. The full collection of papers presented at the Congress was published in 1896 by Macmillans under a subsidy by the American Mathematical Society.

The American Mathematical Society had its roots in the New York Mathematical Society which was organized in 1888, primarily through the activity and influence of Professor Thomas S. Fiske of Columbia University. Its membership in the early years was confined for the most part to persons in the immediate vicinity of New York, but in three years it had acquired sufficient permanency to warrant the establishment of a monthly publication known as the Bulletin of the New York Mathematical Society.

The benefits of this society to mathematical study were so evident that when the widely separated workers in mathematics from various universities came together at the World Columbian Exposition there was immediate discussion of the advisability of enlarging the range of membership and of the Society's activities so as to give it a national significance.

As a result of these discussions the name of the Society was changed to The American Mathematical Society and the monthly publication, after three volumes had been completed, was likewise changed to the Bulletin of the American Mathematical Society. Professor Fiske continued as Editor with the assistance of Professor Alexander Ziwet of Michigan and Professor Frank Morley, then of Haverford.

During a part of his stay in Chicago Professor Klein was entertained in the home of one of his recent students in Gottingen, Professor Henry S. White in Evanston. This gave opportunity for free conversation of a kind less formal than was possible at the Congress and out of these conversations in which friends of Professor White had a share, there came an invitation to Professor Klein to extend the discussions of the Congress into a Colloquimm under his guidance in which a view of the then present day mathematics should be presented. More than half of those attending the Congress remained for the Colloquium which was held from August 28 to September 9 in rooms of Northwestern University in Evanston. Klein lectured each morning. Professor Ziwet served as Secretary, preparing the lectures for publication by The Macmillan Company for the American Mathematical Society, under the designation - Lectures on Mathematics, The Evanston Colloquium.

It was in this Colloquium that Professor Klein came to know Miss Mary Winston (Mrs. Henry B. Newson), a student at the University of Chicago, who, on his invitation shortly thereafter went to Gottingen for study and was the first woman student to be admitted to Klein's seminar.

The impetus given to Mathematical study by Klein's visit was quite significant. Other factors in the growing interest were the opening of the University of Chicago with Professor E. H. Moore as the leader in the mathematical faculty and the coming at the same time of Henry S. White to Northwestern University. An earlier friendship between these two enthusiastic students opened the way to frequent conferences and informal discussions in which other members of the two faculties took part. Bolza of the University of Chicago was a wise consultant in the active trio while Maschke and I, for the most part, were interested listeners.

Out of these conferences there grew a desire to bring in a larger group and an invitation accordingly was sent out to students and teachers of mathematics in neighboring institutions to meet for discussion and the presentation of papers, resulting in a gathering at the University of Chicago on December 31, 1896, and January 2, 1897, under no more pretentions name than a Conference. There were eighteen members of the Society present including, besides the local members, Davis of Nebraska, Newson of Kansas, McNeil of Lake Forest, Hancock later of Cincinnati, Townsend and Shaw of Illinois, and Ziwet of Michigan. Fourteen papers were read and a resolution was adopted that in the opinion of those present it was desirable for members of the American Mathematical Society readily accessible to Chicago to hold two meeting a year for reading and the discussion of papers. A second Conference was fixed for April 24, 1897.

Considerable anxiety was felt at the Society headquarters in New York lest the activity in the west should mean a division of the Society but after extended correspondence the Council voted "to approve the organization of a Section of the American Mathematical Society by those members who may be present at the Conference to be held in Chicago on April 24."

Accordingly, at the second Conference of members of the Society held on April 24, 1897, the Chicago Section of the American Mathematical Society was formed under an authorization of the Council, this being, in a sense, the model on which other sections later were to be established. The organization of the Section was kept as simple as possible to avoid any semblance of separation from the Society, the only officer at first being a secretary, the present writer, with whom was associated a program committee to solicit

and approve papers to be presented. From its inception the Section has continued to meet twice a year, such meetings coming later to be recognized as local meetings of the Society itself.

So it was that the Society began to extend its creative influence to various centers and to stimulate its members to productive scholarship by affording facilities for helpful intercourse. The result is manifest in the multitude of worthy papers presented each year for publication.

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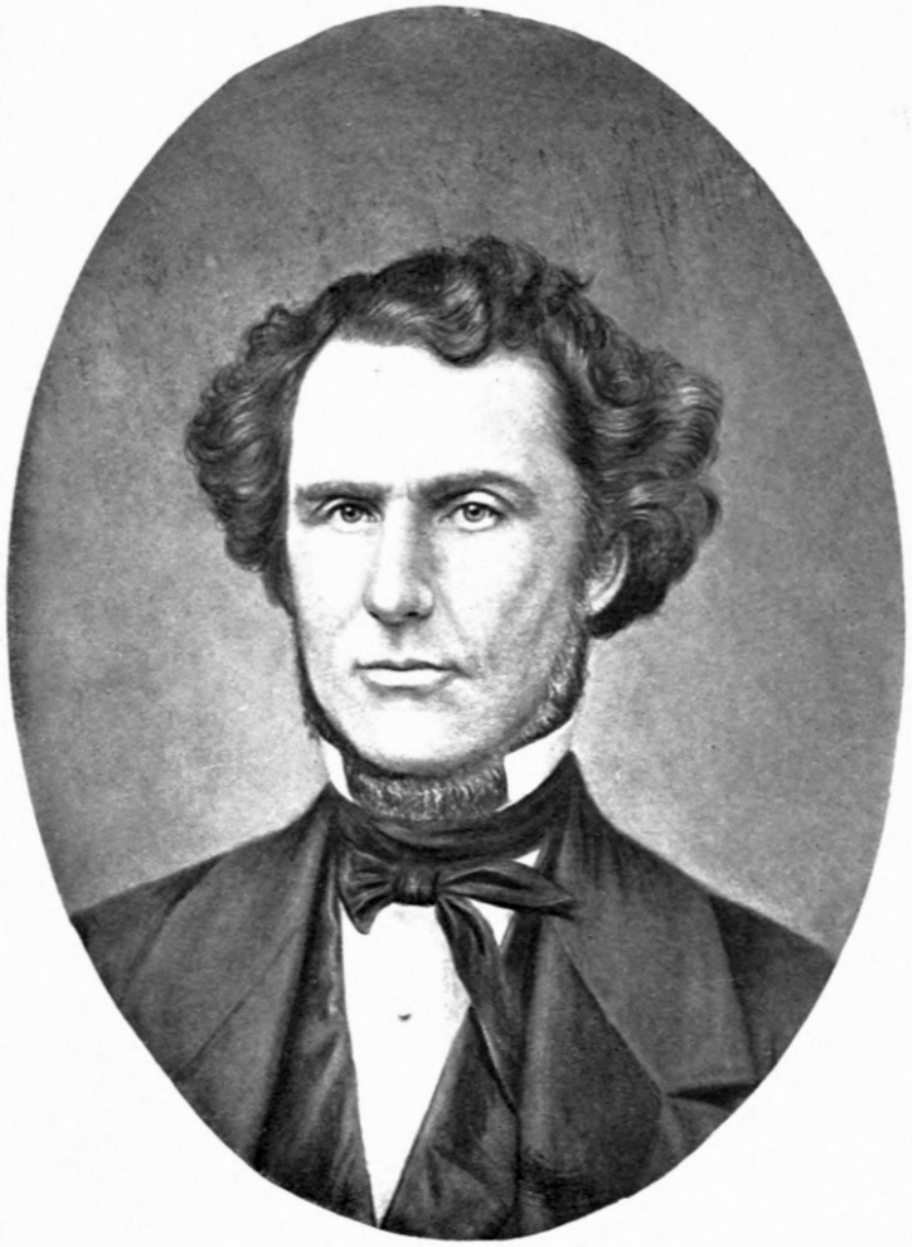
PORTRAIT GALLERY

Henry Sanborn Noyes (1822—1872).

The first Professor of Mathematics at Northwestern University, from 1855 to his death in 1872. He also served twice as the acting President of Northwestern (1854—1856 and 1860—1867), and was responsible for the construction of the first permanent building on campus, University Hall. Like many later Presidents, a street in Evanston is named after him.



Clark Titus Hinman (1819—1854). The first President of Northwestern, Hinman recommended the Trustees appoint Noyes, having known him from their days together at the Newbury Seminary in Vermont, where Hinman had been the Principal. Hinman died in 1854 of typhoid fever and dysentery while traveling home to New York during the summer, less than a year in office, and Noyes (as one of only two other faculty members who had been appointed up to that time) was asked by the Trustees to stand in for Hinman until a replacement could found.

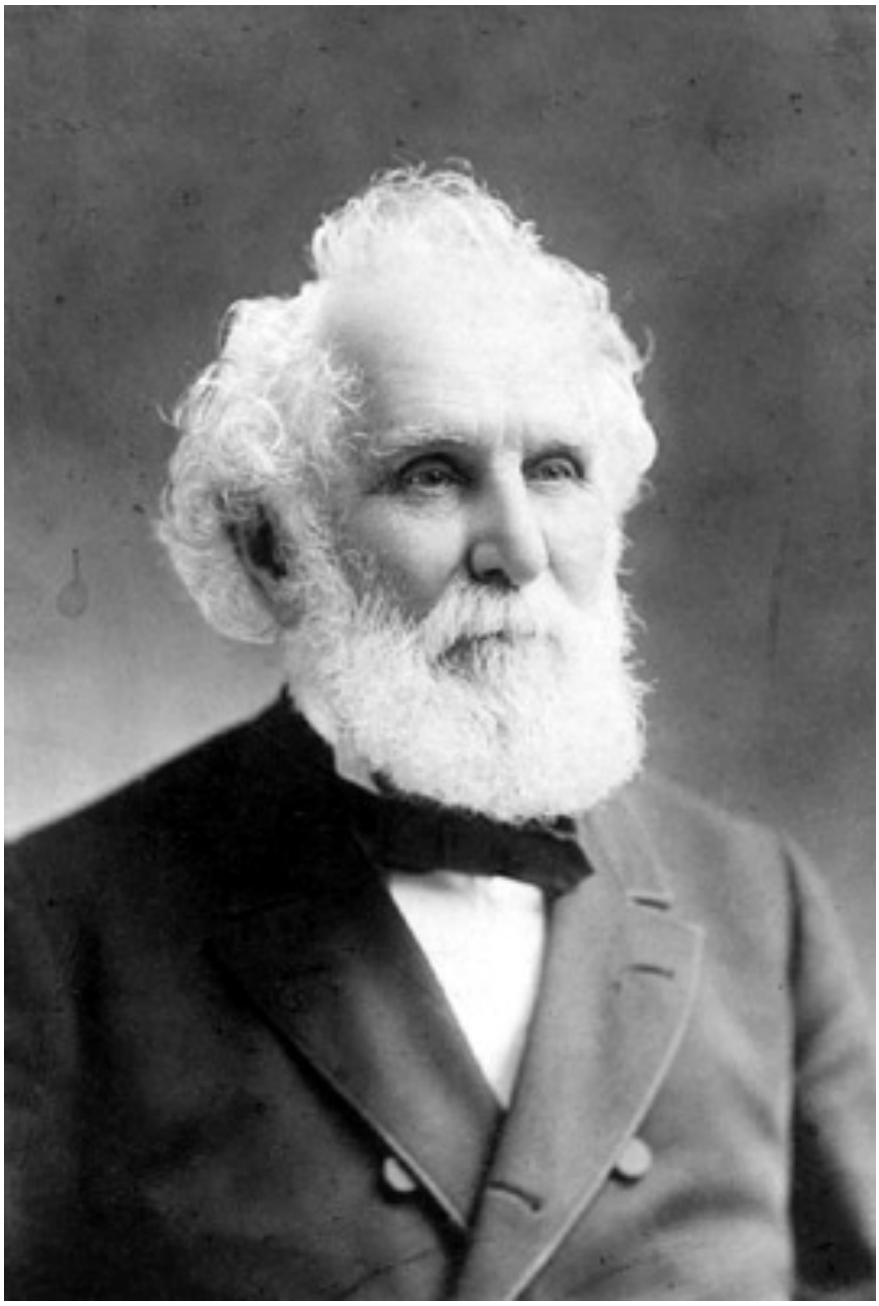
Julius Field Kellogg (1830—1894). The second Professor of Mathematics and chair of the Department from 1872 to his death in 1894, Kellogg initially came to Northwestern as a Professor of Civil Engineering 1869, but became the Professor of Mathematics after Noyes died in 1872. A popular teacher, he was a fixture on campus for a quarter of a century. Although esteemed by many for his scholarly attainments, he had only two years of formal academic training at Yale and an honorary MA from Lawrence College in Wisconsin. He became the Noyes Professor of Mathematics in 1876 when the Trustees established it on the recommendation of John Evans, its first President.

Eliakim Hastings Moore (1862—1932). The third chair of the Department, Moore was the first faculty member in the Department to have a PhD in mathematics (Yale, 1885). Initially an instructor in the NU Preparatory Academy in 1886-87, he returned soon after as an Assistant Professor in 1889 and then Associate Professor in 1891. He was likely de facto chair of the Department starting in 1890, when Kellogg's health began to fail. Although Moore left for the University of Chicago when it opened in 1892, so that his time at Northwestern was relatively brief, he had an important impact on the Department, both overseeing the establishment of a major and offering advanced courses, as well as setting the stage for its master's level graduate program.

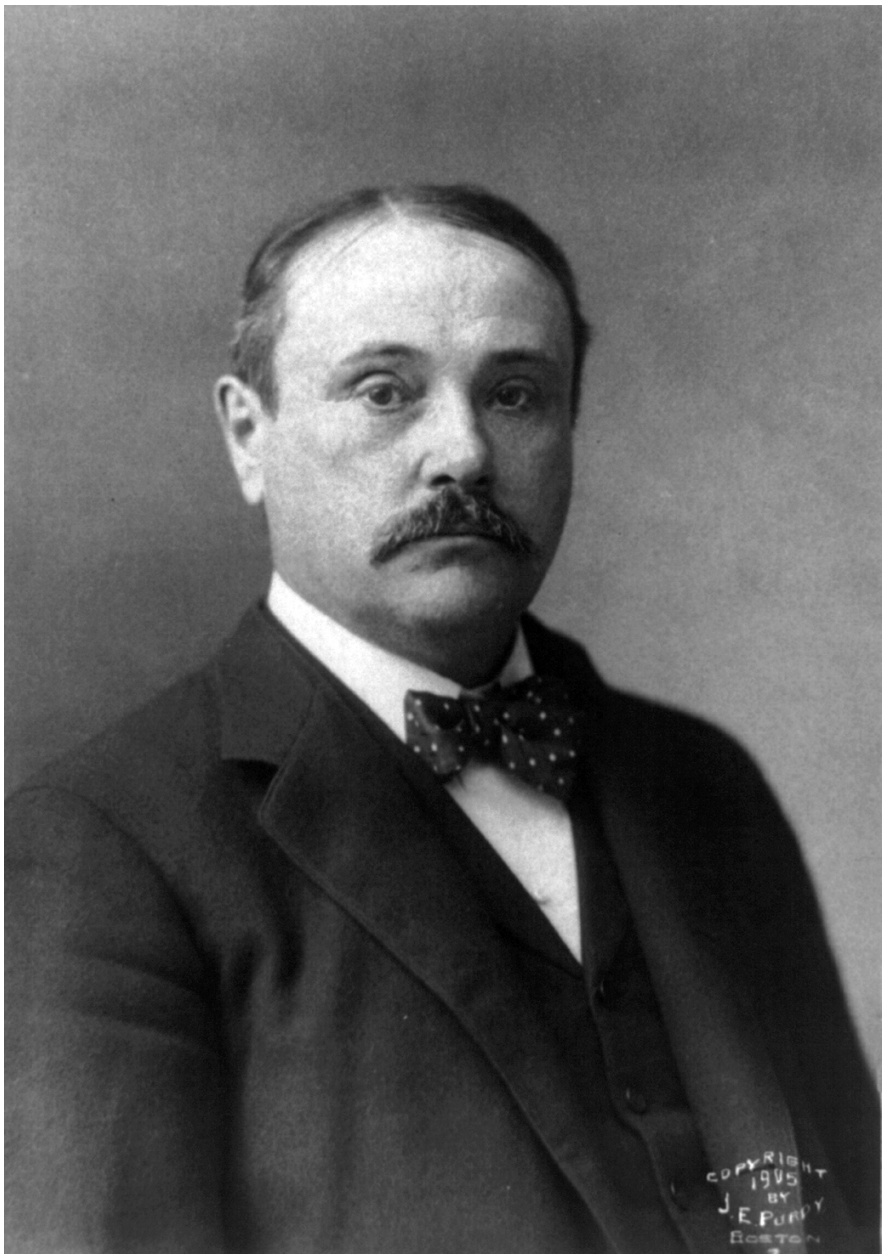
Henry Seely White (1861-1943). The fourth chair of the Department (1892—1905), White was hired in 1892 under hurried circumstances when it emerged Moore was moving to Chicago. He was the second PhD in mathematics Northwestern hired (under Felix Klein in Göttingen, awarded in 1891). Under his watch the Department began to offer graduate courses in Mathematics in 1894. An outstanding research mathematician, he also played an important role in making Chicago a center of US mathematics. He left Northwestern in 1905 to teach at Vassar for personal reasons. He later became a President of the AMS (1907—08), and was elected to the National Academy of Sciences in 1915.

Thomas Franklin Holgate (1859—1945). Holgate came to Northwestern in 1893 as an Instructor, but was promoted after only a year—along with White—to Professor in 1894, remaining at Northwestern for the next forty 40 years until his retirement in 1934. Although "titular" chair of Mathematics after White left in 1905, as Dean of the College of Liberal Arts (1902—1919) and twice acting President (1904—06 and 1916—19), Holgate's activities were necessarily largely at the College and University level, the day-to-day running of the Department being left to his younger colleague D. R. Curtiss. Along with White, Holgate was active in the Chicago section of the AMS, and was its Secretary from the founding of the Section in 1897 until the end of 1905.

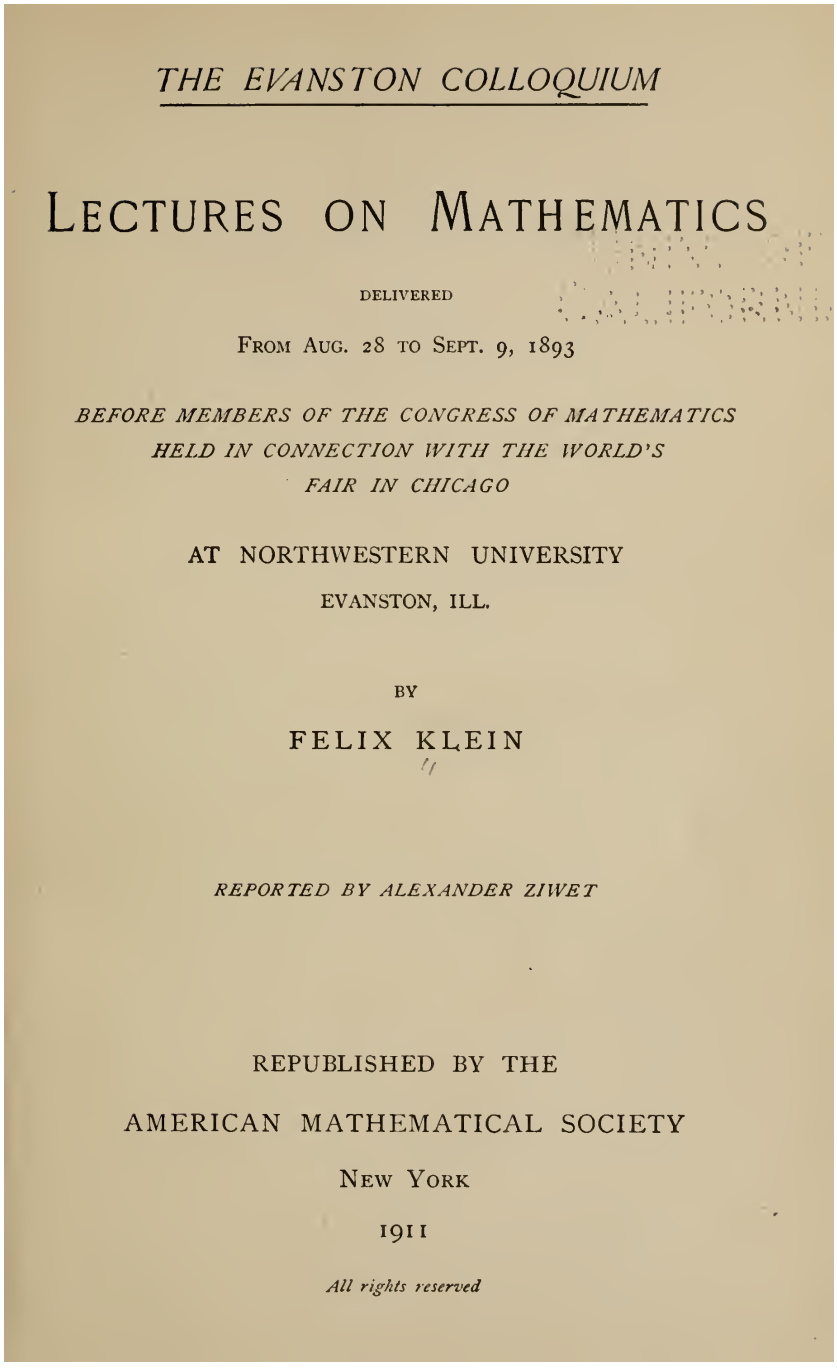
David Raymond Curtiss (1878—1953). Curtiss was the fifth chair of the Department and its longest serving—30 years, from 1905 to 1935. Like his predecessors Moore and White, he had impeccable mathematical credentials: he earned his doctorate at Harvard in 1903, under Bôcher and Osgood, held a postdoc at the École Normale Supérieure in 1904—05, and after teaching at Yale for a year, came to Northwestern. Although he had a respectable publication record, he was also very active at the national level, at various times serving as President of the MAA, and Vice-President of both the AMS and AAAS, as well as being for many years an editor of both the AMS *Transactions* (1914—19) and *Bulletin* (1928—38). His Carus Mathematical Monograph *Analytic Functions of a Complex Variables* (AMS, 1929) is still in print as an ebook.



Orrington Lunt (1815—1897). One of the original founders of Northwestern, as well as a Trustee and President of the Board, his gifts to the University over the years made possible among other things the construction of the present-day Lunt Hall, which initially served as the location of the expanding University Library in 1894 (then called the Orrington Lunt Library in his honor). He had a conservative view of the role of Northwestern, and famously clashed with President Henry Rogers at the latter's inauguration in 1890. Lunt Avenue in Chicago is named after him and his brother Stephen.



Henry Wade Rogers (1853—1926). The sixth President of Northwestern, from 1890 to 1900. The first President of Northwestern who was not a Methodist minister, he transformed Northwestern from a small cluster of colleges into a single cohesive university and expanded the University's liberal arts programs to give students access to a broader program of learning, including the fields of political science and economics. He worked to unify the various professional schools under the authority of the University's Board of Trustees, hired new faculty for all the schools and insisted they be given time and facilities for research as well as teaching. He strongly supported coeducation at Northwestern. His leadership led to a dramatic increase in enrollment, and a recognition of the school as one of the top universities in the country. (The above drawn from the NU Library website.)



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NEW YORK

1911

Felix Klein's "Evanston Colloquium" ***Lectures on Mathematics***, suggested by White, gave Northwestern national visibility, and led to other colloquia volumes published by the AMS.

TITLES AND AUTHORS

The table of contents for the 1911 book ***Monographs on Topics of Modern Mathematics Relevant to the Elementary Field***. Note that in addition to Holgate the contributors were a distinguished group of US mathematicians, including Veblen at Princeton, Bliss, Dickson, and Young at Chicago, David Eugene Smith at Columbia, Huntington at Harvard, F. S. Woods at MIT, and G. A. Miller at Illinois.

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