

Mathematics at Georgia Tech: The First Hundred Years, 1888 - 1987

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1. In The Beginning: The Hopkins/Hall Years, 1888 – 1905

Background

In the 1850s a movement to improve “technical education” arose in the northern and midwestern states, inspired in part by developments in Germany and France. This led, for example, to the creation of the Chandler Scientific School at Dartmouth in 1852, the Department of Mines, Arts, and Manufacturers at the University of Pennsylvania in 1855, and in the founding of M.I.T. and the Worcester County Free Institute of Industrial Science, both in 1865. The latter, with its “shop culture,” would in many ways become the model for the early Georgia School of Technology.

By the early 1880s this movement had reached the South, now driven by the desire to compete effectively with the more industrialized North. In 1881 a conversation between Major J. F. Hanson and Nathaniel E. Harris led to an editorial in the *Macon Telegraph and Messenger*, of which Hanson was the manager, calling for a “Technological School” in Georgia. Hanson was also a “great mill man and manufacturer,” later the president of the Central of Georgia Railway and the Bibb Manufacturing Company. He was also helpful in getting Harris, who would later be dubbed the founder of Georgia Tech, elected as a state legislator in 1882. In that year Harris introduced a resolution in the Georgia legislature to form a committee to investigate the creation of a technical school for the state. This resolution was approved, and a committee, including Harris, went north to visit M.I.T., the Stevens Institute of Technology in New Jersey, the Cooper Union in New York, and the Worcester Free Institute. They concluded that the Worcester model was the most appropriate one for the school they hoped to see established. The committee reported on their work in 1883, and Harris introduced a bill calling for the creation of such an institution. This bill met bitter opposition, partly for financial reasons, and was not passed until 1885. In 1886 Governor McDaniel signed the bill which authorized \$65,000 for the new school, and a commission, headed by Harris, was formed to create and manage it. Bids with offers of lands, buildings, and funds were received from Athens, Atlanta, Macon, Penfield and Milledgeville. After twenty-four ballots the commission selected Atlanta, whose bid included \$70,000 from the city and a citizens committee, \$2,500 in annual support, and a gift of four acres of land from Mr. Edward Peters of the Peters Land Company. The commission then purchased four and three-quarters acres of land along

North Avenue. In the Spring of 1888 the commission selected Isaac S. Hopkins, the president of Emory College, as the first president of the new Georgia School of Technology, at a salary of \$3,500.

Hopkins had graduated from Emory in 1859 and from the Medical College of Georgia in 1861. But rather than pursue a medical career, he entered the ministry. Eight years later he returned to teach at Emory. His own hobbies of woodworking and mechanics led to the first technology department on Emory's Oxford campus, first housed in a workshop in his own home. Hopkins was also very aware of the growing strength of industry and technology in the North and spoke out about the fact that the new mills in the South needed northerners as foremen and supervisors. Hopkins became the president of Emory in 1884, and in 1885 a building was completed to house his Department of Toolcraft and Design, but financial problems and opposition from faculty members devoted classical studies kept that department from prospering. As a result, he was quite ready to take on the leadership of the new Georgia School of Technology. After his departure the technology department of Emory closed for good.

On June 7, 1888, Hopkins began his selection of faculty members. The first person he nominated was Captain Lyman Hall as head of the Department of Mathematics. Next was Rev. Charles Lane as head of the Department of English. In July R. B. Shepherd was added as professor of mechanical engineering and freehand drawing. In August Dr. W. H. Emerson was added as professor of chemistry. Each of these four were to receive a salary of \$2,000 per year. M. P. Higgins, on loan from the Worcester Free Institute, came for one year as the first superintendent of the school's shops. Hopkins was to serve as the professor of physics.

By the fall of 1888 the school's first two buildings were completed. They were the academic building, now known as the Tech Tower, and the Shop Building, which had a matching tower. Classes began on October 8 of that year, and by January of 1889 there were 129 students registered for the first degree offered, the Bachelor of Science in Mechanical Engineering, all but one from Georgia. Tuition was free for all but the Mr. Stone from Tennessee.

The Curriculum

The Act of the General Assembly of Georgia which authorized the new school stated that it was to be a "Technological School for the education and training of students in the industrial and mechanical arts." The "shop school" model adopted was based largely on

that of the Worcester Free Institute, itself similar to many institutions already in existence on the continent, especially in France and Germany. The students spent their mornings (in coats and ties) in the academic building, and their afternoons in the shop building. The shop building contained an engine room with boilers, a blacksmith shop, a tool room, drafting room, painting and finishing room, and large workrooms for both wood and metals. For the first thirty or so years the faculty lists would include the superintendent of the shop as well as the foremen of its several divisions.

Although shop-based, the curriculum had a heavy emphasis on mathematics and also on drawing. The first catalogue pointed out that, "By reason of its connections with the various industrial arts and manufactures, the science of drawing, both free hand and mechanical, has more immediate bearing on the pursuits of everyday life than any other branch of technical education." The first year students were called the Apprentice Class, second year students the Junior Class, followed by the Middle Class and Senior Class.

The curriculum for the apprentice class consisted of mathematics, free hand drawing, English, physics, and shop work. In the first term the mathematics was algebra, using Wentworth's *Elements of Algebra*, and in the second term it was algebra and plane geometry.

In the junior (second) year the curriculum called for mathematics, drawing, including descriptive geometry, English, physics, chemistry, and shop work. The mathematics consisted of the completion of plane and solid geometry, plane and spherical trigonometry, and surveying. A course in descriptive geometry, taught by the drawing department, was also listed as part of mathematics program. Texts by Wentworth were used for the geometry and trigonometry, and one by Faunce for the descriptive geometry.

The third or middle year called for mathematics, drawing, English, engineering, physics, chemistry, geology, and shop work. Here engineering consisted of foundations, materials, machinery, and mill work. The mathematics included analytic geometry, field practice in plane table surveying, map work, and the beginning of calculus, using a text by Taylor. The catalogue stated that "The Differential and Integral Calculus are pursued together, thereby enabling their early application in Mechanics and Physics."

The senior year included mathematics, English, engineering, physics, chemistry, geology, drawing, and shop work. In this case the mathematics for the entire year was the calculus.

The mathematics courses were divided into sections of fifteen to twenty-five students, and there were daily “recitations,” with the students being marked every day. The catalogue stated that, “In the lower branches attention is given to continued drill in examples and problems and to accuracy of recitations. In the higher branches interest is awakened by original problems and investigations requiring a thorough understanding of the principles of the text.”

Much can be learned from the minutes of faculty meetings of the period, written out in longhand by Lyman Hall, who was the first secretary of the faculty. (He remained in that position until he assumed the presidency in 1896.) The minutes of a meeting on March 1, 1889, record that “Hall moves that candidates for the Apprentice Class be required to pass an examination in mathematics as follows: arithmetic complete, algebra, fundamental operations including addition, subtraction, multiplication, division, factoring, greatest common divisors and least common multiples.” The motion carried.

The earliest of the resulting entrance examinations contained “arithmetic” questions such as the following:

A speculator sold 18 mules for \$2,148.84, thereby making a profit of 26 per cent. What did the mules cost apiece?

If the freight on 17 bales of cotton for 85 miles is \$22.00, what will the freight be on 35 bales for 171 miles?

and

If 450 soldiers are to be furnished with clothing, each suit requiring 9 yards of cloth 1 yard wide, how many yards of flannel $\frac{3}{4}$ of a yard in width would be required to line the suits?

The “algebra” section of the same examinations consisted of questions requiring the addition, multiplication, and division of polynomials in several variables.

Perhaps it was the result of some poor performances on these entrance examinations that in 1891 the “Sub-Apprentice Class” was created for the students who still needed instruction in the material required for admission, particularly in English and mathematics. At that time such “academies” were common at other institutions as well. By 1897, among the 267 students, 118 were in the Sub-Apprentice class. By this point the faculty had grown to 10, with two in mathematics

The minutes of nearly all of the faculty meetings of the first fifteen years include reports of academic deficiencies, as well as of misconduct such as leaving the campus without permission or rude behavior to a faculty member. An example from November of 1892 states that “many of the Apprentice Class having been reported as deficient in mathematics, Professor Spain was requested to submit a list of them to the President who was requested to lecture them and warn them to improve or consider themselves liable to be remanded to the Sub-Apprentice Class.”

It may be that the instruction being offered for the Sub-Apprentice Class is what made it possible to strengthen the curriculum. By 1902 trigonometry had moved from the second year to the first, analytic geometry from the third to the second, and the calculus was completed in the third year. At this point the faculty had grown to 19, with 5 in mathematics. By 1905 differential equations and the theory of equations had been added to the curriculum. There were also mentions of “special topics” and “applications,” but mathematics in the fourth year was no longer required.

The Faculty

Lyman Hall (Feb. 18, 1859 – Aug. 6, 1905)

Captain Hall, as he was known, was born in Americus, the son of an old Georgia family. His great-uncle, also named Lyman Hall, was one of the three Georgians to sign the Declaration of Independence, and later was one of the early governors of the state, where his efforts led to the chartering of the University of Georgia in 1785. Captain Hall attended Mercer College for three years before being appointed to West Point, where he graduated in 1881. Health problems prevented him from joining the army, and he entered teaching. From 1883 to 1886 he was assistant professor of mathematics and “assigned to drawing” at the South Carolina Military Academy, now the Citadel. (The Citadel had a faculty of six at the time, with one other professor of mathematics and engineering.) John P. Thomas, in his *The History of the South Carolina Military Academy*, writes of Hall that, “a young man of military bearing and of high character, he soon showed himself to be a thorough instructor and a superior tactician. Acquainted, moreover, with military forms and etiquette, his services to the Citadel were at this stage especially useful.” In 1888 Hall was teaching at the Moreland Academy near Atlanta when he was hired as the first professor of mathematics for the new Georgia School of Technology. In 1896 he was appointed the second president when Hopkins resigned to devote his full time to the ministry. West Point graduates of the period could be found on the

engineering staffs, not only of military and government projects, but also of private industry, and they played a prominent role in the organization of engineering departments at Harvard, Yale, Rensselaer, and other educational institutions. Hall was also the author of three algebra texts. He was a fairly private person, but energetic and well liked, and was chosen to be the secretary of the faculty from the start. In 1892 the Trustees decided that he should collect the matriculation fees that were owed by the students who did not have the free scholarships assigned to the counties of Georgia. He was to receive an additional \$200 per year for doing so (provided that he put up a bond of \$1000).

Hall was always a strict disciplinarian, which is perhaps best illustrated by one famous incident which occurred after he had become president. In 1901 the senior class decided as a group not to return to school after the Christmas break until January 2, 1902, rather than on January 1, New Year's Day, when they were expected to report. As a result, Hall suspended the whole class until February 2, required that they petition him in person to return on that date, and announced that they would not get their diplomas until November 2, so that they would have time to make up missed work. This was not completely unprecedented. According to the minutes of a faculty meeting on May 22, 1893, the middle class was suspended from May 22 until June 5 "for being absent on May 18 after being denied permission to be so." But Hall's actions against the senior class caused quite an uproar, involving not only parents, but trustees, and even the state legislature. The faculty stood behind President Hall, however, and 17 of the 18 members of the class did return in February.

As president Hall expanded the school's offerings to include modern languages, programs in civil and electrical engineering, and, with the help of a Pittsburgh industrialist, raised the funds to begin the A. French Textile Department. He was a tireless fund raiser. The campus had two buildings in 1896 and nine at the end of his presidency. These included a dormitory and dining hall known to students as the "shacks" (no running water or electricity), the Knowles Dormitory (with water), the Swann Dormitory (with both), the electrical building, now the Savant Building, the French Building, and, in his last year, the Chemistry Building, later to bear his name. The enrollment more than tripled during this period to over 500 in 1905 making it larger than any other technological school in the country other than Purdue and MIT. During his administration an athletic association was formed to manage the school's sports teams. In 1903, after some bad years in both baseball and football, Hall helped raise the funds, including contributing some of his own money, to hire the legendary coach Paul Heisman (although he did misspell the coach's name in the terse letter which offered him the job). In August of 1905 Captain Hall died at the age of 46 at a summer resort in Danville, New York. Many said that he had simply worked himself to death. He is buried with his wife in Atlanta's West View Cemetery.

Frank O. Spain (1866 - 1941)

Frank Spain was the second member of the mathematics department, having been hired in 1889. Spain was born in South Carolina and attended the South Carolina Military Academy, Class of 1886. He would therefore have been at that institution when Lyman Hall taught there. Hall and Spain constituted the entire department for five years until 1894. Nonetheless, Spain is much better remembered for his connection with early Georgia Tech football! The first Georgia School of Technology football team was fielded in 1892. It was coached by Professor E. E. West and included Frank Spain. Official sports records next list as coaches for the 1893 and 1894 teams both Frank Spain and Lt. Leonard Wood, later of Rough Riders fame, Military Governor of Cuba, Army Chief of Staff, and Governor General of the Philippines. At the time Wood was a military surgeon at nearby Fort McPherson. The rules being somewhat loose at the time, both Spain and Wood played on the 1893 team as well, with Wood as captain and Spain at center. That team remains famous as the first to beat the University of Georgia. The game, which Georgia Tech won by a score of 28 to 6, was more than a little controversial however. The people from Athens complained that Wood, then over 30, was not really affiliated with Georgia Tech (although at least one person claimed that Wood had paid his matriculation fee to Captain Hall, “who understood the situation,” and that he did so to use the school's shops to learn how to make splints and other items useful to a military surgeon). Then there was the fact that the referee was the brother of the trainer for the Atlanta team, a man by the name of Nourse, who was also a team member. The Georgia Tech fans pointed out, on the other hand, that the UGA team included a paid professional trainer. In any case, the win is fondly remembered among Georgia Tech faithful, and in 1935 the ANAK Society placed a plaque at Grant Field with a list of the team members, including Spain and Wood.

In the fall of 1894 the *Constitution* reported that Spain had left Georgia Tech to join a theatrical company, describing him as, “one of the best known young men in the city.” After appearing in several roles in New York he returned to Atlanta and became a representative for The American Book Company, an early publisher of textbooks, including the famous McGuffey readers and at least one of the algebra texts by Lyman Hall. In 1901 he returned to teaching at the new University School for Boys in Stone Mountain. Mrs. Spain's name appeared often in the society pages of the *Constitution* in descriptions of tea parties and bridge games and in connection with affairs of the 10th Street School, attended by Frank O. Spain, Jr. At one point, for example, Mr. and Mrs. Spain both appeared before the city Park Board to urge improvements in Piedmont Park along the 10th Street side. In 1915 they moved to Florida, where Frank went into banking and eventually became a public utilities executive.

David Brainerd Oviatt (1858 – 1919)

Oviatt was not actually in the mathematics department, but rather was a professor of drawing. Courses taught by the drawing faculty were considered to be part of the mathematics program in the early years, and the first graduates of the school later reported that their mathematics instruction was given by Hall, Spain, R. B. Shepherd and Oviatt. Shepherd was the first professor of mechanical engineering and freehand drawing. He was replaced after just one year by John Saylor Coon, who came from the University of Tennessee where he had been the chair of the mechanical engineering department for one year. Oviatt had B.S. and M.S. degrees in mechanical engineering from Cornell, and was an instructor at the University of Tennessee during the one year that Coon was there. Apparently they came to the Georgia School of Technology together in 1889. In 1896 Oviatt returned north and began a career in commercial engineering, working for railway and bridge companies and the New York Board of Water Supply.

Thomas Pettus Branch (1864 – 1923)

Thomas Branch obtained a B.S. degree from Vanderbilt and held a variety of engineering jobs for ten years before coming to Georgia Tech in 1895. Although sometimes described as a professor of civil engineering from the time of his arrival at Georgia Tech, the program in that field was not begun until later. Instead, Branch was considered a professor of mathematics, replacing Spain and a recent graduate of the South Carolina Military Academy, D. Jennings Lucas, who had filled in as an instructor for one year upon Spain's departure. (Evidence suggests that Lucas was, in fact, Mrs. Hall's nephew.) In 1902 Branch added the title of “Acting Professor of Civil Engineering” and went on to become the head of the new department in that field. Branch succeeded Lyman Hall as the secretary of the faculty when Hall became president in 1896 and held that position until his death in 1923. One of his two sons, Thomas Pharr Branch, a 1918 Georgia Tech graduate in electrical engineering, was himself an instructor in the mathematics department in 1924.

William Jennings (1863 – 1908)

William Jennings, born in Charleston, South Carolina, also attended the South Carolina Military Academy and graduated in 1886, the same year as Frank Spain. So he, too, was there when Lyman Hall was on the faculty, and he was there in 1883 when Hall married one of his older

sisters, Anne Toomer Jennings. He was therefore the brother-in-law of the president when he was hired by the Georgia School of Technology in 1899. Apparently nepotism was not a problem. The mathematics faculty grew to five for the first time that year, and the catalogue stated of mathematics that there were “more instructors in this department than any other, and often sections are smaller in order to give as much individual instruction as possible.” In 1902 Jennings was promoted from “adjunct” to “junior” professor, thereby gaining the right to vote in faculty meetings. He remained at the institution until 1906, the year after Hall died. He then stayed in Atlanta, living with his sister Sarah and bachelor brother Elliott Jennings, and continued to teach, but died in 1908.

Allan Benton Morton (1870 – 1933)

Allan Morton was born in Pennsylvania of English parents and went to Brown University, where he received an A.B. degree in 1894 and an A.M. degree in 1895. In 1894-5 he was also an instructor at Brown, and he taught at the Park Institute in Pittsburgh before coming to the Georgia School of Technology in 1899, the same year as Jennings. He was the first person in mathematics to have a career of more than thirty years at the school, remaining on the faculty in mathematics until his death in 1933. He was also the first to take a leave of absence, going back to Brown in 1909-1910. In 1925 he earned a Sc.D. degree at the University of Georgia. Somehow he came to be known as “Froggy” Morton, and eventually he was called that by students and by other faculty members alike. Perhaps the name was inspired by a raspy voice, or it might have been related to the “Frog – i – More Rag”, written by Jelly Role Morton about 1908 in honor of an early 20th century vaudevillian with that stage name. In time Morton would become dean of the Apprentice Class and dean of the Summer School. He was also the second director of the Night School, a division that had been created in 1908 to serve those seeking manual training but unable to attend the regular sessions of the school. He was its director from 1917, when the first director resigned to accept an officer's commission in World War I, until 1923. Morton was a charter member of the Mathematical Association of America when it was founded in 1916 and very active in the Southeast Section of the MAA after it was formed at Georgia Tech in 1922. He was the chairman of the section in 1928.

Otto Theodore Geckeler (1873 – 1932(?))

Otto Geckeler came to the Georgia School of Technology in 1903. Students later remembered him as an “irascible German,” although he was actually born in the small village of Patrickburg,

Indiana, possibly of immigrant parents. He received an A.B. degree from the University of Indiana in 1894 and did graduate work at the University of Chicago in 1894-95. In 1899 he married a woman from Seale, Alabama, and the next year was teaching school in his wife's hometown. By 1902 he was the manager of the Columbus, Georgia, branch of McClendon's Agency for Teachers. (Teachers could register with this agency for a fee of twenty-five cents.) Perhaps this is how he learned of a position at Georgia Tech, which he joined the next year. He remained at the school until 1908, serving as the head of the department after the death of Lyman Hall. He spent the next year as a Harrison Fellow at the University of Pennsylvania and then took a position at Whitman College in Walla Walla, Washington. In 1911 he went to the Carnegie Technical Schools, now CMU, (and several years later married a second wife, Cora, nearly half his age, his first wife dying in Atlanta almost fifty years later). In 1924 Geckeler became head of the mathematics department at Carnegie. At Carnegie he was known as "Zero-T" Geckeler. Robert Walker, who went from to Princeton for graduate work in 1930, in an 1984 interview with William Aspray and Albert Tucker, recalled Geckeler as "very smart, but not much trained mathematically," allowing however, that the mathematics program he directed at Carnegie was a good one.

Junior Instructors

During the Hall administration a number of junior instructors were employed for one or two years each, primarily to provide teaching for the Sub-Apprentice Class. These included Floyd Charles Furlow (1898-1899), M. P. O'Connor (1899-1900), P. B. Winn (1900-1902), and W. H. Ferguson (1900-1902), a University of Georgia graduate. Winn was later a superintendent of schools in Elberton, Georgia. Furlow, a Georgia Tech graduate in mechanical engineering, went on to an illustrious career. After serving as an instructor in mathematics, the first Tech graduate to become a member of the faculty, he was put in charge of the experimental engineering laboratory. There he oversaw student projects, including one involving the new plunger type of elevator. President M. L. Brittain, in his book *The Story of Georgia Tech*, relates that at the time Atlanta's first "skyscraper" was being built at the corner of Pryor Street and Edgewood Avenue, and that the contractor had so much difficulty installing the elevators that he turned to Georgia Tech for help. Furlow was sent and soon had the elevators working properly. Supposedly, the contractor was so impressed that he offered to hire Furlow at twice his Georgia Tech salary. In any case, by 1908 Furlow was in New York and the vice president of the Plunger Elevator Company. By 1909 he was a director of several small companies, and by 1917 the president of the Otis Elevator Company. He did, however, maintain his interest in his alma mater and served on the Board of Trustees until his death in 1923.

2. Legends Are Born: The Matheson Years, 1906-1921

Background

Upon the death of Lyman Hall, Kenneth Gordon Matheson, a professor of English, was named chairman of the faculty, as Hall had been when President Hopkins resigned. And, as with Hall, he was named president less than a year later. Matheson was born in 1864 in the old inland South Carolina town of Cheraw. (The house that was the home of the Matheson family for many generations can still be viewed there.) Matheson attended the South Carolina Military Academy, graduating in 1885. So, like the football player Frank Spain and Hall's brother-in-law William Jennings, Matheson would have been at that institution while Hall taught there. During the first ten years after his graduation he served as the Commandant of Cadets at the Georgia Military College in Milledgeville, at the University of Tennessee, and at the Missouri Military Academy, teaching English at the last two. He next attended Leland Stanford, Jr. University, where he earned a master's degree in English. He was hired by the Georgia School of Technology in 1897, early in Hall's presidency. He began as a junior professor, but according to *Engineering the New South: Georgia Tech 1885 – 1985*, written by Robert McMath and other Georgia Tech faculty members, he was quickly promoted to full professor in 1898 due to the “sudden and mysterious” disappearance of the head of his department. He went on to become head of that department before being named president, a post he held until 1922 when he resigned to accept the presidency of the Drexel Institute of Art, Science, and Industry.

One of Matheson's first goals as president was the creation of a library. He had begun one in his office and later located it on the third floor of the academic building. His appeal to Andrew Carnegie resulted in a grant of \$20,000 for a library building on the condition that Georgia Tech would provide \$2,000 for its support, and the 1905-1906 catalogue announced that, “a model library building will grace the campus at the beginning of fall (1906) term.” The campus was growing as well with the purchase of additional lots on Cherry, Kimball, and Fowler streets, and of more land on the eastern side of the campus, including two thirds of the site of the present day Grant Field (the remaining third being donated by John W. Grant). In 1906 the first “Greater Georgia Tech Campaign” was launched, one of the earliest usages of now familiar shortened name for the school. In 1908 the architecture program was begun, and in that same year the Night School was opened. This was also the year in which the first edition of the yearbook, the Blue Print (then two

words), appeared. The school newspaper, the *Technique*, would come along three years later. In 1912 the Co-Operative Program was begun under direction of Professor Branch. In 1912 the School of Commerce was begun. Although women would not be admitted to Georgia Tech until 1952, an act of the General Assembly at the time specifically allowed for their admission to the late afternoon and evening classes offered by the School of Commerce, given that these were not to be held on the campus. Instead they were held in downtown office buildings. This would later become a part of the University of Georgia, and eventually, in 1951, become Georgia State University. World War I led to the creation of the School of Military Aeronautics and R.O.T.C. It was estimated that 35% of all of the Georgia Tech graduates were in active service at some point, a majority being commissioned officers. Among the faculty members who enlisted was a mathematics instructor by the name of William Alexander, who would later become famous in athletic circles.

During the Matheson administration the Georgia Tech Y.M.C.A. came to play a central role on campus. This organization had begun around 1890 during the Hopkins presidency and met in the Swann dormitory during the Hall years. In 1912 funds from John D. Rockefeller made possible the construction of the Y.M.C.A. Building across North Avenue from the campus. That building is now the L.W. "Chip" Robert, Jr. Alumni/Faculty House, named for a prominent alumnus who was yet another one time mathematics instructor. After its construction it became an early version of a "student center," containing bowling alleys, pool and billiard rooms, and a barber shop, as well as reading rooms and an auditorium. Mathematics faculty members, including Field, Morton and Alexander, played important roles in its activities.

The later years of the Matheson presidency saw the first stirrings of research at Georgia Tech. In 1914 Matheson had pushed for a campus power plant to provide steam and electrical power, and pointed out that it would provide "power laboratory experience and research facilities for faculty and students." The legislature declined to provide money for such a project, but it went ahead with private funds. Later Matheson would state that the mission of Georgia Tech should be, "teaching first, then research, and finally extension work among the people of the state." In 1919 Dr. Andrew M. Soule, the president of the State College of Agriculture, a powerful division of the University of Georgia, campaigned to have the Engineering Experiment Station, now G.T.R.I., established in Athens. The Station had been authorized by the General Assembly that year (although it would receive no state funds until 1934). More than likely Soule was motivated by the Smith Howard Act of 1917 which called for federal funds to be provided for vocational training and engineering research. The resulting dispute was settled by the legislature which, at Matheson's urging, passed an act placing the station at Georgia Tech. He was not successful, however, in obtaining any of the funds provided for Land Grant Colleges under the Morrill Act.

The size of the student body grew only modestly in the first years of this period. A 1910-1911 report to the State Department of Education listed 815 students, including those in the night school and summer school. They came from 17 states and 97 Georgia counties. The same report mentioned that the parents of these students included 124 merchants, 85 farmers, 45 manufacturers, 38 physicians, 22 engineers, 20 traveling salesmen, 17 teachers, and 11 cotton merchants. Each county of the state was now entitled to 15 free scholarships, and the resident tuition for others was \$100, with \$25 in fees. The faculty had grown to 56. By 1919-1920 the net overall enrollment was 2032, not counting 177 who were listed as “non-collegiate.” This growth reflected, in part, a surge that occurred after World War I.

In 1906-1907, the second year of the Matheson administration, the mathematics department added two new members, Floyd Field and Vernon Skiles, who would remain at Georgia Tech for nearly forty years and play a large role in its development. These two, along with Froggy Morton, and later David Leslie Stamy and David Melville Smith, would remain the mainstays of the mathematics department for several decades. The mathematics department grew from five or six in the first years of the Matheson period to nine by 1912-1913. It shrank somewhat during the first world war but had reached eleven by 1921. All but Field, Skiles, Morton, Stamy, and Smith were junior instructors or assistant professors, most remaining at Georgia Tech for just one or two years.

In 1915 a group of people associated with the *American Mathematical Monthly*, which had begun publishing in 1894, approached the Council of the American Mathematical Society with the idea of setting up a division devoted to the interests of collegiate mathematics teaching. Having been rebuffed by the Society, they circulated a letter to gauge support for a separate organization. With several hundred positive responses, they met in Columbus, Ohio, in December of that year and founded the Mathematical Association of America. Field, Morton, Skiles, and D. M. Smith were among the Charter Members, which included anyone enrolled between January 1 and April 1 of 1916. Early in 1916 Dean R. P. Stevens of the University of Georgia arranged a meeting to organize a Southeastern Section of the new MAA. Too few were able to attend, and a second effort failed again in 1917. Finally in 1921 Floyd Field hosted a successful organizational meeting at his home in Decatur, with representatives of the University of Georgia, Emory, Agnes Scott, and the Alabama Polytechnic Institute, now Auburn. In April of 1922 the first meeting of the Section was held at Georgia Tech with 63 people in attendance. There were five talks, including “Some Possibilities of the Slide Rule” by D. M. Smith and “Einstein's Theory of Relativity” by W. S. Nelms of Emory. In that year all six of the junior instructors in the Georgia Tech department of mathematics were listed as members of the MAA.

The Curriculum

By 1905-1906 the names of the individual classes had changed to the current ones. The “Sub-Apprentice Class” had become the “Apprentice Class,” followed by the freshman, sophomore, junior, and senior classes. In the apprentice year the curriculum called for algebra through quadratics, graphical representation, and solution of equations, using Lyman Hall's *Elements of Algebra*. The entrance examination for freshmen now called for geometry as well as algebra. The freshman courses covered algebra, including higher simultaneous equations, inequalities, proportion, variation, progressions, logarithms, the binomial theorem, limits, undetermined coefficients, and partial fractions, as well as analytic geometry, and trigonometry using Crawley's *Trigonometry*. In the sophomore year there were solid analytics, calculus, the theory of equations, and differential equations. Mathematics continued in the junior year for all but the students in the textile program and consisted of special topics, review, and applications “suited to the needs of the classes.” Over the next few years these would include, for example, spherical trigonometry and least squares for those in civil engineering, and vector analysis and Fourier series for those in electrical engineering, with differential equations for both. No mathematics for the senior year was listed in the catalogue of that year.

By 1912 individual course descriptions were included in the catalog. Those with numbers less than 11 were the algebra and geometry courses taught by junior instructors for the apprentice students. Course number 11 was the algebra portion of the freshman curriculum, taught from Hall and Knight's *Algebra for Schools and Colleges*. Mathematics 13, 16, and 18 were the other freshman courses, while 21, 25, and 26 were the sophomore classes, including the calculus, taught by people such as Field, Skiles, and Morton. Courses numbered in the thirties covered the topics available for juniors.

A 1913 article by S. Epstein of the University of Colorado, published in Volume 20 of the *American Mathematical Monthly*, listed that author's view of the “irreducible minimum” of mathematics for engineering students at the time. Most of the topics, if not all, were available at Georgia Tech. The suggested entrance requirements for freshmen were listed as one and a half years of algebra, one year of geometry, and one half year of solid geometry. In the freshman and sophomore years the article called for one semester of algebra, including exponents, logarithms, determinants, quadratic equations, arithmetic and geometric progressions, the binomial theorem, series, complex numbers, vectors, partial fractions, permutations, combinations, and probability, as well as one semester of trigonometry, and one semester of “engineering analytics” including polar coordinates, conic sections, transformation

of coordinates, and coordinates in space, and finally the calculus, including differential equations. The junior year courses were differential equations, at least as an elective for those in civil, mechanical, and electrical engineering, and least squares, which was described as including probability, error analysis, approximation formulas, and normal equations. The senior year electives recommended were determinants and the theory of equations, Fourier equations, Bessel functions, vector analysis, hyperbolic functions, harmonics, and partial differential equations.

By 1908, in addition to the engineering and science courses, Georgia Tech had courses in business English, economic theory, general history, political economy, and physical geography. Since there was no other home for these subjects, all were taught in the English department, giving a hint of the structure of what would much later become the Ivan Allen College before the College of Management was spun off from it. The Modern Languages Department had been created in 1904 during the Hall administration, and in 1908 all students except those in the textile program were required to take two years of foreign language.

The Faculty

Floyd Field (1873 – 1958)

Floyd (“bobcat” or “bocat”) Field was born in Salem, Oregon, the sixth of twelve children, four of whom died in infancy. He attended Willamette University and received his A.B. degree there in 1897. He received another A.B. From Harvard in 1900 and in 1900-1901 taught mathematics and physics at the Allen School for Boys in West Newton, Massachusetts. In that year married Lillian Roblin, also from Oregon. In 1902 both he and his wife received A.M. degrees from Harvard and his first son, Burt, was born. In 1902-1903 he taught mathematics at Pennsylvania State College. From 1903 to 1906 he was head of the mathematics department at the Evanston Academy of Northwestern University. At that school he was interested in teaching algebra and geometry together and designed a two year program to do so, a part of which was published in *Science Magazine*. His second son, Gilbert, was born in 1904. During that period he also visited the University of Chicago, weekly in the last two years, and took one course there in 1905-1906. He was the secretary of the Northwestern Science Club and reported on its activities in *Science Magazine*. An article he wrote on “Elementary Education” appeared in May of 1906 in the *School Review*, later the

American Journal of Education. In 1906 he was hired by Georgia Tech as an instructor. In a note which appeared in a Harvard alumni publication he stated that the ill health of his oldest son was the reason for his move to the South. In his second year he was made an assistant professor. In his third year, with Hall gone and Otto Geckeler off at the University of Pennsylvania, he became acting head of the department. In his fourth year he was made a full professor and head of the department. In 1912 he went back to Harvard for a year, but during that year his wife died and he returned to Atlanta. He remarried in 1914 and later had a daughter and third son.

Without a doubt Field is best remembered by Georgia Tech alumni (and on the web) as the first owner of the “Ramblin' Wreck.” The term itself apparently goes back much further. Some claim it's first association with vehicles referred to cars cobbled together by early Georgia Tech engineers working on the Panama Canal which opened in 1914. But Field owned the first, albeit unofficial, Ramblin' Wreck in Atlanta. It was a 1914 Model T Ford which he purchased in 1916. Field was an avid motorist, and for years he drove his Model T everywhere. This included to and from his home, which after 1920 was a house that he and his eldest sons had built in Decatur, as well as to his old home in Oregon, and to meetings of the American Mathematical Society and Mathematical Association of America all over the country. In 1927, despite complaints from students, he decided to retire the vehicle. The *Technique* ran an obituary for the old car which read in part, “The car itself was a stimulus to flagging spirits. What persistence lay in its performance, as year in and year out it hauled the Dean to and from school. Of course its body was not in keeping with the latest style, or its color one to excite an artist, but what can be more beautiful than faithfulness. Who can ask more of machinery other than to have it run.” In 1929 and 1930 the Model T was remembered by road races from Atlanta to Athens, but when these were deemed too dangerous by Field and others, they were replaced by the Ramblin' Wreck Parades held on campus. Field led the first one in 1932.

In 1921 Field lobbied the Trustees for the creation of the post of dean of men, and when they agreed he was given the position himself - with the understanding that he would remain head of the mathematics department, continue to teach ten hours a week, and get no increase in pay. He remained a dean, eventually the dean of students, until his retirement in 1946. He remained head of the department until 1934 when that position was taken over by D.M. Smith.

During his more than two decades as dean Field was involved in nearly every aspect of life on campus. He is often credited with having created the Greek system at Georgia Tech. In fact fraternities had been around for some time, the first, ATO, having been founded at Georgia Tech already in 1888, and the second, SAE, in 1890. But Field did create a fraternity “system.”

He organized an Interfraternity Council, oversaw the establishment of the fraternity row along Third Street, and insisted the houses follow sound business practices and be ranked according to average GPA. He, along with Vernon Skiles and others, brought the leadership honor society, ODK, to Georgia Tech, as well as Phi Eta Sigma, an honor society for freshmen. In 1931 at an annual meeting of the National Interfraternity Society in New York he gave a long report on regional conferences, something which he had begun in the Southeast. NASPA, a national organization for student affairs administrators in higher education, named him their "Hero of the Year" for 1925-1926, and the next year he was president of that organization. In 1998 the national Theta Chi fraternity initiated their annual Floyd Field Award for outstanding Greek affairs professionals. Field was already a member of the AMS in 1915 and became charter member of the MAA in 1916, serving as the first Governor of its Southeastern Section. He belonged to the School Science and Mathematics Association as well as the Georgia Academy of Science and was active in the affairs of the Georgia Tech YMCA. Throughout his career he attended and gave countless talks at meetings and banquets of these and other organizations. Meanwhile, he served a term as the superintendent of the Sunday school of a large Methodist church.

The 1946 Blue Print was dedicated to Field when he finally retired that year. He was succeeded as dean by G. C. Griffin, another former mathematics instructor, who had been his assistant for 13 years. Field remained active even after that. In November 1951, for example, at the age of 78, he represented Georgia Tech at a conference in Athens (whose topic was, fittingly, gerontology). In 1962, four years after his death, the Floyd Field Residence Hall at Techwood and Bobby Dodd Way was dedicated to his memory.

William Vernon Skiles (1879 – 1947)

William Skiles was born in Troy Grove, Illinois. Like Field, he came from a large family, with nine brothers and sisters, and seven half-siblings by his father's first marriage. He received a diploma from Illinois State Normal University in 1901, and after a couple years of public school teaching, went to the University of Chicago where he received a B.S. degree in 1906. Later he would obtain a A.M. degree from Harvard in 1911 and a Sc.D. degree from the University of Georgia in 1926. Skiles career at Georgia Tech was very similar to that of Floyd Field. Both came to Georgia Tech in 1906, both became deans in the twenties, and both continued in those positions until their retirements in the middle forties. In Skiles' case he became the academic dean in 1925 after the retirement of Georgia Tech's first dean, William Henry Emerson. He later described the duties of the dean as being in charge of everything that the president didn't want to handle. If a student wished to withdraw, his parent or

guardian had to send a letter of approval directly to Skiles. A Georgia Tech alumnus, William Lloyd Johnson, Jr., writing in an alumni publication, recalled that in the forties Skiles was the “unofficial chairman of the Fulton County Draft Board” since “if you had a deferment, and he felt your grades were unsatisfactory, one phone call and you were on your way to the armed forces.” Robert Wallace, in his book *Dress Her in White and Gold*, quotes Fred Ajax, once a proctor in the Techwood dorm and eventually Tech's director of placement, as follows: “When Dean Skiles became angry at a person, he refused to speak to him under any circumstances. He and Dean Field went two years without speaking in the early forties, and I received a great deal of experience as a go-between in those days.” By then, of course, both were well past sixty. Ajax relates one incident in which he served as a go-between, and which reveals both range of Skiles duties as dean and also something of his temperament. There was a Naval Officers Training Program on campus and Skiles himself was responsible for making all decisions concerning transfer credit for those entering that program and also for making out their schedules. He often refused to grant credit for work done elsewhere as not up to Georgia Tech standards. But a friendly young officer with the program would nonetheless rewrite the schedules, placing the trainees in more advanced courses. Ajax states that, “Dean Skiles told me that he was ready to throw the navy off campus unless the practice was stopped, and the young officer removed from campus.” At that time Ajax was himself a reserve naval officer assigned to Emory. When Ajax finally persuaded the program's commanding officer, who apparently was also a bit hard-headed, to concede to all of the dean's demands, Skiles simply said “Have him send me a letter to that effect and I'll think it over.” The offending young officer was gone in 24 hours.

Although clearly not a man to be trifled with, Skiles was apparently liked well enough by the students. He is said to have attended almost every social event on campus and to have made almost all of the trips to away games with the football team. (He had taught Coach William Alexander, who replaced Heisman in 1920, when Alexander was a student. They had both arrived at Georgia Tech in the same year.) The Blue Print was dedicated to him in 1927 and again in 1935. The 1935 dedication said of Skiles that, “by reason of his unfailing courtesy, his sympathetic understanding, and his ever present sense of right and fair play, has won the confidence of the students and made them his admirers and friends.” In 1943 the ANAK Society awarded him their Distinguished Service Watch, and 1995 the Beta Theta Pi fraternity created their William Vernon Skiles Alumni Service Award.

Skiles was still teaching calculus in the forties, wearing a hearing aid because of his increasing deafness. When a student of that era complained that Skiles wasn't using the same symbol for the logarithm as the text, he was told that, “I've been teaching for 36 years,

and that's the way we're going to do it.” When he finally did retire in 1945 Lauren Norvell, writing in the *Atlanta Journal*, hailed him as “Tech's Mr. Chips.” In 1964 the Bauhaus-inspired Classroom Building, first occupied in 1959, was renamed in his honor. The plaque which features his likeness on the library side of the building was unveiled by another mathematics faculty member, Ralph Hefner, by then dean of the General College.

David Melville Smith (1884 – 1962) D. M. “Doc” Smith, like Floyd Field, is another one of the memorable figures in the history Georgia Tech. President Brittain, writing in his *The Story of Georgia Tech*, states that Smith “was among the very pillars of Georgia Tech during its formative years” and that “since the days of J. S. Coon he has been the most interesting and talked about professor of the school (Coon having been the head of the mechanical engineering department from 1889 to 1923). Echoing Brittain, Robert Wallace wrote in his biography of Georgia Tech that, “only D. M. Smith of the mathematics department ever attained anything like the adulation given to Dr. Coon,” adding that, “the mathematics department seems to have been the main source of supply of men-turned-legends at Tech.”

Smith was born in Nashville, Tennessee, and attended Vanderbilt University, receiving an A.B. degree there in 1905 and an A.M. degree the following year. He began his teaching at Centenary College in Louisiana and taught next at Fort Worth University, later a part of Oklahoma City University. In 1910 he went to the University of Chicago for further graduate work and in 1913 was hired by Georgia Tech. He received his Ph.D. from Chicago in 1916. His thesis work was on the calculus of variations, the main interest of his advisor Gilbert Bliss, and an article bearing the title of his dissertation, “Jacobi's Condition for the Problem of Lagrange in the Calculus of Variations” appeared in the *Transactions of the A.M.S.* in 1916. In 1914 he was promoted to assistant professor, in 1922 to associate professor, and in 1934 to full professor and head of the department. He remained head of the department until 1950 and retired in 1954. In 1959 he was named an Honorary Alumnus by the Alumni Association.

William Alexander had graduated from Georgia Tech in 1912 and when Smith arrived was an assistant to Coach Heisman and an instructor in civil engineering. They were fraternity brothers and soon became fast friends, a friendship that lasted their entire lives. Together they would later devise an athletic tutoring program, particularly for football players. Smith is remembered by some primarily for helping insure that those players “made the cut academically” so that they could continue to play. After his retirement Smith worked for the tutoring program until his death in 1962, although Wallace quotes coach Bobby Dodd as saying that during his last two years he returned his paycheck to the Athletic

Association each month because he felt he had not earned it.

The pages of Georgia Tech alumni publications contain many reminiscences of “Doc” Smith. Among them are the following.

Fred C. Luther, EE '55 - “The absolute highlight of my academic career at Tech was my three quarters of calculus under Professor D. M. Smith. I can still remember him referring to our class as a hopeless bunch of 'Swamp Bunnies' incapable of absorbing his teaching. He made calculus very easy for us, never used a textbook, and taught us to take organized notes.”

Luther, having encountered Smith near the end of his career, recalled him as being a small white haired gentleman with a noticeable limp, caused by one short leg, who always wore a black suit and bow tie and who drove a black 1930's coupe, perhaps his version of the Ramblin' Wreck.

Charles Byrd, ChE '48 - “I am reminded of D. M. 'Doc' Smith who was a great teacher and a Georgia Tech legend. He always gave 10 quizzes each of 10 problems.” Byrd relates that when a student pushed for partial credit on one of those problems, Smith agreed, taking the one from the ten, him and giving what was left.

Finally Boutwell Luther, a 1922 graduate speaking in his 100th year, said that two faculty members still stuck out in his mind. One was Dean Emerson, and the other Smith. “I'll never forget D.M. Smith. He was my professor of mathematics when I flunked. He was a good-hearted guy; I liked him. But I just couldn't make any sense of calculus. It was a hopeless case for me; he couldn't pass me.”

Upon Smith's retirement, Oscar Davis, also from the class of 1922, said that “When one of those rare and wonderful teachers does appear as a professor in the classroom, it is a miracle, but one that is not fully appreciated until more mature years come to the student. It is such people who make memories and colleges. In my book D. M. Smith is one of them.”

Although remembered primarily as a great teacher and strong supporter of the football team, Smith did take significant steps to strengthen the mathematics department after becoming its head. Unfortunately these were largely reversed later due to political developments both local and global. The 1923 English collegiate building at the corner of Cherry Street and Bobby Dodd Way is named in his honor.

David Leslie Stamy (1885 – 1944)

David Stamy was the fifth and last of those teaching during this period who remained in the mathematics department throughout their careers. Stamy was born in Pennsylvania and attended Ursinus College, obtaining his A.B. degree in 1908. After teaching in the public schools in Pennsylvania he went to the University of Chicago where he earned an A.M. degree, with a thesis entitled “Formulas Relating the Movable Trihedra of Two Twisted Curves.” He was hired as an instructor at Georgia Tech in 1913, the same year as D. M. Smith, and remained in the department until his death. He was promoted to assistant professor in 1921 and to associate professor in 1926. In 1939 he became assistant head of the department. While Stamy did not become a dean like Field, Morton, and Skiles, nor leave as deep an impression as D. M. Smith, his many years of dedicated teaching did not go unappreciated. In fact, the 1941 yearbook was dedicated to him, calling him, “one of the most deserving men at Tech.”

The Junior Faculty

The list of junior faculty in the department during this period is a long one. Most were hired as instructors primarily to teach the courses for the apprentice class, and only remained at Georgia Tech for a year or two. The list includes A. Bramlett (1905-07), J. F. Travis (1905-06), E. C. Colpitts (1906-07), J. B. Smith (1906-07), R. C. Morrow (1907-09), L. W. Murphy (1908-1913), L. W. Robert, Jr. (1908-1909), T. L. Kelley (1909-10), F. S. Nowlan (1909-10), W. R. Wright (1909-12), P. S. Connor (1910-11), J. McCormack (1910-11), J. W. Speas (1910-13), A. M. Withers (1910-11), W. M. Johnson (1911-12), W. A. Alexander (1914-16), B. B. Strang (1912-13), B. H. Farquhar (1912-13), W. S. Beckwith (1913-14), L. E. Williams (1914-15), P. E. Hemke (1914-18), E. R.C. Miles (1917-18), G. A. Bingley (1918-19), H. G. Shaw (1918-1919), H. A. Simmons (1919-20), E. B. Wilson (1919-1923), W. H. Boerkle (1919-1922), W. W. Elliott (1920-21), J. L. Driscoll (1920-23), Z. N. Holler (1920-21), R. I. White (1921-23), G. T. Trawick (1921-23), and P. L. Armstrong (1921-23).

Several of these became public school teachers, including William Herman Boerkle and Robert Irving White, both from the University of Pennsylvania, John Francis Travis from Ohio State, and B. B. Strang, from Columbia. (While a student Travis had submitted many solutions to problems in the *American Mathematical Monthly*. This was before the existence of the MAA and sometimes as much as two thirds of the Monthly then consisted of such problems . Otto Geckeler had contributed to a solution in the very first issue in 1894.) More than a dozen others went on to long academic careers, often quite distinguished (although not all in mathematics).

Percy Lamar Armstrong had a bachelor's and a master's degree from Southwestern Presbyterian University, now Rhodes College, in Memphis. After serving at Georgia Tech he returned to that institution. His father-in-law, Austin Peay, had become the governor of Tennessee while he was at Georgia Tech. In 1934 Armstrong was arrested for kidnapping his own son, Percy Lamar Armstrong, Jr., and taking him from Tennessee to Denver. (His wife had been granted custody of the governor's grandson in a divorce settlement several years earlier.) Armstrong, and a younger man arrested with him, stated that they had intended to open a restaurant in Denver.

Wightman Samuel Beckwith was born in Covington, Georgia, and graduated from the Georgia Military Academy in 1906. In 1909 he earned a bachelor's degree at Emory and the next year taught at Centenary College with D. M. Smith. He came to Georgia Tech in 1913, the same year as Smith, but the next year went to Texas A. and M. After one year there he went to Harvard, where he earned a Master's degree in 1917. He taught next at Ohio Northern University. After five years there he did additional graduate work at Chicago and was hired by the Georgia State Teachers College in Athens. In 1932 he moved to the University of Georgia and remained there for the rest of his career. He died in 1968.

George A. Bingley had graduated from Princeton and done missionary work as an English teacher in Japan before serving as a mathematics instructor at the U. S. Naval Academy during the war. He began at Georgia Tech in the fall term of 1919 but, having already secretly taken an examination to regain his post at the Academy, when that appointment came through he left "without warning." The Trustees made it clear that they were not pleased. In 1924 he became an assistant professor at St. John's College, where he remained for twenty-five years.

Andrew Bramlett, attended the Georgia Military Academy, and the Citadel. He later taught and was commandant of cadets at Clemson University. He served in World War I as the commander of a coastal artillery unit. He died in 1951 and is buried in the Marietta National Cemetery.

Elmer Clifford Colpitts earned his bachelor's degree at Mt. Allison Academy in New Brunswick, Canada, and a doctorate at Cornell 1906. He came to Georgia Tech the next year, the first member of the department with a Ph.D. After one year he moved to Emporia College in Kansas. Four years later he joined what is now Washington State University, finishing his career there in 1955. (In 1924 his older sister Julia also earned a Ph.D. in mathematics at Cornell.)

Peter Stokes Connor was yet another graduate of the Citadel, having received his degree there in 1907. Later he returned to his native South Carolina and devoted himself to farming, while his wife made a career of teaching. He died in Branchville in 1942.

William Whitefield Elliott held a bachelor's degree from Hampden Sydney College and a master's degree from the University of Kentucky when he came to Georgia Tech. He then went on to obtain a Ph.D. degree from Cornell University in 1924 (along with Julia Colpitts), taught a year at Yale, and was hired by Duke University the next year. At Duke Elliott became the acting head of the department and wrote a number of textbooks, some with E. R. C. Miles. He later endowed the W. W. Elliott Research Assistant Professorship at Duke.

Benjamin Harrison Farquhar was born in Lake Charles, Louisiana, and entered Washington and Lee in 1906. He took two years off to teach in Louisiana high schools, but returned to Washington and Lee to receive his degree in 1912, whereupon he became an instructor at Georgia Tech. He next went back to Washington and Lee to earn a master's degree, and then returned to Lake Charles, where he worked as a civil engineer, first for a sulfur mining company, and later for the state. He died in Houston in 1969.

Paul E. Hemke became one of the pioneers in aeronautical engineering education. After Tech he taught at Northwestern and then at U. S. Naval Academy alongside Bingley. Next he was employed by the National Advisory Committee of Aeronautics at Langley Field. He obtained his Ph.D. at Johns Hopkins in 1924. After a stint at Case and a Guggenheim Fellowship, which he used to study aerodynamics, he became the first chair of the aeronautical engineering department at Rensselaer. In 1951 Hemke was appointed dean of the faculty at Rensselaer. In 1956 he became vice president, and in 1957 provost as well. After his retirement in 1958 he taught in the mathematics department part time until 1963. That university now has a Hemke lecture series and a Paul E. Hemke Award for the best undergraduate in aeronautical engineering.

Truman Lee Kelley received his A.B. degree at the University of Illinois in 1909. He became an instructor at Georgia Tech the next year. After one year he went to Columbia University, where he received an A.M. in psychology in 1911. He spent the next year in Fresno, California, teaching in a high school and a junior college. By then he had become interested in the new field of psychometrics, and he entered Columbia University, where he received a Ph.D. in 1914. He would eventually go on to be highly influential in the introduction of statistical methods in psychological studies. He taught at the University of Texas from 1914 to 1917 and at Teachers College, Columbia University from 1917 to 1920 before going to Stanford. There he

participated in the development of the widely used Stanford Achievement Test Battery. In 1931 Kelley moved to the Graduate School of Education at Harvard, and remained there until his retirement in 1950. He was the author of a dozen books, some of the most influential being *Statistical Method* (1923), *Interpretation of Educational measurements* (1927), and *The Kelley Statistical Tables* (1948). He served as president of the Psychometric Society in 1938-39, vice-president of the American Statistical Association in 1926. He was also a co-founder of the national honorary education society Kappa Delta Pi.

Joseph McCormack was born in Cleveland and grew up in Vermont. He attended Middlebury College, where he graduated with high honors as class valedictorian. After his short stay at Georgia Tech he pursued a teaching career in New York state. He became the chairman of the mathematics department at Theodore Roosevelt High School, at one time the largest high school in the world, and also served on the New York Board of Regents. He was the author of 15 textbooks. One of these was one of the most successful and widely used geometry texts in the first half of the twentieth century. It contained a rigorous treatment of Euclidean geometry but also had practical applications and photographs of man-made structures. His texts are said to have done much to change the way mathematics was taught in American schools. In 1937 Middlebury awarded him an honorary doctorate. He retired to Florida and died there in 1962.

Edward Roy Cecil Miles, a Georgia Tech graduate in electrical engineering, taught one year University of Georgia after Tech, became an Instructor at West Point, and later obtained a Ph.D. from Rice. He went on to Duke where he wrote textbooks with Elliott as well as the book *Supersonic Aerodynamics, a Theoretical Introduction*, based on a course he developed during a two year stay at Johns Hopkins.

Lawrence Washington Murphy had a bachelor's degree from Vanderbilt when he came to Georgia Tech. After five years he went to Harvard where he earned a master's degree and served as an instructor for one year. Later he taught at the Hotchkiss School.

Frederick S. Nowlan taught at Columbia University, Carnegie School of Technology, Brandon College in Manitoba, and Bowdoin after his year at Georgia Tech. In 1925 he obtained a doctorate at Chicago and went to the University of Manitoba for one year. He next joined the faculty of the University of British Columbia and remained there for twenty years. During that period he did research on division algebras and the history of numbers and helped organize the Pacific Northwest Section of the MAA. He was that section's first secretary/treasurer. In 1948 he moved to the University of Illinois, where he finished his career.

Hubert Grover (de Grafeur) Shaw had attended Oberlin College and had a bachelor's degree from Harvard when he came to Georgia Tech. He MAY also have had a doctorate in chemistry. Harvard records indicate that he was born in Fall River, Massachusetts, in 1869. After Oberlin he had a scholarship at Harvard in 1892-1893 and was appointed as an assistant in chemistry that year. In 1893 he wrote a paper with Theodore William Richard who would go on to receive the Nobel Prize in chemistry in 1915. Shaw's Harvard A. B. is listed as having being awarded in 1894 "of the class of 1893." In 1893 he married Elizabeth A. deQuedville, and in 1894 he was teaching in Toledo, Ohio, where his son, Charles Bunsen Shaw, was born. (Charles Bunsen would become a fairly well known college librarian and author.) By 1907 Shaw was back in New England. Over the next decade he taught at a lengthy list of private and public schools. During this period Harvard alumni publications began to list Shaw as having a 1894 Ph.D. in chemistry from Ohio University as well as his Harvard degree. He next joined the chemistry faculty at Georgia Tech. In September of 1918 he filled out a draft registration card on which he listed himself as a "student" living in room 722 of the Y.M.C.A building on North Avenue with closest relation A. B. "Froggy" Morton, and giving his birth year as 1880, making him 38 rather than 49. He carefully omitted a middle name of that form but then began appearing in Georgia Tech faculty lists as "Hubert de Grafeur Shaw." When William Alexander, later Coach Alexander, resigned to enter the service Shaw replaced him and so was listed in the 1919 Blue Print as an instructor of mathematics. That listing showed only his Harvard A.B., but later editions would always include a Ph.D. In 1919 the Trustees noted that Shaw would return to chemistry when Alexander returned. He then continued as an instructor and assistant professor of chemistry. The 1925 Blue Print showed him as Hubert de Grafeur Shaw in the faculty list, but also as H. G. Shaw in a list of faculty belonging to an on campus Free Mason organization. A few years later he was living in Kansas and in 1928 was admitted to the Kansas Academy of Science (as Hubert deG. Shaw). In the 1930 census he listed himself as a professor of chemistry living in Atchison, Kansas. But by 1931 he was H. G. Shaw again, and using a Gainesville, Florida, address for an item he placed in a Situations Wanted column in the *Chemical Engineering News*. That item read, "POSITION WANTED by Ph.D. in chemistry with mathematics equivalent." In the same year he published a letter on the conversion from centigrade to Fahrenheit which listed his affiliation as the Georgia School of Technology. By 1936 he was listing his affiliation as the University of Florida. The next year he obtained a position as Dean of Science at Oglethorpe University but died that year.

Harvey Alexander Simmons was a graduate of the University of Chicago when he came to Georgia Tech. After leaving Tech and spending a period at the University of Pittsburgh, he returned to Chicago to earn his Ph.D. in 1925. He then joined the faculty at Northwestern University. While there he wrote popular textbooks on college algebra, trigonometry, and

matrix and tensor calculus. After retiring from Northwestern he taught at Indiana University of Pennsylvania.

J. B. Smith, who held a master's degree, went on to teach at the University of Virginia and later at Hampden Sydney College before serving in World War I as a statistician.

Leister Earl Williams held a bachelor's degree from the University of Chicago when he came to Georgia Tech. He left to enter the armed services, and after the war returned to Chicago to obtain a master's degree. Later he went to the Woman's College of Alabama in Montgomery, now Huntington College, where he became the dean of the college in 1932. He died in Alabama in 1966.

Alfred Miles Withers was born in Virginia and obtained his bachelor's degree at Washington and Lee in 1906. In the next few years he served as an assistant principal in Abingdon, Virginia, and as instructor of English and French at the Augusta Military Academy before becoming a mathematics instructor at Georgia Tech. He next attended Johns Hopkins University, then served as a professor of modern languages for three years at Millsaps College in Mississippi. He next taught for two years at Davidson and served for one year as the acting head of the French department of SMU, followed by three years at William and Mary. In the meantime he did graduate work at the University of Chicago, Grenoble, and at the University of Pennsylvania, where he obtained a Ph.D. in romance languages in 1923. The next year he went to the University of Tennessee, where his wife, Helen Dandridge Withers, was also hired as an assistant professor of art. But during that year his wife was fired along with six others. Those firings caused a controversy because it was claimed that some were let go simply because they favored integrated education, which the university denied. Both then went to Concord State Teachers College in West Virginia. Alfred remained there, publishing in language and education journals well into the 1960s. After his retirement he also taught at VPI before dying in 1966.

Winthrop Robins Wright was born in New Jersey in 1888 and received his bachelor's degree at the University of Michigan in 1909. He spent the next three years as an instructor in mathematics and physics at Georgia Tech. Then, after attending Columbia University for one year, he returned to Michigan where he earned a Ph.D. in physics in 1918. The next year he joined the department of physics and astronomy at Swarthmore College and remained there throughout his career. He soon became involved in the activities of Swarthmore's Sproul Observatory, and often traveled to locations where one could observe an eclipse, including a trip to Mexico in 1923. In 1926 he and his family traveled to Great Britain, where

he was inducted as a Fellow of the Royal Astronomical Society. He continued to write about astronomy and physics education almost until his death in 1953.

Among these early junior instructors who went on to careers outside of academia are Morrow, Holler, Johnson, Speas, and Robert.

Rufus Clegg Morrow earned a bachelor's degree at the University of North Carolina in 1903 and had done agricultural and industrial school mission work with his parents in Mexico before coming to Georgia Tech. He returned to Mexico as a missionary in 1909 and remained there until the death of his wife in 1951. He died in Ohio in 1968.

Zeb North Holler, who had graduated from Davidson in 1908, and taught at Oklahoma A. and M., became an instructor at the University of Pittsburgh after his one year at Georgia Tech, but eventually returned to his home town of Greensboro, N. C. and became a sales representative for a chemical company. His son, Zeb North Holler, Jr., was a prominent Presbyterian minister and civil rights worker in Atlanta and Greensboro who led the investigations after the "Greensboro massacre" of 1979.

Wilbur Moore Johnson graduated from Ohio Wesleyan University and did graduate work at the University of Michigan, Harvard, and the University of Chicago. After leaving Georgia Tech he entered the insurance business and in 1926, after working for several different insurance companies, joined Central Life of Illinois as an actuary. In 1929 he was listed as vice president and actuary at that firm and in 1951 became its president. He was a Fellow of what would later be the Society of Actuaries, a charter member of the American Academy of Actuaries, and served as treasurer of the American Institute of Actuaries from 1928 to 1937. He died in 1976 at the age of 94.

Jeannie (James) Whewell Speas was born in Donnah, North Carolina, near Winston Salem, and entered the University of North Carolina in 1904, receiving his first degree in 1908. Having been first in his class and president of Phi Beta Kappa, he was awarded a fellowship for 1908-1909 and earned a master's degree in mathematics that year. (In the same year the first master's degree in mathematics at the University of Georgia was awarded to Tomlinson Fort.) After a year serving as the principal of a North Carolina school Speas became an instructor at Georgia Tech, teaching courses for apprentice students. Upon leaving Tech he entered the employ of the Trust Company of Georgia, then went to the National City Company, the securities marketing division of the National City Bank of New York. In 1922 he opened the Atlanta office of the

Hibernia Securities Company and in 1924 formed the brokerage firm Bell, Speas & Company. He got out of that business in 1929 and joined the investment department of the First National Bank of Atlanta (later Wachovia) in 1930. A year later he was placed in charge of the bank's investment portfolio and in 1936 made a vice president, with the title of Trust Officer being added in 1940. In 1949 he was named to the board of trustees of the Employees Retirement System of Georgia and was elected to a second term in 1953. After his retirement he was associated with Norris and Hirshberg, investment brokers. He died in 1969 at the age of 81.

The name of **Lawrence Wood (Chip) Robert, Jr.** is still well known at Georgia Tech. The Faculty/Alumni House is named for him. Robert graduated in 1908 with a degree in civil engineering. As an undergraduate he had earned 14 letters in athletics, serving as the captain of the cross-country team in 1907 and the football and baseball teams in 1908. It is said that he never took a final examination because of his class performance. (As far back as 1902 students with good enough records were excused from examinations.) After serving as an instructor in mathematics for one year he joined an Atlanta industrial engineering company. In 1911 he organized the the Dallas-Robert Company. In 1916 he formed Robert and Company, architects and engineers. In that same year he was an assistant football coach at Georgia Tech. Over the next several decades his company constructed many large facilities in the South, including textile mills and later the Bell Bomber Plant in Marietta. He became chairman of the board of Alabama Mills and a director of railroad, banking, and airline companies. Robert was active in Democratic politics and served as the treasurer of the National Democratic Committee. During the first term of Franklin D. Roosevelt he was Assistant Secretary of the Treasury. Robert was elected to the Georgia Tech Athletics Hall of Fame and was awarded the first Alumni Distinguished Service Award. From graduation on he was a member of the Athletic Association and helped organize and was president of the Alumni Association. He served on the Georgia Tech Board of Trustees and, from 1937 to 1943, on the Board of Regents of the University System of Georgia. The former Y.M.C.A. building was restored with funds from his daughters through the Robert Foundation and was dedicated in his name in 1979.

Finally there is coach **William Anderson Alexander**. Alexander was born in Mud River, Kentucky, in 1889. Although he spent some time at the Berry School in Rome, Georgia, his preparation was such that he had to enter Georgia Tech in 1906 as an apprentice. Vernon Skiles taught him calculus and remembered him as a good student who asked an awful lot of questions. Nonetheless it took him six years to obtain his B.S. degree in civil engineering in 1912. During that time he played on the "scrubs" football team for three years, made the varsity team, and got a letter in that sport in his last year. Meanwhile he was on the track team and served as the president of the Student Athletic Association which helped fund the athletic

program. It seems that all of those who have commented on or written about Alexander say that upon graduation he became an assistant to Coach Heisman and an instructor in mathematics. But the catalogues of 1913 and 1914 list him as an instructor in civil engineering. From 1915 to 1917 he was an instructor in mathematics and an assistant coach. In June of 1917 the Trustees accepted his resignation so that he could enter the ambulance field service in France. Later he became a mathematics instructor for the field artillery. He served as an instructor in the department of mathematics again in 1919-1920. D. M. Smith is quoted in *Dress Her in White and Gold* as saying that he himself picked up his first interest in football as an undergraduate at Vanderbilt, and that he had already tutored athletes there, but that, "Coach Alexander was the man who developed my interest in the sport. He was one of the most forceful men I ever knew and my favorite on the Tech campus." In 1920 Coach Heisman resigned, having agreed in a divorce settlement that if his wife elected to remain in Atlanta, he himself would leave it. Alexander then became the new head coach. He remained in that position until 1944 and served as athletic director until his death in 1950. His teams won one national championship and went to the Orange Bowl, Cotton Bowl, Sugar Bowl, and the Rose Bowl. The Rose Bowl game is remembered as the one which featured the "wrong-way run" of Roy Riegels, which occurred when that California center got confused and carried the ball 64 yards in the wrong direction. Georgia Tech won by a score of 8 to 7. Within months of Alexander's death a campaign, eventually headed by Chip Robert, was begun to raise one and a half million dollars for a sports facility to be named in his honor. The resulting Alexander Memorial Coliseum was dedicated in 1956. When that structure was renamed the Hank McCamish Pavilion in 2012 an outdoor courtyard was added, named for Alexander and including his bust.

Staying the Course: The Brittain Years, 1922 - 1943

Background

Upon the resignation of President Matheson, the trustees choose Dr. Marion Luther Brittain as Georgia Tech's fourth president. Brittain had been born in Wilkes County, Georgia, in 1865, his father being a well known Baptist minister, and his mother a member of the prominent Callaway family. He received his A.B. degree from Emory at Oxford in 1886 and began his career as a teacher in Gordon County. In 1897 he became a member of the faculty of Boys High School in Atlanta and the next year did graduate work at the University of Chicago. By 1900 he had become the superintendent of the Fulton County schools and in that year finished his first book, *An Introduction to Caesar*, published by the American Book Company. In 1910 he became State School Commissioner and in 1911 State Superintendent of Schools, a position he held until coming to Georgia Tech. In 1913 he was president of the Southern Education Association and in 1917 State Director of Vocational Education, an outgrowth of the Smith Howard Act, which provided for federal funds for such instruction. In 1919 he received an LL.D. Degree from Mercer University and was later given that degree by both Emory and the University of Georgia as well. An award he funded at Emory bears his name and is still that institution's highest student honor. (The neoclassical revival house which was his home from 1911 until 1922 is located at 1109 West Peachtree Street. It has been placed on the National Register of Historic Places and currently houses a medical practice.) Brittain himself produced the first history of Georgia Tech, so we have a first hand, and highly personalized, account of the school during this period. His *The Story of Georgia Tech* was written in 1948 and published after his death in 1953.

One can get an idea of what Brittain was up against from an article published in June of 1923 on the front page of the *Atlanta Constitution*, whose editor and general manager Clark Howell was a long time Georgia Tech supporter and trustee. This article pointed out that only three states provided less funds for higher education, those being the lightly populated states of Vermont, Delaware, and New Mexico. It went on to mention that the University of North Carolina received 6% of that state's budget, while the University of Georgia, including its College of Agriculture, received only 1.2% from Georgia and Georgia Tech only 0.8%. The article claimed that in 1922-23 half a dozen states spent more on higher education than the University of Georgia had received in the more than 100 years of its existence. And this was at a time when Georgia was a relatively wealthy state, at least compared with others in the region. Salaries at Georgia Tech were embarrassingly low, which may help explain why five of the seven junior instructors in the mathematics department quit at the end of the 1922-1923 school

year (as did more than half of the instructors in the science and engineering departments). There were positive developments nonetheless. In 1924 a ceramics program was begun, and in that year the school received its accreditation from the Southern Association of Colleges and Secondary Schools. It was also in that year that Clark Howell, on behalf of the *Constitution*, gave Georgia Tech a “full radio set.” The newspaper had assembled this equipment to compete with WSB owned by the *Atlanta Journal*, but by law was prohibited from using it to broadcast material from its news service. It could only be used for education and entertainment. The station was licensed to broadcast as WGST in 1924. (The Board of Regents took control of the station in 1946 and it was sold in 1970.) In 1925 the first M.S. degree was awarded, and in 1926 the naval R.O.T.C. program was begun. Brittain was especially proud of the latter since Georgia Tech was one of just six institutions chosen to begin this new program, the others being Harvard, Yale, Northwestern, and the State Universities of California and Washington. (Brittain himself was aboard the USS Colorado for a R.O.T.C. training cruise in 1937 when that ship was ordered to join the search for the missing aviatrix Amelia Earhart. He later stated that he felt there was reason to believe that the United States government was somehow involved in her mission.) State support did improve during the decade of the twenties. In 1929 Georgia Tech's appropriation was triple what it had been when Brittain began. That was not to continue.

Brittain's proudest accomplishment was securing a grant of \$300,000 in 1930 from the Guggenheim Fund for the Promotion of Aeronautics. This was the last such award made by the fund before it went out of existence, and Georgia Tech had been chosen to receive it in a competition which involved 27 southern colleges and universities. In his history of Georgia Tech Brittain states that just after the award the chancellor of Vanderbilt told him that “I would have secured that award for Vanderbilt if you and D. M. Smith, your fine head of the mathematics division, had not filled that department at Georgia Tech with those excellent Ph.D. instructors from Harvard.” This account, although quoted in later histories, seems more than a bit suspect however, especially since Smith (while he was a Vanderbilt man) did not become head of the department until 1934. And although Field and Skiles had master's degrees from Harvard, it doesn't appear that anyone in the department had a Ph.D. from that institution in 1930. In the mid and late thirties the department did, however, hire more than a half dozen new faculty members with doctorates, including three from Harvard, the first two being Ballou and Steen in 1934, followed by Sewell in 1936. (The number of doctorates in mathematics awarded per year by institutions in the United States and Canada had increased a fair bit by that time, rising from an average of 26 during 1920-25, to an average of 75 during 1930-35. A 1934 survey indicated that a total of 1268 doctorates in mathematics had been awarded since the first U. S. doctorate in 1862, and that there were 937 individuals with mathematics doctorates teaching in the country's 1098 colleges and universities, twenty of whom were in Georgia.)

From its beginning Georgia Tech had in a certain sense been a branch of the University of Georgia. By 1906 there were three other such branches, the Georgia Normal and Industrial College for Girls in Milledgeville, the Georgia State Industrial College for Colored Youths in Savannah, and the South Georgia Normal School in Valdosta. The state had also created 10 "A&M" schools, one in each congressional district, which were additional branches of the University of Georgia, answering to its College of Agriculture. Most of these were actually at the high school level. By 1930 junior colleges had begun appearing as well, and there were 26 units in all. Each had its own president and board of trustees, and all competed for state funds. By the end of the twenties the Charles Snelling, the chief executive of the University of Georgia, had decided that the various branches were draining his school of its resources and called for reform. Brittain agreed about the need for change. In 1929 a commission, headed by businessman Ivan Allen, was formed to study the bureaucracies of the state. This commission found that the state needed to centralize its financial management and reorganize its system of higher education under a single Board of Regents. This led to the Reorganization Act of 1931 which created the University System of Georgia. By 1933 legislation was in place which provided for a lump sum appropriation to the Board of Regents and gave that board the authority to rearrange the units of the system. As a result, the A&M schools and several other institutions were abolished, all engineering courses were transferred to Georgia Tech, and Tech's Evening School of Commerce was established separately, primarily for adult education.

In 1932 the Georgia Tech Foundation was formed, and in 1934 the Engineering Experiment Station, which had been authorized by the General Assembly in 1919, finally received some state funds. State revenues could not be carried over from year to year however, making it difficult for the station to enter into longer term contracts. The solution was the creation of the Georgia Tech Research Institute, GTRI, to handle contracting.

In 1934 Governor Eugene Talmadge, a staunch conservative, quarreled with the Board of Regents over the borrowing of federal funds which he saw as "New Deal Money." When he became governor again in 1941 there were real problems. Talmadge attacked W. D. Cocking, the dean of the University of Georgia's department of education, whom he suspected of advocating the coeducation of whites and blacks. He also wanted to terminate Marvin Pittman, the president of Georgia State Teachers College, who apparently had offended him in some way. When the board refused to go along, he coerced some members into resigning and appointed his own people. Cocking and Pittman were then fired, along with six professors who had spoken in support of Cocking. Talmadge also tried to make his friend David "Red" Barron vice president of Georgia Tech. Barron had been an athletics hero at Tech, but the students protested, and even began a march on the capital. In 1941 such meddling led the Southern Association of College and Schools to strip ten university system schools, including Georgia

Tech and the University of Georgia, of their accreditation. In 1942 Talmadge lost a primary bid to Ellis Arnall, who had made removing the University System from political interference a part of his platform. In 1943 the Board achieved constitutional status. Accreditation was later restored and Pittman rehired.

The senior personnel of the mathematics department remained almost unchanged during the twenty plus years of the Brittain presidency. Among the group consisting of Field, Skiles, Morton, Stamy, and D.M. Smith, only Froggy Morton, who died in 1933, was no longer present when Georgia Tech's fifth president Blake Vann Leer took office in 1944. The department's growth was modest, increasing from 13 in 1923 to 17 in 1944. Once again many of the positions were filled by instructors and other junior faculty who remained for just one or two years. Whereas earlier many who filled these positions were recent recipients of bachelor's degrees many now had master's degrees, and in the thirties quite a few with Ph.D.'s were hired. Wallace in his book *Dress Her in White and Gold*, quotes D. M. Smith as saying in a 1953 interview that, "by the early 1940's we had built up what I considered one of the very best mathematics departments in existence." But he lamented the fact that the re-election campaign of Eugene Talmadge had caused an exodus of teachers. By the early forties almost all of the junior faculty members with Ph.D.'s were gone. Fully half of them would later head departments of their own including those at LSU and the University of Florida. This was followed by the Second World War which, according to Smith, "virtually finished off the fine department we had built up." During the war there was severe shortage of instructors. Many were on leave with the military, including mathematic's Hook, Mundorff, and Sewell. The government projected a need for 2500 teachers for the 250,000 students it expected in the army and navy training programs it was setting up at 300 institutions. The AMS and MAA set up a joint information bureau whose sole purpose was to help departments find instructors. (Such developments were reported in a section of the *Monthly* entitled "War Information" which appeared in every issue for several years, not disappearing until the summer of 1945.) Georgia Tech was then back to hiring faculty members who had master's degrees or just bachelor's degrees, some of whom were to remain in the department for more than 30 years.

In his 1953 interview, Smith added that, "we've been rebuilding ever since – Dr. Fulmer is carrying on, and some day we will get it back to its 1941 level." Herman Fulmer, who had come to Georgia Tech in 1922, was by then acting head of the department. Among the others who did have fairly long careers at Georgia Tech were Walter Reynolds, Jr., Clarke W. Hook, Roy M. Mundorff, Ralph Hefner, and George C. Griffin. Mundorff would eventually become the head basketball coach (but continue to teach mathematics). Hefner would become dean of the General College, created in 1948. George Griffin would replace Floyd Field as dean

of students and remain in that position for nearly twenty years, earning himself the title of “Mr. Georgia Tech.”

The Curriculum

Just as the list of the senior members of the mathematics department remained almost the same throughout the Brittain presidency, there were very few changes to the mathematics curriculum during this period. At its core was the calculus which occupied both semesters of the sophomore year, taught out of Granville or Granville, Smith, and Longley. The entrance examination covered plane and solid geometry and advanced algebra (including logarithms “as this is necessary for freshman trigonometry”). There were some “pre-freshman” courses including “Shop Mathematics,” which included practical industrial applications for the students in Industrial Education, and a “Business Mathematics” course. The regular freshman courses covered analytic geometry and the use of the slide rule, as well as trigonometry. The sophomore calculus was followed by a year of differential equations in the junior year. The 1923-24 catalogue stated that additional courses would be offered if “a sufficient number of qualified graduate students apply.” (The first master of science degrees were awarded in 1925.) These courses included advanced algebra, complex variables, advanced algebra, and “modern geometry.”

A few years later a mathematics of finance course was added, which covered such topics as interest, annuities, amortization, bonds, and building and loan associations. Later Fourier series and spherical harmonics were added to the list of courses which would be offered if there was sufficient interest. An additional differential equations course was added for seniors, and another for graduate students. In the mid-thirties the freshman trigonometry became part of an “elementary functions” course, which also included exponentials, complex numbers, and the binomial theorem. The second semester continuing to be devoted to analytic geometry. An introduction to statistical methods made its first appearance in 1939.

By the early forties the freshman courses were using textbooks written by members of the Georgia Tech faculty, including a review algebra book by Sewell, and trigonometry and analytic geometry texts by Ballou and Steen. All three of these authors eventually went elsewhere, and the last two would go on to produce a series of additional texts on these and other topics over the following decades, at least one of which was still being republished in 1963.

The Faculty

Herman Kyle Fulmer (1894-1962)

Herman Fulmer was born in Mississippi and earned his bachelor's degree from the University of Mississippi. After a period teaching he attended Columbia University, receiving an M.A. degree from that institution in 1922. The next year he was appointed as an instructor at Georgia Tech where he would remain throughout his career. In 1934 he served on a national commission of the Society for the Promotion of Engineering Education which surveyed advanced mathematics courses suitable as special topics courses for engineers. He spent the following year on leave at Cornell University and in that year was promoted to associate professor. In 1950 he became acting head of the department when D. M. Smith retired from that position at the age of sixty-five. He remained the acting head until his retirement in 1957. In 1951 he authored a text on college algebra with fellow Georgia Tech faculty member Walter Reynolds. The next year served as the president of the Georgia Council of Teachers of Mathematics, as well as Chairman of the Southeastern Section of the MAA. Fulmer was a member of the ANAK honorary society, and the west campus Fulmer Residence Hall, Georgia Tech's first dormitory for female students, is named in his honor.

Roy M. Mundorff (1900-1966)

Roy Mundorff was born in Gettysburg, Pennsylvania, the son of a blacksmith shop owner. He entered Gettysburg College but transferred to the University of Pennsylvania where he earned a bachelor's degree in 1921. After a year of teaching and coaching in Richmond, Indiana, he was hired by Georgia Tech as an assistant professor of mathematics and freshman basketball coach. In 1926 he became the varsity basketball coach, but continued teaching. By 1934 he was president of the National Association of Basketball Coaches. Being in the Naval Reserves, he was called to active duty in 1940, and in 1941 was a Naval ROTC instructor. In 1942 he became commandant of the Naval Radar School at Harvard and in 1945 the Acting Commander of the whole Naval Training School at Harvard and an assistant professor there. He returned to Georgia Tech after the war as assistant athletics director and assistant to the head of the Physical Training Department, responsible for the intramural program. Upon the death of coach Alexander he became head of the Physical Training Department. In 1952 he left Tech to become the athletics director at the University of Louisville. He was inducted into the Georgia Tech Athletics Hall of Fame in 1968.

Walter F. Reynolds, Jr. (1894-1956)

Walter Reynolds was the son of an editor for Clark Howell's newspaper, the *Atlanta Constitution*, and while a student wrote articles on amateur sports for that publication. After attending Atlanta Boys School he entered Georgia Tech in 1912. In 1913 he went to the U.S. Naval Academy but later returned to Georgia Tech to earn a B.S degree in mechanical engineering in 1917. In 1923, after military service in the coast artillery and a period in sales, he was hired as a mathematics instructor at Tech. He would remain a member of the mathematics department until 1956, being promoted to the rank of full professor in 1953. His college algebra text, written with Herman Fulmer, was published in 1951.

Clark Winters Hook (1903-1974)

Clark Hook was born in Pennsylvania, the son of a clergyman, and grew up in New York state. After attending Palmer Institute he entered Elon University in North Carolina where he earned a bachelor's degree. He then went on to the University of North Carolina, obtaining a master's degree there with a thesis entitled "A Comparison from the Pedagogical Point of View of Solutions in Radicals of the General Quartic." He was hired as an instructor at Georgia Tech in 1928 and promoted to assistant professor in 1941. Like Mundorff, he was in the Naval Reserve, and in May of 1942 he reported to the U.S. Naval Academy as an mathematics instructor, where he remained until after the war. He was promoted to full professor in 1953, along with Reynolds, and retired in 1955. It appears that Hook and D. M. Smith were the first members of the department to be granted emeritus standing.

Ralph Aubrie Hefner (1902-1967)

Ralph Hefner was born in West Virginia and attended Roanoke College, graduating in 1925. In 1927 he received a master's degree from the University of Chicago and in 1929 came to Georgia Tech as an instructor in mathematics. After receiving a Ph.D. from Chicago in 1931 he was promoted to assistant professor. He gave talks at professional meetings on the properties of "Nasik Magic Squares" but also contributed a chapter on the applied mathematics of electricity, gunnery and ballistics in *The Practical Mathematics Library*, and later gave seminars on statistical quality control in several states. On campus he gave magic shows. (He was the historian of the Atlanta Society of Magicians.) He was promoted to associate professor in 1935 and to full professor in 1937. In 1947 he succeeded Vernon Skiles as Dean of General Studies. He became the Dean of the General College when that unit was formed in 1948, a post he held until 1967. The Hefner Residence Hall is named in his honor.

Austin Leroy Starrett (1907-2006)

Austin (“Al”) Starrett was born in China Lake, Maine, where his uncle owned the Starrett Tool Company. He received his B.S. degree at Dartmouth College in 1929 and later earned an A.M. degree at Harvard. He was hired as an instructor at the Georgia School of Technology in 1935, one of a half dozen with advanced degrees from Harvard hired in the mid-1930's. Unlike most of these, Starrett remained at Georgia Tech for the rest of his career. He rose through the ranks and became a full professor in 1957, one of only four with that title among the nearly 30 department members at the time. During the spring of 1957 he served as acting head of the department while director Herman Fulmer was indisposed. He was widely viewed as an even-tempered gentleman of the old school. In 1973 he retired back to China Lake where he had spent many of his summers. He died there May 5, 2006.

Chandler H. Holton (1907-1985)

Chandler Holton was born in Northfield, Massachusetts, the son of a carpenter. After earning an A. B. degree at M.I.T. he taught at the Mt. Herman School for Boys in Gill, Massachusetts, before beginning graduate work at Harvard, where he was Al Starrett's roommate. Having earned an A.M. degree at Harvard, he joined Starrett at Georgia Tech in 1937. In 1940 he married Starrett's older sister Geneva May. Like Starrett, he remained at Georgia Tech until he retired in 1970. Sometimes known as “smiley,” Holton was an avid amateur astronomer, and a charter member of the Atlanta Astronomy Club. The Holtons summered with the Starretts in China Lake, where Chandler was able to pursue his hobby using a Fernald 8-inch Springfield telescope on loan from the American Astrological Society. He died there in 1985. Geneva May, like her brother Al, lived to the age of 99, and died in China Lake in March of 2004.

The Junior Faculty

At the end of the 1922-23 year five of the eight Instructors in the department resigned. Only Fulmer, Munsdorff, and Robert White returned the next year. They were joined by five others hired for just one year, including Thomas Pharr Branch, the son of a secretary of the faculty, and George C. Griffin, who more than twenty years later would become Dean of Students Griffin. During the next decade nearly twenty others were hired who would finish their careers elsewhere. Roughly half had master's degrees. Most remained in academia, with

nearly half of these acquiring doctorates in the process. During 1934-1939 nearly half of those hired had doctorates, coming from places such as Harvard, Brown, Illinois, and Chicago. By 1942 almost all of these were gone, probably due in large part to the political arguments between Eugene Talmadge and the University System, which led to Georgia Tech's brief loss of accreditation. Only Sewell remained, but he was on leave with the military and remained in the army after the war. During the war there was a general shortage of mathematics and engineering instructors, and the department struggled to find new faculty members. It would be five years before anyone else with a doctorate would be hired again.

The list of those who were members of the department during the Brittain presidency, but who did not remain much beyond the end of that period, includes the following. T. P. Branch (1923-24). G. C. Griffin (1923-24), J. G. Evans (1923-24), J. A. Taylor (1923-24), J. H. Purks (1923-24), G. S. Bruton (1924-25), L. K. Patton (1924-27), G. W. Nicholson (1924-26), H. H. Pixley (1924-26), F. A. Dillman (1926-27), J. F. Stengel (1926-35), A. R. Maupin (1926-28), C. A. Benander (1927-28), R. A. Smith (1927-30), J. L. Clayton (1928-29), R. F. Watkins (1928-34), G. Z. Updike (1929-30), N. N. Royall (1929-36), R. C. Cobb (1930-31), H. W. Knerr (1930-33), G. E. Reves (1930-35), H. M. Cox (1931-32), D. H. Ballou (1934-42), F. H. Steen (1934-1942), H. W. Haggard (1934-35), W. V. Parker (1934-36), G. A. Rosselot (1935-37), W. H. Sears (1935-40), W. B. Coleman (1936-38), W. E. Sewell (1936-45), D. L. Webb (1936-42), G. B. Lang (1938-39), W. H. Meyer, Jr. (1938-39), L. J. Green (1939-41), V. N. Robinson (1939-40), C. L. Carroll, Jr. (1939-40), W. C. Bornmann (1941-46), R. C. Lyndon (1941-42), L. B. Williams (1940-43), and S. Lambert (1942-43).

George C. Griffin was born in Savannah in 1897 and entered Georgia Tech in 1914 as a member of the last “sub-apprentice” class. In 1916 he played, and scored, in the famous (or infamous) football game between Georgia Tech and Cumberland College which Tech had won by a score of 222 to 0, still considered the greatest rout ever in college football. (Perhaps Georgia Tech was just out to revenge a 22 to 0 loss to Cumberland in baseball the previous year.) Griffin served in the first world war and returned to obtain a bachelor's degree in civil engineering in 1922. He then became an assistant football coach. When most of the instructors in the mathematics department departed at the end of the 1922-23 year, Griffin was pressed into service for the department for the following year. He next became the track and field coach and cross country coach and in 1930 became an assistant to Dean of Men Floyd Field. In the 1930s he organized the first placement office at Georgia Tech. After serving in World War II, he succeeded Field as dean of students and remained in that position until his retirement. His involvement in alumni affairs, placement, recruiting, coaching, and just about anything else called for, led him to be called “Mr. Georgia Tech.” He received the 1995 Distinguished

Alumni Service Award. The plaza of the Student Galleria is named in his honor. Upon his retirement Governor Carl Sanders proclaimed May 16, 1964, "Dean George Griffin Day." He died in 1990 at the age of 93.

Joseph Graham Evans had a bachelor's degree in mechanical engineering from North Carolina State. After his year at Georgia Tech he moved to Charlotte, North Carolina, became a practicing civil engineer, and died there at the relatively young age of 47.

James Harris Purks, Jr. was the son of the superintendent of schools in Greensboro, Georgia. Like his father, he earned a bachelor's degree from Emory University. He later returned to Emory where he became a professor of physics and eventually dean. He then went on to become the director of the North Carolina Board of Higher Education and provost and acting president of the Consolidated University and University of North Carolina System. In 1957 Emory awarded him an honorary LL.D.

Gaston Swindell Bruton was born in Lumberton, North Carolina, and had a bachelor's degree and master's degree from the University of North Carolina when he came to Georgia Tech. After one year he went to The University of the South, also known as Sewanee. In 1932 he earned a Ph.D. from the University of Wisconsin. At Sewanee he eventually became the acting dean of administration and later provost. That university has a Gaston Bruton Chair in mathematics. Bruton was also the Sewanee tennis coach for many years and was later inducted into the Sewanee Athletics Hall of Fame. The tennis courts there now bear his name.

Leslie Karr Patton was hired the year after he received a bachelor's degree in electrical engineering from Georgia Tech. After three years at Tech he enrolled in Emory where he earned a degree in the Department of Education with a thesis entitled "Student Activities in Relation to Academic Status," based on observations of students at Emory and Georgia Tech. He went on to earn a Ph.D. from the Teachers College of Columbia University in 1940 with a thesis entitled "The Purposes of Church-related Colleges: a Critical Study – a Proposed Program." In the early forties he was a professor of psychology as well as director of personnel at Coe College. Later he went to Tusculum College in Tennessee, where he was acting president in 1950-51.

George Wilson Nicholson was a graduate of the Citadel and had a master's degree from the University of South Carolina when he came to Georgia Tech. He next went to Sewanee, and, after obtaining a Ph.D. at the University of North Carolina in 1933, taught at the University of Mississippi.

Henry Howe Pixley had a bachelor's and a master's degree from Stetson and a master's degree from Chicago when he was appointed as an instructor at Georgia Tech. After serving at Tech and at Bryn Mawr, he went on to the City College of Detroit, now Wayne State University. In 1931 he and his wife each received a Ph.D. from Chicago. He remained at Wayne, going on leave in 1934 to serve as a mathematical economist in the Division of Economic Research and Planning of the National Recovery Administration. He rose through the ranks at Wayne, eventually serving serve as an assistant dean of the College of Liberal Arts there.

Arthur Ray Maupin came to Georgia Tech after receiving a bachelor's and a master's degree from the University of Kansas. After three years he became an instructor at the U.S. Naval Academy and later worked for the U.S. Department of the Interior, Bureau of Reclamation.

James Frederick Stengel attended Moravian College before entering Princeton, where he earned a degree in mathematics with high honors in 1926. He came to Georgia Tech the next year and remained on the faculty for eight years. Later he served on the faculty and became dean of education at Linden Hall Seminary for Girls in Pennsylvania, where his father had once been president. In later years he moved to California and entered the field of industrial relations, working for several aircraft manufacturing plants, including Marquardt Airplane Corp. and Fairchild Engineering and Airplane Corp. Later he became the director in industrial relations at Fairchild. He was a tournament level golfer and skilled sports aviator.

Roy Archer Smith came to Georgia Tech after receiving a bachelor's and a master's degree from Vanderbilt. He taught later at Indiana University.

Raiford F. Watkins was born in Newnan, Georgia, and held a bachelor's degree in mechanical engineering from Georgia Tech. He joined the faculty as an instructor in 1928, a position he held until 1934. He died in 1936 at the young age of 34, being described at the time as a "Decatur fraternal and religious leader."

Jesse Lee Clayton held a bachelor's and a master's degree from the University of Michigan and had taught at Georgetown College in Kentucky before coming to Georgia Tech. In 1929 he became an Instructor at the U.S. Naval Academy with Maupin.

Guy Zalan Updike had a bachelor's degree from Randolph Macon and a master's degree from Columbia when he came to Georgia Tech. After his one year at Tech he taught in New York at City College, Columbia, and Barnard College.

Norman Norris Royall, Jr., like Pixley, had a bachelor's and a master's degree from Stetson. While at Georgia Tech he earned another master's degree at Emory. Next he was on the faculty of the Citadel, and in 1940 he obtained a Ph.D. at Brown and moved to Winthrop College. Later he taught for many years at what is now the University of Missouri at Kansas City, where he became the dean of the College of Arts and Sciences. That institution now has a lecture hall and classroom building named for him.

Roy Calhoun Cobb had a bachelor's degree from the University of South Carolina and in 1927 earned the third master's degree in mathematics ever awarded by that institution. After teaching school in Columbia, he came to Georgia Tech in 1930. After one year he returned to South Carolina, where he became a probate court judge and entered politics, serving several terms in the state legislature.

Henry W. Knerr had a bachelor's degree from the University of Illinois and a master's degree from Harvard. After three years at Georgia Tech he earned a Ph.D. in physics at the University of Michigan in 1937 and became a professor at Pennsylvania State university. He remained there for 32 years and was an associate dean of the Graduate School when he retired.

George E. Reves had studied at Milsaps College and Vanderbilt before coming to Georgia Tech in 1930. After five years at Tech he went to the Citadel. He earned a Ph.D. at Cincinnati University in 1941 and later became the head of the mathematics department at the Citadel. He remained in that position until his retirement in 1975.

Henry Miot Cox had degrees from Emory and Duke universities when he was hired by Georgia Tech. After one year he became Secretary to the Examiners of the University System of Georgia. This organization resulted from the Reorganization Act of 1931 which placed all of the state-supported institutions in a single system. Earlier the older and stronger institutions such as Georgia Tech had often refused to give credit for courses taken at the younger and weaker schools. The Examiners were intended to be a sort of “bureau of standards,” and were authorized to give state-wide examinations in ten courses which represented an early version of a “core curriculum.” These were intended to insure that equal achievement at the different units of the new system received equal credit, thereby making possible transfer of credit “without let or hindrance.” Cox remained in that position until in 1939 when he became an assistant professor and assistant to the Bureau of Instructional Research at the University of Nebraska. Later he became the director of that bureau. He remained active in the Nebraska Section of the MAA, continuing to serve as an officer of that section after his retirement in 1973. He was also the executive director of the national Annual High School

Mathematics Contest sponsored by the MAA, NCTM, and others, for which he received the MAA's first Certificate of Merit in 1977.

Donald H. Ballou attended Phillips Andover Academy, and did his undergraduate work at Yale, where he participated in the first Putnam Examination. He obtained a A.M. degree from Harvard in 1931 and a Ph.D. there in 1934. Along with Parker and Steen, he was one of the first people hired with a doctorate by the department in the middle of the 1930s. Like most of the others with doctorates who would be hired over the next several years, he left in 1942. He then joined the faculty at Middlebury College. At Middlebury he continued the textbook writing he had begun at Georgia Tech and became head of the department in 1954. He is credited with beginning computer science education at Middlebury. He was named Dana Professor of Mathematics in 1971 and retired in 1973. He lived to celebrate his 100th birthday in 2008 and died in September of that year.

Harold Witter Haggard had a bachelor's degree from Dennison University and had been an instructor at the Armour Institute of Technology in Chicago before coming to Georgia Tech. He was later on the faculty of North Park College, also in Chicago.

William Vann Parker had degrees from the University of North Carolina and Princeton, as well as a doctorate from Brown, when he was hired at Georgia Tech in 1934. He had previously taught at Sewanee. He was appointed as an associate professor at Louisiana State University in 1937 and became head of the department there in 1943. In 1950 he became head of the mathematics department at Auburn and in 1953 took on the additional job of dean of the graduate school there, a position he held until his retirement almost twenty years later. Auburn's Parker Hall houses a computer center and classrooms for mathematics and the sciences.

Gerald A. Rosselot had a bachelor's degree from Otterbein College in Ohio where his father was on the faculty, and a master's degree from Ohio State. He began at Georgia Tech in 1934 as an instructor in mathematics and physics and earned his Ph.D. from Ohio State in 1936. He became an assistant professor in physics 1937. He became an associate professor of physics in 1939 and assistant director of the Engineering Experiment Station in 1940. In 1941 he was promoted to full professor and became director of EES. He held the latter position until 1952, during which period he was one of the founders of Scientific Atlanta. In 1952 the Georgia Tech administration, concerned about possible conflicts of interest, asked its employees to choose between Scientific Atlanta and Tech. This may have been an influence in Rosselot's decision to leave to become Director of Engineering at the Bendix Corporation in 1953. In 1955 he became Director of Scientific and University Relations for that firm and retired in 1972.

Walton Harvey Sears, Jr. was the son of a civil engineer and member of the Massachusetts State Water Commission who had graduated from M.I.T. in 1902. Sears had a bachelor's degree and master's degree from Harvard when he was hired at Georgia Tech in 1935. In 1940 he became an instructor at the U.S. Naval Academy and remained there for the rest of his career.

Walter Edwin Sewell was born in Newnan, Georgia, in 1905. He received a A.B. degree from the University of Georgia in 1925 and S.B. and A.M. degrees from the same institution in 1926 and 1927, respectively. After working as a civil engineer in South America for four years he received an A.M. degree from Harvard in 1932 and a Ph.D. there in 1936. He began as an instructor at Georgia Tech in 1936 and was promoted to assistant professor in 1937. His text entitled *Review Course in Algebra* was published in 1938. In 1940 he took a leave of absence to join the army as a major. He remained in the service after the war and in 1948 was Chief of the Education Branch of the U.S. Army. Later he was a professor of military science and tactics at the State University of Iowa.

Frederick Henry Steen had an A.B. degree from Colgate, and like Ballou and Sewell, an A.M. degree and Ph.D. from Harvard when he was hired by Georgia Tech in 1934. Also like Ballou, he left in 1942, in his case to join the faculty at Allegheny College in Pennsylvania. He remained at Allegheny for the remainder of his career, becoming head of the department, and continuing the writing of textbooks he had begun with Ballou. He was secretary of the faculty at Allegheny for twenty years before his retirement in 1977. Finally, again like Ballou, he lived to celebrate his 100th birthday and died in January of 2010 at the age of 102.

Donald L. Webb received his Ph.D. from California Institute of Technology in 1936 with a thesis on logic, written under the supervision of Eric Temple Bell. He was hired as an instructor at Georgia Tech in 1937 and promoted to assistant professor in 1939. He left in 1942 to join the faculty at Texas Tech University.

Gaines Barrett Lang had a bachelor's and master's degree from the University of Georgia, and a Ph.D. from the University of Illinois. He began his teaching career at West Georgia College in 1937 and came to Georgia Tech in 1938. The next year he became an instructor at Emory and later an instructor at the University of Florida. He remained at Florida, where he eventually became head of the department.

William Herman Louis Meyer attended Westminster before obtaining a master's degree from the University of Chicago in 1937. He then taught at Bowling Green University, Georgia Tech, and the College of Wooster before returning to Chicago in 1943. He spent part

of World War II at the Aberdeen Proving Ground, finally obtaining his Ph.D. at Chicago in 1947. He then joined Chicago faculty and was promoted to full professor there in 1963. In 1968 he became associate chairman, a position he held until his retirement in 1985.

Louis J. Green obtained his Ph.D. from the University of Chicago in 1937 and taught at Indiana University before coming to Georgia Tech. Later he went to Case School of Applied Science, now part of Case Western Reserve University, where he remained for more than thirty years. During the war he worked at the NACA facility in Cleveland. (NACA – the National Advisory Committee for Aeronautics – was a forerunner of NASA.) Green was active in the Ohio Section of the MAA, serving as its chairman in 1974.

Virgil Nelson Robinson came to Georgia Tech with a doctorate from Chicago in 1939. After one year he went to Louisiana State University. During the war he was on leave with U. S. Navy. After the war he joined Sears on the faculty of the U. S. Naval Academy, where he remained for the rest of his career.

Charles Lowell Carroll, Jr. came to Georgia Tech with a bachelor's and a master's degree in 1939. During the war he was an instructor in the Pre-Flight School at Chapel Hill. In 1945 he received his Ph.D. from the University of North Carolina as the first doctoral student of Nathan Jacobson. He went on to a career at North Carolina State University and in 1997 was honored by the AMS for his fifty years of membership in that organization.

William Charles Bornmann attended Hamilton College and earned an M.A. degree from Columbia before coming to Georgia Tech where he served from 1941 to 1946. He left academia for the insurance industry, and retired in 1981 after thirty years with the Johnson, Higgins Insurance Company, where he had been vice president and head of the casualty department. He died in 2004 at the age of 86.

Roger Conant Lyndon was born in Calais, Maine, and attended Harvard where, after switching from literature to mathematics, he graduated in 1939. He then took a job as a banker, but soon returned to Harvard, earning a master's degree in 1941. After a year as an instructor at Georgia Tech he returned to Harvard for a third time. While there he taught navigation in the V-12 Navy College Training Program and studied for his doctorate, which he received in 1946 under the supervision of Saunders MacLane. After leaving Harvard he worked at the Office of Naval Research and then served for five years as an instructor and assistant professor at Princeton before moving to the University of Michigan in 1953. His first research was on mathematical logic and relational algebras, and later studied homological algebra and

cohomology, His book *Combinatorial Group Theory*, written with Paul Schupp in 1976, became one of the most important works in the field. He had many doctoral students at Michigan, including his second, Kenneth Appel. He is known for Lyndon words, the Curtis-Hedlund-Lyndon theorem, Craig-Lyndon interpolation, and the Lyndon-Hochschild-Serre spectral sequence. Lyndon died in Ann Arbor in 1988. The Roger Lyndon Collegiate Professorship of Mathematics at Michigan is named in his honor.

Lloyd B. Williams received his B.A. degree from Reed College and his M.S. from the University of Chicago. After teaching at Georgia Tech and Hamilton College he returned to his alma mater, where he remained for more than three decades and served as the head of the mathematics department. The Lloyd Williams Scholarship Fund at Reed was established in his honor. Williams was a board member of both the MAA and the AAUP and made several films about famous mathematicians. He died in 2000.

Seymour Lambert earned his bachelor's degree in aerospace engineering at Georgia Tech in 1942. He was hired as an instructor in mathematics the next year but was drafted in 1944. After the war he attended Cal Tech, as D. M. Smith had recommended, and earned his Ph.D. there. He worked for the NACA Ames Labs and JPL and was Director of Aviation Systems at North American during the Apollo spacecraft project. Later he joined the faculty at the University of Southern California, where he remained until his retirement.

4. An Era of Change: The Van Leer years, 1944 - 1956

Background

The arrival of Georgia Tech's fifth president, Colonel Blake Van Leer, coupled with the end of the second world war, brought about a period of significant changes for the institution, and as well as for the department of mathematics. Shortly after his arrival Van Leer set about to revamp the administration. By 1946 long-time deans Fields and Skiles had retired. D. M. Smith would remain head of the mathematics department until 1950 and retire in 1954, but among the twenty or so who were members of the department at the beginning of the 1940's, only four, Fulmer, Hefner, Holton, and Starrett, would still be there after Van Leer's term in office. By way of contrast, among those hired while Van Leer was president at least 14 were still present 15 years after he was gone. In large part this reflects the fact that the department grew dramatically after the war when the G. I. Bill led to a surge of returning veterans. The enrollment had declined to less than 3000 during the 1930's, then remained fairly stable during the war due to the various military training programs on campus. But by 1948 the enrollment had doubled to well over 5000. To deal with this growth the mathematics department hired just about anyone it could find. Ten people were hired just between the start of the fall 1945 semester and the beginning of the spring 1946 term. (The school returned to the quarter system the next year.) By 1948 the department had grown to nearly 30, plus a full 25 part-time instructors.

Blake Ragsdale Van Leer was born in Magnum, Texas, (now Oklahoma) in 1893. He earned a bachelor's degree in electrical engineering at Purdue in 1915. He then became an instructor and head of the hydraulics lab at Berkeley. He served in the first world war, first as a lieutenant, and by 1919 as a captain. He returned to Berkeley where he earned a master's degree in mechanical engineering in 1920. He remained there until 1927, and after a study grant in Munich during 1927, became an engineer in the private sector. In 1932, after serving as assistant secretary of the American Engineering Council, he became dean of engineering at the University of Florida and in 1938 took the same position at North Carolina State. Having been a major in the army reserves since 1941, he returned to active service as a lieutenant colonel in 1942 and became a full colonel in 1943. In that year he was granted an honorary doctorate by Washington and Jefferson College. (The fact that he never obtained an earned doctorate may explain why he always preferred to be addressed as "colonel," although President Brittain did not seem to be bothered by the fact that his three doctorates were all honorary). In 1944 he was released from active duty and assumed the presidency of Georgia Tech. Van Leer has been described as "often brash," "gruff,"

“aloof,” and “intuitively combative,” but also as “responsive,” and “appreciative of talent.” He was the first engineer to serve as Georgia Tech's president and made progress towards recognizing his avowed ambition of transforming the institution into the “M.I.T of the South.” During his presidency research was emphasized, and GTRI and the Experiment Station grew in importance. The campus more than doubled in size, with the addition of the new Gilbert Library and new buildings for architecture and electrical engineering, as well as new dormitories and the Alexander Memorial Coliseum.

In 1946 the first Ph.D. in engineering was approved. In 1947 the branch for educating technicians, which would eventually become Southern Tech, began operations. In that same year the Evening School of Commerce, which had begun in 1913, was made the Atlanta Branch of the University of Georgia. The Evening School, which had been largely independent of Georgia Tech since the 1930's, would later become the Georgia State College of Business Administration, then the Georgia State College, and finally in 1969, Georgia State University. The next year GST became GIT; the Georgia School of Technology became the Georgia Institute of Technology. In 1952 the “service” Department of Mathematics became the degree-granting School of Mathematics, with bachelor's and master's degrees in applied mathematics and a much expanded list of course offerings. In that same year the Board of Regents finally approved the admission of women to the daytime programs on the main campus (but only to programs that were not available elsewhere in the university system – which included applied mathematics).

In 1954 an effort led in part by I. E. Perlin from the School of Mathematics resulted in the acquisition of the institute's first serious computer, an Energy Research Associates 24-bit 1101 (1101 being binary for ERA's Project 13). These machines had been designed for the Navy's code breaking activities. The first had been delivered to the U.S. Government in 1950. Some claim that Perlin actually convinced Douglas MacArthur to give the machine to Georgia Tech. In any case, by 1955 an addition to the research building had been completed to house Rich Electronic Computer Center as a division of the Engineering Experiment Station, with the ERA 1101 and a NCR 102-D. The School of Mathematics had already introduced courses in coding, numerical analysis, and the operation of “automatic computers” in 1954. In that year an American Society for Engineering Education panel on the problems of training in the use of computing equipment called for attention to be devoted “to the type of training that can be provided in typical engineering schools and universities, only a few of which have, or can afford to have, any large scale installations.”

In his first week Van Leer selected the relatively young mathematics professor Ralph Hefner to be the head of a Committee on Regulations, Constitution, and By-Laws, charged

with drafting a set of statutes, as had been called for by the Board of Regents. Van Leer made it clear what he wanted those statutes to include. He wanted the faculty to have authority over all academic matters and executive functions left to the administration. He wanted an administrative arrangement in a model similar to a military staff structure, with fewer people reporting directly to the president. There were to be deans of engineering, graduate studies, general studies, and student affairs. Dean Skiles office was to be that of a vice president, in charge of academic affairs and the coordination of the four deans and the registrar. Instead Skiles became the “executive dean.” But being already in poor health, Skiles retired in January of 1946. In 1948 there was a further reorganization. The one-time mathematics instructor George C. Griffin, who had replaced Floyd Fields as dean of students, took on added duties. Skiles position was replaced by that of the dean of faculties. Finally a new position of vice president in charge of research, engineering extension, planning, and construction was created and given to Dean of Engineering Cherry L. Emerson. Emerson was the son of William H. Emerson, Georgia Tech's first professor of chemistry and first dean. But Cherry Emerson himself had only a Georgia Tech bachelor's degree, and some complained that it was not appropriate for someone with his limited academic credentials to serve as a vice president. (Perhaps the fact that Herman Fulmer had only a master's degree explains why his title remained “acting director” for six years.)

From the beginning Van Leer had announced his desire to promote graduate education and research. In 1946 the Board of Regents supplied \$15,000 for graduate education which made possible graduate fellowships of \$1,800. In 1947 the first faculty research awards were introduced, and the hydraulics lab in civil engineering was started. A Sigma Xi chapter was also begun in 1947. (Hefner and Van Leer were already members of that organization, but the chapter did not achieve full status until 1953, since it was felt that Georgia Tech faculty members were not given enough time for research.) The National Science Foundation Act was passed in 1950 making possible federal grants directly to individual faculty members and departments. Prior to that time all of the federal grants had come from the Department of Defense and had been included in the budget of the Experiment Station. In 1945 there were fewer than twenty members of the Georgia Tech faculty with doctorates. (Almost all of the more than a half dozen with Ph.D.s hired by D. M. Smith in the 1930's were gone.) But by 1955 there were 82 with doctorates on campus. A dozen of these were in the School of Mathematics. Among them were men such as Currie, Garrett, Nohel, Perlin, Sledd, and Willoughby, who were responsible for the first original research being produced by members of the department.

The Curriculum

The department's course offerings remained largely unchanged during the mid-1940's, still with algebra, trigonometry, and analytic geometry in the first year and calculus in the second, plus the course on the mathematics of finance and a differential equations course. By 1946 an advanced calculus course for graduate students from other areas, Math 601-2-3, was being taught by Bailey, Smith, Starrett, and the recently arrived I. E. Perlin. This sequence covered implicit functions, line integrals, Bessel functions, the Fourier transform, complex variables, vector analysis, and elliptic integrals. By 1948 a similar sequence had been introduced at the 400 level and was taught from a text by Reddick and Miller. The next year Perlin added a 700 level "applied mathematics" sequence which had the 600 level sequence as a prerequisite, and which included topics such as dynamical and electrical systems, the calculus of variations, the Laplace transform, and conformal mappings. The next year saw the addition of a second junior-level engineering mathematics course and a graduate course in partial differential equations, and the next a 400-level course in vector analysis.

With the transformation in 1952 from a service department to a degree granting school with bachelor's and master's degrees in applied mathematics, the list of courses offered grew dramatically. At the 400 level there were courses in probability, taught by Nesius and Wahab, the theory of equations, taught by Garrett, and numerical methods, taught by Bailey. At the graduate level there were new courses in the Laplace transform, matrix analysis, real analysis, complex analysis, the calculus of variations, metric differential geometry, and a sequence in mathematical physics. Within a couple years these were joined by 400 level courses in the theory of equations, graphical methods, numerical analysis, and principles of digital computers, and at the graduate level by a course in numerical analysis, two courses in programming and coding, and second courses in real and complex analysis.

I. E. Perlin was the first faculty member with a doctorate hired at the end of the war and for several years thereafter was the only one offering the most advanced courses given by the department. In the early 1950's he was joined by others such as Evans, Garrett, Nohel, Sledd, Wahab, and Willoughby. In the meantime, one individual in particular, John Cecil Currie, who had arrived in 1949, set out to introduce as many new undergraduate courses as he could and eventually taught the first offerings of the theory of equations, matrix theory, number theory, linear programming, the theory of games, mathematical logic, and group representation theory.

The Faculty

Alson Hunnicutt Bailey (1908-1973)

Alson (“Al”) Bailey was born on a farm in Clinton County, Ohio, and earned his bachelor's degree in 1930 at Wilmington College in that state. In 1936 he received his Ph.D. at Ohio State University under the direction of Tibor Rado. He taught at Central Normal College in Indiana and at Purdue before coming to Georgia Tech in 1942, where he would remain for thirty years. His nickname among the students was “Boot Camp” Bailey, perhaps because his strict grading system caused some of the students in the Navy V-12 training program to be forced out of school and into active service. He was cited by Wilmington College as a distinguished alumnus in 1949. In 1951 he was promoted to the rank of full professor, one of only four members of the department with that title at the time.

James Clyde Brooks (1913-1992)

J. C. Brooks was one of the many veterans hired at the end of the second world war. J. C., as he was always called, was born in Oxford, Georgia, and earned a bachelor's degree at Piedmont College in 1938. While there he had been editor of the school paper, president of the senior class, and captain of the basketball team for two years. After teaching at the Martin Institute in Jefferson, Georgia, for three years, he earned a master's degree in mathematics at the University of Georgia. He next taught at Gainesville High School for one year before entering the service.

While in the navy he attended training schools at Dartmouth and Chicago and then taught cadets and pilots. He was discharged in November of 1945 as a Lieutenant Commander. The letter he wrote requesting a position at Georgia Tech was dated December 20 of that year, and a letter from D. M. Smith to President Van Leer recommending his appointment was dated just six days later. (No faculty committees or deans would become involved in the hiring process for some time to come.)

J. C. was promoted from instructor to assistant professor in 1947 and to associate professor in 1966. Prior to retiring in 1977 he had served as faculty advisor for the Blueprint, had been a member of the Georgia Tech Admissions Committee and of the Board of Directors of the Wesley Foundation, and had written the mathematics section of the Georgia State Professional Engineering Examinations. In 1986 Piedmont College awarded him an honorary doctorate in education and in 1991 named him Alumnus of the Year.

John Cecil Currie (1913-1983)

Cecil Currie, as he chose to be called, was born in Oxford, Mississippi, and earned his bachelor's degree from Mississippi Southern in 1933, followed by a master's degree from the University of Mississippi in 1936. After teaching first at Louisiana State University and then at the North East Junior College of that institution, he returned to Louisiana State itself as an assistant professor in 1946. He received a Ph.D. there in 1948. The next year he became an associate professor at Alabama Polytechnic Institute, now Auburn, and one year later an associate professor at Georgia Tech.

From the beginning he set out to study as many areas of mathematics as he could, perhaps inspired by his father who had taught mathematics, English, history, psychology, ethics, and Greek during his career. Cecil arrived at Georgia Tech at a time when there were few advanced courses. Within a couple years, however, the department was preparing to become a degree granting school. This gave him the opportunity to introduce new courses in a wide variety of fields, including computer programming. As early as in the 1940's he had begun to read about computers, and beginning in 1951 he spent his summers working in the operation research division of Lockheed. He next became affiliated with the Rich Electronic Computer Center when it began operations in 1955 and worked there part time until Institute regulations made that impossible. Later he was named computer coordinator for the school. In that role he managed user access and wrote packages of programs for registration and class roll management, as well as for calculus and numerical analysis courses. He was promoted to full professor in 1958 and continued teaching until his death in 1983.

W. Buell Evans (1918-2003)

Buell Evans was born in Monticello, Alabama and majored in both mathematics and chemistry at the University of Southern Mississippi where he received his bachelor's degree in 1939. After a short stint with the United States Weather Bureau, he went to Louisiana State University where he earned a master's degree in mathematics and physics in 1941. After joining the Air Force he was stationed in Cambridge, Massachusetts, and took the opportunity to earn a master's degree in meteorology at M.I.T. After the war he earned his Ph. D. at the University of Illinois in 1950 and became an assistant professor at Georgia Tech the following year. He was called to active duty again during the Korean conflict and spent two and a half years stationed in Tokyo before returning to Georgia Tech. During the 1960's he spent four years with a group from UCLA as a visiting professor in Indonesia. Upon his return he joined the mathematics department at Emory University. Having developed an interest in

computing by that point, he was responsible for the installation of an IBM 1410 machine at Emory in 1965 and eventually became director of the Emory Biomedical Data Processing and Analysis Center and chairman of the Emory biometry department.

Arthur E. Fulton (1906-1973)

Arthur Fulton was born in Webbsboro, Elbert County, Georgia. He was another of the many veterans hired as an instructor at the end of the second world war. With a master's degree from the University of Georgia and the author of *The College Placement Algebra Workbook: Defense Mathematics* published in 1942, he was promoted to assistant professor in 1947, a position he held until his death in 1973. Like Al Bailey he had a reputation for strict grading and was sometimes referred to as “Steamboat” Fulton.

James Richard Garrett (1917-2009)

As an undergraduate James Garrett participated in a five year program which led to bachelor's degrees from both Lenoir Rhyne College and Cal Tech. He received his Ph.D. at Duke University in 1950 under the direction of Leonard Carlitz, and became an assistant professor at Georgia Tech the next year. His master's thesis, also written at Duke, had dealt with the distribution of primes, and his doctoral dissertation had been concerned with equations in finite fields. He continued the latter work after coming to Georgia Tech but also began to study the mathematics of computation with I. E. Perlin, and earned a master's degree in meteorology at Cal Tech in 1952. He developed a relationship with the Rich Electronic Computer Center and took an interest in computations related to artificial earth satellites. He left Georgia Tech in 1960 to enter the private sector and was soon working as manager of mathematical services for the RCA at Patrick Air Force Base in Florida, where that firm had a contract in support of a missile test project for the Air Force. By the mid 1960s he had become a visiting lecturer SIAM and continued his work in computation throughout his career.

William A. Martin

Bill Martin was one of the many veterans hired late in 1945 to begin teaching in January of 1946. He had a master's degree from the University of Illinois, and like several of the others, he was promoted from instructor to assistant professor the next year. He became an associate

professor in 1963 and remained in that position until his retirement in 1973. He was one of those who became interested in linear programming and joined the others teaching that new subject in the '60s and '70s.

William Vincent Neisius (1917-2011)

Vincent Neisius earned a bachelor's degree in chemical engineering at Georgia Tech in 1940 and became an instructor in the mathematics department in 1942. He then became part owner in Neisius-Beverly studios which did time study engineering. He also worked for the Firestone Tire Company before returning to the Georgia Tech faculty in 1946. In 1950 he earned a master's degree at Emory University. At Tech he developed an interest in computing and in methods for analyzing transportation fare structures after consulting with Georgia Power when they were installing air conditioning in their trackless trolleys. In 1952 he joined Alweg Transit Research Company, whose owner had financed the computer company Logistics Research. Neisius then wrote programs for the first ALWAC computer, which was operational in June of 1953, just eight months after the decision to build that machine was made. Later he was marketing manager and eventually executive vice president of Logistics. He went on to work for J. B. Rea Company, Systematics, and Packard Bell before joining TRW in 1961, where he would be project manager for simulator development and management systems. He remained at TRW until his retirement in 1987. An interview he gave in 1973 can be found in the Computer Oral History Collection at the Archives Center of the American Museum of Natural History. He maintained his interest in Georgia Tech, donating to the school for over fifty years. He returned in 2008 for a reunion of the class of 1940 and told the participants of a hot air balloon trip over vineyards in France which was part of the celebration of his ninetieth birthday. (You can now find a video clip on Youtube which features him telling a string of not-so-safe-for-work jokes on the occasion of that birthday.)

Irwin Earl Perlin (1911-1977)

Irwin E. Perlin grew up in Chicago where he played basketball and volleyball and served as the president of the Latin Club at Tuley High School. He received B.S. and M.S. degrees at Northwestern University before earning his doctorate at the University of Chicago in 1935 under Gilbert Bliss, the advisor of D. M. Smith nearly 20 years earlier. He then taught at the Armour Institute of Technology and the Illinois Institute of Technology. (In 1941 he wrote a paper on modifications of divergent harmonic series which could make them converge, reviving

a subject which had been dormant for 20 years, and which would then be taken up by others such as P. Erdos and I Niven.) During the second world war served in the navy in Cleveland, Ohio, and at the USNR Midshipman's School in New York. After the war he was hired as an assistant professor at Georgia Tech. Soon thereafter he was teaching the most advanced courses offered by the department, primarily for graduate students from other units. By 1952 he had been promoted to the rank of professor. At about that time his early interest in computing led to his assignment to secure advanced equipment for Georgia Tech. It has been claimed that he actually talked Douglas MacArthur into giving Tech its first machine, an Energy Research Associates ERA 1101. Supposedly this allowed Georgia Tech to use the \$1,000,000 it had set aside for equipment to build a structure to house it instead. (ERA had been begun as a group working on code breaking for the navy during WWII, and had been purchased by Remington Rand in 1952.) In any case, the 24-bit ERA 1101 arrived at Georgia Tech in 1954, and by 1955 an addition to the Engineering Experiment Station's Research Building had been completed to house the new Rich Electronic Computer Center. At that point he became a full time employee of the computer center and in 1967 was appointed as its director. When the School of Information and Computer Science was created in 1970 he became a professor in that department, a position he held until his retirement in 1976. He died in the crash of Southern Airways Flight 242 in 1977.

Colbert Thaxton Purvis (1920-1992)

Colbert Purvis grew up in Atkinson, Georgia, and obtained a bachelor's degree from Georgia Teachers College in 1940. After two years as a high school teacher and coach, he entered the Navy. He was another of the veterans hired as an instructor in the fall of 1945 to begin teaching in January of 1946, first in the Extension Division. He became an assistant professor in 1953 and in 1957 obtained a Ph.D. at the George Peabody College for Teachers of Vanderbilt University with a dissertation devoted to criteria for high school mathematics programs. In the late 1950s he organized the first high school mathematics competitions at Georgia Tech. In 1961 he went to Hayward State College in California and then continued to teach and organize institutes for high school teachers in the East Bay area until his retirement.

Carl Robert Swenson (1920-1994)

Bob Swenson was born in Rockford, Illinois, and obtained a bachelor's degree at the University of Chicago in 1942. The next year he was hired as an instructor at Georgia Tech. During

1942-46 he was on leave with the United States Navy. He took another leave of absence during 1948-9 to obtain a master's degree at Emory University. The next year he was promoted to assistant professor, and in 1959 he was promoted to the rank of associate professor. An avid bridge player, he continued to teach until his retirement in 1978. He died in January of 1994.

John Rich Vail (1905-1990)

John Vail was born in Boston, the son of a hay and grain merchant. He obtained a bachelor's degree in commerce and economics at the University of Vermont in 1931 and later earned a master's degree at the University of Michigan. (The Vail family had been in this country since about 1650, and had made Vermont their home for six generations.) John Vail came to Georgia Tech in 1941 as an instructor, and, having taught at a naval air station during World War II, was promoted to the rank of assistant professor in 1947. He remained in that position until his retirement in 1972.

James Hatton Wahab (1920-2009)

James Wahab obtained his bachelor's degree at William and Mary University in 1940. From 1942 to 1946 he served in the Army Air Corps. He received his master's degree from the University of North Carolina in 1950 and his Ph.D. there the next year. He came to Georgia Tech in 1952 where he remained until 1958 when he went to the University of Louisiana at New Orleans as chairman. Later he was chairman and academic dean at the University of North Carolina at Charlotte before becoming the chairman at the University of South Carolina in 1968. He remained at South Carolina until 1983 and is credited with initiating the program in probability and statistics at that institution. One of the first people he hired there was the 1970 Georgia Tech graduate in mathematics and operations research, Jim Buckley. Wahab later taught at Rollins College and the University of North Florida. He was particularly active in the MAA, twice serving as the chairman of the southeastern section.

Edgar Franklin Wells (1916- < 2004?)

Edgar Wells may have been the only philosopher ever hired by the department. Born in North Carolina, he received his master's degree at the University of North Carolina in 1937

and then attended Harvard. There he organized the papers of the nineteenth century philosopher Josiah Royce and obtained his Ph.D. in 1941. He was hired by Georgia Tech after a year at UNC Greensboro, and remained in the department until moving to the University of Wisconsin for one year in 1946. He next became a professor of philosophy at the University of Pittsburgh, where he remained for fifteen years. Later he taught at Slippery Rock State College, also in Pennsylvania.

Ralph Arthur Willoughby (1924-2001)

Some have called Ralph Willoughby the “father of sparse matrix theory.” He grew up in California, and, after serving in World War II, attended the University of California at Berkeley, where he received his Ph.D. in 1951. He was hired as an assistant professor at Georgia Tech the following year and was promoted to the rank of associate professor in 1954. Having worked during the summers at the Oak Ridge National Laboratory, he joined Babcock and Wilcox in 1955 and became involved in atomic energy research. Two years later he became a member of the Mathematics Group at IBM Research. His initial work on circuit simulation led to more efficient integration methods for stiff systems of ordinary differential equations. He and his IBM colleagues then realized that, while large, the systems involved were also sparse. This led to new general methods for sparse matrices, and applications to other areas such as linear programming and power system analysis. He sought to encourage people from these application areas to communicate with numerical analysts. This work was to have a large impact on numerical linear algebra. Later he turned his attention to large eigenvalue problems, before retiring from IBM in 1991.

Guy A. York (1909-1992)

Guy York was another among many veterans hired in late 1945 to begin teaching in January of 1946. He had received his master's degree at the University of North Carolina in 1933. He was also one of those, along with Bill Martin and J. C. Brooks, who remained in the department for the rest of their careers, retiring as an assistant professor in 1974.

Junior Instructors

The burst of hiring at the end of World War II produced a very large contingent of part-time instructors, instructors, and assistant professors. As in the earliest days of the department, quite a few of these were recent Georgia Tech graduates. Some like those above remained in the department for nearly thirty years, but most stayed for just a few, and it is difficult to identify all of them now. Each annual catalog contained a list of the departmental faculty – essentially naming those who had been present the previous year – and the editions of the Blueprint from the period also had faculty lists. The archives of the Georgia Tech Library contain “Faculty Rolls” for the entire institute for some of the years in question as well. But unfortunately, in most cases no two of these match completely. Some include the instructors in the extension division, others do not. (by 1950 the Engineering Extension Division, including the unit which would become Southern Tech, had an enrollment of 7,787, while the enrollment in the “day division” was 6,069.)

With the best evidence available itself somewhat problematical, what is given here may be incomplete, and may well have a few errors. There were simply too many part-time instructors, 25 in 1948 for example, to deal with all but a few of them. The following may, however, give some idea of those who were members of the mathematics department for relatively short periods during the Van Leer presidency. The list includes F. McK. Adams (1946-48), L. A. Beale (1948-52), J. P. Brown (1947-50), W. R. Carnes (1951-55), S. H. Chasen (1947-50), R. S. Christian (1946-50), H. L. Cook (1946-50), L. R. Daniel (1947-52), H. L. Durham (1947-52), R. W. Edenfield (1942-46), M. H. M. Esser (1952-55), W. S. Gnann (1947-51), H. C. Griffin (1947-50), H. R. Henry (1947-48), R. L. Herring (1954-56), W. B. Kehl (1943-45), C. W. Long (1946-1950), G. M. Manning (1946-50), O. Newell, Jr. (1947-48), G. K. Overholtzer (1952-56), W. M. Perel (1954-56), T. I. Porter (1947-50), M. D. Prince (1947-49), F. M. Rowan (1943-44), S. B. Sommerville (1945-46), T. E. Suttles (1948-1949), J. I. Teat (1945-1947), D. C. Trexler, Jr. (1945-1946), R. B. Underwood (1945-47), J. G. Wall (1948-51), and H. C. Ward (1950-51).

Francis McKee Adams was probably the only rear admiral ever hired by the department. Born in 1900 in Troy, Alabama, he attended the United States Naval Academy and went on to 24 years of active duty, including considerable combat service. He served at sea from December of 1941 to April of 1945, including a period as the commanding officer of the USS Pierce. He was advanced to the rank of rear admiral when he was placed on the retired list and shortly thereafter joined the other veterans who began teaching at Georgia Tech in January of 1946. He died in Seattle, his wife's home, in 1973.

Luther A. Beale was born in Jacksonville, Florida, in 1923 and grew up around Savannah. He served in the United States Navy in the South Pacific at both Guadalcanal and Iwo Jima during World War II . He earned a bachelor's degree in civil engineering at Georgia Tech in 1948 and became an instructor in the mathematics department the next year. He later added a master's degree in civil engineering . In 1955 he went to Lamar University in Beaumont, Texas, as chairman of the civil engineering department. He received his Ph.D. from the University of Texas in 1966. Upon his retirement in 1984 a new wing of Lamar's engineering building was named in his honor and a memorial scholarship in civil engineering at that institution also bears his name. Shortly before his death in 2001 he was named a “Fellow” of the American Society of Civil Engineers.

Walter R. Carnes, born in Mississippi, obtained a bachelor's and a master's degree in aeronautical engineering at Georgia Tech before becoming an instructor in the mathematics department in 1951. He spent 1952 and 1953 on leave in the United States Air Force and then continued as a mathematics instructor until 1955. After receiving his Ph.D. he taught aeronautical engineering at Georgia Tech for several years before going to Mississippi State University, where he retired in 2003 as associate dean of the College of Engineering.

Sylvan H. Chasen earned a bachelor's degree in chemical engineering at Georgia Tech in 1946 before becoming an instructor in the mathematics department the next year. He continued as an instructor until 1950 and then spent two years as a graduate student at Emory University. He left Emory to become a mathematician at the US Naval Air Station in Patuxent, Maryland and later joined Lockheed (along with M. David Prince, another former mathematics department instructor from the same years). While at Lockheed he authored books on interactive computer graphics and computer aided design.

Robert S. Christian had a bachelor's from Westminster College and a master's degree from Washington University when he was hired as an instructor to begin teaching at Georgia Tech in January of 1946. He was promoted to the rank of assistant professor the next year. In 1952 became an assistant professor at the Atlanta Division of the University of Georgia, which had once been the Evening School of Georgia Tech and would eventually become Georgia State University. At the time of his death he was an associate professor in the Georgia State College of Business Administration.

Hollis L. Cook was born in 1913 in Calera, Alabama, and earned his bachelor's degree at Stephen F. Austin State University and a master's degree at Texas A&M University. He taught at Edinburgh Junior College and Auburn before coming to Georgia Tech as an

instructor in January of 1946. In 1947 he was promoted to assistant professor, and remained in that position until 1950. In 1951 he received his Ph.D. from the George Peabody College for Teachers of Vanderbilt University. He then taught at the University of Arkansas and Troy State University before becoming the chairman of the mathematics department of West Texas State A&M University. He remained chairman there for 22 years. He is credited with establishing the master's degree program in mathematics at WTAMU and in 1967 was named its Outstanding Teacher of the Year. A scholarship to support a master's degree student in mathematics bears his name at that institution. He died in Nacogdoches in 1998.

Leonard Rupert Daniel earned a bachelor's degree in chemical engineering in 1946 and became an instructor in the mathematics department the next year. He was promoted to assistant professor in 1951 and in 1952 received his Ph.D. in chemistry. He later went to Howard Payne College in Brownville, Texas, where he became head of the chemistry department, and eventually chairman of the math and science division.

Howard L. Durham, Jr., like Daniel and Chasen, had a bachelor's degree in chemical engineering when he became, first a part-time instructor in 1947, and then an instructor in the mathematics department. He remained an instructor until 1952. Like many of the mathematics instructors of that period, he had studied with I. E. Perlin. After taking a leave of absence in 1952-53 he returned to the Engineering Extension Division. There he developed an interest in aeronautics, eventually authoring papers on helicopters and other aerospace topics. He also served as an assistant professor in the department in 1961-62.

Robert Wilson Edenfield was born in 1874 in Hephzibah, Georgia, outside of Augusta, and earned a bachelor's degree at Mercer University in 1901. He became high school teacher and eventually was the head of Gordon College in Barnesville, Georgia, and president of Hearn Academy in Cave Spring. During that period he spent 21 months at the University of Chicago and a summer each at the University of North Carolina and the University of Georgia. In 1938, already at retirement age, he began teaching in the Georgia Tech Evening School and in 1942 became an instructor in day program as well. He continued doing both until 1946. He lived long enough to help organize the fiftieth reunion of his Mercer class I 1951, and died in 1954.

Martinus H. M. Esser studied at the University of Chicago and received his Ph.D. at Northwestern University in 1946. He taught the Iowa State Teachers College and the Illinois Institute of Technology before coming to Georgia Tech in 1952. His earliest research dealt with mathematical biophysics, with papers on such subjects as the mechanism of the inner

ear and the structure of trees. His doctoral dissertation was on self-adjoint transformations. In 1956 he went to the University of Maryland and the next year to the University of Dayton. He remained at Dayton for the rest of his career, also working at the Aerospace Research Laboratories at Wright Patterson Air Force Base. Past the age of 90, he still resided in Dayton in 2011.

Henry Clay Griffin was born in Eclectic, Alabama, near Montgomery, in 1920. In 1941 he earned a bachelor's degree in electrical engineering at Georgia Tech and, after working briefly in Milwaukee, entered the service. He spent one year with the Navy in New Orleans and then became an officer in the Signal Corps, serving primarily in Alaska, until 1946. He then became one of the many returning veterans who became instructors at Georgia Tech. In 1951 he left to manage a family ranch in Senoia, Georgia. When the ranch was sold in 1962 he returned to engineering, working for Southern Bell for the next twenty years and becoming district manager for radio and microwave engineering for the state of Georgia. He died in July of 2000.

Harold Ray Henry obtained a bachelor's degree in civil engineering at Georgia Tech in 1946 and became an instructor in the mathematics department the next year. Later he was an instructor in the civil engineering department. He went on to obtain a master's degree in hydraulics at the University of Iowa and a Ph.D. degree in fluid mechanics at Columbia. In 1952 he was awarded the J. C. Stevens Award from the American Society of Civil Engineers, an award which recognized the excellence of a paper in the field of hydraulics. After a period at working at the hydraulics laboratory at Michigan State, he went to the University of Alabama at Tuscaloosa, where he became professor and chairman of the department of civil and mining engineering and was associated with university's bureau of engineering research. His name often appears in lists of "creation scientists," and he served as a technical advisor to the Institute for Creation Research.

William Brunner Kehl came to Georgia Tech with a master's degree from Harvard in 1943. Later he joined the Instrumentation Lab at M.I.T. where he became interested in the use of computers. He then moved to the University of Pittsburgh, eventually becoming the director of the computer center there. As the result of a project involving health law statues, he helped devise the technique of text schematics which led to a seminal paper on information retrieval for legal studies in 1961. During the 1960s he participated (along with William Atchison) in drafting the influential ACM recommendations for academic computer science programs. In the early 1970s he moved to UCLA where he would become director of the Center for Information Services and director of the Office of Academic Computing. He died at the age of 90 in 2009.

Clyde W. Long was another of the veterans who became an instructor in January of 1946. He had a bachelor's degree from McMurry College in Abilene, Texas, and after earning a master's degree at SMU, he returned there in 1953 to become the only member of its mathematics department at the time.

George M. (“Mutt”) Manning was born in Albany, Georgia, in 1923, and entered Georgia Tech in 1940. He earned letters in football in 1941 and 1942. By 1943 he was president of the student body and captain of the football team. He was then considered to be a “stellar center” and “outstanding All-American candidate.” But in late October of that year Manning, and the others who had joined the Navy V-12 training program begun the previous July, were suddenly transferred to other training stations – a week before the Duke game. (Cadets in Army training programs on other campuses were not allowed to participate in intercollegiate sports. As a result, many institutions were forced to discontinue their football programs, and schools such as Alabama, Auburn, Stanford, and Syracuse were unable to field any teams in 1943. Those in the Navy and Marine V-12 programs, such as the one at Georgia Tech, on the other hand, were encouraged to take part in varsity sports – which was fine until the call-ups began late in that same year.) Manning ended his service in the navy as a Lt. Commander, j.g. and returned to Georgia Tech to become one of the many veterans hired as an instructor by the mathematics department in 1946. He continued in that position until 1950, while finishing his bachelor's degree and earning a master's degree in mechanical engineering, also serving as an assistant football coach. After Georgia Tech he was employed as a mechanical engineer at the Cocker Machine and Foundry Company, a maker of machines for the textile industry in Gastonia, North Carolina. Later he was chief engineer for Cleo Screws Heating and Air Conditioning Company and retired as president of Sun-Drop Bottling in Gastonia. During this period he officiated at ACC games for 35 years. He died in 1999.

Oswald J. Newell, Jr. was born in 1925 in Plumerville, Arkansas, and received his bachelor's degree in chemical engineering in 1946. The next year a paper he co-authored with a chemistry professor won one of the very first Sigma Xi research awards at Georgia Tech. He was an instructor in the mathematics during 1947-48 and earned a master's degree in chemical engineering in 1948 with a thesis entitled “Construction and Testing of a Hydrogen Liquifier.” After leaving Georgia Tech he entered the oil industry, working for Continental Oil Company. In 1956 earned a master's degree in industrial management through the Sloan Fellows program at MIT. From 1958 to 1963 he was superintendent of the Continental refinery in Denver. In 1963 he became vice president for manufacturing at Douglas Oil Company in Los Angeles, and in 1966 president of Continental Carbon Company in Houston. In 1975 he became executive

vice president for worldwide refining at Conoco, Inc. and in 1983 executive vice president for manufacturing technology at that firm. His wife Virginia, who died in 2011, had been a trustee the Houston Ballet and on the Board of Directors of the Houston Grand Opera. The family farm in Plumerville was eventually operated as the Newell Farming Company, Inc.

Gordon Klinzman Overholtzer attended UCLA on a Paramount Pictures Scholarship, graduating in 1944. He then earned a Ph.D. at Indiana University in 1948 with a dissertation on p-adic analysis. He taught at the University of Kansas and Purdue before coming to Georgia Tech as an assistant professor in 1952. In 1956 he went to the State College of Washington and later taught at what is now California State University, Los Angeles. He in died there in 1968, still in his 40s.

William M. Perel had a master's degree from the University of Indiana when he came to Georgia Tech in 1952. In 1956 he went to Texas Tech, and later taught at the University of Louisiana at New Orleans, before moving to Wichita State University where he became head of the department in 1967.

Thomas Isaac Porter received a bachelor's degree in education from the University of Missouri in 1915 and served as an instructor in mathematics and physics in the 1920s. In 1931 he earned a master's degree in mathematics at the University of Chicago with a thesis entitled "The History of the Classical Isoperimetric Problem." He came to Georgia Tech as a physics instructor in the extension division in 1945 and later served as an instructor in the mathematics department from 1947 to 1950. He died in Missouri in 1960.

Morris David Prince was born in Greensboro, North Carolina, in 1926 and earned his bachelor's degree in electrical engineering at Georgia Tech in 1946. After one year in the navy he returned to enter graduate studies and serve as an instructor in the mathematics department. In 1949 he earned his master's degree with a thesis entitled "Resolution as a Function of Band-width in a Television System." In 1951 he left the mathematics department to become a research engineer with the Engineering Experiment Station. Later he worked for the Federal Telecommunication Laboratory in Atlanta, then joined Lockheed. There he became a senior staff specialist, and in 1971 he published a book entitled *Interactive Graphics for Computer-aided Design*. Lockheed was one of the first commercial establishments to use computer graphics, and his book described some of the advances which had been made there. After his retirement he was inducted into the Georgia Tech College of Engineering Hall of Fame.

Frank M. Rowan was already in his sixties and had been teaching for a long time when he became an instructor in the mathematics department in 1943-44. From 1914 to 1920, for instance, he had been the principal of the First District Agricultural and Technological School in Statesboro. That tiny institution, after a total of five name changes, would eventually emerge as Georgia Southern University. After serving in the mathematics department Rowan would continue for several more years, first as an instructor, then as an assistant professor in the engineering drawings and mechanics department.

Thomas E. Suttles, Jr. was the son of the Tax Collector for Fulton County and had degrees from Georgia Tech and the United States Naval Academy when he became an instructor in the mathematics department in 1948. He earned a master's degree in mathematics at Georgia Tech in 1954 and a Ph.D. in physics at New York University in 1962. He later joined TRW where he worked on communication satellites.

James Ira Teat obtained a Georgia Tech bachelor's degree in textile engineering in 1940 and became an assistant director of the Co-operative Division the following year. He served the Navy during World War II, and then became an instructor in the mathematics department in 1945 and an instructor in the Evening School in 1948. He then went into the textile industry at Whittier Mills in North Carolina but often returned to the campus to give advice to students in his field. He died in North Carolina in 1993.

Duke Caleb Trexler, Jr. held a master's degree in economics from the University of Texas and was navy veteran when he became an instructor in the mathematics department in 1945. He was later the executive director of the Commission on Drug Safety established by the pharmaceutical industry in the early 1960s and then executive secretary of the National Research Council, Division of Medical Sciences, Commission on Drug Dependence, National Academy of Sciences. He died in Florida in 2005.

James Graham Wall held a bachelor's and a master's degree from the University of North Carolina when he was appointed as an assistant professor in the mathematics department in 1948. In 1951 he took a leave of absence to begin further graduate work at the University of Georgia. He earned a Ph.D. there in 1954 with a dissertation entitled "An Analytic Study of Critical Thinking Among College Freshmen" based on observations of students at Emory and Georgia Tech. From there he went to Valdosta State University where he eventually became dean of men.

Henderson C. Ward had served as an instrument flight instructor from 1943 until 1946 before

completing his bachelor's degree in chemical engineering at Georgia Tech in 1948. He began graduate studies the next year and served as an instructor in the mathematics department in 1950-51. In 1952 he and Walter W. Wright earned the first two master's degrees awarded by the School of Mathematics. In 1953 he earned a Ph.D. in chemical engineering and joined the faculty of that school, where he remained until his retirement in 1985. He was chosen as the Georgia Tech Teacher of the Year in 1983. He also became a Fellow of the American Institute of Chemical Engineers and in 2003 was inducted into the College of Engineering Hall of Fame. He was also the co-author of *A Century of Chemical Engineering at Georgia Tech*, published in 2006. Henderson died in October of 2008.

5. Growing Pains: The Harrison/Hansen Years, 1957 - 1971

Background

President Van Leer, having been in ill health much of the previous year, suffered a massive heart attack and died in January of 1956. Paul Weber, who had been named dean of the faculties just months before, became the acting president. Weber had come to Georgia Tech as an instructor in chemistry almost thirty years earlier. He had gone on to earn his Ph.D. at Purdue in 1934 and taught in the departments of chemistry and chemical engineering before serving as assistant to the director of the experiment station, Gerald Rosselot. Still later he became the head of the school of chemical engineering. He was to remain in the position of acting president for nearly 18 months. Weber was very highly regarded and described as fair, thorough, soft-spoken and detail oriented. He did not, however, enjoy the political and social aspects of the presidency. He continued the building program that Van Leer had started, a program which would see the completion of Alexander Coliseum in 1956, and later that of the Skiles Classroom Building in 1959. He also worked hard to remedy an embarrassing salary situation, obtaining some additional funds from the regents and arranging the first salary supplements from the Georgia Tech Foundation. Nonetheless the institute lost more faculty members than it gained during his first year.

The search for a new president went slowly, hindered by the low salaries and the looming issue of desegregation. Two members of the Board of Regents essentially stumbled on Edwin D. Harrison in May of 1957 while visiting the University of Toledo, where he was serving as the dean of engineering. Once he was identified things moved quickly, and he was elected the next month, to take office in August of that year.

Harrison was born in Evadale, Arkansas, in 1916, the son of a career military officer. He earned his bachelor's degree at the United State Naval Academy in 1939 and remained in the navy until 1945. In 1948 he received a master's degree in mechanical engineering at VPI and in 1952 a Ph.D. at Purdue. He had served briefly as an assistant dean at VPI before going to Toledo.

Harrison worked well with Weber, who had retained his position as dean, and, unlike Weber, seemed to thrive on public relations. He oversaw a strengthening of the entrance requirements, designed to take place over a five year period beginning in 1959. By 1963 the requirements called for, among other things, two units of algebra, one of plane geometry, and one-half unit of both trigonometry and advanced algebra. (The Board of Regents had already called for the submission of SAT scores by all applicants to state colleges and universities in 1957-58.)

Harrison's first major challenge concerned integration, and it is a measure of his success that, while it was strenuously opposed by the legislature and the governor, in 1961 Georgia Tech would become the first public institution of higher learning in the South to be peacefully integrated without a court order.

Also in 1961 plans were laid for a major self-study, to be completed in time for the Institute's 75th anniversary in 1963. The meetings and discussions meant to guide this self-study revealed serious tensions between those, mostly in the college of engineering, who wished to emphasize undergraduate education and to preserve the “shop culture” upon which Georgia Tech had been formed, versus those who wished to broaden the scope of the institution, with more attention to research and graduate work, and with more offerings in the sciences, mathematics, and the humanities. These tensions came to a boil in 1965 when Harrison announced an administrative reorganization, which included the firing of Jesse Mason as the dean of engineering. Mason, supported by all but one of the directors of the engineering schools, had been a very outspoken opponent of any broadening of the role of the institute. The new plan called for five vice presidents, with Weber becoming the vice president for academic affairs and Mason the vice president for “special projects.” Mason was furious, but the plan was put in place. Arthur G. Hansen, formerly the chairman of the mechanical engineering department at the University of Michigan, and with a doctorate in applied mathematics, became the new dean of engineering in 1966. Only then were major steps taken to revise the engineering programs and to introduce a “core curriculum.”

Both Van Leer and Harrison had sought to strengthen research and graduate education, but progress was slow. In 1956 Herman Fulmer would write to a job applicant (later hired) that “When it comes to considering people for promotion, teaching comes first. We do not rate a man by publications or papers presented. Of course, we like to have these things and encourage them.” Two years later Marvin Sledd, who had succeeded Fulmer in 1957, would write to another applicant (also later hired) that “We encourage research activity, but we do so less frantically than is the practice in some institutions.” Despite these sentiments, discussions had already begun in 1955 concerning the introduction of a doctoral program in mathematics. Work on a proposal for such a degree was already underway in 1959, but it was not approved until five years later. By that time Sledd had been succeeded by Bertram Drucker as director, and George C. Caldwell had become assistant director. The first doctorates in mathematics were awarded to Wilbur Stiles and George Cain in the spring of 1965 and to John Jayne the following December. At that time 53% of the Georgia Tech faculty held doctorates, up from 38% in 1963, with the percentage in mathematics being slightly higher. By then the department had added several members with active research programs such as Robert Kasriel and William Kammerer, who with Sledd served as the advisors for the first half dozen doctoral students.

But it had also lost others such as Nohel, Garrett, Evans and Willoughby.

By 1969 Georgia Tech had doctoral programs in 13 disciplines, but there were serious questions about their quality. The American Council on Education released assessments of graduate education in 1964 and 1969. In the 1969 report programs were ranked on a scale of one to five, with the top three categories, distinguished, good, and adequate-plus, being the only ones reported. Georgia Tech was rated in chemical, electrical, mechanical, and civil engineering, and in chemistry, physics, and mathematics. It improved its ratings a bit in some areas between the two reports, but on the "quality of graduate faculty" in the 1969 report only civil, electrical, and mechanical engineering were rated as good, with chemical engineering, physics, and chemistry as adequate-plus, and mathematics not even ranked. When the criterion was the effectiveness of doctoral programs, no program at Georgia Tech rose above adequate-plus, and mathematics was again unranked. Clearly the graduate programs at Georgia Tech, and particularly in mathematics, had a long way to go.

The administrative reorganization which Harrison pushed through in 1965 was followed by a period of instability which would last throughout his presidency. In addition to the new dean of engineering, Arthur Hansen, there was a new vice president for academic affairs, Arthur Trabant, formerly the dean of engineering at the State University of New York at Buffalo, who replaced Paul Weber in July of 1966. In the same year the dean of the Graduate Division, Mario Goglia, who had been a strong voice for graduate education, left to become the vice chancellor for research at the Board of Regents. In 1967 Ralph Hefner, the mathematician who had been dean of the General College for nearly twenty years, passed away. He was to be replaced by Vernon Crawford who had been head of the physics department. Then in the spring of 1968 Vice President Trabant announced his decision to leave to become the president of the University of Delaware.

In July of 1968 Harrison announced his resignation, to be effective in June of 1969. In January of 1969 J. P. Stevens and Company announced that Harrison would become one of their executive vice presidents, and in February he was granted a four month leave of absence. Accounts differ as to what brought about his resignation, but it seems likely that one contributing factor was his disagreement with the "strong" chancellor of the Board of Regents, George L. Simpson, Jr., over how to replace Trabant. Simpson had been known for trying to exert his influence over important units of the system, which extended to participating in their senior personnel decisions.

When Harrison's leave of absence became effective Chancellor Simpson named the new dean of the General College, Vernon Crawford, as the acting president of Georgia Tech. Three

months later the engineering dean, Arthur Hansen, was named the next president. Crawford then became the vice president for academic affairs, and a decade later would become the chancellor of the University System.

Hansen had been born in Sturgeon Bay, Wisconsin, and was only 44 when he assumed the presidency. He had a B.S. degree in electrical engineering and a M.S. degree in mathematics, both from Purdue and a Ph.D. in applied mathematics from Case Western Reserve University. He had spent the first ten years after he received his doctorate as a research scientist at NASA's Lewis Flight Propulsion Lab in Cleveland and had been a member of the engineering faculty at the University of Michigan for eight years, most recently as chairman of the mechanical engineering department, before coming to Georgia Tech as dean of engineering. As president Hansen continued his efforts to revise the engineering curriculum and to expand offerings in social sciences and the humanities. In this he received strong support from Crawford. By 1970-71 the requirements for undergraduate engineering degrees had been made more flexible, with the number of hours required reduced from 220 to 180-190, while a core curriculum covering 101 hours of course material had been adopted for all undergraduates. Hansen also struggled with the role of the Engineering Experiment Station, attempting to align it more closely with the academic programs. But after just two years in office Hansen announced his resignation, effective July 1, 1971, to accept the presidency of his alma mater, Purdue. He would remain there until 1982, and then become the chancellor of the Texas A&M system. He died at his retirement home in Florida in July of 2010. He was 85 years old.

The Board of Regents then named James P. Boyd as acting president. Boyd had been a member of the physics department from 1935 to 1961, and director of the Engineering Experiment Station from 1957 to 1961. In 1961 he had become the president of West Georgia College and in 1971 had been named Vice Chancellor for Academic Development at the Board of Regents. Boyd was highly respected, and his experience both as a Georgia Tech faculty member and as director of the experiment station made him a good choice for the role. In October of 1971 the regents announced that the Stanford dean of engineering, Joseph M. Pettit, had accepted the position of president, to begin his duties the following spring.

The Curriculum

At the beginning of 1956 mathematics had a total enrollment of 3676, with more than 200 in courses beyond the differential equations level. All of the students took algebra, trigonometry,

and analytic geometry in the first year, plus three quarters of calculus in the second. Some engineering departments also required differential equations. There were about 30 mathematics majors, including a few in the master's degree program in applied mathematics. The undergraduate majors took "higher algebra," analysis, and "modern algebra," and were to choose five more courses from among linear programming, engineering mathematics (including complex analysis), probability, statistics, vector analysis, group theory, topology, and the principles of computing. There were graduate courses in applied mathematics, ordinary differential equations, partial differential equations, the Laplace transform, matrix analysis, hydrodynamics, real and complex analysis, topology, group theory, and statistics.

As the new entrance requirements came into effect, the calculus slowly started appearing earlier. By 1960-61 algebra and trigonometry were covered in the first quarter, with the second quarter devoted to analytic geometry and calculus, and the third to calculus. Calculus continued in the first two quarters of the second year, and there were differential equations courses in the second and third quarters of that year. A course in finite mathematics became required for mathematics majors, taught out of the book by Kemeny, Snell and Thompson. Graduate courses had been added in tensor analysis, special functions, and integral equations, and there was a three quarter sequence in abstract algebra.

Over the next few years undergraduate courses in logic and game theory would be added, as well as graduate courses in algebraic topology and functional analysis and more advanced graduate "topics" courses to support the new doctoral program.

Finally in 1966-67 the freshman year was entirely devoted to the calculus. Courses in algebra and trigonometry were still taught but carried no credit for students in engineering and the sciences. There was a fourth quarter of calculus in the second year, followed by a course in calculus and linear algebra, and another in differential equations. The finite mathematics course was still required, and courses in linear programming and coding were still available, as was a course in information theory. In 1968-69 an undergraduate sequence in partial differential equations was added, and the required course in finite mathematics was replaced by a course entitled "Introduction to Set-Theoretic Concepts," covering Cartesian products, set operations, equivalence classes, mappings, sequences, and cardinality, taught from the book *Relations, Mappings, and Continuity* by Kasriel.

In 1964 a School of Information Science had been created to offer a M.S. degree which combined library science, mathematics, and computing. In 1970 that school developed a minor program available to all Georgia Tech students. At this point, while the school of

mathematics continued to offer a course in linear programming, its other computer related courses were dropped from the its curriculum. Two years later a renaming produced the School of Information and Computer Science (ICS).

The Faculty

George Charles Caldwell (1919 – 1973)

George Caldwell was born in Asheville, North Carolina, and earned his bachelor's, master's, and, in 1956, his doctoral degree at the University of North Carolina. He then taught at North Carolina State University where he became an associate professor in 1959. In 1962 he came to Georgia Tech to serve as the assistant director of the School of Mathematics under then director Bertram Drucker. In 1966 he was promoted to the rank of full professor and became associate director. His administrative duties included the scheduling of classes and general oversight of the undergraduate programs. He carried out these duties with a mixture of firmness, grace, and good humor until his untimely death due to a heart attack at the age of 54.

Samuel Henry Coleman (1929 – 1974)

Harry Coleman, as he was known, earned his master's and doctoral degrees at the University of Virginia before teaching at the University of Wisconsin, then coming to Georgia Tech as an associate professor in 1965. His doctoral work had been in analysis under the direction of E. J. McShane, and he himself had two doctoral students, Charles Green at Wisconsin, and James Buckley at Georgia Tech. His career was cut short when he died of cancer in 1974.

Bertram Morris Drucker (1919 – 1993)

Bert Drucker was born in New York, New York, and after attending school there, received all of his higher education at the University of North Carolina. He served as an instructor at North Carolina, first in psychology, then in mathematics, before receiving his doctorate in mathematics in 1953. In that year he came to Georgia Tech and in 1958 became the assistant director of the school. The following year he was promoted to associate professor and associate director. He was promoted to full professor and appointed director of the school in 1962, remaining as director until 1970.

Having held a graduate fellowship at Oak Ridge National Laboratory for two years which involved working with digital computers, Drucker was able to play a central role in the introduction of this new field at the Institute. He was involved in the establishment of the Rich Electronic Computer Center and after it was formed gave lectures and seminars to train faculty and staff in programming and coding. His efforts led to the introduction of undergraduate courses in programming and numerical analysis in the school during the mid-1950s. He served two years as treasurer of the Association for Computing Machinery and was for many years a consultant to the Committee on the Undergraduate Program of the MAA, visiting and assisting many small colleges in the development of curricula in computer science and numerical analysis.

He also played a large role in the creation of the doctoral program in mathematics at Georgia Tech. That program had been discussed as early as 1955, but as associate director, then director, he was finally responsible for its formal initiation in 1964.

Bert was also the faculty advisor to several student organizations, including Drama-Tech, and in 1960 received the Dean Pershing Award presented by the Student Council "to the faculty member who has made the greatest contribution to student activities during the year." In 1979 he received the Institute's Outstanding Teacher Award. He returned to full time teaching after serving as director and retired in 1980.

Donald M. Frieden (1925 – 1999)

Don Friedlen was born in Chicago. After serving in the United States Naval Reserve he attended the Illinois Institute of Technology where he earned a bachelor's and master's degree. He then did graduate work at the University of Illinois before becoming an instructor at the University of Syracuse from 1955 to 1958. He was hired as an assistant professor at Georgia Tech in 1958 and promoted to associate professor in 1964. In addition to teaching a wide variety of courses on campus, he also taught linear programming at a Union Bag Camp facility in Savannah and engineering mathematics at Southern Tech. He also did volunteer work for a number of local organizations. He retired in 1996, and died in 1999.

Jamie Joseph Goode (1935 -)

Jamie Goode was born in Savannah, Georgia, and attended Georgia Tech as an undergraduate, majoring in physics. In 1958 he obtained a master's degree in mathematics, one of the first students to do so. He next attended the University of North Carolina where he received his doctorate in 1962. Having begun working summers at the Engineering Experiment Station

as an undergraduate, he continued to do so after finishing his master's degree. In 1962 he returned to Georgia Tech as an assistant professor and also continued his association with the Rich Electronic Computer Center for several years. He conducted research in mathematical programming, optimization, and non-linear programming and was promoted to associate professor in 1967 and to full professor in 1980. His doctoral student, Elaine Hubbard, was only the second female to earn a Ph.D. in the department. Jamie retired in 1998.

Dar-Vieg (David) Ho (1931 -)

David Ho was born in Beijing, China, and earned his bachelor's degree in civil engineering at Taiwan University in 1953. After coming to the United States he earned a master's degree, also in civil engineering, at the University of Tennessee in 1955. He then went to Brown University where he earned his Ph.D. in mathematics. He became an assistant professor at Georgia Tech the next year and was promoted to associate professor in 1966. In 1978 he became assistant director of the school and associate director in 1989, remaining in that position until his retirement in 2000. During his 22 years in an administrative position he oversaw the scheduling of every mathematics course taught and the registration of perhaps as many as 300,000 students. This included devising software for various aspects of these tasks such as the scheme once used to pre-register all Georgia Tech freshmen for English, chemistry, and mathematics. Often described as “tireless” and “patient,” David always seemed to be able to work easily with everyone. In retirement he and his wife Rosalyn often traveled , returning to China on several occasions. His three children, all Georgia Tech graduates, established a Georgia Tech Foundation fund which bears his name.

Eric Robert Immel (1924 – 1984)

Eric Immel was born in Clifford, Ontario, Canada, and earned his bachelor's and master's degrees at Queen's University. In 1951 he received his Ph.D. at UCLA and joined the faculty at the University of Wisconsin, first as an instructor , then as assistant professor. He came to Georgia Tech in 1956. He was promoted to associate professor in 1958 and to full professor in 1963. His interests were in analysis and probability, and he was the advisor for thirteen master's degree students, including Jamie Goode. For ten summers, from 1959 to 1970, he served as a visiting professor at Wisconsin, teaching and participating in NSF summer institutes for college mathematics teachers. A lifelong bachelor, Eric was an opera buff and avid world traveler, managing to visit Europe, Japan, Thailand, Africa, and the Caribbean before his death in 1984.

Rodger Durgin Johnson, Jr. (1930 -)

Rodger Johnson was born in Richmond, Virginia, and attended Dartmouth College as an undergraduate. He then earned a master's degree, and, in 1956, his Ph.D. at the University of Virginia. His dissertation was in topology, under the direction of Edwin Floyd. He came to Georgia Tech as an assistant professor the next year and was promoted to associate professor in 1961. He served as the advisor for master's degree students Julio Bastida, John Gard, and Gary Hamrick. Johnson retired in 1993.

William John Kammerer (1931 – 1998)

Bill Kammerer was born in Rochester, New York, and received his bachelor's degree at the University of Rochester in 1954. He went to the University of Wisconsin for his graduate work, receiving his master's degree there in 1955 and his Ph.D. in 1959. In 1960, after working briefly in the Operations Research Group at the Case Institute of Technology, he accepted the assistant professorship at Georgia Tech which he had been offered the previous year. He was promoted to the rank of associate professor in 1963 and to full professor in 1971. His research area was numerical analysis, and he served as the advisor for Wilbur Stiles, who received one of the first doctorates awarded by the department, as well as for Thomas Lucas, George Reddien and Luis Kramarz. He served as the computer coordinator for the school and was acting director for two years prior to his retirement in 1989.

Robert Herman Kasriel (1918 – 2007)

Bob Kasriel was born in Tampa, Florida, and attended the University of Tampa, receiving his bachelor's degree there in 1940. For the next two years he served as an assistant to the president of that institution, in charge of war training courses. From 1943 to 1945 he served at the United States Air Force School of Applied Tactics and from 1945 to 1947 at the U.S. Marine Academy. He then entered graduate school at the University of Virginia, earning his Ph.D. in topology under the direction of Gordon Whyburn in 1953. During 1952-1954 he was also a research scientist at the NACA (now NASA) facility at Langley Field. He became an assistant professor at Georgia Tech in 1954. He was promoted to associate professor in 1957 and to full professor in 1962. Acting director Herman Fulmer had asked someone in Virginia who was to interview Kasriel for a faculty position, “Does he look you in the eye, or is he shifty?” Bob, it turned out, was unusually modest and kind, and anything but “shifty.” In 1962 he received the Ferst Sigma Xi Research Award, and later served as the president of the Georgia Tech chapter of

Sigma Xi. In 1983 he also received an Outstanding Teacher Award. His undergraduate topology textbook was adopted by nearly 100 institutions. Bob served as advisor for George Cain, who received one of the first doctorates awarded by the school, as well as for Richard Fuller, David L. Brown, and Stanley Wertheimer. He retired from Georgia Tech in 1984 and died of cancer in 2007 at age of 88.

Rudolf Kurth (1917 - ?)

Rudolf Kurth was born in Berlin and studied mathematics and philosophy in Berlin and Heidelberg before serving in the army from 1939 to 1946. He then attended the University of Berne where he obtained his doctorate in 1949 and habilitation in 1951. He next taught at a number of universities in the United Kingdom, while writing books on philosophy and celestial mechanics. He taught briefly at Michigan State University before coming to Georgia Tech as a full professor in 1964. At Georgia Tech he continued his writing and was advisor for one doctoral student, Philip Lee, III. In 1969 he went to the University of Southern Illinois, where he remained until his retirement in 1981. At Southern Illinois, and for nearly thirty years in retirement, he continued to publish a long list of books on academic affairs, the mechanics of the solar system, politics, ethics, and epistemology, most often in German. In 2008 he was living in the Canary Islands.

John Paul Line (1929 - 2011)

Jack Line was born in Pontiac, Michigan, the son of a high school science teacher. He did his undergraduate work at the University of Michigan and obtained a master's degree there in 1951. He continued his graduate studies, working with Ruel V. Churchill, the author of the classic text on complex analysis, until accepting a position as a visiting instructor at Oberlin College in the spring of 1955. He taught at the University of Rochester the following year. He was hired as an assistant professor at Georgia Tech in 1956 and promoted to associate professor in 1962. A square dancing enthusiast, he served as chairman of the National Square Dance Convention in Atlantic City in 1980. He retired from Georgia Tech in 1995.

Albert Leroy Mullikin (1936 -)

Al Mullikin attended Classen High School in Oklahoma City, Oklahoma, and did his under-

graduate work at the University of Oklahoma. He obtained his Ph.D. at the University of Wisconsin in 1965 and joined the Georgia Tech faculty the next year. He served as an assistant dean of the General College for one year before being promoted to associate professor in 1970. He conducted research with Marvin Sledd and his doctoral students on problems involving chains of oscillators and orthogonal polynomials. From 1979 to 1983 he also worked part-time at the Engineering Experiment Station, now GTRI, and in the spring of 1983 became a full-time employee of the station, where he has conducted research on guided missile simulation and tracking.

Mohammed Zuhair Nashed (1936 -)

Zuhair Nashed received his S.B. and S.M. degrees in electrical engineering at MIT and his Ph.D. in mathematics at the University of Michigan in 1963. He joined the faculty at Georgia Tech as an assistant professor the following year and was promoted to associate professor in 1965. In 1967 he won a Lester Ford Award, given by the MAA for papers of expository excellence, and in 1969 was promoted to full professor. He spent 1976-77 as a visiting professor at the University of Michigan and the next year joined the mathematics faculty of the University of Delaware. In 1983 he became a professor of electrical engineering at Delaware as well. In 2002 he went to the University of Central Florida as professor and chairman of the mathematics department. His research interests included integral and operator equations, inverse and ill-posed problems, numerical analysis, nonlinear functional analysis, and approximation. He published over 130 papers and served as the editor of several journals and on the editorial board of a dozen more.

John A. Nohel (1924 – 1999)

John Nohel was born in Prague and lived there until 1939 when his family were forced to leave their home. In 1943 he became an American citizen and joined the U.S. Navy. After his military service he obtained a B.A. degree in electrical engineering at George Washington University in 1948 and a Ph.D. in mathematics at M.I.T. in 1953. He took a position as an assistant professor at Georgia Tech the following year. He was promoted to associate professor in 1955 and to full professor in 1959. In 1961 he joined the mathematics department at the University of Wisconsin, where he taught until his retirement in 1991. He was the author of more than 80 research papers, co-authored or co-edited a dozen books, and advised ten doctoral students. His early work involved the study of the qualitative behavior of solutions of

differential equations, Volterra integral equations, and differential-delay equations. Later he studied integrodifferential equations and their application to the theories of viscoelasticity. At Wisconsin he served as chair of the department from 1968 to 1970, as director of the Mathematics Research Center from 1979 to 1987, and as founding director of the Center for the Mathematical Sciences from 1987 to 1990. In 1984 he was elected a fellow of the American Association for the Advancement of Science. Three issues of the *Journal of Integral Equations and Applications* were dedicated to him in 1990 in commemoration of his 65th birthday. After his retirement he moved to Switzerland and continued his research, as well as serving as the main editor of the selected works of his doctoral advisor Norman Levinson, a project which was completed in 1997.

James Maxwell Osborn (1929 -)

Jim Osborn was born in Ypsilanti, Michigan, where his father taught chemistry at the Eastern Michigan College of Education. He earned his bachelor's degree at the University of Michigan in 1951 and went on to obtain a master's degree there the following year and a Ph.D. in 1955. His dissertation, written under the direction of George Piranian, was in complex analysis. He served as an instructor at Ohio State University from 1954 to 1957 before becoming an assistant professor at Georgia Tech. Jim had known Jack Line, who had come to Georgia Tech a year earlier, since entering college. Osborn was promoted to associate professor in 1960. He served as the advisor for several master's degree students and directed an extensive self-study of the school in 1972. In 1987 he received an Outstanding Teaching Award. He retired in 1995 and later traveled widely with his wife Sara.

Emma Juanita Jernigan Pitts (1924 – 2004)

Juanita Pitts was born in McKensie, Alabama, the daughter of a high school mathematics teacher and principal. In 1945 she obtained her bachelor's degree from then Troy State Teachers College and became a teacher in Bibb County High School. In 1947 she married Thomas Pitts, and they lived on a farm until his death in 1953. She then returned to teaching and also began taking summer courses at the University of Alabama. From 1956 until 1962 she was an instructor at Alabama, earning a master's degree there in 1957. She joined the faculty of Georgia Tech as an assistant professor in 1962, just two years after Tech's first female faculty member, Mary K. Cabell, had spent one year as a member of the department. Juanita would remain the only woman in the department for nearly a decade. She directed the Math Lab

and was promoted to associate professor in 1982, before retiring in 1987.

Daniel A. Robinson (1932 – 2007)

Dan Robinson was born in Schenectady, New York. He received his bachelor's degree from New York State College for Teachers, now SUNY Albany, in 1953 and a master's degree from Rensselaer Polytechnic Institute the next year. He continued his graduate work at the University of Wisconsin from 1954 to 1959, when he joined the faculty at Georgia Tech. In 1963-64, supported by an NSF Faculty Fellowship, he returned to Wisconsin to complete his Ph.D. with a dissertation on loop theory. He continued his research on Bol loops and Moufang loops throughout his career. He was promoted to associate professor in 1964 and to full professor in 1975. He supervised two doctoral students, Edward Huthnance, Jr. and Roberto Rivera, and wrote 174 reviews for the Mathematical Reviews. He received a First Sigma Xi Research Award twice, in 1967 and 1980. Dan was known for his clear and precise lectures, as well as for his sense of humor. He retired in 2001 and at that point had been a member of the department for 42 years, one year longer than D. M. Smith who until then held the record for length of service.

Marvin Banks Sledd (1912 – 1988)

Marvin Sledd was born in Greensboro, Alabama, one of nine children of Andrew and Annie Candler Sledd. His father had begun his career as a professor at Emory College in Oxford, where his father-in-law had been president. With a Ph.D. from Yale, Andrew was later the president of what would become the University of Florida and was the president of Southern University when Marvin was born. Andrew Sledd spent his last twenty-five years, from 1914 to 1939, as a professor of Greek and New Testament at the Chandler School of Theology of Emory. Marvin himself attended Emory, earning his bachelor's degree there in 1935 and a master's degree in 1936. From 1937 to 1940 he worked for the General Electric Company and took the advanced engineering courses the company provided. From 1941 through 1943 he was an instructor in electrical engineering at M.I.T. and from 1943 to 1946 a radar officer in the U.S. Marine Corps Reserve. He returned to M.I.T. in 1946 as an assistant professor of electrical engineering, receiving a master's degree in that field in 1948, before returning to Emory as an assistant professor of mathematics. In 1950 he began doctoral work in mathematics at M.I.T. and the next year was hired as an associate professor of mathematics at Georgia Tech. Explaining to acting director Herman Fulmer why he preferred to come to Tech rather than

return to Emory he stated that the expertise he had developed, “would be wasted at a liberal arts college.” He returned to M.I.T. during 1953-54 to complete his Ph.D. and was promoted to full professor at Georgia Tech a year later. In 1957 Sledd became director of the school. Sometimes described as a “contrarian,” he was outspoken, and a stickler for his own code of ethics. This occasionally led to confrontations with colleagues, including the equally strong-willed dean of engineering, Jesse Mason. Sledd resigned the directorship in 1962, having submitted a letter in the fall of 1961 which included a handwritten list of his reasons for doing so, the first of which was just “Mason.” (He also cited lack of support for the School of Mathematics and excessive paperwork.) He was named a Regents' Professor in 1968 and retired in 1981. He advised ten doctoral students, including John Jayne, Frederick Cook, and Alan Law, who were among the first half dozen to receive their degrees from the school.

William Rodger Smythe, Jr. (1927 - 2012)

Bill Smythe was born in Orlando, Florida, and served in U.S. Navy before attending Orlando Junior College in 1946-47. He then went to Rollins College (a liberal arts school founded in the same year as Georgia Tech), where he earned his bachelor's degree in 1950. He obtained a master's degree at Duke University in 1952 and a Ph.D. there in 1955. He came to Georgia Tech as an assistant professor the next year and was promoted to associate professor in 1959. He was one of those who took an early interest in the teaching of the linear programming course offered by the department and in 1966 co-authored a popular undergraduate text on that subject. He retired in 1981 after suffering a mild stroke but was able to continue teaching part-time for several years. He was interested in baroque and Renaissance music and was an expert at playing it on the recorder. He also published nearly four hundred doublecrostic puzzles. His wife Jackie joined the department's office staff in Bill's last year as a full-time faculty member and remained with the school for several years thereafter.

Frank Wilhelm Stallard (1923 - 2011)

Frank Stallard was born in Appalachia, Virginia, and earned a bachelor's degree in chemistry at Emory and Henry College in 1944. After serving two years in the U.S. Army he obtained a master's degree in mathematics at Brown University and joined the faculty at East Tennessee State College. In 1951 he entered the doctoral program at the University of North Carolina where he received his Ph.D. under the direction of William Whyburn in 1955. During 1953-55

he also served as an instructor at the Oakridge National Laboratory. After one year as an instructor at Iowa State College, he came to Georgia Tech in 1956 as an assistant professor and was promoted to associate professor in 1959. His research interests were in ordinary differential equations. He served as the advisor for several master's degree students, as well as doctoral students Robert H. Martin, Jr. and Laddie Rollins. Frank retired in 1983. He and his wife Mary celebrated their 55th wedding anniversary in July of 2010, residing then in Wilmington, N. C., where he died in November of 2011.

James Wilson Walker (1922 – 1988)

Jimmie Walker was born in Burlington, North Carolina, the son of a judge. He earned his bachelor's degree at the University of North Carolina in 1943, and then as an officer in the U.S. Naval Reserve he attended Notre Dame University and earned a certificate in meteorology at N.Y.U. and another in Russian at the University of Colorado. He returned to the U.N.C. to obtain a master's degree in mathematics in 1949 and was an instructor there the following year. From 1950 to 1955 he was a civilian intelligence specialist in the United States Air Force. He returned to U.N.C. and earned his Ph.D. in the department of statistics and operations research there in 1957. He was hired as an associate professor at Georgia Tech the next year. During the 1960s he was one of the faculty members who worked part-time at the Engineering Experiment Station. Walker was interested in civic affairs and in 1961 drafted a resolution, signed by most of the department, to the governor's Sibley Commission in favor of the integration of the public schools. He was a vocal supporter of President Harrison in his efforts to broaden the role of the Institute and a strong voice in departmental affairs. The architect of many of the school's programs in probability and statistics, he won an Outstanding Teacher Award in 1977. After his retirement in 1983 he continued to teach courses at Georgia Tech and at Emory and in 1986 was a visiting professor at West Point. He died of cancer at the age of 66 in 1988.

Joseph Willie Wray (1912 – 1990)

Joe Wray was born in Cedartown, Georgia, and was a high school teacher before earning his bachelor's degree at the University of Georgia in 1939. He then became a high principal in Lavonia, Georgia, and also taught at Clinton High School in Clinton, South Carolina, prior to returning to Georgia where he obtained a master's degree in 1944. He was on the faculty of Flora McDonald College and served for one year as an instructor at the North Carolina State University before entering the graduate program at the University of Illinois in 1947. He spent one year as an acting professor at the State Teachers College in New Paltz, New York, and in 1950 he became an assistant professor at the University of Idaho, receiving his Illinois Ph.D. in

analysis in 1952. That summer he served at the Naval Research Laboratory. He remained at Idaho until 1956, spending two summers at Aberdeen Proving Grounds. He came to Georgia Tech in 1956 and was promoted to associate professor in 1959. After he retired in 1978 he and his wife Sarah built a home north of Atlanta. He died in his garden at that home in 1990.

Instructors and Others

In the decade following the introduction of the doctoral program many of the graduate students in that program were eventually given faculty positions as instructors. Most of these, along with other instructors, and many who held other regular faculty positions for shorter periods of time, are listed below.

William F. Atchison had obtained a bachelor's degree from Georgetown College, a master's degree from the University of Kentucky, and a Ph.D. from the University of Illinois before serving with the U. S. Navy during World War II. After the war he returned to Illinois as a programmer. In 1955 he joined the new Rich Electronic Computer Center at Georgia Tech. In 1959 he became head of the computer center and later became a professor in what would eventually become the School of Information and Computer Science. Although not always listed as a member of the mathematics faculty, he appears in various yearbook group photographs seated with the rest of the members of the department. In 1966 he left to become director of the Computer Science Center at the University of Maryland. At Maryland he was instrumental in the creation of degrees in computer science and in 1973 became the acting chair of the newly formed department of computer science there. He was a leading expert in education and curriculum development, and in the 1960s he chaired the ACM committees whose reports recommended comprehensive curricula for computer science programs which were used as the basis for programs worldwide. His work in that area led to many awards, including the ACM Distinguished Service Award in 1973, and his installation as a Founding Fellow of the ACM in 1994. He remained at Maryland until his retirement in 1988 and died in 1998.

Julio Rafael Bastida earned his master's degree with Robert Kasriel in 1960 and then went to the University of Georgia where he earned his Ph.D. in 1963. He returned to Georgia Tech for one year as an assistant professor. He then went to the University of Brasilia and Kansas State, before joining the faculty at Florida Atlantic University, where he completed his career, and where there is an endowed scholarship named in his honor.

Roy Bushnell Bogue held a bachelor's and a master's degree from Auburn University when he came to Georgia Tech as an instructor in 1960. After three years he joined the faculty at what is now the University of West Georgia, where he remained until his retirement.

James J. Buckley had earned a master's degree in industrial engineering at Georgia Tech when he entered the doctoral program in mathematics. He served as an instructor in the school for three years before earning his Ph.D. with Henry Coleman in 1970. He served as an assistant professor in the mathematics department and later the management science department at the University of South Carolina until 1976. He then went to the University of Alabama at Birmingham. He remained there until his retirement in 2007, writing many papers and books on fuzzy sets and fuzzy logic, and their applications in the decision sciences.

David Lyle Brown received a master's degree in 1965 and after serving as an instructor for five years, a Ph.D. with Robert Kasriel in 1970. He then began a long career with the National Radio Astronomy Observatory in Virginia, eventually serving as systems administrator there.

Mary Katherine (Kay) Cabell earned a permanent place in the history of Georgia Tech as the first female member of the regular faculty. Born in Knoxville, Tennessee, she attended the University of Tennessee before entering the graduate program at the University of Virginia. Her husband, Randy Cabell, had earned a bachelor's and a master's degree in electrical engineering (and led the Fowler Street Five band) at Georgia Tech. He met Mary Kay when he went to Charlottesville to attend the Darden School of Business. After completing his work there in 1959, he stayed on in a teaching position for one year while Mary Kay completed her doctorate. He then accepted a job with IBM, which brought them to Atlanta. The School of Mathematics at Georgia Tech had close ties with the department in Virginia and included such U.VA. graduates as Roger Johnson and Bob Kasriel. This may have helped in the decision to break with tradition and hire the first woman at Georgia Tech. After one year Randy's job took them to the Washington D. C. area, so Mary Kay held her Georgia Tech position for just one year. But the precedent had been set. She then began teaching at George Mason University, eventually becoming the undergraduate coordinator there, and retiring in 1998 as associate professor emerita. Randy retired from IBM in 1988 and they lived in a log house in Boyce, Virginia, where he pursued his interest in historical brass band music , and she joined him in musical and church activities.

David M. Clark served as an assistant professor at Georgia Tech for one year before obtaining his Ph.D. with Trevor Evans at Emory with a dissertation on universal algebra. He then began a long career at SUNY New Paltz, where he did research in a number of fields, including model theory, neural networks, natural dualities, topological algebras, and inquiry-based learning. At New Paltz he was named a “Distinguished Professor,” and served as associate dean of the School of Science and Technology.

Richard McCranie Crownover earned a bachelor's degree in physics at Georgia Tech and served as an instructor for two years before earning his master's degree in mathematics with Eric Immel in 1960. He went on to earn his Ph.D. at LSU in 1964 and joined the mathematics department at the University of Missouri the next year. He remained at Missouri until his retirement in 1999, having written papers on Banach spaces, scene analysis, and pattern matching, and a book on fractals and chaos, and having served as director of undergraduate studies, director of graduate studies, and associate chairman.

Theodore Kingsbury Dyer was the son of Gustavus W. Dyer, a faculty member at Vanderbilt and the Archivist for the State of Tennessee. Ted held a bachelor's degree in engineering and a master's degree in chemistry from Vanderbilt and studied theology at the University of the South before serving in the U. S. Navy during World War II. He was an instructor for several years at the University of Kentucky after the war before serving as an assistant professor at Georgia Tech for the one year 1957-58. He died in North Carolina in 2004.

Kent Bruce Erickson served as instructor for two years before going to the University of Wisconsin, where he received his Ph.D. in 1970. In 1973 he joined the faculty at the University of Washington and remained there until his retirement, writing nearly 30 research articles on such topics as random walks and branching processes.

Cloyd South Goodrum, Jr. was born in Davidson, North Carolina, the son of a drug store owner and Davidson Commissioner. He taught for several years at Charlotte College before becoming an instructor at Georgia Tech for two years. In 1965 Charlotte College became the the University of North Carolina at Charlotte, and he returned to teach at that new institution, where his son, also named Cloyd, would later teach computer science. He died in 2001.

John M. Gwynn, Jr. received his higher education, including his Ph.D., at the University of North Carolina. He joined the mathematics department at Georgia Tech in 1961. In 1971 he moved to the newly formed School of Information and Computer Science. In 1976 he became a professor of computer science at the California State University at Sacramento. There he continued to work on multiprocessor computer systems and became an authority on gambling mathematics, particularly as it relates to such games as Pai Gow and Caribbean stud poker.

David Guy Herr earned a bachelor's degree in electrical engineering before obtaining a master's degree in mathematics with John Nohel in 1960. He served as an instructor in the department the next year and then went to the University of North Carolina where he earned a Ph.D. in the department of statistics and operations research. After working at the Research Triangle Institute and Duke University he joined the faculty at the University of North Carolina at Greensboro and remained there until his retirement in 2002, contributing his expertise in statistics to research in a wide variety of fields such as health sciences, sports medicine, and textiles.

J. N. Hunt earned his Ph.D. at the University of London and worked at a hydraulics research laboratory in Great Britain before serving as an associate professor at Georgia Tech in 1958-59. He then joined the department of meteorology at the Imperial College of Science and Technology, London and in 1964 moved to the mathematics department at The University of Reading. He remained there until his retirement in 1993, writing numerous papers and books on fluid dynamics and computational mechanics. He remained active in his field after his retirement and also wrote papers on other topics, including the early numbering of houses in Paris.

Edward Dennis Huthnance, Jr. received his bachelor's degree in physics at Georgia Tech in 1964 and a master's degree in mathematics in 1966. He served as an instructor for three years before obtaining his Ph.D. with Daniel Robinson in 1969. Later he was chairman at Newberry College before moving to Bloomburg University in Pennsylvania, where he conducted research in artificial intelligence, linguistics, and cryptography and from which he retired in 2003.

John William Jayne held a master's degree from Vanderbilt University when he first served as an instructor from 1956 until 1960, and again from 1962 to 1966 when he earned his Ph.D. with Marvin Sledd. His was the third doctorate awarded by the department. After teaching at the U.S. Naval Academy he joined the faculty of the University of Tennessee at Chattanooga in 1971. He remained there until his death in 1993. A mathematics scholarship funded by his friends and colleagues at UTC is named in his honor.

William J. Jones was born in Kentucky and earned his bachelor's degree at Vanderbilt University in 1951. He then served in the U.S. Air Force until 1955 before attending the University of Kentucky, where he earned a master's degree in 1957. He was an instructor at Georgia Tech from 1958 until 1961 and a lecturer in 1961-62. He remained at Georgia Tech until 1965 when he joined the faculty at Tennessee Tech University. Having already become the faculty advisor for the Georgia Tech chapter of the Tau Kappa Epsilon fraternity in his second year as an instructor, he was instrumental in the creation of a chapter of that organization at Tennessee Tech. He remained involved with that fraternity for nearly 40 years, donating a considerable amount of his own funds to improve the chapter's housing.

Abraham Joseph Kainen was a veteran of the Air Force and held a master's degree from the University of Texas when he became an instructor at Georgia Tech in 1957. He remained in that position until 1960 when he joined the faculty at the University of Tampa. He continued at Tampa for the rest of his career, being promoted to associate professor there in 1973.

Alan Greenwell Law held a bachelor's and a master's degree from the University of British Columbia when he became an instructor at Georgia Tech in 1961. He earned his Ph.D. with Marvin Sledd in 1968. After graduate school he developed an interest in approximation theory, and later in digital imaging and computing, eventually writing more than 40 papers and editing or co-editing several books on these topics. He spent nearly 40 years teaching at the University of Regina, Memorial University, St. John's, Newfoundland, and the University of Waterloo. At Regina he was a member of the computer science department and in 1993 became chairman of that department. At Memorial he was the dean of science. After retiring from Waterloo, he became an adjunct professor of computer science at the University of British Columbia, Okanagan, and adjunct professor of clinical neurosciences at the University of Calgary. In 2009 he published a text on scientific computing using MATLAB.

David Lowell Lovelady was an instructor for three years and received his Ph.D. with James Herod in 1971. After one year at the University of South Carolina, he joined the faculty of Florida State University. He remained at Florida State until 1979 and while there wrote a series of papers on differential equations, but later appears to have left academia.

Walter Frederick Martens earned his bachelor's degree at Georgia Tech and served as an instructor for five years before obtaining his Ph.D. with Marvin Sledd in 1971. The next year he joined the faculty of the University of Alabama at Birmingham, then just three years old. He remained there until his retirement in 2001, having served as associate chairman from 1991 until 1997.

Robert Harold Martin, Jr. earned his bachelor's degree at the University of South Carolina and served as an instructor at Georgia Tech before obtaining his Ph.D. with Frank Stallard in 1970. The next year he joined the faculty at North Carolina State University, where he remained throughout his career, serving as the head of the department from 1989 to 1999. He published 50 research papers, as well as one book on ordinary differential equations and one on functional analysis, his two main research interests. He also supervised six doctoral students.

William P. McKibben earned his bachelor's degree at Georgia Tech in 1961 and became an instructor in the School of Mathematics in 1968. He obtained his Ph.D. with Marvin Sledd in 1973 and the next year joined the faculty of Oxford College of Emory University, where he taught until his retirement in 2000. While at Oxford he served as department chair and for five years as an associate dean. While on a leave of absence at Georgia State University he became interested in astronomy and co-authored several papers in that field. On his return to Oxford he reintroduced that subject to the curriculum and continued to teach it even after his retirement. He was the winner of several teaching awards and in 2010 was given Emory University's Distinguished Emeritus Award.

Vaughn Walter Morrison held a bachelor's and a master's degree from Ohio University when he served as an instructor during 1964-65. He next attended Emory University and in 1968 joined the faculty of Florida Presbyterian College, now Eckerd College, in St. Petersburg. He remained in St. Petersburg and was active in the Florida Ornithological Society there before moving to Todd, North Carolina, after his retirement.

Wilbur Hallam (Hal) Purcell, Jr. was born in Florida, the son of a school principal, and attended the University of Florida. He held a Ph.D. from Duke University when he became an assistant professor at Georgia Tech in 1965. He held that position until 1971 and appears to have remained in Atlanta thereafter.

George W. Reddien, Jr., having earned a bachelor's and a master's degree at Georgia Tech, became an instructor and obtained his Ph.D. with William Kammerer in 1971. After teaching at Vanderbilt University for eight years, he moved to Southern Methodist University in 1979. At SMU he served as department chairman from 1980 to 1986 and again from 1994 to 1997. He was associate provost from 1986 to 1989 and dean of research and graduate studies from 1989 to 1992. His principal research interest was in the numerical solution of boundary value problems, and he served as the editor and managing editor of the SIAM Journal of Numerical Analysis. He retired from SMU in 2008.

Coke Stevenson Reed served as an instructor in 1963-64, then returned to Georgia Tech as an assistant professor for one year after obtaining his Ph.D. at the University of Texas in 1966. He then taught at Auburn University, where he did research on dynamical systems. While at Auburn he spent summers at the Institute for Defense Analysis in Princeton. There he developed an interest in parallel computing and switching systems. He left Auburn for Micro Computer Control Corporation in Austin and then became a full time employee at IDA. He is credited with inventing the "Data Vortex," a new topology for optical fiber switching systems. After leaving IDA he founded Interactic Holdings LLP in Princeton, a developer of parallel switching systems, especially those based on data vortex technology, an area in which Reed now holds nearly thirty patents. He later moved Interactic Holdings to Austin.

Laddie W. Rollins obtained his bachelor's degree at Georgia Tech and earned his Ph.D. with Frank Stallard in 1972. He served as an instructor for three years before receiving that degree. After working for McDonough Power Equipment, Inc. (Now Snapper Power Equipment) he joined the faculty of Truett-McConnell College at its Watkinsville campus in North Georgia.

Henry Sharpe, Jr. was born in Cullman County, Alabama, and attended Vanderbilt University before obtaining his Ph.D. at Duke University in 1952 with a dissertation on topology. The next year he became an assistant professor at Georgia Tech. In 1956 he moved to Emory University and rose through the ranks there, becoming chairman in 1973. While at Emory he

developed an interest in combinatorics and later wrote two undergraduate texts in that field. In 1993 he went to Washington and Lee University as the Rupert and Lillian Redford Professor of Mathematics and chair of the department, positions he held until his retirement in 1991.

George Robert Slayton had attended the U.S. Naval Academy and held a master's degree from Emory when he became an instructor in the School of Physics in 1960. After a one year leave of absence he became an instructor in mathematics in 1965. In 1968 he joined the Georgia Tech Athletic Association and remained there until his retirement in 1995. He had been the faculty advisor for the wrestling club while an instructor and was the faculty advisor for the barbell club from 1979 until 2002.

Wolfram (Wolf) Stadler was born in Germany in 1937 and emigrated to the U. S. as teenager. After serving in the U. S. Air Force he earned a bachelor's and master's degree in aerospace engineering and a master's degree and Ph.D. in engineering mechanics at Georgia Tech. After one year as an assistant professor of mathematics in 1968-69 he was a visiting professor and researcher at various universities in the U. S. and abroad, including a six year stint as a research associate in optimization and control theory at Berkeley. In 1978 he joined the School of Engineering at San Francisco State University, where he developed that school's robotics program. He was a member of the American Academy of Mechanics and an editor of several journals on optimization, dynamics and control. He died in 2001 as the result of injuries sustained in a head-on collision with a drunken driver.

Robert Taylor Stubbs was born in Savannah and attended Auburn University and the University of Georgia before obtaining his bachelor's and master's degrees at Georgia Tech. He then served as an instructor in the school of mathematics for one year. He next went to Armstrong College in Savannah where he published a book entitled *The Algebra of Real Numbers*. Later he taught for a number of years at Edward Waters College and the University of North Florida. He died in Jacksonville, Florida, in 2003.

Wayne G. Sullivan obtained his bachelor's degree in chemistry at Georgia Tech and then attended Oxford University where he earned a doctorate in mathematics in 1968. He returned to Georgia Tech as an assistant professor of mathematics the following year. Four years later he moved to the Dublin Institute for Advanced Studies in Ireland, later joining the faculty of

University College Dublin, where he conducted research on the application of large deviation techniques in information theory, symbolic dynamics, and networks.

Wai Mun Syn was born in Singapore and obtained his bachelor's and master's degree in electrical engineering at Georgia Tech. As an undergraduate he had participated in the “AA Math Club,” open to students who had earned an “AA,” in mathematics, an AA having once been a part of the grading scheme. He served as an instructor in mathematics for one year before starting a long career with IBM, where he specialized in the simulation of physical processes and co-authored the handbook on that company's simulation language. He died in 2006. A remembrance of his life in photographs created by his son can be found online at [www.vimeo.com](http://www.vimeo.com/1950029) 1950029.

William Perry Timlake was born in Mississippi and attended Louisiana State University before earning his bachelor's and master's degrees at the University of North Carolina. He served as an instructor at Georgia Tech for two years before going to the Swiss Federal Institute of Technology (E. T. H.) where he earned his Ph.D. in 1964 with Peter Henrici. He then joined IBM, working first at its scientific center in Houston, and later at its center in Cambridge, Massachusetts, conducting research on applications of numerical analysis to the health sciences and bioengineering.

Donald Alastair Trumpler was born in Vancouver, British Columbia, and obtained his bachelor's and master's degrees at the university of British Columbia before attending M.I.T. where he earned his Ph.D. with Norman Levinson in 1958. He became an assistant professor at Georgia Tech the next year, and remained in that position for three years before going to Rutgers University and later teaching at the University of Hartford and UMASS, Amherst.

Stanley Joseph Wertheimer received his bachelor's degree in chemical engineering at Rensselaer before earning his master's degree in mathematics at Georgia Tech in 1961 and his Ph.D. in 1970 with Robert Kasriel and George Cain. He spent two years at the Oak Ridge National Laboratory before joining the faculty at Connecticut College where he taught until his retirement in 2001, having served as director of academic computing from 1974 to 1994 and department chairman from 1982 to 1988.

Howell K. Wilson did his undergraduate work at Georgia Tech and served as president of Pi Mu Epsilon. He obtained his Ph.D. with James Serrin at the University of Minnesota in 1964. He joined the faculty at Georgia Tech as an assistant professor the next year. After three years he moved first to the University of Southern Illinois at Carbondale, then to the University of Southern Illinois at Edwardsville, where he eventually became department chairman. He published one text on ordinary differential equations and had one doctoral student. He returned to Georgia Tech as a visiting associate professor for one year in 1969-70.

6. Coming of Age: The Pettit Years, 1972-1987

Background

When Joseph Pettit was named president in the Fall of 1971, Paul Weber, who had worked with three presidents and served as acting president after the death Van Leer, was quoted as saying that, “this man tops them all in experience and eminence in engineering education before coming to Georgia Tech.” He had ample reason for that evaluation. By then Pettit had been dean of the College of Engineering at Stanford University for thirteen years, was president-elect of the Association for Engineering Education, a Fellow of the Institute of Radio Engineers, the author of two textbooks, and a member of the American Academy of Engineering (to which no single member of the Georgia Tech faculty belonged at the time).

Joseph Mayo Pettit was born in 1916 in Rochester, New York, and grew up in Portland, Oregon. He obtained his bachelor's degree at Berkeley in 1938 and his Ph.D. in electrical engineering at Stanford in 1942. After joining the Radio Research Laboratory at Harvard during World War II and then becoming supervising engineer with the Airborne Instruments Laboratory, Inc. in New York, he joined the Stanford faculty in 1947.

After his appointment as president, Pettit stated the Georgia Tech was a “first class undergraduate school,” but he made it clear that he felt that much more needed to be done in the areas of graduate education and research. (In 1965 the Association for Engineering Education had published a document on goals, and Pettit had drafted the section dealing with graduate education.) While three previous presidents had also expressed their interest in these areas, often strongly opposed by some, such as engineering Dean Jesse Mason, it was during the Pettit presidency that major progress in research was made. In 1974 engineering Dean Thomas Stelson was named to the new position of vice president for research. In that role he served as the enforcer of new rules that tied available state funds to levels of external support. Research funding grew by 300% between 1971 and 1976, and from 1972 to 1982 federal research and development funding grew 603%, the most among 100 leading institutions. This was especially important as state funding for higher education was actually declining. Georgia had dropped from 14th in such funding among the several states in 1970, to 33rd in 1980. A recession caused even more severe budget problems in the early 1980s. In the meantime enrollments, which had declined somewhat in the early 1970s, reversed course and grew by 30% in the second half of that decade, and by 1983 enrollments caps had been put in place for the most popular majors.

The Pettit years also saw big changes in the Georgia Tech faculty. In his inaugural address in May of 1972 the president pointed to the need to recruit and retain increasingly better faculty and spoke of the need to raise the standards for appointment, promotion, and tenure. At the time the tenure system was in considerable disarray, and some even said that it was impossible to tell who had tenure and who did not. Pettit oversaw a general tightening of that system and exerted a strong influence on hiring as well. In 1965 only 51% of the faculty held doctorates. By 1977 that figure had already grown to 77%.

Despite the large increases in extramural research awards, and such developments as the creation of the Advanced Technology Development Center and the Microelectronics Research Center in the early 1980s, Georgia Tech's graduate programs did not make comparable progress. There was a large increase in the number of masters students, but the number of doctoral students remained almost constant. A 1982 report on American doctoral programs evaluated eight programs at Georgia Tech and found most of them as strong, with some approaching excellence, but none yet in the first rank in their respective fields. By the end of the Pettit presidency, however, a faculty was being assembled, and a level of funding achieved, which would lay the groundwork for the large strides which would be made in the following decades.

Joseph Pettit died of cancer in September of 1986. Henry J. Bourne, Jr., was then named acting president. Bourne, an electrical engineer who had taught at Berkeley and MIT and been a chairman at Rice, had succeeded Vernon Crawford as vice president of academic affairs when Crawford became the chancellor of the university system. He held that position until the arrival of Georgia Tech's next president John Patrick Crecine. The School of Mathematics had new leadership at the beginning of this period as well. John Neff, who had come to Georgia Tech from Case Institute of Technology in 1961, was named acting director in 1971 upon the resignation of Bertram Drucker and was named director in 1972. He would hold that position until the arrival of Les Karlovitz in 1978. In 1982, when Karlovitz became dean of the College of Sciences and Liberal Studies (the old General College), he was succeeded as director by William Ames who served until 1987.

Hiring increased during the early 1970s, aided perhaps by a soft market for people with doctorates in engineering and the sciences, and by John Neff's wide circle of acquaintances in the AMS, and especially the MAA. The practice of appointing most doctoral students as instructors was phased out, with the number of such positions dropping from 10 in 1970 to zero in 1975. As a result, the size of the faculty, with the instructors included, remained relatively constant. Hiring picked up even more during the remainder of Neff's term, driven in part by a surge in enrollment which began in 1974. The number of students in first and second year calculus and differential equations courses rose from 3079 in the fall of 1973 to 4434 in the fall

of 1976. The school had begun experimenting with large classes with 100 to 150 students as early as 1972, but these, like the smaller classes, still consisted of five lectures per week, with the lecture-recitation format still more than five years away. In 1976 the average number of contact hours per week for the faculty was 9.1, with ten at 11 or more, including three at 15. In the meantime the number of undergraduate mathematics majors dropped from 254 in 1971 to just over 100 in 1976, no doubt due in large part to the creation of the undergraduate degree in computer science in 1972. That number then remained essentially constant for the next decade.

At the beginning of this period the School had had a committee system for some time, including curriculum committees, a graduate admissions committee, hiring committee, and a promotion and tenure committee consisting of the full professors. All of these were strictly advisory to the director who made all decisions on hiring, raises, promotion, and tenure (subject to the approval of the dean). The members of all of the committees were appointed by the director until the fall of 1976 when for the first time the members of the undergraduate and graduate committees were elected. At the same time an advisory committee, which included the chairmen of several other committees, was formed.

The number of doctoral students grew modestly during the first part of this period, then declined and later began to grow again slowly. The overall graduate enrollment, which had dropped as low as 32 in 1976, when the number of students in the master's degree program had dropped to 10, rose to more than 50 by 1984. Although the doctoral program had been introduced in the mid 1960s, it still had very little structure at the beginning of the 1970s. An internal departmental self-study conducted during the summer of 1972 under the direction of James Osborn reported that, "a new graduate curriculum should be developed soon." In 1972 Richard Duke was hired as an assistant director, joining Associate Director George Caldwell, and charged with responsibility for the graduate program. Upon the death of George Caldwell in 1973, George Cain became an assistant director and held that position until he was succeeded by David Ho in 1978. From 1979 on Ho was the only assistant director, with various faculty members filling the roles of undergraduate and graduate coordinators. Ho remained in his position until his retirement in 2000. New requirements for both graduate degrees were finally adopted in July of 1976. After doctoral students were no longer made instructors, almost all of the graduate students were supported by teaching assistantships. Largely for this reason very few international students were admitted. Until the lecture-recitation model was adopted these students taught smaller classes in first or second year subjects which involved five contact hours per week. Partly due to low stipend levels and partly due to enrollment pressures, some assistant taught two such course in one quarter of the year, although it was recognized that this might hinder their studies. All of the teaching assistant were also for spending one hour each week in the Math Lab which had opened in 1971. Enrollment pressure

also led the school to employ graduate students from other departments, primarily physics. As the push for greater external funding on campus took hold, the first examples of such support began to appear in mathematics. The first record of a faculty grant (not associated with the experiment station) is of one made to James Herod by the Research Foundation of New York in 1970 with a budget of \$2,640. The first personal NSF grant was obtained by Stephen Demko in 1974, and the second by Robert Kertz in 1975, but in 1976 five faculty members received awards from NSF and the Army Research Office with budgets totaling \$71,300. The growth after that was such that the total of awards made from 1978 to 1982 reached nearly one million dollars. The amount of published research grew rapidly as well. In 1971-72 16 of the 42 faculty members (38%) had published at least once, with an average of a little less than two and a half papers each. By 1977 61% of the faculty were considered research active. In the six year period from 1976 to 1982 the faculty published about 260 articles, or an average of more than five each during those six years. By 1985-86 the average number of papers had grown to more than five per faculty member during a single year.

The School had its first external review in 1977. It was conducted by a visiting committee chaired by Irving Kaplansky of the University of Chicago, and including such prominent mathematicians as Victor Klee of the University of Washington and Richard Duffin of Carnegie Mellon. The report of that group was responsible in part for the resignation of John Neff and the hiring of Les Karlovitz as director in 1978.

Hiring slowed down after 1977, and many of the untenured faculty members were not retained. The number of assistant professors, which had peaked at 20 in 1980, had dropped to 5 by 1986. The total size of the faculty, which had reached 50 in 1980, dropped to below 40 in 1987. This was particularly disturbing given that enrollments had continued to grow in the 1980s (although not as rapidly as in the late 1970s). Many in the faculty felt that this shrinkage was entirely the result of decisions made by Les Karlovitz as director and dean (while it was also true that the Institute had serious budget problems in the early 1980s). In the end, the senior faculty demanded, and got, a meeting with Karlovitz and then acting president Henry Bourne to express their unhappiness with the loss of positions. Two years later there would be a new dean and a new permanent director, and a more optimistic era would begin.

The Curriculum

At the beginning of this period all Georgia Tech course numbers added a fourth digit with the first indicating the level. In mathematics the second indicated the field, such as 1 for algebra, 2 for probability and statistics, and 3 for analysis. Of much greater importance for the entire instructional staff was the introduction in 1979 of the lecture-recitation format, first for large freshman classes, and soon for all large first and second year courses. This resulted in a welcome reduction in the numbers of contact hours for both faculty and teaching assistants, and made possible the use of undergraduate teaching assistants to conduct recitation sessions.

In 1972 a probability and statistics course was added to the requirements for mathematics majors. In 1973 a sixth quarter differential equations course with substantial linear algebra was called for, replacing the differential equations course taken by others. An introductory course in computer programming was required, to be taken either in electrical engineering or in the new School of Information and Computer Science. For the most part, however, the undergraduate requirements remained unchanged, with required upper division courses in algebra, linear algebra, real and complex analysis, plus course work at or above the 3000 level in a degree-granting school other than mathematics, and additional mathematics courses at the 4000 level, to include at least one sequence in probability and statistics, differential equations, numerical analysis, or mathematical models. The list of undergraduate course offerings grew, with a large increase in the number of courses in probability and statistics, some growth in the area of numerical analysis. The number of students from other schools taking 4000-level mathematics courses grew significantly, particularly in linear algebra.

The requirements for the doctorate introduced in 1976 called for six five-hour courses in real, complex, and functional analysis, algebra, topology, and mathematical modeling. Students were to demonstrate proficiency in two foreign languages, a requirement which was later phased out. The course requirements were later changed to include two three hour courses in real analysis, one five hour course in complex analysis, a course in Hilbert spaces, and one in modeling. Still later the requirement of specific courses was eliminated altogether.

This period also saw the introduction of the first courses in two areas which would come to play prominent roles in the school. The first of these was combinatorics and graph theory, with a 4000-level course in this area, Math 4010, being introduced in 1974. In 1983 a 3000-level course was added. This course, Math 3012, was then adopted as a requirement for the undergraduate degree in computer science, and, as with the introductory course in probability and statistics, Math 3215, soon had a large enrollment. Math 3012 and a course in numerical

analysis were added to the undergraduate requirements in 1985. The first graduate course in graph theory was also introduced in 1983. In 1985 a course in fractal geometry and another in dynamical systems and chaos were offered for the first time. When these two courses were offered for the second time the next year they already had enrollments of 39 and 20, respectively, a sign of what was to come.

The Faculty

Alfred D. Andrew (1946 -)

Fred Andrew was born in New Brunswick, New Jersey, and earned his bachelor's degree at Yale in 1968. He served in the U. S. Army during the Viet Nam era and then attended Stanford where he earned a master's degree in statistics in 1975 and a Ph.D. in mathematics in 1976. He came to Georgia Tech the next year as an assistant professor, being promoted to associate professor in 1982 and full professor in 1993. His research area was Banach space theory and he also worked on calculus projects involving the use of supercalculators and Mathematica and on other curriculum matters. He served as associate chair of the school from 1991 to 1997 and acting chair in 1997-8. After 2005 he again held the associate chair position until his retirement at the end of 2011.

William Francis Ames (1926 – 2009)

Bill Ames was born in Brandon, Manitoba, and grew up in Wisconsin. After high school he joined the Navy, serving throughout World War II. He next attended the University of Wisconsin, earning his bachelor's degree in 1950. He served in the Navy again during the Korean War before returning to Wisconsin to earn a master's degree in 1955. He was employed by the DuPont Corporation from 1955 to 1959, then joined the faculty of the mechanical engineering department at the University of Delaware. In 1967 he moved to the University of Iowa. There he served for one year as the acting chairman of the Department of Hydraulics and Mechanics. In 1975 he joined the School of Mathematics at Georgia Tech as a full professor. In 1982 he was named director of the school and held that position until 1987. During his career Ames became authority on nonlinear differential equations, writing 113 research publications and writing or editing 18 books in this area. He supervised a dozen doctoral students at Delaware and another ten at Georgia Tech. He was a strong advocate of opportunities for women, and a number of his students were female. From 1991 to 2006 he was editor in chief of

the *Journal of Mathematical Analysis and applications* (JMAA), and after his death his family and the publisher, Elsevier, contributed funds to establish the JMAA Ames Award for outstanding papers published in that journal.

Michael Fielding Barnsley (1946 -)

Michael Barnsley was born in the United Kingdom and received his bachelor's degree in mathematics at Oxford in 1968. He then attended the University of Wisconsin, obtaining a doctorate in theoretical chemistry there in 1972. After spending one more year as a researcher at Wisconsin he returned to the U. K. and taught at the universities of Bradford and Keele. He then spent two years at the Centre d' Etudes Nucleaires, Saclay, before joining the faculty at Georgia Tech as an associate professor in 1979. At Georgia Tech his research interests turned from approximations and bounds in theoretical physics to iterated functions systems and fractals. In 1985, with Stephen Demko, he introduced iterated function theory in the paper "Iterated Function Systems and the Global Construction Of Fractals". In 1987 he founded Iterated Systems, Inc., devoted to fractal image generation and compression and in 1988 published the book *Fractals Everywhere*. He resigned from his position at Georgia Tech in 1991. Ceasing to be the CEO of Iterated Systems in 1994, he joined the faculty of the University of New South Wales. In 1999 he moved to the University of Melbourne and in 2002 to the Australian National University. (Iterated Systems did succeed in developing compression technology that enabled the fast transmission of relatively high-quality images, but widespread use of the internet reduced the need to store large image libraries on PCs, and the company decided not to pursue further research into high-fidelity digital image compression using fractal-based codes and never commercialized its technology. It was renamed MediaBin in 2001, then engaged in image archive management, and was sold to Interwoven, Inc. in 2003. In 2009 Interwoven itself was sold to Autonomy Corp. plc.)

Johan G. F. Belinfante (1940 -)

Johan Belinfante was born in Leiden, the son of a theoretical physicist. In 1955 he received his bachelor's degree in physics at Purdue where his father had become a faculty member. At the young age of 21 he earned his doctorate in physics at Princeton in 1961 and spent the next year at the California Institute of Technology. He then taught at the University of Pennsylvania and at Carnegie Mellon University before coming to Georgia Tech as an associate professor in 1973. After conducting research in theoretical physics in his early career, he turned his attention to Lie

groups and Lie algebras. Still later he became interested in the field of computer-assisted theorem proving, an area in which he continued to remain active after his retirement in 2008.

Marc Aron Berger (1955 -)

Marc Berger was born in Pittsburgh and received his higher education there, obtaining a bachelor's degree from Carnegie Mellon University in 1974 and a doctorate from the same institution in 1977. After spending one year at the Mathematics Research Center at the University of Wisconsin he joined the Georgia Tech faculty in 1978 and was promoted to associate professor in 1984. His research centered on probability, with applications to the stochastic calculus, image generation, iterated function systems, and random matrices. In 1992 he published his text *“Introduction to Probability and Stochastic Processes”*. While at Georgia Tech Berger spent a considerable amount of time in Israel, holding positions at the Hebrew University and at the Weizmann Institute of Science. His position at Georgia Tech was terminated in 1994. In 1996 he was granted a patent for an apparatus and method for encoding digital signals. He has since been chief scientist for Oliver Corporation, Life Picture, Inc., MGI Software Corporation, and most recently, iSee Media, Inc.

Albert Turner Bharucha-Reid (1927 – 1985)

Bharucha-Reid was born in Hampton, Virginia, where his father was on the faculty of the Hampton Institute. Born Albert Reid, he added his wife's name to his own when he married Rodab Phiroze Bharucha. He earned his bachelor's degree in mathematical biology at Iowa State University in 1949 and spent 1950 to 1953 as a researcher at the University of Chicago. During those three years he published eight papers, but chose not to bother with obtaining a doctorate. For the next several years he was a researcher at institutions such as Columbia University, Berkeley, and the Polish Academy of Sciences. He took his first faculty position at the University of Oregon in 1959 and moved to Wayne State University as an associate professor of mathematics in 1961. During his career at Wayne State he served as acting chairman and later for five years as dean and associate provost for graduate studies. He spent the year 1973-1974 at Georgia Tech and returned as a professor of mathematics in 1981. Bharucha-Reid was the author of more than 60 research publications, primarily in probability, algebra and mathematical biology, and was the author of six books, including *Elements of the Theory of Markov Processes and Their Application*, *Probabilistic Methods in Applied Mathematics*, and *Random Polynomials, Probability and Statistics*. In 1984 he moved to Clark Atlanta University and in

that year was awarded an honorary degree by Syracuse University. He is included in many lists of prominent African Americans of the 20th century and in lists of the most important black mathematicians.

George Lee Cain (1934 -)

George Cain was born in Wilmington, North Carolina, the son of an executive with the Atlantic Coast Line railroad. In 1956 he obtained his bachelor's degree at M.I.T. and joined the Lockheed-Georgia Company in Marietta. While at Lockheed he began taking courses at Georgia Tech and in 1960 he became a full time graduate student and instructor. He continued as an instructor for four years and was supported by an NSF fellowship in 1964-65. In that year he earned his Ph.D. with Robert Kasriel, one of the first two awarded by the school. Upon the sudden death of George Caldwell in 1973 he became an assistant director , a position he held until 1978. During his career he wrote papers on topological subjects such as compact mappings, compactification, and fixed points and in 1994 published the text *Introduction to General Topology*, a successor to the text written by his advisor twenty-plus years earlier. He had three doctoral students, Gary Llewellyn, Luis Gonzales, and Franklin Mendivil. He retired in 2001 and in 2005 published a second book *Separation of Variables for Partial Differential Equations: an Eigenvalue Approach*, written with Gunter Meyer.

Nathaniel Chafee (1940 -)

Nat Chafee was born in Rhode Island and attended Harvard, obtaining his bachelor's degree there in 1962. He earned his doctorate under the supervision of Jack Hale at Brown University in 1966. He spent two years at the University of Michigan and one at UCLA before returning to Brown in 1969. In 1973 he came to Georgia Tech as an assistant professor of mathematics. There he conducted research in differential equations, and was promoted to associate professor in 1980. After his retirement in 2004 he remained in Atlanta and continued his philanthropic activities.

Mark J. Christensen (1947 -)

Mark Christensen was born in Detroit, and earned his bachelor's degree at Wayne State University in 1969. He obtained a master's degree in physics at Purdue in 1970 and another in

mathematics at Wayne State in 1972. In 1975 he completed his doctorate at Wayne State under the supervision of Albert Bharucha-Reid and joined the faculty at Georgia Tech the following year. His first research was in probability and he published a number of papers in that area, including a half dozen with his advisor. He became increasingly interested in computing at Georgia Tech and was one of the leaders in the implementation of a computer system for the school. He was promoted to associate professor in 1982. In 1984 he took a leave of absence to work at the Northrop Grumman Corporation and joined that firm the next year. There he developed an interest in software engineering and particularly in software project management. In 2002, after becoming an independent consultant in that field, he published *The Project Manager's Guide to Software Engineering Best Practices* with R. H. Thayer, and with Thayer edited tutorials for the IEEE Computer Society software development professional certification examinations.

Stephen G. Demko (1947 -)

Steve Demko was born in Kingston, Pennsylvania, and did his undergraduate work at Seton Hall. He obtained his Ph.D. at Kent State University in 1973 with a dissertation on numerical analysis written under the supervision of Richard Varga. He joined the faculty at Georgia Tech the following year. He conducted research in numerical linear algebra, approximation theory, and iterated functions and in 1974 was the first member of the department to receive a personal NSF research grant. A paper he wrote with Michael Barnsley in 1985 introduced the subject of iterated function theory, and he collaborated with Barnsley on the book *Chaotic Dynamics and Fractals*. After resigning from Georgia Tech, he was employed at Iterated Systems, Inc., but eventually returned to Tech to teach in a visiting position.

Richard Alter Duke (1937 -)

Richard Duke was born in Geneva, Ohio, and attended Kenyon College and earned a master's degree at Dartmouth College before entering the doctoral program at the University of Virginia. He received his Ph.D. in 1965 with a thesis written under the direction of Gordon Whyburn. The next year he joined the faculty at the University of Washington. Having worked with John Neff for many years at the College Board Advanced Placement Program, he came to Georgia Tech in 1972 as an assistant director when Neff became school director that year. He continued as assistant director for six years. His research interests were in graph theory and combinatorics. A number of his papers in these areas were written with famed mathematician

Paul Erdős who was a frequent visitor to Georgia Tech. He was one of the founders of the Interdisciplinary Doctoral Program in Algorithms, Combinatorics, and Optimization, and was the first director of that program. Later he would serve as acting school director from 1998 to 2002. He retired 2006.

John Hancock Elton (1946 -)

John Elton was born in Jacksonville, Florida, and obtained a bachelor's degree in physics in 1968. From 1969 to 1973 he was a statistician and programmer in the U. S. Air Force and meanwhile earned a master's degree in statistics at St. Mary's University in 1972. He then spent one year as a statistician in the U. S. Civil Service before entering Yale where he obtained his doctorate in 1978 under the supervision of Shizuo Kakutani. For the next three years he held a postdoctoral position at the University of Texas. He joined the faculty at Georgia Tech first as a visiting assistant professor in 1982 and then in a tenure track position in 1984. He was promoted to associate professor in 1987. Like Stephen Demko, Elton left Georgia Tech to work at Iterated Systems, Inc., and eventually held several patents with that company's founders, Barnsley and Sloan. Also like Demko, he too returned to Tech to teach in a visiting position.

Jeffrey S. Geronimo (1949 -)

Jeff Geronimo was born in Cairo. He earned his bachelor's degree in physics and chemistry at the State University of New York, Albany, in 1972 and his doctorate in biophysics at the Rockefeller University in 1977. He came to Georgia Tech as a visiting assistant professor the following year and from then until 1983 he held visiting positions at Rockefeller, Georgia Tech, and Saclay. In 1983 he became an assistant professor at Georgia Tech, being promoted to associate professor in 1986 and to full professor five years later. His research interests included spline and fractal wavelets and orthogonal polynomials. His work on orthogonal polynomials on Julia sets contributed to the development of iterated function theory by Barnsley and Demko. He had one doctoral student at the Universidad Carlos III de Madrid, which he visited in 2001-2002, and two at Georgia Tech, James King and George Donovan. His work with Donovan earned him Georgia Tech's Best Thesis Advisor Award in 1996.

William L. Green (1945 -)

Bill Green was born in Harrisonburg, Virginia, and earned his bachelor's degree at Yale in 1967. He obtained a master's degree at the University of Pennsylvania in 1970 and his doctorate there in 1973. His first faculty position was as a visiting lecturer at the Mathematical Institute of the University of Oslo. He came to Georgia Tech for one year in 1974 then taught at Williams College for two years before returning to Georgia Tech in 1977. He was promoted to associate professor in 1982 and to full professor in 1991. His research interests included operator theory and applications of functional analysis to areas such as network theory. He was the school's undergraduate coordinator from 1986 to 1988 and its graduate coordinator from 1991 to 2002. He also served as the chairman of the institute's Graduate Committee. Green retired in 2008, giving him the opportunity to devote more time to devote to his long held interest in music.

Evans M. Harrell, II (1950 -)

Evans Harrell was born in Indianapolis, Indiana and earned his bachelor's degree at Stanford in 1972. He obtained his doctorate at Princeton in 1976 working with Barry Simon. He was an assistant professor of physics at Haverford College the following year then spent a year as a visitor at the University of Vienna. He was a fellow at M.I.T. and an assistant professor at Johns Hopkins before coming to Georgia Tech in 1983. He was promoted to associate professor in 1985 and to full professor in 1990. His research interests included mathematical physics, differential equations, dynamical systems, and spectral geometry and he supervised one doctoral student at Johns Hopkins and six at Georgia Tech. In addition to being the author of numerous research articles, he also produced an on-line text *Linear Methods of Applied Mathematics* with James Herod. From 2002 to 2005 he served as associate chair for graduate studies and in 2005 became an associate dean of the College of Sciences.

James Victor Herod (1937 -)

Jim Herod was born in Selma, Alabama, and attended the University of Alabama. He earned his doctorate at the University of North Carolina in 1964 and served in the Army at an Air Force Weapons Lab before coming to Georgia Tech in 1966. His early research concerned integral equations. During his career he devoted much of his time to teaching and writing, supervising six doctoral students and publishing electronic books on mathematical biology with computer algebra models with Edward Yegers and Ron Shonkwiler, multivariate calculus with George

Cain, and linear methods of applied mathematics with Evans Harrell, as well as producing electronic notes on such subjects as Hilbert space and differential equations. He was an advisor for a variety of student organizations, including the Technique, and his visiting positions included stints at the University of Montana, West Point, and Karlsruhe. After his retirement in 1998 he moved to Grove Hill, Alabama, where he continued his interest in hiking and running, and turned to writing fiction. In addition to several short stories, he published the novel *Gathering Moss* in 2008 and *A Journey Beyond Innocence* in 2009.

Theodore P. Hill (1943 -)

Ted Hill was born in New York, New York, and attended West Point where he obtained his bachelor's degree in engineering in 1966 (and where he claims to have incurred a record number of disciplinary actions). Continuing in the military, he obtained a master's degree in operations research at Stanford in 1968 and served as a lecturer at Washington University in 1970-71. He obtained a master's degree in mathematics at Berkeley in 1974 and his doctorate there in 1977. The next year he became a visiting assistant professor at Georgia Tech and began a tenure track position at Tech in 1978. He was promoted to associate professor in 1984 and to full professor in 1990. His research interests have included such areas as optimal stopping theory, fair division problems, and Benford's law. He has held visiting positions at a long list of places, including Leiden, Hawaii, Berkeley, Göttingen, Tel Aviv, Mexico, Costa Rica, and Amsterdam, giving lectures in four different languages in these and many other locations. He supervised six doctoral students at Georgia Tech and one in Amsterdam. An avid traveler, he visited more than 50 countries, often hitchhiking or getting around by bicycle. He retired from Georgia Tech in 2003, following a protracted dispute with the administration of the school and the institute. He then became a Research Scholar in Residence at California Polytechnic Institute, San Luis Obispo, and later an adjunct professor of electrical and computer science at the University of New Mexico, continuing his research, particularly with work on Benford's law.

Les Andrew Karlovitz (1936 – 1990)

Les Karlovitz was born in Budapest and came to the U. S. with his family two years later. His father, Bela Karlovitz, was an engineer who headed the Pittsburgh laboratories of the Westinghouse Corporation and held the first patent for a practical magnetohydrodynamic generator, based on work done at the experimental facilities of those labs. (The “Karlovitz number” used in the study of turbulent combustion is named for him.) Les earned his bachelor's

degree at Yale in 1959 and his doctorate at Carnegie Mellon University in 1964 under the supervision of Richard Duffin.. His first academic position was at Western Reserve University. In 1968 he joined the faculty of the University of Maryland. In 1976-77, on leave from Maryland, he served as program director for classical analysis and geometry at the National Science Foundation. He came to Georgia Tech as mathematics school director the following year upon the resignation of John Neff. As director he was responsible for the introduction of the lecture-recitation format for calculus classes. In 1982 he was named dean of the College of Science and Liberal Studies, the successor to the old General College. During the time that Karlovitz was school director and dean the size of the mathematics faculty shrank by as much as 20%, and some unhappy faculty members felt that his policies were primarily to blame. In 1989 he left to become the vice president for academic affairs at Western Washington State University in Bellingham, Washington, but already ill, he died of cancer in April of 1990.

Robert Paul Kertz (1946 -)

Bob Kertz was born in Milwaukee and obtained his bachelor's degree at the University of Chicago in 1968. He earned his master's degree the following year at Northwestern University and his doctorate there in 1972. He spent his entire academic career at Georgia Tech, as an assistant professor from 1972 to 1978, associate professor from 1978 to 1987, and as full professor from 1987 until his retirement in 2008. He conducted research in probability theory, specializing in probabilistic sequential decision models and inequalities for stochastic processes. He supervised two doctoral students and was one of the founders of the interdisciplinary Master of Science Degree Program in Quantitative and Computational Finance. He was the director of that program from its beginning in 2000 until 2006 and co-director from 2006 to 2008.

Gunter H. Meyer (1939 -)

Gunter Meyer was born in Stettin, Germany, and came to the U. S. as an exchange student during his high school days. He returned to attend the University of Utah where he earned his bachelor's degree in 1961. He did his graduate work at the University of Maryland, obtaining a master's degree there in 1963 and a doctorate in 1967. He spent the next three years as a research mathematician at Mobil Oil Corporation before coming to Georgia Tech as an associate professor in 1971. In 1973 he published the book *Initial Value Methods for Boundary Value Problems* and was promoted to full professor in 1978. In addition to his research on

numerical methods for differential equations and free boundary problems from the physical sciences, he also studied applications of numerical analysis to financial engineering and taught courses for the Quantitative and Computational Finance master's degree program. He held visiting positions at Brunel University, the Australian National University, the University of Westminster, and Chiba University in Japan. He retired in 2002 and in 2005 published a book on differential equations written with George Cain.

Thomas D. Morley (1950 -)

Tom Morley was born in Atlanta and did his undergraduate work at the University of Maryland. He obtained a master's degree at Carnegie Mellon University in 1973 and a doctorate there in 1976. He was a visiting lecturer at the University of Illinois during 1976-7 and an assistant professor at that institution from 1977 to 1982. He next became a visiting assistant professor at Georgia Tech, eventually becoming an associate professor in 1986 and a full professor in 1992. He did research in applied functional analysis and later became quite involved with the use of microcomputers in the classroom writing papers on the use of Mathematica.

John David Neff (1926 – 1998)

John Neff was born in Cedar Rapids, Iowa, and served in U. S. Navy before earning his bachelor's degree at Coe College in 1949. In 1951 he earned a master's degree at Kansas State University and then joined the technical staff at Bell Labs. He earned his doctorate at Florida State University in 1956. His wife, Mary Frances Neff, earned a doctorate in mathematics at Florida State the same year. At the beginning of March of 1956 Georgia Tech's then acting director Herman Fulmer wrote to Neff, saying he want to talk to him about a position. But before the end of that month Fulmer had to write again, stating that he had “run out of funds.” The Neffs then took positions at Case Institute of Technology. In 1961 the Neffs did come to Atlanta, John to Georgia Tech, and Mary Frances to Emory. John was promoted to associate professor in 1964 and in 1971 was named acting director of the school upon the retirement of Bert Drucker. The next year he was promoted to full professor and became the school director, a position he held until 1978. Neff was a great story teller and made many friends in mathematical community, especially among the members of the American Mathematical Association and the Georgia Council of Teachers of Mathematics. He served on the board of governors of the MAA and was the chairman of its southeastern section, as well as being the president of the G. C. T. M. For many years he was involved with College Board, Educational

Testing Service advanced placement calculus program where he was chief reader from 1967 to 1971 and chief examiner from 1971 to 1975. In 1974 he received the Coe College Alumni Award of Merit and in 1984 the MAA Award for Distinguished Service. He also earned the Distinguished Service Award from the G.C.T.M. in 1992 and a distinguished teaching award from the southeastern section of the MAA in 1994. Neff retired in 1997 and died of a heart attack in 1998 while attending a meeting of the Coe College board of trustees.

Kevin Thomas Phelps (1948 -)

Kevin Phelps was born in New York, New York, and attended Brown University, earning his bachelor's degree there in 1970. After one year with the Sperry Rand Corporation he joined the U.S. Air Force. While stationed in Alabama he took courses at Auburn University and became a full time graduate student there in 1974, earning his master's degree in 1975 and his Ph.D. in 1976. He joined the Georgia Tech faculty the following year and was promoted to associate professor in 1983. From 1984 to 1986 he served as the undergraduate coordinator for the school. His research interest were in design theory and coding theory and in 1988 he returned to Auburn which had an very active group in those areas. He later served as the chairman of the Department of Discrete and Statistical Sciences during a period when that unit was one of two (sometimes contentious) mathematics departments at Auburn.

Ronald Wesley Shonkwiler (1942 -)

Ron Shonkwiler was born in Chicago and earned a bachelor's degree in aerospace engineering at California State Polytechnic University, Pomona, in 1964. After two years at the U.S. Naval Ordnance Laboratory in California he earned a master's degree in mathematics at the University of Colorado in 1967 and his doctorate there in 1970. He joined the Georgia Tech faculty the following year and was promoted to associate professor in 1976, and to full professor in 1992. His wide interests included Monte Carlo methods, optimization, mathematical epidemiology, and computer geometry. He was also one of those instrumental in creating the school's computing system. He supervised four doctoral students and published several books on a variety of subjects, including *Explorations in Monte Carlo Methods*, written with Franklin Mendivil, *Mathematical Biology: An Introduction with Maple and Matlab*, written with James Herod, and *An Introduction to Parallel and Vector Scientific Computation* with Lew Lefton.

Alan D. Sloan (1945 -)

Alan Sloan was born in New York, New York, and earned his bachelor's degree at M.I.T. in 1967. He received his Ph.D. at Cornell in 1971 and spent the next year in a postdoctoral position at Carnegie Mellon. He came to Georgia Tech as an instructor the following year and in 1974-75 was a visiting assistant professor at Princeton. He returned to Georgia Tech as an assistant professor and was promoted in 1978. His early research interests included mathematical physics and nonstandard analysis. In 1983 he won a Sigma Xi Best Science Paper Award. In 1984 he formed Micro Video Systems, Inc., a video tape and DVD rental company, whose business address was his home. In 1987 he left Georgia Tech and co-founded Iterated Systems, Inc. with Michael Barnsley, serving as president of that firm until 1994, and later as an executive vice president. In 1988 Barnsley and Sloan announced their fractal based image compression results in an article in BYTE magazine and in the following years obtained several patents related to that work. Sloan was no longer with the company when, renamed MediaBin, and refocused on image archive management, was sold to Interwoven, Inc. in 2003.

Jonathan E. Spingarn (1951 -)

Jon Spingarn was born in Washington, D. C. , where his father was a lawyer and governmental advisor on arms control, and his mother held various government positions, including executive assistant to Senator and Secretary of Health, Education and Welfare, Abraham Ribikoff. She later became a prominent spokesperson for cancer survivors. Jon did his graduate work at the University of Washington where he earned his doctorate in 1977 under the supervision of Terrence Rockafeller. He did research on optimization and one of his papers on the partial inverse of a monotone operator has been cited well over 100 times. After his retirement he published an on-line linear algebra text consisting of a collection of mini-lessons in pdf format, designed for self- instruction, as well as “Chio”, a string processing library for Common Lisp.

Marcus Carlton Spruill, III (1944 -)

Carl Spruill was born in Oakland, California, and did his undergraduate work at Old Dominion University where he earned a degree in psychology in 1966. Next at Purdue University he obtained a master's degree and doctorate in statistics. He joined the faculty of Georgia Tech in 1973, being promoted to associate professor in 1978, and to full professor in 1993. His research interests included chi-squared statistics, stochastic processes, interpolation and extrapolation. He was the author of more than 40 research articles in these areas before his retirement in 2005.

Michael P. Stallybrass (1929 -)

Mike Stallybrass was born in Ilkley, England, and earned a degree in mechanical engineering at Imperial college in 1953. Having come to the United States, he obtained a master's degree in applied mathematics at Brown University in 1957. He spent 1958 to 1963 at the Stanford Research Institute and then became a lecturer in mathematics at the University of Glasgow where he obtained his doctorate in 1966. After returning to the Stanford Research Institute for one year, he came to Georgia Tech as an associate professor of mathematics and of aerospace engineering. In 1970 he was awarded Monie A. Ferst Sigma Xi Research Award, and 1978 he became a full professor in the School of Mathematics. His chief research interest was in mixed boundary problems motivated by problems arising in the physical sciences, and he supervised three doctoral students, Stephen Scherer, Richard Summers, and Richard Ingle. After his retirement in 1998 he spent considerable time teaching and traveling in China.

Ernst P. Stephan (1947 -)

Ernst Stephan received his Ph.D. from the Technical University Darmstadt in 1975. He was hired as an associate professor at Georgia Tech in 1984. His research was in numerical analysis, particularly boundary element methods. He returned to Darmstadt in 1998 and later moved to Leibniz University Hannover. In 2007 a conference was held in Hannover to celebrate his 60th birthday, and a special edition of the journal *Applied Numerical Analysis* was dedicated to him on that occasion.

Yung Liang Tong (1935 -)

Yung Tong was born in Shandong Province, China, and earned his bachelor's degree at Taiwan National University in 1958. In 1963 he obtained a master's degree in statistics at the University of Minnesota and in 1967 earned his doctorate there. The next year he joined the faculty at the University of Nebraska and rose through the ranks to become a full professor there. He became one of the foremost authorities on probability inequalities, and his 1980 book *Probability Inequalities in Multivariate Distributions* was the definitive work on this subject for some time. He spent 1982-3 as a visitor at Stanford and Berkeley and came to Georgia Tech in 1984. In 1992 published a second book *Convex Functions, Partial Orderings, and Statistical Applications*, written with J. E. Pečarić and F. Proschan.

Junior Faculty

Nearly twenty of the instructors and assistant professors hired during the 1970s did not remain at Georgia Tech. Most of these, and some hired in the 1980s, are listed below.

Robert Roy Appleson received his undergraduate degree and doctorate at Vanderbilt University. He served as an instructor at Georgia Tech from 1973 to 1975. He later returned to Vanderbilt as Director of Sponsored Research and then became Director of Assessment and Program Review for Tennessee Higher Education Commission. After a stint as Associate Vice President for Academic Affairs at Northern Kentucky University he joined the Higher Learning Commission in Chicago, an affiliate of the North Central Associate of Colleges and Schools, where he has served as Vice President for Accreditation Relations since 2000.

Catherine Cowan Aust received her bachelor's degree at the University of Georgia and her Ph.D. at Emory University. She was an instructor at Georgia Tech from 1972 to 1975, the first woman to be appointed to that position. In 1975 she moved to Clayton Junior College, now Clayton State University. There she served as head of the mathematics department and later as founding Dean of the College of Information and Mathematical Sciences. A student award in mathematics at Clayton State is now named in her honor.

Emmanuel Nicholas (“Nick”) Barron obtained his bachelor's degree at the University of Illinois in 1970 and his doctorate at Northwestern University in 1974. He became an assistant professor at Georgia Tech the following year. He resigned in 1980 to work at the Bell Labs in Illinois. He then joined the faculty of Loyola University in Chicago where he conducted research in optimal control, non-linear differential equations, and game theory, writing more than 50 papers in these and other subjects. He has served as acting head and graduate program director in mathematics as well as graduate program director in computer science. In 2008 he published *Game Theory: An Introduction*, the first such work to include computer algebra.

Zalman Samuel Berstein received his Ph.D. at Northwestern University with a dissertation on cohomology and was an assistant professor at Georgia Tech in 1974-5. Later he turned to actuarial work and was employed by Hewitt Associates, specializing in benefits and compensation, especially in foreign countries. He has since retired.

Steven B. Boswell received his Ph.D. in probability and statistics at Rice University and was an instructor at Georgia Tech in 1982-3 and an assistant professor in 1983-4. Later he became an instructor and research statistician at Harvard Medical School's School of Public Health, and still later a member of the Distributed Simulation System Group at M.I.T.'s Lincoln Laboratory, where he did research on airport capacity, network flows in commercial air traffic, and satellite-based surveillance.

John Tucker Cannon received his bachelor's degree at Antioch College where his father, once a group leader on the Manhattan Project, had become a faculty member. He published his first paper with Thomas Jordan in the Journal of Mathematical Physics the next year. He obtained Ph.D. in mathematical physics at Princeton in 1968 and was an instructor at Knox College, a Moore Instructor at M.I.T., and an assistant professor at the Rockefeller University before coming to Georgia Tech in 1975. He held that position until 1978. In 1981 he published *The Evolution of Dynamics, Vibration Theory from 1687 to 1742* with his wife Sigalia Dostrovsky, who held a Ph.D. in the history of science from Princeton. The couple also published other works relating the scientific revolution to the history of music. They eventually relocated back to Yellow Springs, Ohio, the home of Antioch.

James C. Crabtree earned a bachelor's and a master's degree at the University of South Carolina and doctorate at the University of Illinois before coming to Georgia Tech in 1984. In 1987 he went to work as a statistician for the U.S. Department of Energy at Savannah River facilities. From 1991 to 2001 he was on the staff of the Material Control and Accountability section in the Office of Safeguards and Security, and in 2001 he became the Material Control and Accountability Manager for the Department of Energy.

Lance D. Drager earned his bachelor's degree at the University of Minnesota and a master's degree and doctorate at Brandeis University. He was an assistant professor at St. Francis College in Pennsylvania for one year and spent two years at the Courant Institute before coming to Georgia Tech in 1980. His research interest included global analysis, differential equations, and differential geometry. In 1983 he moved to Texas Tech where he was promoted to associate professor in 1990, and where he remained throughout his career.

Joel C. Fowler obtained his bachelor's and master's degrees at Emory University. In 1984 he

received his doctorate with a thesis on design theory under the supervision of Richard Wilson. He came to Georgia Tech the next year. More interested in teaching than research, he went to Southern Polytechnic State University in 1987 where he eventually became department chairman.

Andrew N. Harrington was born in Boston and did his undergraduate work at Brown. He earned a Ph.D. at Stanford in 1976 and joined the Georgia Tech faculty the following year. While there he conducted research on Julia sets and iterated functions with Michael Barnsley and Jeffrey Geronimo. In 1983 he joined the department of mathematics and computer science at Loyola University as an associate professor. While on leave in 1988-89 he served as a senior scientist at Barnsley and Sloan's Iterated Systems, Inc. At Loyola he served as graduate program director for computer science from 2000 to 2004 and in 2002 became an associate professor of computer science when that unit became a separate department. He also served as the coach of Loyola's undergraduate programming teams.

Harvey J. Iglarsh received his bachelor's degree from the Illinois Institute of Technology in 1965 and attended graduate school at Cornell University. He came to Georgia Tech in 1970 as an instructor and upon receiving his Ph.D. at Cornell with a dissertation in functional analysis in 1971, was promoted to assistant professor. In 1976 he received an MBA degree from Georgia State University and joined the McDonough School of Business at Georgetown University as an assistant professor, being promoted to associate professor in 1980. At Georgetown he conducted research on the economic aspects of tourism and international marketing as well as the economic costs of terrorism. In 1990 he earned a master's degree in taxation from Georgetown and turned his attention to such issues as tax equity.

William J. Layton received his Ph.D. at the University of Tennessee in 1980 with a dissertation on numerical analysis. He joined the faculty at Georgia Tech the following year and was promoted to associate professor in 1985. In 1987 he moved to the University of Pittsburgh. There he has conducted research involving the modeling of viscous and turbulent flows with a special focus on large eddies in such flows. He is the author of more than 100 research articles and three books and has supervised more than 20 doctoral students.

David L. Morgan obtained his bachelor's and master's degrees at Washington State University

before attending the University of Wisconsin where he received his doctorate in 1968 with a dissertation on Jordan algebras under the supervision of J. Marshall Osborn. He served as an assistant professor at Georgia Tech, a position until 1973. Later he spent most of his career at Kennesaw State University where he taught computer science as well as mathematics. After his retirement from Kennesaw he served as a lecturer at the University of Denver.

William F. Moss earned his bachelor's degree in electrical engineering at M.I.T. and his doctorate in mathematics at the University of Delaware in 1974, coming to Georgia Tech the following year. His first research concerned boundary problems for partial differential equations. In 1981 he moved to Clemson University. There he became interested in the pedagogy of technology and mathematics curriculum development, as well as computational mathematics and modeling. He was also active in pre-service and in-service teacher learning and professional development. In 2008 he was named the Clemson Alumni Distinguished Professor of Mathematical Sciences and 2009 he was given the IEEE Educational Society Frontiers in Education Helen Plants Award.

James Anthony Pennline was a numerical analyst and an assistant professor at Georgia Tech for one year 1974-5. He then taught at Virginia Commonwealth University. In 1981 he had a summer faculty fellowship at NASA's Lewis Research Center in Cleveland, now Glenn Research Center. In 1983 he joined that center, where he remained for the rest of his career.

John Piepenbrink received his Ph.D. in 1969 at UCLA under the supervision of Raymond Redheffer and taught at the University of Minnesota before coming to Georgia Tech in 1975. His research interests included elliptic integrals, hamiltonians, integral inequalities, and Schrödinger operators. In 1981 he joined the faculty of West Georgia State University. Having suffered from physical disabilities much of life, he died in 1997 at the age of 53.

Stephen Edwin Scherer attended the University of Miami for two years before transferring to Georgia Tech where he remained to obtain his bachelor's, master's, and doctoral degrees. His dissertation, written under the supervision of Michael Stallybrass, dealt with boundary problems in elastodynamics related to earthquakes. He was one of the last graduate students to serve as an instructor, which he did for six years before obtaining his degree in 1974. The next year he joined the faculty at what was then Kennesaw Junior College. Having used computers in his

doctoral work, he was made computer coordinator for mathematics and science in his first year, and would eventually become director of technology services for the entire institution. In 1982 he was the first recipient of Kennesaw's Distinguished Teaching Award and in 1985 served as the interim chairman of the mathematics and computer science department after that had become a separate unit. After his retirement in 2002 he set about building a house in Blue Ridge and helped establish high school mathematics contests in North Georgia.

William George Sikonia obtained his Ph.D. at the University of Colorado in 1970 and served as an assistant professor at Georgia Tech for the next two years. He then joined the U. S. Geological Survey where he did some of the initial work on adapting Taylor's finite element method to the study of glacial dynamics and sediment transport, especially in southeastern Alaska and western Washington state.

Kathleen Ann Spear obtained her doctorate at Carnegie Mellon University in 1984 with a dissertation on continuum mechanics. She served as an assistant professor at Georgia Tech from 1983 to 1985 and later did research in geophysics at the Laboratory for Atmospheric and Space Physics in Boulder and at the Lockheed Palo Alto Research Laboratory.

Michael Bahry Tamburro received a bachelor's degree in aerospace engineering at R.P.I. in 1962 and a master's degree in mechanics and materials at the University of Minnesota in 1965. He worked at the North American Aviation company before obtaining his Ph.D. at U.C.L.A. in 1974 with a dissertation on differential equations under the supervision of Michael Crandall. He served as an assistant professor at Georgia Tech from 1974 to 1980 and was last known to be living in Socorro, New Mexico.

Raymond D. Terry earned his Ph.D. at Michigan State University in 1972 with a dissertation on ordinary differential equations. He served as an instructor at Georgia Tech from 1972 to 1975 before moving to California State Polytechnic University, San Luis Obispo. He retired from that institution in 2007 but continued to teach some courses there.

Wesley Eugene Terry obtained his Ph.D. at Cornell University in 1973 and served as an assistant professor at Georgia Tech in 1974-5 before moving to New Mexico State University

in Las Cruces.

Nicholas John Weyland attended Canisius College and earned a master's degree at Michigan State University before obtaining his Ph.D. at the University of Notre Dame in 1976 with a dissertation on holomorphic functions. He served as an assistant professor at Georgia Tech from 1976 to 1982. Later he taught computer science at Montana State University before moving to California where he held computer science positions at the Lockheed Missiles and Space Company and the Lockheed Palo Alto Research Laboratory.

Doron Zeilberger was born in Haifa, did his undergraduate work at the University of London, and obtained his Ph.D. at the Weizmann Institute in 1976. He was a visiting assistant professor at Georgia Tech in 1978-9 and supervised one master's degree thesis while there. After positions at Illinois, Weizmann, and Pennsylvania, he joined the faculty of Drexel University in 1983. In 1990 he moved to Temple University and taught there until he became the Board of Governors Professor of Mathematics at Rutgers University in 2001. He is known for his solution of the alternating sign matrix conjecture and for the creation of "WZ" theory with Herb Wilf, a proof theory for combinatorial identities, as well as Zeilberger's algorithm, which can be used to find new identities. Both of the latter two are now used extensively in modern computer algebra theory. He is the recipient of the MAA Lester R. Ford Award, and with Wilf, the AMS Steele Prize. He has also been awarded the Institute of Combinatorics and Applications Erdős Medal. The Erdős Medal citation described him as a, "champion of using computers and algorithms to do mathematics quickly and efficiently."

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