

The History of Otorhinolaryngology at Mayo Clinic



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The sum-total of medical knowledge is now so great and wide-spreading that it would be futile for one man to attempt to acquire, or for any one man to assume that he has, even a good working knowledge of any large part of the whole. The very necessities of the case are driving practitioners into coöperation. The best interest of the patient is the only interest to be considered, and in order that the sick may have the benefit of advancing knowledge, union of forces is necessary.

William J. Mayo¹

The following historical account was written after the 100th anniversary of the Department of Otorhinolaryngology to document the development of the specialty at Mayo Clinic in Rochester, Minnesota. This article serves to commemorate those before us, ensuring that the details of this formative time are not forgotten. It also celebrates more than 150 years of otology, rhinology, and laryngology practice at Mayo Clinic. This report was compiled from multiple sources including the annual reports to the Mayo Clinic Board of Governors, the *Mayovox* (Mayo Voice) newsletter, the illustration archives of the Mayo Clinic Division of Creative Media, staff biographies, curriculum vitae, memoirs, personal interviews, full-text journal articles, and book publications including *The Doctors Mayo*, *Mayo Roots: Profiling the Origins of Mayo Clinic*, *Early Days in the Mayo Clinic*, and *Sketch of the History of the Mayo Clinic and the Mayo Foundation*. The core information for this report was abstracted from the annual report documents submitted to the Mayo Clinic Board of Governors every year by the section or department chair that detailed routine departmental business and any notable activities from the preceding year. The article is organized into 4 distinct historical eras: (1)

the early years, (2) the establishment of the specialty, (3) adversity, transformation, and expansion, and (4) the modern era.

From the Department of Otorhinolaryngology, Mayo Clinic, Rochester, MN.

The Early Years

As with all specialties at Mayo Clinic, the genealogy of the Department of Otorhinolaryngology begins with Dr William Worrall Mayo. Dr W.W. Mayo immigrated to the United States from England in 1845, and received his medical training in La Porte, Indiana, and St. Louis, Missouri. Shortly after beginning his medical practice, Dr W.W. Mayo contracted malaria and elected to leave Lafayette, Indiana, and traveled to Minnesota in 1856 in search of a more healthful climate. Dr W. W. Mayo and his family journeyed to several cities in Minnesota before ultimately settling in Rochester after Dr Mayo was appointed by President Abraham Lincoln to serve as the examining physician for draftees in southern Minnesota during the Civil War. During these years, his 2 sons were born—"Will" on June 29, 1861, and "Charlie" on July 19, 1865. Even early on, Dr W. W. Mayo involved his sons in the care of his patients; they would frequently attend country rounds and were sometimes permitted to observe "kitchen table operations" at the Carpenter House or participate in autopsies (Figure 1).² These early decisive experiences led the brothers to pursue formal surgical training and return to Rochester to join their father's practice—Dr William James Mayo after obtaining his medical degree in 1883 from the University of Michigan at Ann Arbor and Dr Charles Horace Mayo after receiving his medical doctorate at Northwestern University, Chicago, Illinois, in 1888. Notably, Dr W. J. Mayo received much of his training in Michigan under Dr George E. Frothingham, Professor of Ophthalmology and Otology.^{3,4} Additionally, shortly after graduating, Dr C. H. Mayo traveled to Europe for 6 months, where he spent much of



FIGURE 1. The Carpenter House, located at 621 North Broadway in Rochester, Minnesota, was used by Dr William Worrall Mayo for outpatient surgical procedures before the construction of Saint Marys Hospital was completed in 1889. Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.

his time observing treatment of eye, ear, nose, and throat conditions, and he assumed responsibility for most of this work after returning to Rochester.⁴

It is notable that the brothers received their education at a time of great discovery in Western medicine and surgery. In 1864, Dr Joseph Lister, disheartened by the formidable rate of infection and the constant stench of hospital wards, began using carbolic acid (phenol) as an antiseptic in solutions for hand washing, instrument cleaning, dressing application, and even steam spray atomization.⁵ It was also at this time that several significant surgical advances in the field of head and neck surgery were made, including Dr Emil Theodor Kocher's goiter excision in 1872, Dr Christian Albert Theodor Billroth's first description of total laryngectomy in 1873, Dr William S. Halsted's beginning use of cocaine as a topical vasoconstrictant and anesthetic in 1885, and the introduction of rubber gloves in 1889.⁶ It was said regarding this era, "Probably the most interesting period of medicine has been that of the last few decades. So rapid has been this advance, as new knowledge developed, that the truth of each year was necessarily modified by new evidence, making the truth an ever-changing factor."⁷

The early success of the Mayos was propelled by their exemplary surgical outcomes

during a time when laboratory medicine, surgical pathology, asepsis, anesthesia, and exploratory surgery were in their infancy.^{6,8} In these years, a surgeon operated on all areas of the body, and a notable part of their practice dealt with the treatment of head and neck ailments. In Dr W. W. Mayo's seventh bibliography entry of 13 publications, he reports on the surgical management of a lingual epithelioma, a carcinoma of the tongue, in the 1885 *Transactions of the Minnesota State Medical Society*.^{9,10} In this report, the patient was placed in a reclined position, a chloroform anesthetic was administered, the tumor was resected using a "dulled scissors" and a "sharp scoop," and the area was subsequently cauterized with a hot iron.⁹

Central to the history of the Mayo Clinic and the establishment of the Department of Otorhinolaryngology was the construction of Saint Marys Hospital after a series of tornados devastated the local region in August 1883.² Saint Marys Hospital was finally operational on October 1, 1889, with the 3 Mayos and 5 of the Sisters of Saint Francis comprising the medical and executive staff. The hospital and clinic buildings relevant to the history of otorhinolaryngology at the Mayo Clinic are presented in [Figures 2 through 8](#).³

The completion of the 27-bed hospital welcomed the first major growth period in the history of Mayo Clinic, between 1889 and 1906.² During this time, a total of 21 staff



FIGURE 2. Saint Marys Hospital was completed in 1889 and was the primary site where Dr Charles H. Mayo performed hundreds of operations of the head and neck before work was delegated to the specialty sections. Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.



FIGURE 3. Constructed in 1900 on the north-west corner of what is now First Avenue and Second Street SW in Rochester, Minnesota, the first floor of the Masonic Temple was used by the Section of Otolaryngology and Rhinology for examinations, diagnostic work, and minor surgical procedures from 1901 to 1914. Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.



FIGURE 5. The major operative work of the Section of Otolaryngology and Rhinology was transferred to the Worrall Hospital, located at 215 Third Street SW in Rochester, Minnesota, after its opening in January 1919; however, minor surgical procedures were still performed on the second floor of the 1914 building. Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.

were added, including 13 permanent member physicians, 6 interns, and 2 laboratory assistants.⁶ Specific to the field of otolaryngology, Dr Justus Matthews was hired on May 2, 1906, as the section head of laryngology and rhinology, and Dr Gordon B. New was hired



FIGURE 4. The 1914 building—the original building called “Mayo Clinic”—represented the first fully integrated multispecialty group practice of medicine. Following construction, the Section of Otolaryngology and Rhinology was transferred to the north wing of the second floor of the Clinic. The building was located on the corner of First Street and Second Avenue SW in Rochester, Minnesota, now the site of the Siebens Building. Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.

on May 20, 1910.¹⁰ Dr Matthews learned his trade under the instruction of Dr C. H. Mayo. Also relevant were the additions of Dr Gertrude Booker Granger in 1898, who was the first woman physician to join the Mayo practice and was an assistant to Dr C. H. Mayo in the treatment of diseases of the ears, nose, throat, and eyes¹⁰; Dr Carl Fisher in 1909 as the section head of ophthalmology and otology, predominantly managing only conditions of the eye¹⁰; Dr Henry S. Plummer in 1901 as the chief of medicine, who had a keen interest in upper aerodigestive endoscopy and the treatment of thyroid disease¹⁰; Dr E. Starr Judd in 1902 as head of one of the sections in surgery and later as chief of the surgical staff, whose major interest was the treatment of cancers and tumors of the head and neck¹⁰; and Dr Walter E. Sistrunk in 1911 as head of one of the sections in surgery, whose primary interest was the treatment of head and neck tumors and who developed the definitive surgical treatment of thyroglossal duct tract anomalies (Figure 9).^{6,10-12} From 1893 to 1906, the annual surgical caseload increased 12-fold, from 406 to 4770, with more than 100 thyroid operations performed annually in the 2 operating rooms at Saint Marys Hospital.⁶ Notably, the Upper Midwest was considered the “goiter belt” because of the low iodine content in the water, and operations of the thyroid gland comprised approximately 10% of the surgical volume in the early 1900s.^{3,4}



FIGURE 6. In 1929, all office work of the Section of Otolaryngology and Rhinology was transferred to Desk N-6 of the new Mayo Clinic building—now called the Plummer Building—and the entire corridor was assigned to the section. The space included 15 examination rooms and 1 room for vestibular testing in addition to separate staff office space. The new office was equipped with space for holding and storing medical records as well as a pneumatic tube system and vertical carrier for efficient transport of clinical records. At the time the Plummer Building was completed in 1928, it was the tallest building in Minnesota. Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.

Even in the early years of practice, the specialization of surgery had begun. The Mayo brothers saw the importance of dividing surgical fields between them to best meet the patients' needs and manage their large case volume.^{2,3} As Dr C. H. Mayo put it best, "The definition of a specialist as one who 'knows more and more about less and less' is good and true. Its truth makes essential that the specialist, to do efficient work, must have some association with others who, taken altogether, represent the whole of which the specialty is only a part."¹³

At this time, Dr W. J. Mayo was primarily invested in gynecologic and visceral surgery,

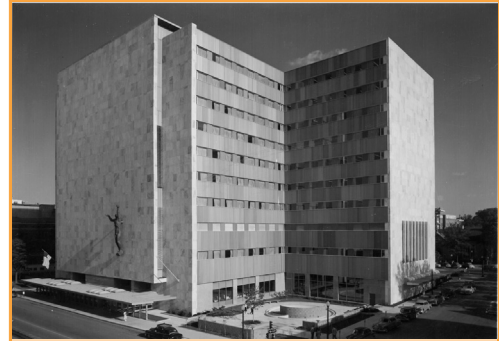


FIGURE 7. On June 19, 1954, the clinical work of otolaryngology moved to the West 5 desk of the new Mayo Building, which included 26 patient examination rooms and separate facilities for audiometric and vestibular testing. Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.

while his brother Dr C. H. Mayo began pioneering several surgical specialties including head and neck surgery, neurologic surgery, and orthopedic surgery.^{2,3} In this regard, Dr C. H. Mayo was the first otorhinolaryngology specialist at the Mayo Clinic. In a 1905



FIGURE 8. Most recently, the Department of Otorhinolaryngology moved from the Mayo Building to the Gonda Building on December 14, 2009. The new space includes 32 patient examination rooms, 13 double-walled sound booths for audiological testing, and 8 rooms dedicated to vestibular testing in addition to several procedure rooms, conference rooms, and separate office space. The Gonda Building can be seen between the Mayo Building on the right and Methodist Hospital on the left. Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.

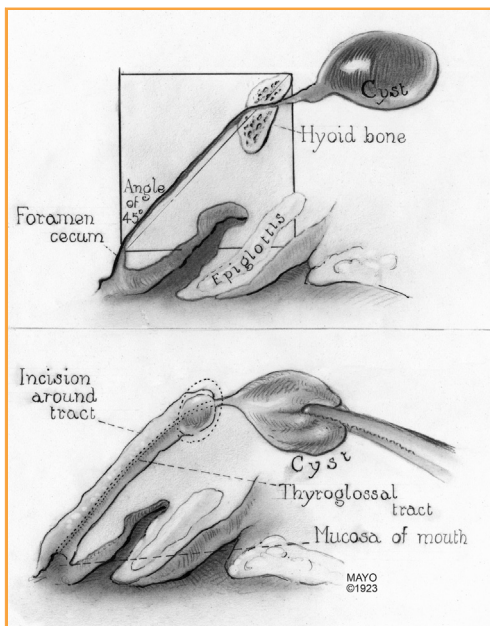


FIGURE 9. Walter Ellis Sistrunk of Mayo Clinic first described the importance of removing the central portion of the hyoid bone *in addition to* the tract of tissue extending to the base of tongue and foramen cecum to prevent recurrence of thyroglossal duct cysts, which was an improvement of Schlange's 1893 description of removing the central portion of the hyoid bone alone. Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.

publication, Dr C. H. Mayo remarked on the technical details of head and neck cancer surgery, an area at which he excelled, stating, "This is to me a most interesting region for surgical work. A large part of abdominal work is recreation as compared with the bulk of what might be called the heavy surgery of the neck."¹⁴ He was known for his unusual surgical dexterity, and Dr W. J. Mayo referred to his brother on several occasions as the greatest living surgeon (Figure 10).²

A review of the 1904 surgical log reveals that 3131 operations were performed by the brothers and their assistants that year.³ During this time, they would perform up to 20 operations in a day, operating 6 days a week.² Among these operations, Dr C. H. Mayo had performed 215 operations of the face and 135 of the neck.³ The 413 scientific articles that Dr C. H. Mayo authored included such

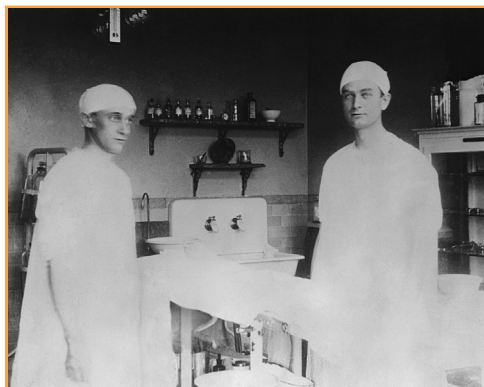


FIGURE 10. Charles Horace Mayo (left) standing next to his older brother, William James Mayo (right) in the first operative theater at Saint Marys Hospital (photograph taken in 1904). Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.

topics as surgical treatment of thyroid and parathyroid disease, tuberculous adenitis of the neck, foreign bodies of the trachea and esophagus, surgical management of esophageal diverticula, the relationship between mouth conditions and general health, removal of sinonasal malignancies, and many others.¹⁰

The Establishment of the Specialty

The growth and work completed by 1917 ushered in a new era for Mayo Clinic.⁶ At this time, the staff had enlarged to a critical number, allowing the clinical work to become increasingly divided by sections. The early sections at the Mayo Clinic that comprise the modern practice of otolaryngology—head and neck surgery included the sections of surgery, with treatment of thyroid and parathyroid disease and care of certain head and neck cancers (Figure 11); the Section of Ophthalmology and Otology established in 1909 with Dr Carl Fisher as head, which primarily dealt with conditions of the eye; the Division of Medicine with Dr Henry Plummer and his interests in aerodigestive endoscopy; and the Section of Laryngology and Rhinology established in 1906, with Dr Justus Matthews serving as section head, which was subsequently divided in 1917 into the Section of Laryngology, Oral and Plastic Surgery and the Section of Otolaryngology and Rhinology (Figure 12).

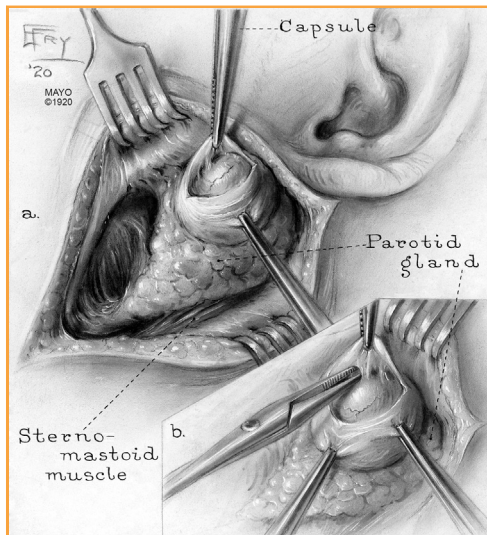


FIGURE 11. Early surgical illustration depicting enucleation of a malignant tumor of the parotid gland in order to reduce the risk of facial paralysis. Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.

Given the fragmented, overlapping, and often shifting nature of many early surgical sections that comprise the modern practice of otolaryngology—head and neck surgery, the exact start date of the Mayo Clinic

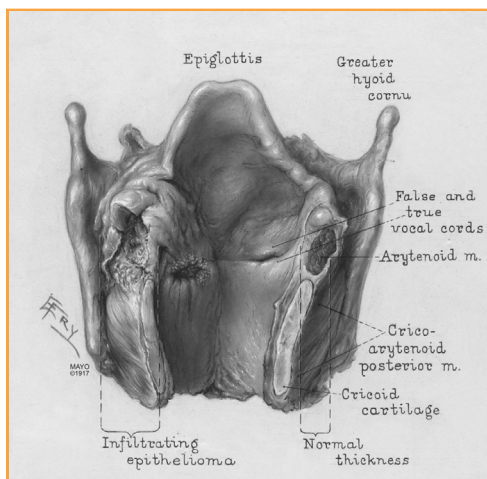


FIGURE 12. Illustration of a surgical specimen with an infiltrating left vocal cord epithelioma, or squamous cell carcinoma. Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.

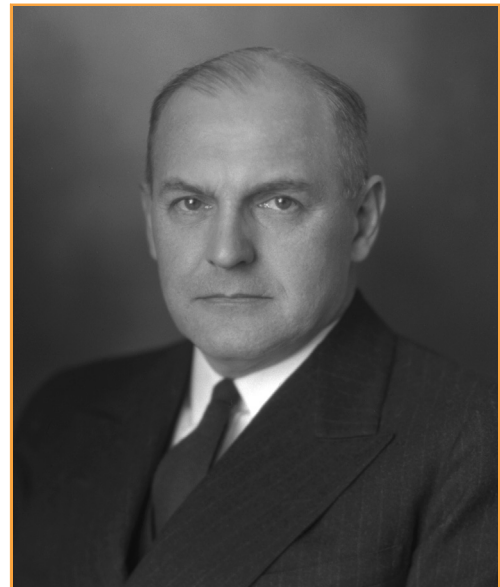


FIGURE 13. Harold "Pete" Lillie was the first head of the Section of Otolaryngology and Rhinology at Mayo Clinic, holding this appointment from 1917 to 1951. Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.

Department of Otorhinolaryngology initially may seem somewhat obscure. However, a careful review of publication history and surgical case logs of this time reveals that the official founding date of the department should be May 2, 1906, with the establishment of the Section of Laryngology and Rhinology. Subsequently, the department's history predominantly continues through the Section of Otolaryngology and Rhinology. Because the 1917 section transformation played a pivotal role in the history of the department, this transition is reviewed in greater detail. On April 1, 1917, 2 years after the official establishment of the Mayo School of Graduate Medical Education, Dr Harold I. Lillie joined Drs Matthews and New as a specialist in diseases of the nose and throat (Figure 13; Tables 1 and 2). Three months later, on July 1, 1917, the Section of Otolaryngology and Rhinology was established at Mayo Clinic, and Dr. H. I. Lillie was appointed chief, a position he held until October 1, 1951.³ The formal appointment of Dr H. I. Lillie to section head upset Dr Matthews, who resigned that same year. It is said

TABLE 1. Chairs of the Section/Department of Otorhinolaryngology, Mayo Clinic, Rochester, Minnesota

Department chair	Chair years	Consultant years
Justus Matthews	1906-1917	1906-1917
Harold I. Lillie	1917-1951	1917-1953
Henry L. Williams	1951-1958	1934-1963
Kinsey M. Simonton	1958-1967	1937-1970
D. Thane R. Cody	1968-1982	1963-1987
H. Bryan Neel III	1982-1990	1974-2005
Thomas J. McDonald	1990-2003	1972-2007
Charles W. Beatty	2003-2011	1982-Present
Colin L. W. Driscoll	2011-Present	2002-Present

that during this time, Dr New persuaded Dr H. I. Lillie to divest himself from several areas of the specialty to allow Dr New to form the separate section of Laryngology, Oral and Plastic Surgery (Thomas J. McDonald, MD, written communication, 2002). Dr New was originally an assistant to Dr Matthews in 1910 and had a background in dental surgery, head and neck trauma surgery, and ablative head and neck oncologic surgery. In contrast, during these years, most of Dr H. I. Lillie's time and interests involved the surgical treatment of suppurative disease and its related complications. He could not foresee the substantial changes to the field that would occur with the introduction of antibiotics, and thus this division of labor seemed both equitable and natural. Although not evident at the time, the departure of laryngology, oncologic surgery, and plastic surgery was a major strategic error on Dr H. I. Lillie's part because it set in motion major obstacles that the section would need to address more than 50 years later. Despite the seeming overlap of laryngology between the 2 sections, the appointments of 1917 stipulated that two-thirds of the laryngology cases go to the Section of Laryngology, Oral and Plastic Surgery and a third to the Section of Otolaryngology and Rhinology; however, in practice, laryngological surgery largely remained under the jurisdiction of the former.¹⁵

Dr H. I. Lillie's background is particularly interesting because he was the first physician in the field of otolaryngology at Mayo Clinic to receive training from someone other than Dr C. H. Mayo.⁴ Dr H. I. Lillie was born in Grand Haven, Michigan, on May 6, 1888,

and received his Doctor of Medicine degree at the University of Michigan in 1912.^{10,16} He subsequently received his graduate clinical training from 1912 to 1913 under the supervision of Dr Roy Bishop Canfield, the first Clinical Professor of Otolaryngology at the University of Michigan. Between 1913 and 1917, Dr H. I. Lillie worked as an instructor and assistant in otolaryngology at the University of Michigan Medical School and subsequently at Rush Medical College in Chicago. It was rumored that unfairness in referral apportionment at his Chicago practice led him to search for other job opportunities, and the open land of Rochester was particularly appealing to him with his equestrian background.⁴

During his 36 years of service, Dr H. I. Lillie organized and directed the graduate education program in otolaryngology and rhinology at Mayo Clinic, authored nearly 100 articles in leading medical journals, was the President of the American Laryngological, Rhinological and Otological Society in 1939, the President of the American Laryngological Society in 1945 and 1946, and the President of the American Board of Otolaryngology in 1949, while serving as a member between 1942 and 1953.^{10,16} During Dr H. I. Lillie's time of leadership, the section grew from 4 to 9 staff physicians, and academic productivity increased markedly. During these years, each staff surgeon published an average of 8 journal articles annually and gave dozens of lectures nationally and internationally. "The Chief," as many affectionately addressed him, was a master clinician and surgeon.¹⁶ He frequently emphasized that understanding a patient's entire clinical condition was required for correct diagnosis and treatment of local disease. As an accomplished surgeon, his operative skill was characterized by a "minimum of wasted motion."¹⁶ A respected colleague from Rochester, New York, Dr C. Stewart Nash wrote, "Pete was a man who possessed the ruggedness of a lumberjack, the power of a football player, the expertness of a horseman, the skill of a famous physician and surgeon, the strictness of a disciplinarian and the renown of a teacher."¹⁶

By the early 1900s, the focal infection theory had grown popular in Western medicine and strongly influenced medical and surgical practice.¹⁷⁻²⁰ This theory held that a primary silent or unrecognized focus of infection

TABLE 2. Physician and Doctorate Staff of the Section/Department of Otorhinolaryngology, Mayo Clinic, Rochester, Minnesota

Staff member	Years
Emeritus/active (MD)	
Justus Matthews	1906-1917
Gordon B. New	1911-1950
Harold I. Lillie	1917-1953
Bert E. Hempstead	1921-1950
W. Berkeley Stark	1925-1934
Carl M. Anderson	1925-1937
Henry L. Williams	1934-1963
Kinsey M. Simonton	1937-1970
O. Erik Hallberg	1942-1970
Henry A. Brown	1942-1974
Clifford F. Lake	1944-1979
James B. McBean	1945-1978
D. Thane R. Cody	1963-1987
Jack L. Pulec	1963-1969
Kenneth D. Devine	1968-1979 ^a
John C. Lillie	1968-1976 ^b
Lawrence W. DeSanto	1968-1997
George W. Facer	1970-2000
Eugene B. Kern	1970-2001
Thomas J. McDonald	1972-2007
Stephen G. Harner	1973-2003
Bruce W. Pearson	1973-2004
H. Bryan Neel III	1974-2005
Nicolas E. Maragos	1977-2010
Ku Won Suh	1977-1982
William J. O'Rourke	1978-1996 ^c
Mitchell S. Marion	1986-1989 ^d
Thomas V. McCaffrey	1980-1998
Jack L. Clark	1979-1981
Kerry D. Olsen	1981-Present
Charles W. Beatty	1982-Present
Ray O. Gustafson	1982-2015
David A. Sherris	1984-2003
Tom D. Wang	1987-1993
Jan L. Kasperbauer	1989-Present
Evan L. Nelson	1990-2009
Laura J. Orvidas	1995-Present
Sharon E. Libi	1996-2002; 2016-Present
Norval E. Bemhardt	1997-1999
Scott E. Strome	1998-2004
Dana M. Thompson	1999-2006; 2008-2013
Luis A. Garcia	1999-2009
Colin L. W. Driscoll	1999-Present
Harvey M. Freedman	2000-2009
Alain N. Sabri	2001-2004
Jens U. Ponikau	2001-2005
Eric J. Moore	2001-Present
Oren Friedman	2003-2010

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TABLE 2. Continued

Staff member	Years
Emeritus/active (MD), continued	
John F. Pallanch	2004-2016
Daniel J. Blum	2005-2015
Brian A. Neff	2005-Present
Dale C. Ekblom	2007-Present
John H. Shelby	2007-Present
Shelagh A. Cofer	2008-Present
Daniel L. Price	2008-Present
Ann F. Bell	2010-Present
Grant S. Hamilton III	2011-Present
Matthew L. Carlson	2012-Present
Erin K. O'Brien	2012-Present
Jeffrey R. Janus	2013-Present
Karthik Balakrishnan	2014-Present
Serban San Marina	2014-Present
	(research associate)
Kathryn M. Van Abel	2015-Present
Janalee K. Stokken	2015-Present
Lisa A. Schimmenti	2015-Present ^e
Emeritus/active (PhD)	
LeRoy D. Hedgecock	1949-1978
Jack F. Utting	1969
Lawrence W. Keating	1970-1977
Darrell E. Rose	1970-1996
Wayne O. Olsen	1974-1996
Christopher D. Bauch	1978-2014
Martin S. Robinette	1985-1998
David Cyr	1989-1990
Robert H. Brey	1990-2007
David A. Fabry	1990-2002
Jon K. Shallop	1998-2008
Jodi A. Cook	2002-2006
Diana M. Orbelo	2006-Present
René H. Gifford	2006-2010
Neil T. Shepard	2007-Present
Cynthia A. Hogan	2008-Present
Douglas P. Sladen	2011-Present
Gayla L. Poling	2015-Present

^aAt Mayo Clinic since 1947^bAt Mayo Clinic since 1952^cFamily practice, serving as medical otorhinolaryngologist.^dAt Mayo Clinic until 2001^eMedical genetics.

existed and could result in secondary infections at sites susceptible to circulating toxins or microbiological spread. It was believed that by removing the primary nidus, many chronic ailments could be prevented or cured. Numerous anatomic sites were implicated as common foci, but the oral cavity and pharynx

were the most well recognized. As a result, tooth extraction and tonsillectomy were frequently performed even in the absence of local symptoms, leaving many patients edentulous (Figure 14). Influenced by Dr Edward C. Rosenow, who was recruited from Chicago to Mayo Clinic to assist in laboratory diagnostic testing and basic science research, Dr C. H. Mayo published in support of the focal infection theory.^{2,19,21} As a result, in the 1920s more than 80% of the operations performed within the Section of Otolaryngology and Rhinology involved tonsillectomy. Between 1920 and 1930, 2000 to 3000 tonsillectomies were performed annually, compared with fewer than 1000 in the 1930s after growing skepticism regarding the merits of this theory surfaced.¹⁷

In the early years, the Section of Otolaryngology and Rhinology at Mayo Clinic was primarily engaged in the treatment of conditions affecting the sinuses, pharynx, and ears—diseases of the head and neck behind the “mucocutaneous margin.” Beyond pharyngeal procedures for tonsillitis and treatment of systemic chronic disease, the otolaryngologist was preoccupied with the management of acute suppurative otomastoiditis and infections of the paranasal sinuses to the point that other conditions of the head and neck were forfeited to other sections. Although it is difficult to conceive today, in the preantibiotic era life-threatening intracranial complications including septic dural sinus thrombosis, meningitis, abscess, and empyema were common sources of severe morbidity and mortality and required surgical intervention to halt progression, often resulting in disfiguring defects. During this era, radical mastoidectomy and external approaches to the paranasal sinuses, such as the Lynch, Denker, or Caldwell-Luc procedures, were common (Figure 15).¹⁷

The introduction of antibiotics in the 1930s and 1940s radically altered the landscape of the specialty. The first time sulfanilamide and its derivatives were mentioned within the section’s historical archives was in 1939. Subsequently, penicillin was first referenced in 1942 and streptomycin in 1945.^{15,17} Because penicillin was not widely available until after World War II, Dr Dorothy Heilman at Institute Hills, a local private Mayo Clinic–affiliated laboratory, developed the first supply for clinical

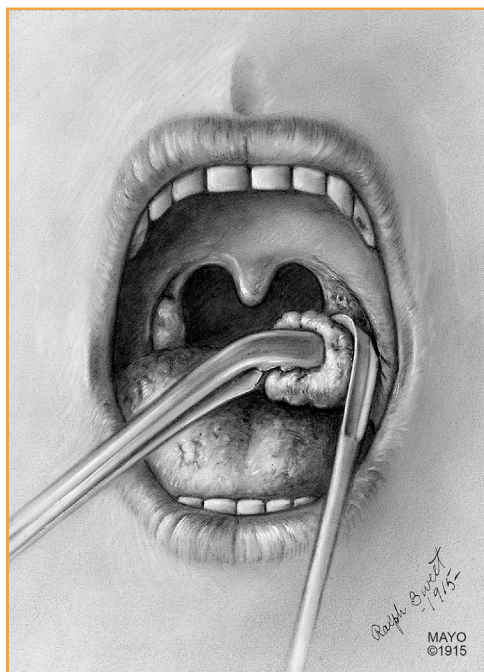


FIGURE 14. Surgical illustration of left palatine tonsillectomy using a “scoop method,” which was efficient but imprecise and bloody. During the early 1900s, tonsillectomy was rampant because of concern over the “focus of infection.” Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.

use at Mayo Clinic. Purportedly, the first patient treated with penicillin in the Section of Otolaryngology and Rhinology was a terminally ill woman with severe leukopenia who had extensive cellulitis of the face.⁴ After receiving a substantial dose of 60,000 U of penicillin per day via continuous intravenous infusion, the patient experienced complete recovery in only 3 days, and her urine was collected to extract any precious remaining antibiotic. In the 1930s, there was a marked transition to primary medical management of many cases of acute infection, and it was generally only cases of chronic infection that ultimately required surgical intervention.¹⁵

The success of antibiotic therapy permitted otolaryngologists to shift their focus from prevention and treatment of life-threatening infections to functional surgery and further advancements in pharmacological therapy. This trend was most evident in the early years

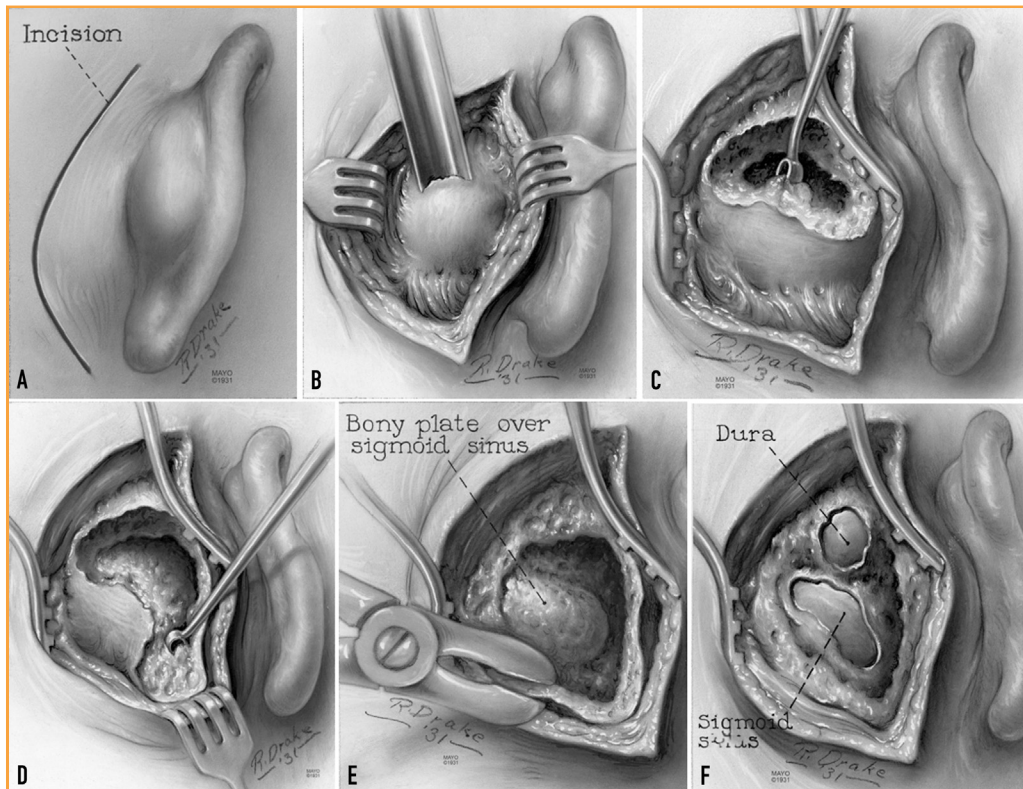


FIGURE 15. Surgical technique of mastoidectomy for treatment of acute otomastoiditis used before the widespread adoption of the otologic drill. A, A Wilde (postauricular) incision is made, and the mastoid cortex is exposed. B, The dense cortical bone is removed with a mallet and chisel. C and D, The less-dense pneumatized bone is curetted away. Additional mastoid cortex is removed with a rongeur to expose the sigmoid sinus (E) and temporal lobe dura (F) when indicated. Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.

of modern otology with the treatment of otosclerosis and Ménière's disease. At the turn of the 20th century, the practice of stapes footplate surgery was condemned given the risk of ascending meningitis and sensorineural hearing loss.²² As an alternative to stapes footplate mobilization, pioneering aural surgeons including Dr Julius Lempert in New York turned to labyrinthine fenestration for treatment of otosclerosis.^{22,23} In 1943, Dr Henry L. Williams visited Dr Lempert for 5 weeks in New York and returned to Mayo Clinic with great enthusiasm for performing single-stage lateral canal fenestration operations.¹⁵ With the availability of this procedure, numerous patients with otosclerosis-type deafness came to Mayo seeking treatment. By 1945, 164 fenestration operations were performed, accounting for half of all mastoid

procedures for that year, and this trend continued for many more years.¹⁵

Along with medical antimicrobial therapy, beginning in the 1930s there was growing interest in the study of allergic disease at Mayo Clinic. In many cases, striking results were achieved when an allergen could be found. Dr Bayard T. Horton and others recognized that groups of patients responded remarkably well to the desensitization of histamine.¹⁷ In 1945, Dr Williams authored an article on the use of diphenhydramine (Benadryl) in the "syndrome of physical allergy of the head," 3 years after its discovery and the same year it became approved for use by the US Food and Drug Administration.²⁴ Finally, in 1950, the same year that Mayo Clinic researchers received the Nobel Prize for the development of cortisone, Drs Williams and Clifford F.

Lake reported on the effects of cortisone on bronchial asthma and hay fever.¹⁵ At this time, there grew an untempered enthusiasm for developing medical treatments—the possibilities for medical cure were endless. The momentum of success from advancing medical therapies even raised questions regarding the future need for oncologic surgery: “If some medicament is developed which will control cancer, general surgical procedures will likewise be reduced. Recent reports in the medical literature indicate that such a medicament is within the range of probability.”¹⁵ By the end of the “Lillie era,” the institution as a whole was flourishing, and the staff of Mayo Clinic numbered 851, 302 of whom were members of the permanent staff.⁶

Coinciding with the early development and evolution of the specialty was the birth and expansion of the Mayo School of Graduate Medical Education and the Mayo Clinic otolaryngology residency training program in 1915. During this year, the Mayo brothers established the Mayo Foundation for Medical Education and Research in association with the University of Minnesota, providing an initial endowment of \$1.5 million dollars.^{2,25} The development and maintenance of the otolaryngology graduate education program required much of the section’s time and resources. During the early to mid 1900s, the educational term of an otolaryngology resident commonly ranged between 2 and 4 years. In 1915, the annual salary of fellows was \$600 the first year, \$750 the second, and \$1000 the third year.²⁶ In 1950, the pay scale increased to a starting annual salary of between \$9000 and \$15,000.¹⁵ First applied by the chairman of the residency graduate committee Dr Emil H. Beckman, the term *fellow* was used in the same way most programs label *resident* today—reminiscent of the graduate students in Oxford, United Kingdom.^{11,26} Dr H. I. Lillie helped develop and strongly supported the apprenticeship model of teaching in which student and instructor worked in close cooperation in the care of patients, and the student was granted increasing responsibility and autonomy as he or she developed skill and experience in the field. In the operating theater, early on the fellow acted as first assistant, but through the course of training was granted a graduated

number of operations to perform under the watchful supervision of the staff surgeon.⁴

Believing in a practical education, Dr H. I. Lillie taught that “suggestions which cause him [the fellow] to think rather than to remember are more productive.”¹⁷ In the early years of the section, there was no organized didactic teaching.⁴ The apprenticeship model of residency teaching still continues today, and the designation of *fellow* remained until after 1970, when it was changed to *resident*. Symbolizing the Mayo brothers’ progressivism toward equality of sex and race, the first graduate in otolaryngology at the Mayo Clinic was a woman, Dr Margaret I. Smith (Table 3).¹¹

Between 1917 and 1940, there was a surplus of able candidates applying for graduate medical education training in the Section of Otolaryngology and Rhinology, and many well-qualified applicants were turned down.¹⁷ This scenario paralleled the general popularity of Mayo Clinic as a whole. Early on, Mayo Clinic established itself as a premier center for surgical training. In the 1920s, more than 1000 candidates sought graduate training opportunities annually, and by the 1940s, nearly 10% of all graduate medical school trainees had completed their residency or fellowship at Mayo Clinic.²⁷ In 1928, it was noted, “The Mayo Clinic is looked upon by otolaryngologists as an excellent place for post-graduate work in the specialty. Many men of standing have suggested to younger men that they come here for their training.”¹⁷ Subsequently, in 1929, Dr H. I. Lillie remarked that there were 15 applications for fellowship in the past year; however, only 3 could be accommodated.¹⁷

Adversity, Transformation, and Expansion

Beginning in 1940 with the first peacetime conscription in the United States, the number of prospective fellowship applicants declined, and the candidate pool included a greater fraction of those who were excluded from the army for technical reasons.¹⁵ It was also during this time that many other training programs were becoming established and would commonly offer a combined eye, ear, nose, and throat experience, which was appealing to applicants who were pursuing community positions.

TABLE 3. Otorhinolaryngology Residents and Fellows, Mayo Clinic, Rochester, Minnesota

1911-1920	
Margaret I. Smith	1908-1911
Roy W. Porteus	1914-1915
E. Frank Chase	1915-1917
Charles M. Clark	1917-1920
1921	
Floyd M. Allen	1919-1921
James C. Braswell, Jr.	1919-1921
1922	
Hermann E. Bozer	1919-1922
Roll O. Grigsby	1920-1922
Malcolm C. Pfunder	1920-1922
John L. Sanders	1920-1922
1923	
French K. Hansel	1919-1923
Horace R. Lyons	1917-1923
Donald C. Rockwell	1920-1923
1924	
William J. Greenfield	1918-1924
Albert B. Murphy	1921-1924
Max E. Settelen	1923-1924
William B. Stark	1922-1924
1925	
Carl M. Anderson	1921-1925
Guy E. Burman	1924-1925
Fred A. Figi	1918-1925
Joseph B. Stevens	1922-1925
1927-1928	
Dewey R. Heetderks	1923-1927
Henry P. Johnson	1924-1927
Victor R. Lapp	1923-1927
Henry F. Wilkinson	1924-1927
Fred Z. Havens	1926-1928
1930	
Walter J. Decker	1924-1930
Nicholas E. Lacy	1927-1930
Walter M. Paton	1926-1930
George C. Saunders	1928-1930
Donald E. Tinkess	1926-1930
Henry L. Williams	1925-1930
1931	
John H. Childrey	1928-1931
Leo P. Coakley	1927-1931
Joel A. Peterson	1927-1931
Ehrhardt Ruedemann	1927-1931
1932	
William H. Craddock	1930-1932
S. Frank Hazen	1929-1932
1933	
Norman C. Cook	1930-1933
Hugh H. Johnston	1930-1933
Walter Kirch	1932-1933
George L. Pattee	1930-1933

*Continued on next column***TABLE 3. Continued**

1935-1936	
Clyde M. Cabot	1931-1935
William M. Youngerman	1931-1935
Wilson J. Troup	1933-1936
1937	
Henry A. Brown	1936-1937
Buford L. O'Neal	1934-1937
Kinsey M. Simonton	1934-1937
1939-1941	
Delmar F. Weaver, Jr.	1936-1939
Robert D. Ralph	1937-1940
William H. Wilson	1938-1941
1942-1943	
Christopher R. Dix	1937-1942
Olav E. Hallberg	1937-1942
Pietro N. Pastore	1936-1942
Walter D. Stevenson, Jr.	1938-1942
Bernard P. Cunningham	1939-1943
1944	
Donald G. Albers	1940-1944
Clifford F. Lake	1939-1944
William C. Thomell	1940-1944
Robert J. D. Williamson	1941-1944
1945-1948	
Hans V. von Leden	1943-1945
Theodore J. Hughes	1946-1947
Stefan J. Olafsson	1944-1947
Robert E. Ryan, Sr.	1944-1947
Arthur A. Spar	1943-1948
1949	
Eugene L. Bauer	1946-1949
James O. Gooch	1946-1949
Miles L. Lewis, Jr.	1948-1949
Joseph X. Medwick	1946-1949
Charles B. Porter	1947-1949
1950	
Neil D. Adams	1947-1950
Wilford W. Beck, Jr.	1947-1950
Walter E. Heck	1947-1950
1951	
Walter P. Anthony	1948-1951
Joseph W. Begley	1948-1951
Lee G. Eby	1948-1951
William C. Hugenberg	1948-1951
1952	
Clyde B. Lamp, Jr.	1949-1952
John C. Lillie	1949-1952
Ivan M. Spear	1949-1952
1953	
Robert H. Freedman	1950-1953
Raul I. Lessa	1951-1953
1955	
Robert S. Hendrick	1951-1955
Quentin D. Jacks	1952-1955
Paul W. Lapp	1951-1955

Continued on next page

TABLE 3. Continued	
1956	
Dean C. Elliott	1953-1956
Arthur J. Kuhn	1951-1956
Jack L. Mahoney	1953-1956
1957-1959	
Paschal A. Sciarra	1954-1957
Louis M. Lehoux	1954-1958
Richard L. Dobbs	1957-1959
Maurice C. Gyde	1956-1959
1960	
Darius K. Shahrokh	1957-1960
Joseph W. Teynor	1957-1960
1962	
D. Thane R. Cody	1958-1962
Paul L. Goethals	1960-1962
Marton Majoros	1959-1962
Jack L. Pulec	1959-1962
John T. Rulon	1959-1962
A. Leonard Zimmerman	1959-1962
1963-1965	
James Parker Cross, Jr.	1960-1963
Berkley S. Eichel	1962-1965
Trevor E. Mabery	1961-1965
Claude Nadeau	1961-1965
Rollie E. Rhodes, Jr.	1961-1965
1966	
A. Munson Fuller	1963-1966
Nathan A. Geurkink	1962-1966
Evan L. Nelson, Jr.	1962-1966
Raymond H. Stecker	1962-1966
Donald P. Vrabec	1962-1966
1967	
Fernando B. Bersalona	1963-1967
Lawrence W. DeSanto	1961-1967
Daniel L. Dewerd	1961-1967
George M. Hall	1965-1967
1968	
Kenneth H. Brookler	1964-1968
George W. Facer	1964-1968
Eugene B. Kern	1964-1968
1969	
Richard E. Cottrell	1965-1969
Peter R. DeMarco	1965-1969
Robert J. Dunn	1967-1969
John W. Miller	1963-1969
Nicholas P. Redfield	1963-1969
Carl E. Reiner	1965-1969
1970	
Philip J. Furman	1966-1970
Frederick W. Hahn, Jr.	1966-1970
George L. Kullman	1966-1970
David F. Wilson	1964-1970
1971	
Richard A. McKinne	1967-1971
Gary L. Townsend	1968-1971

Continued on next column

TABLE 3. Continued	
1972	
George A. Carder	1968-1972
Harvey M. Freedman	1968-1972
Thomas J. McDonald	1968-1972
Allen M. Morimoto	1968-1972
1973	
Richard D. Anderson	1969-1973
Judd H. Chidlow	1969-1973
Kenneth H. Farrell	1968-1973
Charles E. Heinberg	1969-1973
1974	
Mohsen Djalilian	1967-1974
H. Bryan Neel III	1970-1974
James H. Whicker	1970-1974
Richard D. Zujko	1970-1974
1975-1976	
Norman A. Fordyce	1971-1975
James A. Greer, Jr.	1970-1975
Ronald R. Henrickson	1971-1975
John W. Wyllie	1972-1976
1977	
George E. Breadon	1972-1977
Harvey L. C. Coates	1973-1977
Nicolas E. Maragos	1973-1977
Ku Won Suh	1971-1977
1978	
Barry L. Brown	1974-1978
Robert J. Carpenter	1974-1978
Jack L. Clark	1975-1978
Aryeh Gorenstein	1974-1978
Robert E. Ryan, Jr.	1974-1978
1979	
David M. Barrs	1974-1979
Winston M. Campbell	1975-1979
1980	
Thomas V. McCaffrey	1975-1980
Gregory D. Mathew	1975-1980
Robert D. Woods II	1975-1980
1981	
Antonio C. Andrade	1977-1981
James J. Holt	1976-1981
Kerry D. Olsen	1976-1981
1982	
Charles W. Beatty	1977-1982
Ray O. Gustafson	1977-1982
John R. Salassa	1978-1982
1983	
Janet S. Mertz	1978-1983
Michael F. Miltich	1978-1983
John F. Pallanch	1979-1983
William H. Wilder	1978-1983
1984	
Daniel J. Blum	1980-1984
Peter S. Dumich	1979-1984
Frank J. Laird	1979-1984
Robert P. Scheffter	1980-1984

Continued on next page

TABLE 3. Continued

1985	
Howard J. Beck	1981-1985
Eaton Chen	1982-1985
John C. Ellis	1981-1985
Kevin K. McVey	1980-1985
1986	
Joseph W. Bremer	1982-1986
Steven D. Spotts	1981-1986
Arthur P. Wood	1981-1986
1987	
Stephen F. Bansberg	1983-1987
Jeffrey C. Manlove	1982-1987
James B. Miettunen	1982-1987
Nila M. Novotny	1983-1987
1988	
Ronald D. Hanson	1983-1988
Craig P. Hedges	1983-1988
Gregory C. Jones	1983-1988
Robert J. Stanley	1982-1988
1989	
Nicholas J. Berg	1983-1989
Jonathan L. Ferguson	1984-1989
Jan L. Kasperbauer	1984-1989
Gregory V. Osetinsky	1985-1989
1990	
Jeffrey M. Bartynski	1985-1990
James D. Green, Jr.	1985-1990
Richard J. Lipton	1985-1990
1991	
Robert K. Gaughan	1986-1991
Gerard L. O'Halloran	1987-1991
P. Perry Phillips	1986-1991
David H. Slavit	1986-1991
1992	
Michael C. Bard	1987-1992
William J. Kane	1987-1992
David M. Nienhuis	1987-1992
Michael R. Nordstrom	1988-1992
1993	
John V. Cichon	1988-1993
Michael L. Hinni	1988-1993
Eric M. Tallan	1988-1993
Jon V. Thomas	1988-1993
1994	
Kenneth V. Hughes III	1989-1994
Joost L. Knops	1989-1994
Paul A. Reder	1989-1994
James M. Yohanan	1989-1994
1995	
Finn R. Amble	1990-1995
Josef E. Gurian	1991-1995
Willard S. Noyes	1990-1995
Laura J. Orvidas	1990-1995

Continued on next column

TABLE 3. Continued

1996	
Douglas T. Cody II	1991-1996
Judith M. Czaja	1992-1996
Sharon E. Libi	1993-1996
Dana M. Thompson	1991-1996
1997	
Michelle R. Aust	1992-1997
Steven P. Davison	1992-1997
Colin L. W. Driscoll	1992-1997
Eric J. Moore	1992-1997
1998	
Scott M. Gayner	1993-1998
David S. Kaba	1993-1998
Christine M. Puig	1993-1998
Mark C. Witte	1993-1998
1999	
David C. Pearson	1994-1999
William J. Remington	1994-1999
Jordan S. Weiner	1994-1999
2000	
Shawn S. Nasser	1995-2000
Douglas L. Schulte	1995-2000
Patrick A. Shinnars	1995-2000
Michael R. Shohet	1997-2000
2001	
Anthony E. Brissett	1996-2001
Matthew A. Kienstra	1996-2001
A. Daniel Pinheiro	1996-2001
Julie L. Wei	1996-2001
2002	
David J. Congdon	1997-2002
Michelle L. Facer	1998-2002
Nissim Khabie	1999-2002
Matthew J. Taylor	1997-2002
2003	
Larry K. Burton, Jr.	1998-2003
Stacey A. F. Hudson	1998-2003
Tamekia L. Wakefield	1999-2003
Eric C. Weinman	1998-2003
2004	
Kofi D.O. Boahene	1999-2004
Angela D. Martin	1999-2004
Scott A. McLean	1999-2004
Ronald G. Shashy	1999-2004
2005	
Eileen H. Dauer	2000-2005
Lance A. Manning	2000-2005
Matthew S. Pogodzinski	2000-2005
Robert J. Tibesar	2000-2005
2006	
Holger G. Gassner	2001-2006
Michael B. Gluth	2001-2006
Jonathan H. Lee	2001-2006
Shepherd G. Pryor	2001-2006

Continued on next page

TABLE 3. Continued

2007	
Jason P. Haack	2002-2007
Laura M. Iuga	2002-2007
Daniel L. Price	2002-2007
2008	
John B. Bitner	2003-2008
Darren R. McDonald	2003-2008
Abraham J. Sorom	2003-2008
2009	
Eran E. Alon	2004-2009
Douglas K. Henstrom	2004-2009
Patrick D. Munson	2004-2009
Geoffrey J. Service	2005-2009
Christian J. Wold	2004-2009
2010	
Jaspreet K. Dhaliwal	2005-2010
Anthony F. Fama	2005-2010
Jonathan W. Hafner	2008-2010
Michelle M. Roeser	2005-2010
2011	
David J. Archibald	2006-2011
Sivakumar Chinnadurai	2006-2011
Rajanya S. Petersson	2006-2011
Benjamin D. Powell	2006-2011
2012	
Matthew L. Carlson	2007-2012
Cody A. Koch	2007-2012
Steven M. Olsen	2007-2012
Amy M. Saleh	2007-2012
2013	
Amy C. Dearking	2008-2013
Jeffrey R. Janus	2008-2013
William R. Schmitt	2008-2013
2014	
Joseph T. Breen	2009-2014
Brian C. Gross	2009-2014
Ashley G. O'Reilly	2009-2014
Joshua J. Thom	2009-2014
2015	
Ian J. Lalich	2010-2015
Jonathan J. Romak	2010-2015
David G. Stoddard	2010-2015
Kathryn M. Van Abel	2010-2015
2016	
Cara C. Cockerill	2011-2016
Christopher D. Frisch	2011-2016
James R. White, Jr	2011-2016
Stephanie C. Contag	2011-2016

In earlier years, positions in Mayo's otolaryngology fellowship training program were highly sought because of the Clinic's early recognition of the importance of treating head and neck cancer and laryngological disorders. Despite a division of labor between sections, for over 20 years fellows of the

Section of Otolaryngology and Rhinology at Mayo Clinic received training across several sections, including 1 year of training with the Section of Laryngology, Oral and Plastic Surgery. Under the leadership of Dr New, the latter had expanded to include several other notable figures including Dr Frederick A. Figi and Dr John B Erich, who both served as fellows in otolaryngology and rhinology before their appointment as staff in the Section of Laryngology, Oral and Plastic Surgery. However, as founding members of the American Board of Plastic Surgery, Drs New and Erich developed a separate fellowship program in plastic surgery at the Clinic. The establishment of this program resulted in less collaboration between training programs and a reduction in time and educational prospects in laryngology, head and neck cancer surgery and plastic surgery by the otolaryngology fellows.¹⁵ After several negotiations, temporary agreements occurred to improve training opportunities between the sections; however, these arrangements were largely ineffective because of the fundamental problem of specialty jurisdiction.

The timing of the change in the structure of the otolaryngology residency program was incredibly inopportune because other reputable training programs across the country were expanding to encompass skull base surgery, head and neck surgical oncology, maxillofacial trauma, and later, facial plastic and reconstructive surgery. As the specialty expanded, turf battles ensued at many institutions. Most academic centers recognized the expanding domain of otolaryngology—head and neck surgery and adapted to the growth; however, the Section of Otolaryngology and Rhinology at Mayo Clinic was slow to evolve (H. Bryan Neel III, MD, PhD, written communication, October 22, 2015).^{4,15} Further, coinciding with growing internal pressures, the American Board of Otolaryngology placed additional requirements on education in the basic sciences and expanded clinical specialties. The state of affairs was summarized well by an internal publication drafted by the Section of Otolaryngology and Rhinology in 1949:

A decreasing number of suitable men are applying for training in ear, nose and throat. In discussing this situation with

physicians conducting other similar teaching services it is the consensus that a serious situation may develop. More training services have been developed throughout the country because of the influence of the American Examination Board and thus has made available opportunities for training more men in the field. The decrease in incidence of surgical mastoiditis due to the effect of treatment of ear infection with sulfonamides and antibiotics has been a deterrent for physicians entering the field. Actually in the past the field was largely surgical. At present, patients present more medical problems than surgical. The work is not so spectacular but is even more important to the patients. In the future the outstanding men in the field will need to have broad general medical background training and the borderline surgical fields will be included in the scope of the specialty.... When the special surgical field is arbitrarily confined, by the desire and occasionally by the dictum of general surgeons, to structures within the mucocutaneous margin of the involved anatomic structures, it would seem at once too arbitrary and actually a very short-sighted and silly position to take. The same medical education and training are demanded of the special surgeon as of the general surgeon.¹⁵

Although many solutions were considered, including the establishment of a joint program with the University of Minnesota and the consolidation of training between sister surgical specialties, the single otolaryngology training program endured.^{15,17} Despite the trend for many centers to combine eye and otolaryngology training, the departments of ophthalmology and otolaryngology at Mayo Clinic agreed that the lifestyle, hazards of surgery, and clinical skill set of these 2 specialties were too divergent, stating that "it is felt generally that one is either an 'eye man' or a 'nose and throat man.'"¹⁵

During this time of adversity, there was a critical need for the establishment of a fellowship program director. In 1942, Dr Williams was appointed by Dr H. I. Lillie to manage the

fellowship program.¹⁵ After Dr Williams was selected as head of the section in 1951, these duties were transferred to Dr Kinsey M. Simonton. Dr Simonton saw to the development of a more organized curriculum, expanding beyond direct patient consultations to include formal education in anatomy, pathology, audiology, vestibular medicine, and endoscopy.¹⁵ Didactic education was provided by designated members of the section, consultants in related fields, and anatomic demonstrations by Dr W. Henry Hollinshead, a prominent anatomist of the time and author of the definitive 3-volume textbook *Anatomy for Surgeons*.¹⁵ In order to augment surgical training, fresh cadaveric heads could be obtained from the State Hospital for trainees to dissect after hours.¹⁵

In the 1940s and 1950s, reflecting on the considerable changes that had occurred over the preceding 4 decades of the specialty's history, it was clear that the staff surgeons sensed that the Section of Otolaryngology and Rhinology was at a tipping point: the dwindling popularity of the field among prospective medical school graduates and a shift from surgical to medical management for many of the conditions that once defined the specialty demanded reinvention if the specialty was to subsist and succeed.¹⁵

The Section of Otolaryngology and Rhinology sought to expand the specialty's scope to include common conditions of the head and neck that were lost to other specialties during the section's historical preoccupation with surgical treatment of inflammatory diseases. It was proposed that rhinoplasty and operative laryngological procedures be returned to the otolaryngology and rhinology section.¹⁵ This step was argued to be a logical and beneficial change because patients often require intranasal and extranasal procedures for relief of nasal symptoms. Similarly, a case was made that the Section of Laryngology, Oral and Plastic Surgery should be satisfied with the management of "neoplastic and plastic services" alone, and the field of laryngology surgery should be reallocated to the section of otolaryngology and rhinology under the supervision of Drs O. Erik Hallberg and John C. Lillie, who had general surgical training. The precedent for this change existed because the original division of sections in 1917 called for a minimum of a third of the laryngology

cases to be managed by the ear, nose, and throat section.¹⁵ Notably, Dr J. C. Lillie was the son of Dr. H. I. Lillie and received his residency training at Mayo Clinic in the Section of Otolaryngology and Rhinology.

The period of great transformation and growth for the Section of Otolaryngology and Rhinology occurred under the chairmanship of Dr D. Thane R. Cody (Figure 16). Dr Cody received his Doctor of Medicine degree at Dalhousie University Faculty of Medicine in Halifax, Nova Scotia, Canada, and accepted a fellowship position in surgery at the Mayo Foundation in 1958.²⁸ One quarter after beginning his training, Dr Cody transferred to the Section of Otolaryngology and Rhinology, where he remained for his entire career.⁴ Dr Cody was the first physician in the Section of Otolaryngology and Rhinology to receive protected research time of 2 days a week, during which he could spend time in the physiology laboratory to conduct basic science research within the field of immunology. Over time, Dr Cody earned a national reputation as an innovative otologic surgeon, prolific writer and presenter, and basic science researcher. Among many other topics, Dr Cody authored seminal work on the use of corticosteroids for sensorineural hearing loss; cortical audiometry; and concentrations of parenteral antibiotics in the blood, cerebrospinal fluid, and inner ear with implications for streptomycin ototoxicity.⁴ He also developed a novel surgical treatment for Ménière's disease—the “tack procedure”—in which a stainless steel tack prosthesis was placed into the vestibule through the stapes footplate via a transcanal stapedectomy approach. The sharp tack prosthesis would then perform repeated decompression of the saccule during hydropic episodes.²⁹

Dr Cody was a servant of the department, institution, and specialty. Under his leadership, the Section of Otolaryngology and Rhinology graduated from a section to a department, the internal committees of education, clinical practice, and research were initiated, an obligatory 6-month or 1-year basic science laboratory term for fellows was begun, and the development of the chief year, as it is commonly known today, occurred in 1968.¹⁵ However, perhaps the greatest of Dr Cody's accomplishments remains unknown to most. When Dr Cody began as section chief in 1968, he received a letter



FIGURE 16. D. Thane Cody, MD, PhD, played a pivotal role in transforming and expanding the Section of Otolaryngology and Rhinology into an influential department, leading in clinical care, resident education, and research. Reproduced with permission of the W. Bruce Fye Center for the History of Medicine, Mayo Clinic, Rochester, Minnesota.

from the American Board of Otolaryngology on January 10, 1968, stating that “on June 30, 1968, the Department will move from probation to a status where it would close down completely” (T. J. McDonald, MD, written communication, June 17, 2002). It seemed that for 5 years, the knowledge that the training program was under probation had never been shared by the previous section head of otolaryngology. Dr Cody called for an urgent meeting and received permission from the personnel committee to move several key staff from the Section of Laryngology, Oral Surgery and Plastic Surgery to the Section of Otolaryngology and Rhinology, including Dr Kenneth D. Devine and Dr J. C. Lillie. Interestingly, both Drs Devine and J. C. Lillie had already been certified by the American Board of Otolaryngology in the 1950s in order to legitimize their prior involvement in the training of otolaryngology fellows.⁴ Following this meeting, Dr Cody wrote to the American Board of Otolaryngology describing his plan, and on May 29, 1968, the probation status of the training program was lifted (T. J.

McDonald, MD, written communication, June 17, 2002).⁴ This action marked the first major step forward in a long-term struggle to expand the clinical realm of the section.

Realizing the critical and timely need for additional surgical personnel with diverse talents, Dr Cody aggressively recruited new faculty to develop several expanding areas of practice and research: otology and neurotology with Dr George W. Facer in 1970, Dr Thomas J. McDonald in 1972, and Dr Stephen G. Harner in 1973; head and neck surgery with Dr Lawrence W. DeSanto in 1968 and Dr Bruce W. Pearson in 1973; head and neck surgery and rhinology with Dr H. Bryan Neel III in 1974; rhinology with Dr Eugene B. Kern in 1970; laryngology with Dr Nicolas E. Maragos in 1977; general otolaryngology with Dr Thomas V. McCaffrey in 1980, Dr Charles W. Beatty in 1982, and Dr Ray O. Gustafson in 1982; and general otolaryngology and facial plastic surgery with Dr Kerry D. Olsen in 1981. In order to further broaden the training experience, Dr Cody arranged for resident rotations in the Division of Thoracic Diseases for bronchoesophagoscopy experience and at Hennepin County General Hospital in Minneapolis, Minnesota, for maxillofacial trauma (H. B. Neel III, MD, written communication, October 22, 2015). During his term, the first medical otolaryngologist, Dr William J. O'Rourke who was board-certified in family practice, was hired in 1978, and the first physician assistant at Mayo, Carroll F. Poppen, PA, was hired in 1971 (H. B. Neel III, MD, written communication).³⁰ These advancements brought the residency training program and department out of a 20-year downturn and reinstated the department's national reputation in research, education, and clinical care.

Notably, Dr DeSanto was the first otolaryngology resident who received further training outside Mayo Clinic in head and neck surgical oncology. Between 1966 and 1967, Dr DeSanto received additional experience in head and neck surgery at Case Western Reserve University in Cleveland, Ohio.⁴ With his return to Mayo Clinic in 1968, he was the first physician in the department to perform neck dissections for treatment of head and neck cancer, and his practice was critically observed by some of his colleagues in general surgery. Dr DeSanto's perseverance and favorable clinical outcomes,

combined with the existing practices of Drs Devine and Pearson, firmly established head and neck surgery as a major component of the Department of Otorhinolaryngology.

In 1982, Dr Neel succeeded Dr Cody as chair of the Department of Otorhinolaryngology, serving until 1990. Dr Neel continued the momentum initiated by Dr Cody, further improving the reputation of the department and supporting advancement of the specialty at Mayo Clinic and nationally. Instrumental to negotiations regarding official acknowledgment of the expanding and capable head and neck surgical domain of the otolaryngologist at Mayo Clinic was a written report on head and neck surgery (unpublished data, 1988). This 27-page report, submitted to the members of the Board of Governors, sought to "finally end a long cycle of divisiveness among a few and lead to clear recognition that Otorhinolaryngology was the only department at Mayo which practiced the entire scope of head and neck surgery and indeed cared for the vast majority of patients in this specialty." From this point forward, the department began to use the term *otolaryngology—head and neck surgery* to more accurately portray the breadth of the specialty.

The Modern Era

The modern era marks a period of stability and achievement for the Department of Otorhinolaryngology. Mayo Clinic, including the specialty of otorhinolaryngology, has expanded to incorporate campuses in Jacksonville, Florida, and Scottsdale, Arizona, in 1986 and 1987, respectively. Additionally, the Mayo Clinic Health System was initiated in 1992, a network of clinics and hospitals now serving more than 70 communities in Minnesota, Wisconsin, and Iowa. Most recently, Mayo Clinic was ranked first by the *U.S. News & World Report's* Best Hospitals rating in 2016, and the department was ranked first in specialty in 2014. Never before has the Department of Otorhinolaryngology more fully realized accomplishments in the areas represented by the 3 shields of the Mayo Clinic—patient care, education, and research, as summarized below.

Patient Care, the First Shield. From a clinical practice perspective, the modern period is

defined by the subspecialist. Historically, all resident graduates would start their career as a general otolaryngologist until interests and talents matured toward one particular area. In the 1980s, it was normal for a surgeon to perform stapedectomy, glossectomy with neck dissection, and rhinoplasty on any given operative day. Although there are exceptions to this practice, since 1998 nearly all hired staff in the department have received additional subspecialty training following a minimum of a 5-year general otolaryngology residency. The increasing volume of medical knowledge and technical skills required to care for patients with complex otolaryngological disease has led to the development of subspecialty training in areas including otology, neurotology and skull base surgery, head and neck surgical oncology, facial plastic and reconstructive surgery, rhinology, sinus and allergy, pediatric otolaryngology, laryngology, and sleep medicine and surgery. Even within the past 3 years, the department has seen a net growth of 6 subspecialty-trained surgeons in the fields of neurotology, head and neck oncologic surgery, pediatric otolaryngology, sinus surgery, and sleep surgery, as well as the addition of a medical geneticist specializing in head and neck and audiovestibular disorders. Although a comprehensive summary of the current clinical activity of the department is beyond the scope of this report, several notable highlights warrant mention, including the development and expansion of the cochlear implant program, the application of the da Vinci surgical system to augment minimally invasive transoral surgery, and the growth and expansion of endoscopic sinus and anterior skull base surgery.³¹

Today the Department of Otorhinolaryngology enjoys a highly collaborative relationship among subspecialists within the department and among specialties. The introductory quote by Dr W. J. Mayo rings more true today than ever—the field of medicine and surgery has required increasing specialization, which in turn has required greater collaboration with other specialists to provide complete care to the patient. As an example, the multidisciplinary model of care is exemplified by the daily collaboration for treatment of complex skull base disorders seen among otolaryngology, neurosurgery, radiation oncology, medical oncology, neuroradiology,

medical genetics, and speech pathology. Patients are evaluated in a multidisciplinary clinic according to their individual needs, and complex cases are presented at a regularly scheduled skull base tumor conference. The Mayo Clinic model of equal salary within a department is unique in contrast to an incentive-based practice, which is common nationally. Physicians are free to provide care without financial pressures, which fosters collaboration, reduces unnecessary procedures or tests, and ultimately benefits the patient.

Education, the Second Shield. For the past 30 years, the otolaryngology residency program has consistently held a competitive position, prized for early autonomy, high surgical volume, and broad case diversity. From more than 300 applicants, 32 candidates are offered interviews, and only 5 residents are selected each year. The Mayo Clinic residency program continues to follow the apprenticeship model, which remains unique among programs. Additionally, the 6 months of dedicated research time and semiautonomous chief year, originally established by Dr Cody, remain protected attributes of the program. Every year, graduates of the program secure positions in competitive fellowship training programs, with approximately half obtaining academic appointments following training. A fellowship in advanced head and neck oncologic surgery and microvascular reconstruction, initiated in July 2011, has attracted national and international candidates. Additionally, the department has applied for a fellowship program in neurotology and lateral skull base surgery, with an anticipated start date of July 2018.

Research, the Third Shield. The Department of Otorhinolaryngology remains active in basic science and clinical research, and a monthly research symposium is held to facilitate intra-departmental and interdepartmental collaboration. Areas of particular interest include regenerative medicine, whole-exome sequencing for biomarker discovery and analysis of genotype-phenotype correlations, and quality of life outcome analysis in skull base surgery, to name a few. Overall, departmental academic productivity remains high with approximately 100 articles published in peer-reviewed journals and an equal number

of presentations at national and international conferences each year.

Conclusion

In closing, it is fitting to review a timeless reflection by Dr C. H. Mayo, published in 1928 in the *Annals of Otolaryngology and Laryngology*, in which he spoke of his place in medicine and the future of the profession: "How fortunate we have been who have lived during this great period of medical progress of say, 30 years, yet I have heard my father say the same, many years ago. The textbooks of the days of his youth, when the microscope was revealing only the most obvious things and before the germ theory of disease was put forward, show in a most startling way how false their ideas of disease were. Their clinical observations were often strikingly accurate, but sometimes unaccountably faulty.... Yet they called themselves modern and looked back at their predecessors with a patronizing sort of pity from the pinnacles of scientific success to which they had attained. In spite of the soundness of our present theories and the exacting proof to which all our beliefs are put, I cannot always be sure that a century from now somebody will not be saying the same sort of things about us. It may be that we are sojourning in the wilderness, that such discipline is necessary for the children of Medicine, and that we have not yet so much as seen the promised land.... I believe we are traveling the road to the elucidation of all disease, but the journey's end may be a long way off. Each day is a step, and there is always a milestone just around the corner; that is good enough".³²

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