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Presidential Address

Eight former presidents of the AATS

The Boston connection

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The membership of The American Association for Thoracic Surgery has greatly honored me with the privilege of being the sixty-ninth president of this distinguished society. I certainly consider this one of the highest accolades of my professional career.

It is a special pleasure to welcome you to the city of Boston, the home of eight of the sixty-eight individuals who preceded me as president of this Association. The occasion of our meeting in Boston seemed to me an appropriate time to tell you something about these eight former presidents who spent a major portion of their careers in this city.

Samuel Robinson (1875-1947)

The first of the presidents from Boston, Samuel Robinson (Fig. 1), was present at a luncheon at the Waldorf Astoria hotel in New York when the AATS was founded during the First World War, on June 7, 1917. Within minutes after the vote that officially formed the Associ-

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ation, and the election of officers, the president-elect, Dr. Samuel J. Meltzer, rose to thank his colleagues for their confidence and to ask that they reconsider their motion and choose instead Dr. Samuel Robinson. Robinson responded good-naturedly,"As Dr. Meltzer has already been elected, I don't see how he can do this but I appreciate the compliment he has paid me."¹ Of course, Dr. Meltzer's gesture had been just that: a richly deserved tribute to a man who had done as much as anyone in the United States to advance the cause of thoracic surgery.

Samuel Robinson was born in Augusta, Maine, in 1875. He graduated from Harvard College in 1898, from the Harvard Medical School in 1902, and then served 2 years as a surgical house pupil at the Massachusetts General Hospital. In 1904 he took up what he referred to as "the usual humdrum life of a young surgeon of the Back Bay [in Boston], assisting other surgeons and clamoring in the meantime for any unfortunate human being who might enter my office with a surgical trouble."² Because such a practice did not satisfy either Robinson's curiosity or his desire to contribute to the progress of surgery, he volunteered his spare time to work in Walter Cannon's physiology laboratory, concentrating his research on experimental investigations on animals in the interest of improving the techniques of thoracic surgery. In 1906 he received an appointment from the MGH as an assistant in surgery. The staff quickly recognized his ex-

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Fig. 1. Sam Robinson. Artist unknown. (From Meade RH. A history of thoracic surgery. Courtesy of Charles C Thomas, Publisher, Springfield, Illinois, 1961.)

pertise and began sending their surgical chest cases to him.

His activities, both clinical and experimental, impressed Dr. J. Collins Warren, the Moseley Professor of Surgery at Harvard and the MGH. In 1908 Warren sent Robinson to Germany for 4 months to study with Ferdinand Sauerbruch and Ludolph Brauer, who were tackling some of the fundamental problems of thoracic surgery. One of the major limitations confronting them was the inability to control respiration and oxygenation during open chest operations. Sauerbruch designed a negative pressure chamber that enclosed the entire surgical team and the patient's body; the patient's head and the anesthetist were located outside the chamber. Brauer, by contrast, took the positive pressure route and developed a reverse system. Robinson had previously made attempts in Cannon's laboratory to create positive intrapulmonary pressure with steady compression using a face mask. After studying both devices, Robinson concluded that Brauer's approach using positive pressure was preferable.

When he returned to Boston in 1909, Robinson immediately set to work building his own positive pressure cabinet, which became known around the MGH as "Sam Robinson's box" (Fig. 2). It was a weird-looking contraption. Robinson's box enclosed the patient's head and the

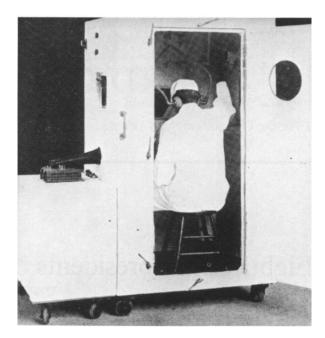


Fig. 2. Sam Robinson's box enclosed the patient's head and the anesthetist. With the door shut, the positive pressure within the box was usually regulated by the anesthetist, although it could also be regulated by the surgeon. The surgeon and the anesthetist communicated via megaphone. An exhaust valve expelled carbon dioxide and anesthetic gases.

anesthetist. The positive pressure within the box was usually regulated by the anesthetist, although it could also be regulated by the surgeon. The surgeon and the anesthetist communicated via megaphone. Carbon dioxide from the patient and the anesthetist, as well as the anesthetic gases, were expelled from the chamber through an exhaust valve. Robinson used his box for only about a year and a half. He performed thoracic procedures on 23 patients, sometimes using the box and sometimes having it as a standby. He reported only four fatalities in this group, none related to the ventilation technique,³ but he was still not satisfied and kept searching for better ventilation. He soon learned that intratracheal insufflation was very effective, and by modifying Meltzer's technique he achieved ventilation with positive pressure via a face mask. So Sam Robinson happily assigned his own box to obsolescence.

In 1909 Robinson performed one of the earliest successful lobectomies for bronchiectasis, a disease he described as "loathesome" and "disgusting," and from which there is reason to suppose he may have suffered. His approach was a multistage one and in his series of five such cases there was only one operative death.⁴

Among Robinson's other major contributions to thoracic surgery was his work, with Cleveland Floyd, on artificial pneumothorax in the treatment of pulmonary tuberculosis. Their hallmark article in 1911 clearly outlined appropriate techniques, both open and closed, of artificial pneumothorax.⁵ Robinson also made important contributions to the treatment of empyema, emphasizing early intervention.

Although the greater part of Robinson's experience in thoracic surgery was with the lung, he was also concerned with problems of the heart. He was an early advocate of surgery for heart injuries, such as gunshot and stab wounds. "Surgery of the heart is dangerous," he admitted. ".... Operation seems for the moment like a repetition of the crime and surgeons tend to leave such situations in the hands of God, lawyers and police officers. This not uncommon attitude should cease."⁶ He proposed such procedures as pericardial drainage and suture of the heart and lung.

At this point my claim to Robinson as a Boston president of the AATS becomes a little tenuous. Robinson left the MGH in 1912 and moved to Clifton Springs, New York, to join James G. Mumford, who had been a senior MGH surgeon. In 1915, after Mumford's death, Robinson went on to Rochester, Minnesota, and effectively became the first chief of thoracic surgery at the Mayo Clinic. During the First World War he served a year at the Letterman General Hospital in San Francisco, but ill health and recurrent pneumonia, quite possibly a consequence of bronchiectasis, forced him to the gentler climate of Santa Barbara. There he practiced general surgery and, in his own words, resigned "all hopes of distinction in my profession."²

This Association did not forget him, however. In 1921 it elected him as its fourth president. Though Robinson did not travel east for the annual meeting in 1922, he sent a presidential address that was read in his absence. It did not, as such speeches sometimes do, list the triumphs of the profession. "The surgery of the neck, the abdomen, the pelvis, the genitourinary system and the extremities is far cleaner, more successful and more remunerative," he concluded. "No surgeon today confines himself to the thorax, and, doubtless, this is in a sense fortunate; but our prevailing tendency is to give our thoracic cases the least attention. The internist is often heard lamenting that he cannot find a surgeon who will take any interest in his cases of thoracic surgery."

Maybe Sam Robinson would be surprised to see how far thoracic surgery has come since 1922. But I'd be willing to bet that, once he got over his amazement, he'd start looking for ways to improve things, because it was his nature never to be satisfied with the status quo.

Wyman Whittemore (1879-1957)

When Sam Robinson left Boston in 1912, his mantel in thoracic surgery at the MGH was inherited by the man



Fig. 3. Wyman Whittemore. Photograph by Fabian Bachrach. (From Meade RH. A history of thoracic surgery. Courtesy of Charles C Thomas, Publisher, Springfield, Illinois, 1961.)

who in due course became the second president of the AATS from Boston, Wyman Whittemore (Fig. 3). He was born across the river, in the hinterlands of Cambridge, in 1879, and graduated from Harvard College in 1901 and from the Harvard Medical School in 1905. He received his surgical training at the MGH and, like nearly all his contemporaries, initially practiced general surgery. Somewhere along the line he developed a certain proficiency in, and preference for, thoracic surgery and, along with Dr. Frederick Lord and a few others, helped organize the first Thoracic Clinic at the MGH in 1926.

As you no doubt imagine, this clinic might have been more properly called the "Pulmonary Clinic." Nearly all the patients treated there during Whittemore's time had either pulmonary tuberculosis or nontuberculous suppurative disease of the lungs. All our romantic images of the Roaring Twenties conveniently leave out the number of persons who were dying of rotten lungs. Sad to say, few of those who applied to the MGH Thoracic Clinic found substantial relief. These results say more about the state of the art in the 1920s than they do about Whittemore's competence. By all reports he was a good surgeon and, though perhaps not a great innovator, courageous enough to attempt unorthodox procedures when standard treatments had failed.



Fig. 4. Frederick Lord. Portrait painted about 1940 by Margaret F. Browne.

For instance, Whittemore was an exponent of exteriorization lobectomy for bronchiectasis in cases in which the disease was limited to one lower lobe of the lung. This grisly operation involved resection of a sufficient number of ribs, freeing up the diseased lobe, suturing the hilum to the chest wall, and closing the wound around the exposed lung. But let us hear Whittemore's own description of the next stages:

Needless to say, when the operation is completed the amount of lung protruding from the wound seems small, it being possibly as large as an orange, but there is a good deal more lung tissue outside the pleural cavity that is hidden by the thickness of the chest wall.... Nature may then be allowed to complete the operation, as in about ten days the lobe has become necrotic. A dry gangrene is at first established, then gradually there is a profuse foul discharge and eventually, in about four to five weeks, this whole area sloughs off, leaving a clean healthy granulating stump deep in the pleural cavity with bronchial fistulae in it.*

Of five patients having such resections, as Whittemore reported in 1927, two made complete recoveries, two had persistent bronchopleural fistulas, and one died.⁸ Not bad results considering the severe disease process and the very high mortality with other treatments. But Dr. Edward D. Churchill, who had witnessed Whittemore's procedure, later described in his unpublished memoirs that he was horrified and called it a "panic stricken retreat from an operative situation that had gotten out of hand."

In 1929 Whittemore was elected president of the AATS. Around that time he had a horseback riding accident resulting in a severe head injury from which he never completely recovered. He retired from medicine in 1934 and moved to Virginia to raise livestock.

Frederick Taylor Lord (1875-1941)

Those of you who notice prepositions have probably wondered why we are The American Association for Thoracic Surgery, not The American Association of Thoracic Surgery or of thoracic surgeons. The reason we are named as we are is that our membership has never been restricted to thoracic surgeons. In fact, the charter members included, along with a preponderance of surgeons, specialists in internal medicine and tuberculosis, endoscopists, anesthetists, physiologists, a pathologist, a radiologist, and an anatomist-that is to say, representatives of those specialized disciplines that were thought to have some bearing on chest surgery. Furthermore, the first president of the AATS was not a surgeon at all, but Dr. Samuel J. Meltzer, an internist-turned-physiologist. Our fourteenth president was Frederick T. Lord (Fig. 4), a Boston internist who had devoted his professional career to studying and treating diseases of the chest and respiratory tract.

Frederick Lord was born in 1875, the same year as Robinson. Also like Robinson, he was born in the state of Maine, though Lord's family soon moved to Lexington, Massachusetts. He graduated from Harvard College in the class of 1897 and completed the Harvard Medical School in 1900. He took his clinical training in medicine at the MGH and in 1903 was invited to join the staff. He rose steadily through the ranks and was appointed visiting physician in 1912, a title he held until his retirement. He was simultaneously active at the Harvard Medical School, where he began as an instructor in clinical medicine in 1905 and became clinical professor of medicine in 1930. He so loved to teach, and to learn, that the Harvard Medical School could not satisfy all his needs. For many years he organized popular teaching sessions for small groups of physicians at his home in the evening. He would send out a case history a few days before the session, and the group would get together to discuss the case. You

^{*}From Whittemore W. The treatment of such cases of chronic suppurative bronchiectasis as are limited to one lobe of the lung. Ann Surg 1927;86:219-26.

might say he had devised an early version of the postgraduate course.

Meanwhile Lord carried on a flourishing private practice, one of the largest in the Boston area at the time. In the early part of this century, persons who could afford to do so avoided hospitals at all costs for fear they would contract some disease other than the one that had prompted them to send for a doctor. Therefore, Lord visited most of his patients in their homes, traveling by train or horsedrawn carriage all over Boston and other parts of Massachusetts, and frequently as far as New Hampshire, Vermont, and Maine.

Wherever he went, Dr. Lord carried with him an enormous medical bag crammed full of examining instruments and diagnostic equipment for collecting and analyzing specimens. He had a reputation as a remarkable diagnostician. Dr. William B. Castle, who later became chief of medicine of the Harvard Service at the Boston City Hospital, and who was a medical house pupil at the MGH, recalled Lord from those days: "I remember ... my astonishment on one occasion in watching Dr. Lord examine a patient's chest. He stated that there was a patch of dullness about three centimeters in diameter posteriorly in the region of the left hilus. These physical findings were not at all obvious to me but a subsequent X-ray disclosed increased density at exactly the point described by Dr. Lord."⁹

From the outset of his career, Lord involved himself in research. His earliest studies, on the influenza bacillus and the etiology of bronchitis, were conducted in a cubbyhole in the MGH Pathology Department. There he worked initially under the direction of Dr. J. Homer Wright, the chief pathologist, and side-by-side with Dr. Reginald H. Fitz, of appendicitis fame. These men encouraged and influenced Lord's work, and his first publications came out of that tiny laboratory space. The studies impressed Dr. Osler, who invited Lord to write chapters on diseases of the pleura and also on influenza for his (Osler's) multivolume system of medicine, Modern Medicine, Its Theory and Practice.^{10,11} Many other publications were to follow, among them a number of books on the treatment of pneumonia, some written in association with Drs. Roderick Heffron and Elliott S. Robinson, 12-15 and Lord's own outstanding volume, Diseases of Bronchi, Lungs and *Pleura*, which was originally published in 1915.¹⁶

Dr. Lord eventually acquired more generous laboratory space where, with Dr. Robert Nye, he investigated the pneumococcus bacillus. He undertook some of the earliest explorations of antipneumococcus sera and helped make serum therapy in pneumonia available to Massachusetts physicians. Some of his research methods were unorthodox. To employ type-specific antiserum, he needed to know the type of pneumococcus that was causing the infection. This he accomplished by injecting infected material intraperitoneally into a white mouse. The next day the mouse would have peritonitis and be growing a pure culture of pneumococcus, and the organisms from the peritoneum could be typed by studying their reaction with type-specific antisera. Though Lord had a laboratory in his home as well as at the MGH, he was often some distance from both. Therefore he had the habit of carrying a small wooden box with a white mouse inside so he could inject promptly at bedside. I suppose Dr. Lord's mouse startled more than one of his patients.

Lord also concerned himself with the problems of tuberculosis, both treatment and prevention. He served for many years as president of the Channing Home, one of the first hospitals exclusively devoted to the care of patients with advanced tuberculosis.

Our Association recognized Lord's accomplishments by electing him as its president in 1931-1932, making him one of only two non-surgeons to have been so honored. He also served as vice president of the National Tuberculosis Association, president of the Massachusetts Tuberculosis League, and held memberships in numerous other professional societies. In 1935 he retired as a visiting physician at the MGH and concerned himself with problems of public health, principally related to tuberculosis. He died suddenly in 1941 at the age of 67, only 4 months after the death of his wife. He was remembered by friends and colleagues with great affection as a kind, quiet, modest, and serene man with a twinkle in his eye.

Edward Delos Churchill (1895-1972)

Sixteen years, the Great Depression, another world war, and Franklin Roosevelt passed into history before this Association selected another president from Boston. He was Edward D. Churchill (Fig. 5), who served in 1948-1949 and who, as many of you know, loomed large in the formation of my own career.

Churchill was born in 1895 in Chenoa, a small town in Illinois. He went to public schools there and then enrolled in Northwestern University, where he earned a bachelor of science degree as well as a masters in biology. In 1917 he entered the second year at the Harvard Medical School, "fully expecting," as he later delighted in telling his students, "to find a race of supermen." But neither real nor rumored supermen could faze young Churchill. He completed the year with top marks and graduated cum laude in 1920 with a doctor of medicine degree.

Churchill passed the next 4 years at the MGH, first as an intern and then as a resident in surgery. In later years, Churchill never wasted any sentimentality about the time he had spent on the house staff. "What I found most dis-

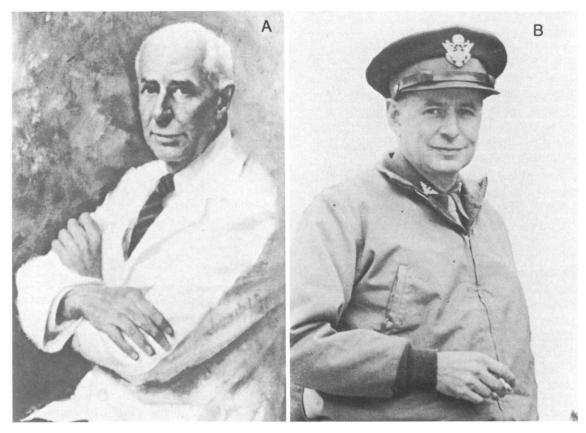


Fig. 5. Edward D. Churchill. A, Portrait by George Augusta in 1979 from photographs (Courtesy of Massachusetts General Hospital Archives). B, During Second World War.

turbing at the time," he reflected, "—and now in retrospect—was the attitude of complacency, the smug suppression of intellectual curiosity.... [T] he surgeons were anti-scientific and anti-intellectual in their attitudes and in the example they were setting for the oncoming generation." (Scannell JG, ed.: Wanderjahr: The Education of Edward D. Churchill. Unpublished manuscript, pp. 7, 10) A lazier intelligence might have accepted the status quo unquestioningly, but Churchill, as Francis Moore remarked, was "a real thinker and scientist."¹⁷

After his residency Churchill spent a year in Cecil Drinker's physiology laboratory at the Harvard School of Public Health. In 1926 he received a Moseley Travelling Fellowship and went to Europe to visit most of the leading surgeons on the continent and eventually also worked for four months with the physiologist August Krogh in Copenhagen. It is interesting to note that during this journey Churchill also visited Brauer and Sauerbruch, just as Sam Robinson had done almost 20 years earlier. Churchill returned to the MGH in 1927 as a full-time member of the surgical staff.

In July 1928 Paul Dudley White asked Churchill's advice about one of his patients, a young woman with severe symptoms of constrictive pericarditis. White thought the patient should have a Brauer pericardiolysis, but Churchill opted for the operation suggested by Delorme and successfully performed in isolated cases by Sauerbruch, Rehn, Schmieden, and others in Europe. During the operation, Churchill accomplished an extensive pericardiectomy and the patient made a splendid recovery.¹⁸ With that, the first successful pericardiectomy in the United States, the Churchill legend was born. A few months later he was appointed associate professor of surgery at Harvard and, on the urging of Dean Edsall, moved across town to Boston City Hospital with the mission to lead the development of a surgical research laboratory. When the effort floundered, through no fault of Churchill's, he turned down attractive offers at Columbia and Cornell in favor of returning to the MGH.

He came back in the spring of 1930, a 35-year-old man, his reputation as a thoracic surgeon secured by his pericardiectomy, by the remarkable success he was having in surgery for pulmonary tuberculosis and bronchiectasis, and by his adventuresome resections of lung cancer. He had also been conducting laboratory studies on problems of traumatic shock. He now broadened his efforts to tackle the problems of parathyroid surgery and to evaluate the Trendelenburg operation for massive pulmonary embolus and began to develop new techniques in segmental resection of the lung and esophageal surgery. These were exciting times in Boston surgery, not only for Churchill, but also for men such as Elliott Cutler and Bob Zollinger at the Brigham, for Oliver Cope who was working with Churchill at the MGH, and for three other past presidents of this Association: Streider at Boston University, Gross at the Boston Children's, and Sweet at the MGH.

During the summer of 1930 Churchill's chief, Edward P. Richardson, suffered a stroke that cut short his fine career and catapulted Churchill into the position of John Homans Professor of Surgery at the MGH. He then embarked on the building of a modern department of surgery.

In the late 1930s Churchill began to design his new residency program. His concept was that, in contrast with the Halsted system, the MGH would take the same number of interns as would be appropriate to finish the program 5 years later. He believed that if the residents were chosen wisely, hard work would follow naturally and not require intense competition among the residents. The MGH put Churchill's scheme into effect in 1940, accepting six interns with the plan that all six would finish, provided they wanted to and did a satisfactory job. The program continued in 1941 but was temporarily interrupted during the war. It was reinstated in 1947 and has continued essentially unchanged for the past 42 years.

When the United States entered World War II, Churchill volunteered his services and received the rank of colonel along with the appointment of surgical consultant to the North African-Mediterranean theater of operations. He shipped overseas in early 1943. He approached the problems of military surgery with the same refined intelligence and scientific attitude with which he ran his department at the MGH. He refused to accept military surgery as "an awful business": It was, in his mind, "a specialized and highly significant mission."¹⁹ He developed guidelines for intelligent, integrated care of wounded soldiers; he championed the use of whole blood and organized a supply system within the war zone. His country honored his contributions by awarding him the Distinguished Service Medal.

Churchill's clinical practice had languished during his nearly 3 years of military service, and he never resumed it with his former intensity. He observed with interest and admiration as his gifted colleague, Richard Sweet, assumed most of the responsibility for thoracic surgery. Churchill meanwhile shifted his energies to rebuilding the surgical staff that had been disrupted by the war, to developing resident education, to establishing a sound basic research component in the department of surgery, and to large-scale administrative affairs in the hospital. There were, as well, time-consuming duties in Washington: the Hoover Commission, the National Research Council, the Department of Defense. He also began to reap honors: president of The American Surgical Association and of this Association, honorary degrees, and numerous other awards.

It was about this time that I arrived on the scene, so you can see why I looked at Churchill with great admiration. He had certainly had an illustrious career as surgeon, biologist, educator, and international leader. In my association with him I was repeatedly impressed by his extraordinary ability to analyze a problem, consider all reasonable alternatives, and develop the most logical and appropriate solution.

However, there was one thing about Churchill which puzzled me and that was his lack of enthusiasm for open heart surgery. In retrospect, it seems to me he did not quite approve of the evolutionary path that he saw surgery taking in the 1950s. Churchill believed deeply that the long-term well-being of the profession would be best served by surgeons who had been provided with excellent backgrounds in general surgery and the biologic sciences. He regarded the trend toward specialization with apprehension, and he worried that surgeons were becoming enthralled with techniques at the expense of scientific knowledge. "The techniques," he wrote, "can be readily acquired by the 'bright boys' who lack comprehension of the significance of what they do."20 In Churchill's view the outstanding surgeon was not only a good technician but also someone who applied scientific principles effectively and who cared for patients throughout their course of illness. Accordingly, he was not greatly impressed by technological advances. To quote him again: "The invention of some gadget facilitates a technical breakthrough into new territory and conquest by instrumentation becomes as soulless as a blitzkrieg."20 Perhaps it was this cast of mind that prevented Churchill from getting wholeheartedly behind the stampede to cardiac surgery.

Churchill retired in 1962 and withdrew gracefully to a reflective life in his homes in Belmont and Vermont. In 1971 the Harvard Medical School enthusiastically agreed to honor him with a chair in surgery to be located at the MGH. He knew about that on the day in 1972 when he took his last walk in the Vermont woods. In 1974 I had the honor of being named the Edward D. Churchill Professor of Surgery.



Fig. 6. Richard H. Sweet. Portrait photograph by Fabian Bachrach in 1961.

Richard Harwood Sweet (1901-1962)

In 1928, at almost the same moment that Dr. Churchill performed his landmark pericardiectomy at the MGH, Richard Sweet (Fig. 6) passed from intern to surgical resident in the same hospital. In due course, Sweet would become the fortieth president of this Association.

Richard H. Sweet was born in 1901 in Newark, New Jersey. He completed his undergraduate education at Columbia University, earned his degree in medicine from the Harvard Medical School in 1926, and joined the surgical house staff at the MGH. Toward the end of his residency, in 1930, he was tempted to concentrate on the fledgling specialty of thoracic surgery, but he resisted the urge and instead accepted an invitation to join Daniel Fiske Jones, one of the great clinical surgeons of the time. And so Sweet committed himself to the MGH and to a clinical career centered on private practice.

The first phrases that rise to the surface when people reminisce about Sweet are "master craftsman" and "great technician." These are quickly followed by observations about his extraordinary composure in the operating room. A French surgeon who had the opportunity to train with Sweet described his approach to surgery as follows:

Nothing was left to chance, and watching him operate gave the impression that everything had been done to preclude any nuisance from arising in the operating field. This did not prevent his surgical performance from being brilliant and remarkably executed. Everything was neatly and clearly exposed; his team was perfectly rehearsed, and each gesture followed the next without any rush, yet without the slightest delay. He had considerable energy and seemed to operate without tiring; one always saw him, as sportswriters say of athletes, "loose," and working in a calm and relaxed frame of mind. All those who, like me, had the honor to spend almost a year at his side and to see him operate, admired his precision, his ease, and his unhurried speed.*

Gordon Scannell told me he had only once seen Sweet betray some anxiety—when he was operating on Harvard President James B. Conant, which proves that Sweet had nerves after all and that the president of Harvard is a figure to be taken very seriously indeed!

In the presence of all but a few intimate friends and colleagues, Dr. Sweet was as reserved and cool as he was in the operating room. He appeared to me a quiet, decidedly private man who carried himself with an air of unmistakable confidence. Accordingly, the house staff and younger faculty had dubbed him "Sir Richard." I somehow felt he merited his title, that he had earned his confidence as a surgeon by careful design of his operative approaches, rigorous adherence to technical detail, and many years of superior results.

Sweet's technical dexterity clearly impressed Churchill. In 1941, when Churchill needed an inguinal hernia repair, he trusted Sweet as his surgeon. The next year the two men collaborated on their classic paper describing their technique of interrupted silk multilayer gastroesophageal anastomosis, which they had developed to avoid esophageal leaks.²¹

At the beginning of 1943, Churchill went off to war. In his absence Sweet set in motion his old dream of specializing in thoracic surgery and organized an unofficial thoracic surgery residency at the MGH. He actually trained three residents before Churchill returned and put a stop to the program. People at the MGH still talk about that and wonder about tension between Churchill and Sweet. Their relationship was certainly a complicated one. However, I am certain that they had a great deal of respect for each other. Dr. Sweet admired Dr. Churchill's intellect and judgment; at the same time he knew that he, Sweet, could probably design and standardize any procedure better than Churchill could. I suspect Churchill

^{*}From Le Brigand H. Richard H. Sweet. Presse Med 1962;18:907.

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knew that too and respected Sweet for those talents. As I said, the respect flowed in both directions: In 1948, when Sweet developed intestinal obstruction, he called Churchill to care for him.

The terrain of thoracic surgery at the MGH belonged to Churchill during the 1930s. During the forties, with Churchill's absence during the war and his subsequent withdrawal from the operating room into the precincts of public service and academia, it passed to Sweet, and he blossomed. His intense concentration in thoracic surgery yielded superb results, especially in surgery of the esophagus, and he developed his own unique approaches to cancer of the esophagus and other esophageal diseases. I have already referred to Churchill and Sweet's important multilayer interrupted suture technique for esophageal anastomosis, which they published in 1942. In 1945 Sweet²² reported the first esophageal resection with intrathoracic supraaortic anastomosis performed in this country. Sweet set a standard in esophageal surgery that is still enviable today: Between 1951 and 1961 he performed more than 300 esophageal anastomoses using the interrupted silk multilayer technique and had only one leak! (Wilkins EW Jr.: 1989, Personal communication.) He also made important contributions in the surgical treatment of other diseases employing transthoracic approaches, notably his operative technique for the treatment of hiatus hernia,²³ his early recommendation of the single-stage approach to the correction of pulsion diverticulum of the pharyngoesophageal junction²⁴ (he never did them any other way), and his transthoracic approach for radical gastric resection.25

Sweet had a brief involvement with the heart in the forties and early fifties, performing some ductus ligations and some pericardiectomies, inserting some Hufnagel valves in the descending aorta, and accomplishing some closed mitral valve operations—all with his customary precision. In 1945 he performed a successful surgical correction of an aortic ring. He believed this to be a "first," only to discover in due course that Bob Gross had accomplished the same feat a few weeks earlier at the Children's Hospital. For a while Sweet also performed a series of operations for severe mitral stenosis. The operation bears his name, the Bland-Sweet procedure.²⁶ The approach, which was suggested by Dr. Edward Bland, then chief of cardiology at the MGH, consisted of an anastomosis between the superior segmental pulmonary vein on the right and the azygos vein to allow decompression of the hypertensive left atrium into the systemic venous system. Sweet's technical abilities made it possible for him to do this difficult operation with considerable success, but the procedure faded into obsolescence when a direct attack on the mitral valve became possible.



Fig. 7. Robert E. Gross. Photograph about 1947 (Courtesy of Children's Hospital, Boston).

In 1950 Sweet published a textbook called *Thoracic Surgery*, which recorded his clinical experiences. In the preface he wrote: "The present volume is based upon the concept that any qualified surgeon can acquire with relative ease a satisfactory proficiency in thoracic surgery by employing the technics herein described."²⁷ That was typical Richard Sweet: quiet, understated, supremely confident.

Sweet was a prime moving force behind the formation of The American Board of Thoracic Surgery and one of its founding members. He served as the third chairman of the Board in 1954-1955. This association elected him as its president in April of 1961, 3 months before he retired from the practice of surgery, as he had always vowed he would do when he reached the age of 60. Three months after his retirement he had a myocardial infarction, and he died in January 1962. But, a perfectionist to the end, he had prepared his presidential address on the subject of hiatus hernia, and it was delivered by his longtime associate and friend, Earle Wilkins.

Robert Edward Gross (1905-1988)

Exactly 25 years ago your president was Dr. Robert E. Gross (Fig. 7), the forty-fourth president of this Associ-

ation and the sixth from Boston. I doubt that any man has ever been more deserving of the honor. I stand in awe of Dr. Gross's record of surgical innovation; it is simply dazzling.

Robert Gross was born in 1905, the seventh of eight children in a Baltimore family. He started tinkering with the world around him at an early age, trying to find out how things worked. For instance, when he was 12 and thought his father was going to be out of town for a week, he dismantled the engine of the family car. His father returned unexpectedly and, seeing the pieces strewn around the garage floor, calmly ordered Robert to put the engine back together again before morning. He did.²⁸ The story says a lot about Robert Gross. Maybe it says even more about his father's capacity for composure, a trait of character that Robert apparently inherited.

Gross, who had spent summer holidays during high school on a Minnesota farm, decided to attend Carleton College in Northfield and to study chemistry. During his senior year a friend gave him Harvey Cushing's twovolume biography of Sir William Osler for Christmas. That book changed Gross's life. Though he had already nailed down a scholarship at the University of Wisconsin to pursue a doctorate in chemistry, he applied to the Harvard Medical School and was accepted. While maintaining an excellent academic record, Gross worked as a volunteer in the old surgical research laboratory at the medical school throughout all 4 years. In his final year he took a 1-month elective on Dr. William Ladd's service at the Boston Children's Hospital. It was Ladd's example that put Gross on the path of pediatric surgery.

Gross received his doctor of medicine degree in 1931 and initially chose to take postgraduate training with Dr. Burt Wolbach, who was chairman of pathology at the Harvard Medical School as well as chief of the pathology departments at the Peter Bent Brigham, the Children's, and the Lying-In hospitals in Boston. The late Dr. Robert Allen, who spoke about Gross before the Pediatric Surgical Association some years ago, unearthed an autopsy report on a 4-month-old baby that Gross filed in 1931. His summary read: "There is then a vascular constricting circle around the esophagus and trachea. This is composed of the arch of the aorta, the pulmonary artery and an open ductus arteriosus." Gross registered his opinion that "division of this vascular circle might have relieved the patient's symptoms." Meanwhile, another pathology resident who had worked on the same autopsy had concluded: "It is quite doubtful whether any aid could have come from local surgical interference."28

By 1935 Gross had spent more than a year as a surgical house officer at the Boston Children's Hospital under Dr. Ladd and had completed the chief residency in pathology at the Peter Bent Brigham Hospital. He then became a surgical resident under Dr. Elliott Cutler at the Brigham. In 1937 he received a Peters Traveling Fellowship, which permitted him to spend 6 months abroad studying in European surgical clinics, and then he became Dr. Ladd's chief resident at the Boston Children's Hospital.

Gross put in long hours in the autopsy room and the dog laboratory experimenting with approaches to the open ductus arteriosus. On August 26, 1938, while Ladd was away on vacation, Gross at the age of 33 and still chief resident, performed the first successful ligation of a patent ductus arteriosus on a 7-year-old girl.²⁹ The child was out of bed the next day and recovered without complications. Much has since been made of Dr. Ladd's absence. One theory holds that Gross picked this time so that he could do the procedure independently, in his own way. Another says that Gross did not believe Ladd was ready to authorize such experimental surgery on a human patient.²⁸ Whatever Gross's reasoning, his achievement was applauded as one of the watersheds of surgical history. As one writer commented, "Why this operation should stand out as a landmark is difficult to say; there is just something about the 'feel' of it that separates it from all that had gone before and stamps it as undeniably modern."30

Bob Gross made many other major innovations in cardiovascular surgery, including the atrial well technique for correction of atrial septal defects³¹ and his work that led to the development of the first practical method for preserving and sterilizing aortic arterial homografts.^{32, 33} He worked out operative procedures to correct anomalies of the aortic arch and in 1945 reported the first succesful operation for a vascular ring,³⁴ a problem that had vexed him since that day in the autopsy room in 1931.

Gross also did pioneering work on the treatment of coarctation of the aorta and only narrowly missed performing the first surgical correction of this condition. He spent approximately 7 years in the laboratory working out a surgical technique. Because the experimental dogs did not have chronic coarctation, they had poorly developed collateral circulation to the spinal cord, and if the crossclamp time was extended they frequently were paraplegic after the operation. Nevertheless, Gross was close to clinical implementation. Meanwhile, in Sweden, Clarence Crafoord had also been interested in the possible surgical treatment of coarctation, and on October 19, 1944, he successfully performed surgical correction in a 12-yearold boy. Twelve days later Crafoord corrected another coarctation, in this instance on a 27-year-old farmer, with similar results. He wrote up the cases and sent his paper to THE JOURNAL OF THORACIC SURGERY, where it was received on June 1, 1945.³⁵ It has been suggested by some

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that the manuscript was sent to Bob Gross for review and this stimulated Gross to immediately call in patients he had been following with severe coarctation. Whatever the stimulus, Gross's first surgical effort on June 28 failed and the patient died in the operating room. But Gross identified the procedural error and tried again on July 6 with a satisfactory result, thus achieving the first correction of a coarctation in this country.^{36, 37}

I've mentioned a few of Gross's surgical innovations both in the laboratory and in the operating room. But, since no man is perfect, even Gross's imagination sometimes failed him. When Dr. Helen Taussig approached him with her suggestion for correcting Fallot's tetrad, Gross replied, "Dr. Taussig, I feel that the good Lord has spoken, and that these young patients with tetralogy simply don't represent a surgical problem."²⁸ Dr. Blalock, of course, soon proved him wrong.

Except to observe that Gross was president of the AATS in 1963-1964, I am going to spare you an orderly recitation of his other achievements, honors, awards, and ascent up the academic ladder. What can be said about a man who won the Lasker Award twice? But I would like to single out two items from that long list: The first is Gross's text, The Surgery of Infancy and Childhood, which he published in 1953 and which has since been reprinted in numerous editions and translated into four languages. It is a genuine classic. The second achievement is Dr. Gross's tremendous impact on pediatric surgery. In 1947, after Dr. Ladd had retired, Gross was named the William E. Ladd Professor of Children's Surgery at the Harvard Medical School and the surgeon-in-chief of the Children's Hospital. The best measure of his success as an educator is the fact that in 1984 Gross's residents directed twelve of the twenty-one approved pediatric surgical training programs in the United States and Canada. In 1985, on the occasion of his eightieth birthday, a chair in pediatric surgery named after him was activated at Harvard and the Boston Children's Hospital.

During my fourth year of medical school I took a 1-month elective in pediatric surgery with Dr. Gross. I knew what he had accomplished, of course, and I was very much in awe of him. I observed how tenderly he cared for his small patients, how devoted he was to his residents, and how unwilling he was to engage in idle conversation. I heard from people who knew him much better than I did that his remoteness was really another side of innate shyness. I found this to be correct. Later, when he and I were colleagues on the Harvard surgical faculty, he was very friendly and kind to me. I heard, too, that he was as much of a perfectionist outside the operating room as in. "In the dining room coats should be worn," he wrote in a note to one resident. And, to another, "Sin all you want, but don't



Fig. 8. John W. Strieder. Photograph by Fabian Bachrach in 1967.

smoke at the nursing station." He had his hair trimmed every Friday afternoon, and he dressed with compulsive neatness.²⁸ But his residents accepted his personal idio-syncrasies with a sense of humor and adored him.

For 25 years Robert Gross had a sign hanging over the door in his operating room. It read: *If an Operation is Difficult, You are not Doing it Properly.*

John William Strieder (1901-)

It is a pleasure to have seated in our audience today Dr. John W. Strieder (Fig. 8), the man who made the first attempt to close a patent ductus arteriosus, who organized the first *bona fide* thoracic surgical residency program in Boston, and who was elected president of this Association in 1971.

Dr. Strieder is a true son of Boston. He was born here in 1901 (the same year as Richard Sweet), received his undergraduate degree from the Massachusetts Institute of Technology in 1922, and graduated from the Harvard Medical School in 1926, as did Richard Sweet. While waiting for his surgical appointment at the Boston City Hospital to begin, he served as a pathology resident at the New England Deaconess Hospital. From 1927 to 1929 he was a surgical house officer on the Fifth (Harvard) Surgical Service at the Boston City Hospital. His apprenticeship coincided with Dr. Churchill's temporary defection from the MGH to the other side of town, of which I spoke earlier. Thus it happened that young John Strieder was Dr. Churchill's house officer for about a year. "I cannot claim J.W.S. as a 'pupil,' "Churchill wrote, "although I would be proud to do so. Like most of us in the 1920's, he achieved his knowledge and skill in surgery by 'open field running.'"³⁸

After he completed his service at the Boston City Hospital, Dr. Strieder became house surgeon at the Boston Lying-In Hospital. The following year, 1930, he discovered that he had tuberculosis. As he recently pointed out to me, the disease was one of the occupational hazards of the medical profession in those reckless days when few precautions were observed when caring for consumptive patients. He reckons that about 10% of his medical school class contracted tuberculosis, and I do not doubt him because the percentage among the men I am talking about today is even higher: Two of the eight, Dr. Scannell being the second, came down with tuberculosis.

Dr. Strieder spent nearly a year at Trudeau Sanitorium as a patient, and when he was well enough to go back to work, he stayed on for another 2 years as an assistant resident. The experience convinced him to become a thoracic surgeon. He applied to the only thoracic surgical residency that existed at that time in the United States, the one in Ann Arbor, Michigan, and thus was trained by Dr. John Alexander.

His residency completed, Dr. Strieder returned to his home town to practice his specialty. "When I began the private practice of thoracic surgery in Boston in 1935," he told this Association 17 years ago in his presidential address, "there were only nineteen surgeons in the country limiting themselves to this specialty—at that time the youngest child of surgery. In those days, a thoracic operation was frequently a race between the surgeon and asphyxia; the technique of intratracheal anesthesia was just being introduced, and the blood bank had yet to be established."³⁹

On the other hand, as we've already seen, the 1930s was an exciting decade for thoracic surgery and John Strieder was one of the innovators of that decade. In mid-February 1937, a 22-year-old woman was admitted to the Evans Memorial Hospital, part of the Boston University School of Medicine Medical Center. A continuous murmur with systolic accentuation, a pronounced systolic thrill, and laboratory evidence led to a diagnosis of "congenital patency of the ductus arteriosus complicated with *Streptococcus viridans* infection." As Dr. Strieder wrote, "Because there was nothing of value to offer in the way of medical treatment, the idea of attempting to obliterate

the patent ductus by surgical means had some appeal. After considerable discussion the matter was broached to the patient and her parents, and the operation was undertaken with their full approval."40 The operation was performed on March 16. Unfortunately, secondary inflammation posteriorly made safe encirclement of the ductus impossible. Dr. Strieder therefore tried to obliterate the lumen of the ductus with plicating stitches. The thrill could no longer be palpated during the operation, and the murmur could not be heard postoperatively. The patient had an uneventful postoperative course and appeared to be doing well when, on the fourth day, she suddenly vomited and became cyanotic. She died within an hour "of acute dilation of the stomach." The autopsy showed a markedly narrowed ductus lumen of approximately 3 mm. The problems he had encountered during the operation led Dr. Strieder to suggest that "in selected cases removal or obliteration of the patent ductus arteriosus should be attempted before the appearance of a serious degree of heart failure or subacute bacterial endocarditis or endarteritis."40 And this is precisely what Bob Gross did 18 months later!

The patent ductus operation was an important moment in Dr. Strieder's career, a courageous near miss. He also made a number of significant contributions in the surgical treatment of trauma to the heart, of cancer of the esophagus and of the lung, and in collapse therapy for tuberculosis.

I hope future generations will also remember Dr. Strieder as a teacher who inspired residents and as the man who championed the cause of thoracic surgery when that was not a particularly fashionable idea in this city. As I mentioned earlier, Dr. Strieder established the first thoracic surgery residency in Boston at Boston City Hospital, where he was director of thoracic surgery from 1946 to 1967.

When The American Board of Thoracic Surgery was founded in 1948, Dr. Strieder was invited as a member without examination. He served as chairman of the Board in 1963-1965. By the time he addressed this Association as its president in 1972, the Board had certified 2423 thoracic surgeons, exactly 2404 more than the number of fully committed thoracic surgeons in 1935 when Dr. Strieder started to practice.

Dr. Strieder's academic affiliation was with Boston University, where he was made professor of clinical surgery in 1947. Just 3 years ago the university honored him by creating the John W. Strieder Visiting Professorship in Cardiothoracic Surgery.

Some years ago Dr. Strieder wrote: "The thoracic surgeon is caught young; he evolves by a process of selection starting early in life. What sort of man should he be? AcVolume 98 Number 5, Part 1 November 1989

tually, he is very much a composite. Ideally, he should have the attributes of integrity, perception, courage, technical facility, and a rugged constitution. It is also to his advantage if he has intelligence above the average, ability to relate cause and effect clearly, and an instinct for translating the abstract into the practical."⁴¹ Dr. Strieder is much too modest to have been thinking about himself when he wrote these words, but I believe they describe him perfectly.

J. Gordon Scannell (1914-)

Finally, I come to J. Gordon Scannell (Fig. 9), the most recent president before me to have represented the Boston medical community. It's a special treat for me to have the opportunity to talk about Gordon, because for the past several years he's been writing papers and delivering speeches about *other* eminent surgeons; it seems to me only fair that his turn has come.

Gordon, like John Strieder, is a local product. He was born in 1914 and grew up in Jamaica Plain, the section of Boston near Franklin Park that was then a gracious suburb. His father, a Boston Irishman, was a fine surgeon, a respected figure in the Irish community, and a teacher of anatomy at the Harvard Medical School. His father was a teetotaler and there was an unspoken ban on alcohol in the family, which meant that Gordon reached the ripe old age of 27 before he realized what he was missing!

Gordon attended Boston Public Latin School, spent a year at Phillips Exeter, and entered Harvard College in 1933. There he led a colorful extracurricular life (about which I'll say something more later) and still managed to graduate *cum laude* with a major in British History. He proceeded directly to Harvard Medical School. When he graduated in 1940 he received the Henry Christian prize for diligence and scholarship, which was usually given to the senior student with the highest scholastic record. He was admitted into the MGH surgical training program in September 1940. That, you may remember, was the year Churchill's new residency scheme went into effect, so Gordon enjoyed what was then the luxury of being able to count on completing the program, provided, of course, that he did a good job.

Up to this point Gordon's life had been pretty smooth sailing. However, in 1941 he encountered some bad weather. During the fall—feeling, as he told me, "rather lousy, with a mild, chronic nonproductive cough"—he had a chest film taken and, having personally fished it out of the developing fluid, saw that tuberculosis had cast a marked shadow on his left upper lobe. He showed the xray film to Churchill, who immediately dispatched him to the Middlesex County Sanitarium for 3 months of bedrest and artificial pneumothorax treatment. Then it was

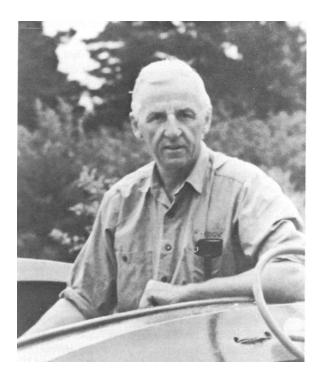


Fig. 9. J. Gordon Scannell. On his boat in 1981.

home for 6 more months of convalescence. Somewhere in here he tasted his first martini and added a new dimension to his life. This experience with tuberculosis naturally directed Gordon's attention to surgical problems of the lung. It also made him ineligible for military service during the Second World War. By the time Gordon returned to full-time residency in January 1943, the United States was deep in the war, Churchill was on his way overseas, and hospitals like the MGH were running on skeleton staffs. Although Gordon was therefore extremely busy, and the educational emphasis in the training program was on general surgery, he frequently scrubbed with Dr. Richard Sweet. This was the period when Sweet was developing his proficiency with esophageal resection, and Gordon absorbed many of his technical ideas and very nearly accepted Sweet's invitation to join his practice.

Gordon finished his residency, the war ended, and Churchill returned and took Gordon once again under his wing—and, effectively, out from Sweet's. He sent him to the University of Minnesota for a year to work with Edward Boyden on lung anatomy, particularly of the right upper lobe, studies that led Gordon to author a number of excellent papers on lung anatomy and its surgical implications.

Gordon returned to Boston in the spring of 1947 and went to work for Churchill, assisting him in his clinical practice. Along with his other activities at the MGH,



Fig. 10. The bulldog affair. **A**, The *Boston Traveler*, March 15, 1934. (Courtesy of *The Boston Herald*. Reprinted by permission.) **B**, *The New York Times*, March 17, 1934. (Copyright [©] 1934 by The New York Times Company. Reprinted by permission. **C**, *The Boston Herald*, April 1, 1934. Handsome Dan II licking the boots of the statue of John Harvard. (Courtesy of *The Boston Herald*. Reprinted by permission.)

Gordon became surgeon at the same Middlesex County Sanitarium where he had been a patient. There he taught a generation of MGH residents how to operate on the lung in general, and how to care for tuberculosis in particular. The influence of Dr. Churchill prompted him to become interested in cancer of the lung, and he made important contributions to this field.

Gordon's career in cardiac surgery began in 1949 when Churchill and Paul Dudley White got together and deputized Gordon and a couple of the cardiologists to organize a cardiac catheterization laboratory and develop a cardiac surgical program at the MGH. They accomplished this "the MGH way" which, at that time, meant on a shoestring. For example, the "laboratory" was a 15by-20 foot angiography room in the radiology department which the radiologists allowed them to use two afternoons a week for catheterizations. Gordon did the first closed mitral valve procedure at the MGH in 1951.

In 1954, Gordon led the MGH effort to prepare for open heart surgery. I was a fourth-year medical student and, with my background in engineering at the Massachusetts Institute of Technology, I was asked to join the group. The first open heart operation at the MGH was done in 1955 under moderate hypothermia without cardiopulmonary bypass. It was the removal of a left atrial myxoma. Gordon was the surgeon. This was actually the first sucessful removal of an atrial myxoma in the United States, although it had been accomplished by Crafoord in Stockholm and Bill Bigelow in Toronto. Gordon made significant contributions in a number of clinical areas related to the heart. One notable example was his work on aortic valvuloplasty under direct vision for acquired aortic stenosis. Our group developed this approach in the pathology laboratory, employing motion picture documentation and hemodynamic measurements before and after various experimental aortic valve procedures on postmortem hearts with calcific aortic stenosis. I had the privilege of presenting our paper on this subject at the AATS meeting in 1958.⁴² Gordon then modified and adapted the laboratory studies to the clinical situation and operated on more than a hundred patients with very good results for that time.⁴³

I was then a very junior member of the cardiac surgical team, and I remember well Gordon's outstanding clinical judgment and fine technical abilities; he kept his equanimity both in and out of the operating room and never blamed anyone else when things did not go right. This is an important quality in any surgeon, but it was particularly helpful in the early days of heart surgery when life was full of unhappy surprises and disappointments.

In 1972, when Gordon decided to scale down his surgical activities, I asked him to take on the directorship of our medical student teaching program in the department of surgery at the MGH. He accepted, and the popularity of the surgery courses skyrocketed, resulting, I believe, in a large number of outstanding students being attracted to our surgical residency program. The students admired Gordon enormously, and he achieved an unusual rapport with them. No doubt having seven children of his own went a long way in giving him insight into young minds, but he has also thought deeply about what education in surgery is, and is *not*.

Over the years Gordon has received a number of honors but, according to his own testimony, being president of this Association in 1977-1978 was the highpoint of his professional career. Before I finish I must add a word about Gordon's wife, Helen, whom he refers to lovingly as "The Big H," as well as "a saint" and "a good sport." Together they created the strong, warm, and large family (seven children and thirteen grandchildren) that has always been Gordon's number one priority and refuge.

I promised you earlier that I'd have something more to say about Scannell during his college years, so now I'll tell you what he was up to at Harvard (Fig. 10). If you had picked up the Boston Traveler on March 15, 1934, you would have seen a headline reading: "Yale's Bulldog Mascot Stolen: Dan II Vanishes as Harvard Swimmers Depart for Home." Or, as the Boston Transcript had it: "Handsome Dan, Yale Bulldog Mascot, Stolen." By March 17 the story had made the New York Times; Handsome Dan, it seemed, had fallen into the clutches of The Harvard Lampoon, which was asking Yale for ransom in the form of the sacred stuffed Ibis stolen 2 years earlier from the Lampoon building. Rumors abounded: Handsome Dan was going to appear at the Hasty Pudding Club show; Handsome Dan would appear at a Harvard dance. Police and reporters were led on a wild chase by a woman with a bulldog, who outwitted them. Yale put out a rumor that Dan was ill and required a special diet. Dan-heaven forbid!-was photographed licking the boots of the statue of John Harvard. The Yale bulldog committee accused the Lampoon of foul play-enticing the dog with hamburger! Finally, after 10 days, Handsome Dan was returned to Yale by the Lampoon editors. But the Yale Daily News reported Dan a changed and disgraced dog. Francis D. Moore, incidentally, was Lampoon president at the time, and he was much photographed with Dan! One name appears nowhere in the yards of newspaper text, the cunning fellow who made off with Handsome Dan. He was a Harvard sophomore, assistant manager of the swimming team, J. Gordon Scannell.

These extraordinary physicians from Boston whoserved as president of the AATS have indeed made their mark on the history of thoracic surgery. I am honored to join their ranks as president of this Association and I thank you again for this great privilege. REFERENCES

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