1. The amazing rise of cardiac surgery

The ‘big bang’ of our mid-century revolution in thoracic surgery was the emergence of a realistic cardiac surgery. Having repeatedly renounced writing another chronological history, the present chronicle is meant to be a retrospective appraisal of the pioneers and events that I actually met and witnessed. The reader can easily refer to excellent historical descriptions for detailed knowledge of particular topics. I have already recommended the excellent historical textbook of Richard Meade or my own 1990 ‘Story of Thoracic Surgery’, as well as the more recent history of Raymond Hurt. The interested scholar will find there the chronological accounts from the vascular ligature of Ambroise Pares to the research of Alexis Carrel, Rehn’s suture of a cardiac stab wound, Elliot Cuttler’s valvulotomies, or the pneumo- and omentopexies of Claude Beck and Lawrence O’Shaughnnessy. It all has been said over and over again.

Of course there are two stories of actual interest today: the first of hypothermia and Bigelow, and the second on ‘makeshift’ myocardial revascularization by Arthur Vineberg. Consequently I might briefly recall these two Canadian pioneers.

2. The hypothermia research of Wilfred Bigelow

During my many visits to Griff Pearson in Toronto I had several occasions to discuss his research with Wilfred Bigelow (Fig. 1) who was still going strong. Another less pleasant image in my memory is the one of our first operations under hypothermia with Charly Hahn at the ‘Clinique La Source’ in Lausanne. I will never forget the picture of our anesthetized patients immersed in an old-fashioned bathtub filled with ice water before being lifted cold and wet on the operating table.

The role of hypothermia as the sole method for open-heart surgery was an extremely short-lived one, from 1952 to 1954 when cardiopulmonary bypass became operational. Few surgeons had the daring, technical skill and speed to be satisfied with the short, 6–10 min time allowed for an intracardiac operation. Rapidly abandoned in favour of the heart-lung machine, hypothermia in the form of the heat exchanger continues to be an essential part of modern bypass-systems. Furthermore, the introduction of ‘cold-cardioplegia’ in 1959–1960 really started the development of ever more sophisticated and time-consuming techniques.

The fascination of many with analgesia, sleep and ‘transient death’ induced by low temperatures is a very ancient one. Napoleon’s surgeon Dominique Larrey should also be remembered because, during the terrible retreat from Russia in the winter of 1812, he used refrigeration by ice and snow to alleviate the pain of the wounded soldiers during amputations. Apparently it was again the war that stimulated hypothermia research in the 1940s and 1950s. In his ‘History of Heart Surgery’ d’Allaines thinks that ‘war related research’ also triggered Bigelow’s early work in Canada. In fact one of the rare publications to be found in the literature is a German experimental study motivated by the death from hypothermia of German pilots who had been forced to bail out into the cold waters of the North Sea. Bigelow’s later, although not initial, research was also in part funded by the Canadian Defense Research Council, which naturally was interested in a general way in the problem of accidental exposure to cold and the resuscitation of soldiers, sailors and pilots of the Canadian Armed Forces. But, as Bigelow himself tells the story, his interest in hypothermia started before the war. It dates back to 1941 when, as a young intern in Toronto he was faced with the problem of frostbite in a young man from the Canadian north woods whose fingers had to be amputated. Surprisingly enough Bigelow could find nothing in the literature. When he told this to his chief W.E. Gallie he was
told “Why don’t you make it your business to find out about it!” Thus it was an apparently insignificant everyday event that made Bigelow the leading pioneer whose name will always be mentioned first when hypothermia is being discussed.

His work was soon interrupted by the war. As an army surgeon in England and during the Normandy invasion, Bigelow became interested in vascular surgery which saved many healthy arms and legs by arterial repair. From 1941 until 1945 Bigelow was an Army Surgeon with the 6th Canadian Casualty Clearing Station in England and, after the Normandy invasion, in North-West Europe. After this interruption of over 4 years Bigelow completed his surgical training as a Research Fellow at the Johns Hopkins Hospital. During that year, in 1946–1947, working with Blalock and his team as well as in the physiology laboratory with Richard Bing, Bigelow experienced the stimulating atmosphere I described earlier. At the time there was no place in the world where one could watch at least one heart operation every morning. The work with Richard Bing in the catheterization laboratory opened up completely new vistas. In daily contact with these men, among whom were Ravitch, Longmire and Bahnson, Bigelow of course understood that cardiac surgery needed a method allowing one to work under direct vision, and that hypothermia offered one road to this goal, although he was aware of Gibbons’ research with the heart-lung machine. As Bigelow writes in his autobiographical book ‘Cold Hearts’, “One night I awoke with a simple solution to the problem: cool the whole-body, reduce oxygen requirements, interrupt the circulation and open the heart”. Thus, back in Toronto after more than 5 years in the army and in Baltimore, Bigelow started hypothermia research in earnest. One aspect of his investigation was the attempt to elucidate the mechanism of hibernation, and to that effect Bigelow and his team collected groundhogs and organized literally a ‘groundhog farm’. These animals were able to withstand extremely low temperatures (5°C), tolerated a prolonged circulatory arrest of up to 2 h allowing open-heart procedures with complete recovery after rewarming. But, how did the hibernating animals do it? For 10 years the Toronto team attempted to solve the mystery of hibernation and finally had to admit defeat. The hibernators did not release their secret and the groundhog farm was closed.

My good friend Pearson told me the story that, as a young medical student, he had to take care of the animals at the farm and that he had invented some sort of a hammock to keep the animals quiet for taking blood samples. His first accomplishment as a brilliant thoracic surgeon!

Bigelow, Callaghan and Hopps presented their first research in April 1950 at the Colorado Springs Meeting of the American Surgical Association. Twenty dogs had been cooled to 20°C allowing a circulatory arrest of 15 min and in 11 cases underwent a cardiotomy (‘a token operation’). Mortality was still very high, only six animals surviving after rewarming. Cardiac standstill was already then successfully treated by an electrical ‘stimulator’, the future pacemaker. The high mortality was essentially due to ventricular fibrillation destroying the myocardial oxygen reserves and also to air-embolization into the coronary circulation. Subsequent research (Cookson and Neptune, Lewis, Swan, Bigelow himself) was going to prevent fibrillation by hyperventilation oxygenation at the start of the experiment, by diminishing cardiac excitability with drugs (procaine, benodaine, prostigmine, acethylcholine), by a more moderate hypothermia (28 instead of 20°C) and by a shorter inflow-occlusion time (10 instead of 15 min). Coronary air-embolization was prevented by clamping the aorta.

On the basis of these results the method began to be used in clinical cases. John Lewis in Minneapolis was the first to succeed. On September 2, 1952 he and Richard Varco closed an atrial septal defect through a wide atrial incision during an inflow-occlusion of 5½ min. It should be mentioned already at this point that Richard Varco was a key person in all achievements accomplished at the University of Minnesota from the time of the first Blalock operations to the open-heart surgery by Lewis and later on by Lilehei.
Henry Swan (Fig. 2), at the University of Colorado, a year later on February 19, 1953 carried out his first open-heart procedure using hypothermia. He excised a stenosed pulmonic valve during a $7\frac{1}{2}$ min inflow-occlusion. Swan was to be the surgeon with the greatest experience who, in the few years before cardiopulmonary bypass, developed surgery under hypothermia to perfection in hundreds of cases with a very low mortality. Both Lewis and Swan used higher temperatures ($26–28^\circ$C) and shorter occlusion times (up to 8 min) than Bigelow. The two names, Bigelow for research and Swan for surgical experience, will always be associated with hypothermia in cardiac surgery.

A third man, Charles Drew, should be remembered for introducing ‘deep hypothermia’. Drew was first assistant to Price Thomas when I first met him and later succeeded his great teacher at the Westminster Hospital in London. He performed his first successful repair of an atrial and ventricular septal defect under deep hypothermia on January 29, 1959. In those days cardiopulmonary bypass frequently produced widespread pulmonary consolidation and blood damage. Drew devised a double left and right bypass-system in order to keep the patient’s lungs as the natural oxygenator, and combined this type of bypass with extremely low temperatures, down to $8–10^\circ$C allowing inflow-occlusion of very long duration for repair of complicated congenital defects in thousands of cases. An important development in this line of strategy was presented at the 1973 meeting of the American Surgical Association and published more extensively in 1976 by Barrat-Boyes (Fig. 3) from New Zealand. He operated on infants only a few weeks old using ‘profound hypothermia with circulatory arrest and limited cardiopulmonary bypass’. In three desperately ill infants he brought the temperature down to $12^\circ$C using a combination of surface and perfusion cooling and rapid rewarming to $35^\circ$C. The arrest time varied between 38 and 67 min in his initial series from 1970 to 1973, and he lost only one out of 24 tetralogy cases. In 1976 his series had grown to 57 infants aged 21 days to about 2 years. Except for this development in combination with bypass, hypothermia as the sole means was soon abandoned in cardiac surgery. It still plays, of course, a very important role in the localized form of ‘cold cardioplegia’. Incidentally Charles Drew—who died at an early age—remains a definitely historical personality. In 1951 he assisted his chief, Price Thomas, during the historical pneumonectomy for the cancer of King George VI, and when good old Price Thomas paid his due to tobacco addiction it was again Charles Drew who cured him by lobectomy! So much for the somewhat too long historical account of hypothermia in cardiac surgery.
3. Early myocardial revascularization

3.1. The Vineberg operation

Mason Sones, the famous Cleveland Clinic cardiologist, played an important role in the bizarre Vineberg Saga. Sones had discovered angiography by accident. One day, in 1958, he attempted what was probably a left ventriculography. At the time his equipment did not yet allow the visualization of the catheter tip, which was obviously in a supravalvular position. Upon injecting the usual dose of contrast media, to Sones’s horror the right coronary artery with all its ramifications was clearly seen on the screen; contrary to his apprehension the patient tolerated the injection of dye into his coronary system without complication. This accidental event was the beginning of selective coronary angiography, the single most decisive factor in the explosive development of coronary artery surgery.

Arthur Vineberg (1903–1988) (Fig. 4) was a cardiac surgeon in Montreal and had also obtained a degree in biochemistry and experimental physiology at McGill University. He was a dedicated investigator and pursued his idea of cardiac revascularization in the face of general skepticism. In fact his solution of implantation of an open-end internal mammary artery into a myocardial tunnel seemed highly unusual. He first proposed the method experimentally in 1946 and since 1950 had operated several patients but was never taken seriously until 1962. Mason Sones, who had ‘accidentally’ discovered coronary angiography, reexamining several of Vineberg’s patients in 1962, was able to clearly demonstrate in vivo that communications between Vineberg’s patent arterial graft and the coronary system existed, and for a very short time before aorto-coronary bypass the Cleveland Clinic under Effler and Favorolo became the Mecca of the Vineberg procedure. In the 1950s the Cleveland Clinic under Effler was one of the most important cardio-thoracic centers.

Donald Effler (1915–) was another of the ‘avant-garde’ surgeons we all respected for his enthusiasm and courage. The fact that he and Favorolo performed hundreds of ‘mammary implants’ successfully and enthusiastically was a striking rehabilitation of Vineberg’s 15 years of dedicated research but in face of the rising technique of direct aorto-coronary bypass surgery the method had soon lost its significance.

Earlier on several respected surgeons, among them Sabiston and even Blalock had taken up the Vineberg operation. Bigelow, who started his laboratory experiments in 1951, 10 years later, at the 1962 AATS meeting in St. Louis, presented his work and reported on 19 clinical cases operated 1–8 years before. Although, in his own words, the Vineberg operation “seemed a most improbable concept”, it seemed to work. Out of his 19 patients Bigelow had 11 long-term survivors. He concluded, “that the most remarkable feature was the radiographic confirmation that an open-end bleeding artery implanted into the heart will remain patent and apparently provide a source of blood supply to the heart”. Vineberg’s idea which goes back more than 50 years and was revived by such a great pioneer as Bigelow almost 40 years ago just 5 years before Favorolo’s breakthrough, may still be remembered in relation to today’s laser myocardial revascularization. (Ref.: Bigelow WG. Clinical mammary artery implantation for coronary artery disease. J Thorac Surg 1963;45:67–79).

3.2. From Blalock to Harken and Lillehei

With the dramatic story of blind mitral surgery and later the one of early bypass open-heart surgery, we enter the short span of 5–6 years representing the climax of our mid-century surgical revolution. Three, maybe four, pioneers represent these years: Harken, Bailey, Lillehei and also Kirklin. I knew them all, privately and professionally. They were my teachers and often my friends.

However, before describing their personalities and accomplishments it seems important to come back to the very foundation of modern cardiac surgery. I have briefly described the atmosphere in the Johns Hopkins hospital where I met Blalock (Fig. 5) when arriving from Europe in 1946. Even if the life and times of Blalock have been written about by many, more competent scholars, Blalock deserves a separate space in a book like mine.
First of all there is no other pioneer in cardiac surgery who has taught and guided more outstanding pupils Sabiston, Ravitch, Longmire, Hanlon, Scott, Bahnson and the great Denton Cooley, all of whom became Department Chairmen and pioneers in their own right.

The other significant influence of Alfred Blalock representing the starting point of modern heart surgery is the blue-baby operation. As the story has been reported since the outset, we know that Blalock, ever since his early days at Vanderbilt University in Nashville, was actively engaged in outstanding research in such different fields as, among many others, thymectomy and posttraumatic shock. One of his more recent research projects was pulmonary hypertension. He carried out experiments on dogs to produce high blood pressure in their lungs by connecting the subclavian to the pulmonary artery. The famous pediatric cardiologist, Helen Taussig (Fig. 6) had been searching in vain to bring more arterial blood to the oxygen-starved lungs of her blue babies. She approached Blalock with her problem and from his research on pulmonary hypertension he immediately knew that it was technically possible. The result was the first palliative operation for tetralogy of Fallot in 1945, and the beginning of modern heart surgery. Ironically, Taussig had supposedly already approached the first pediatric heart surgeon, Bob Gross, who wanted to have nothing to do with it: he had, as he said, enough trouble closing patent ductus without creating new ones! Si non a vero a ben trovato!

One more vivid description of the conditions of our work at that time is a letter I received from Longmire, who was Blalock’s assistant during this historical event. He wrote, “One afternoon in 1945 Blalock went to see an extremely ill cyanotic child in an oxygen tent and indicated the child might be a candidate for a new operation providing additional blood flow to the lung. At operation we lacked all the modern vascular instruments and really had very little but the professor’s determination to carry us through the procedure. With the extremely thin wall of an extremely small pulmonary artery I marvelled at Dr Blalock’s determination in completing this first anastomosis, certainly the most difficult I have ever seen.”.

Blalock’s assistant W.P. Longmire (1913–) (Fig. 7) was also one of the postwar surgeons I learned to admire early on. At the time, in 1946, he was the Chief Resident, in other words finishing his postgraduate training circuit to become a surgeon. Nevertheless, when Blalock was absent for one reason or another, I watched Longmire perform his new and delicate operation with an elegance, ease and dexterity as if it had been the most common procedure such as an appendectomy or inguinal hernia. With the still fairly crude (vascular) instrumentation, needles and sutures of 1946 he seemed to operate even faster than Blalock himself.
In 1948 he was promoted to Chief of the Surgical Department of the UCLA and from then on made his outstanding reputation as a general gastro-intestinal surgeon, but remained naturally interested in problems of cardiac surgery. His coronary endarterectomies of 1958 remain a milestone on the road to modern cardiac surgery. Before coronary angiography (1962 Sones) he performed five operations of extensive coronary endarterectomies based only on palpation, without cardiopulmonary bypass and on the beating heart. As any contemporary cardiac surgeon can understand those were daring and difficult operations. Four of five patients survived and were improved.

Coming back to Blalock who, besides having trained and inspired a whole generation of leaders—Cooley among others, had a remarkable vision and open mind concerning the future of cardiovascular surgery. Therefore, obviously thinking of Blalock, his mentor, Longmire in his 1956 Presidential Address at the American Surgical Association meeting said: "Fortunate are those who have the proper combination of enthusiasm, critical judgment and also an OPEN MIND". In 1955, when Lillehei and Varco had presented their controversial paper on ‘cross-circulation’ at the American Surgical Association, it was Blalock, the uncontested authority, who opened the discussion in a highly positive manner: "I must say that I never thought I would live to see the day when this type of operative procedure could be performed. I want to commend Drs Lillehei and Varco for their imagination, their courage and industry". So much for the, I might say, giant of modern surgery, Alfred Blalock.

3.3. Patent ductus arteriosus and coarctation

Six years before Blalock the patent ductus operation never had the same impact on cardiac surgery. Looking at an anatomical drawing of the heart the ‘ligamentum arteriosum’ or, for that matter, an open patent ductus seemed to be an easy structure to ligate. In fact, today an operation for patent duct is probably an operation for beginners. Even in my time, when from 1947 (my first case) on I closed them with multiple ligatures, in primitive operating rooms of small private hospitals, I usually succeeded with no trouble. As everybody knows, the operation may turn into a drama when, during dissection, the surgeon tears the vessel. I vividly remember the time once this happened to me, when assisted by Professor Jean-Claude Rudler, the chief of the Geneva Hospital where I had been associate cardiac surgeon since 1960, I tore into the posterior wall of the duct. Fortunately, between the two of us, we got the situation under control and cured the patient. I am not ashamed of this incident because it happened to much greater surgeons than myself.

Clarence Crafoord (Fig. 8), a monument in cardio-thoracic surgery and teacher of other world famous heart surgeons—Ake Senning and Bjork among others—had to manage a hemorrhage during a ductus operation by cross-clamping the aorta. He had studied the problem of cross-clamping the aorta in the laboratory since 1935 and this...
incident during surgery gave him the occasion to test the
tolerance of cross-clamping the aorta clinically (28 min!).
As far as we know, this result confirmed his hypothesis that
a coarctation of the aorta—with additional collateral
vascularization—could be resected. He did so in two cases
in October 1944. Therefore, the story of priority conflict
with Gross, who did the operation only in July 1945,
although he had studied the problem in the laboratory for
many years, ‘doesn’t hold water’. Besides, Charles
Hufnagel whom I knew well and who had worked in Dr
Gross’s laboratory at the time, wrote me in a letter dated
December 1, 1987: “Gross did not begin experimental work
in coarctation before we worked together and probably did
not discuss the problem with Crafoord during a visit before
the war. We began our experimental studies in the spring of
1944 and I do not believe either group knew of the work or
intent of the other”. Crafoord’s paper was furthermore
received at the Journal of Thoracic Surgery on June 1, 1945,
before Gross even performed the operation. So, once more
there may be a certain contemporaneity of two great
surgeons’ achievements and therefore the credit for solving
the coarctation problem should be attributed conjointly to
Crafoord, Gross and equally Hufnagel!

Charles Hufnagel (1917–1989) (Fig. 9) worked with
Gross as his assistant at the Harvard Surgical Research
Laboratory and played a pivotal role in the rise of modern
cardiocascular surgery. Having started animal experiment-
ation for the possible treatment of aortic coarctation in 1947
(hence the competition with Crafoord), he became an expert
in the surgery of the aorta. This expertise led to his major
contributions such as aortic graft preservation by rapid
freezing, and ultimately to his famous ‘caged ball valve’ for
the treatment of aortic insufficiency (Fig. 10), experiments
which he presented at the 1949 Congress of the American
College of Surgeons. This Hufnagel caged ball valve was
the very first, the ancestor, of all the early cardiac valves, in
particular the famous ones of Harken and Albert Starr.

Hufnagel moved from Boston to Washington to become
Chairman of the Georgetown University Department of
Surgery. While open-heart valvular surgery (Starr, Carpen-
tier, etc.) was still of the future Hufnagel had the ingenious
idea of placing his valve in the heterotopic aortic position
and in 1952 he implanted his first valve into the aorta of a
patient suffering from severe aortic insufficiency. In 1954 he
reported 23 operations with 17 patients surviving. The
fatalities were essentially due to the desperate stage of aortic
insufficiency of the patients, not to the operation as such. By
his ingenious method of multiple points, atraumatic fixation
rings, Hufnagel was able to insert the valve without
prolonged cardiac arrest.

Once more we are impressed by the young age of these
pioneers. When he started his work on coarctation Hufnagel
was just over 20 years and just 35 years old when he
implanted the first ‘cardiac valve’ into a human aorta!

When I met him in his laboratory in 1946, and a second
time in 1950, I was impressed by his modestly relaxed and
cordial personality. He was enthusiastic about his work and
full of original ideas for ongoing and future research
projects, which he discussed freely having apparently no
hidden secrets. In 1988, a year before his death, I went back
to see him in Washington in order to refresh my memory
about our meetings 40 years ago. He had retired from his
position at Georgetown University Medical School but was
still teaching at the Uniformed Services University of

Fig. 9. Charles A. Hufnagel (1917–1989). Research fellow in the
laboratory of Gross working on resection of aortic coarctation. Later, as
independent surgeon in Washington, DC, he placed the first aortic cage
valve in a heterotopic position.

Fig. 10. Hufnagel heterotopic ball valve for aortic insufficiency. Serrated
ring for speedy fixation without suture.
the Health Sciences in Bethesda, Maryland. He had remained a low-profile, modest, maybe too modest man who, although respected by those who knew him well, may not have gotten all the credit he definitely deserved for his fundamental contributions to the early progress of cardiovascular surgery.

Now, to resume the story of these two well-known congenital malformations one may well say that the approach to the patent ductus is an entirely Bostonian story. It was a Tuft’s Professor of Surgery, J.C. Monroe who in 1907 suggested the ligation of a patent ductus arteriosus but never had a case to try the operation. John W. Strieder probably read the publication and tried the operation on March 16, 1937 in a notoriously difficult case of patent ductus superinfected with bacterial endocarditis, and at a time before antibiotics the patient died 4 days after the operation. Incidentally the first successful operations for superinfected patent ductus were done—probably also without antibiotics—by the British surgeon Oswald Tubbs (of the Tubbs dilatator) in December 1939 and by the Mount Sinai surgeon Arthur Touroff in New York in January 1940.

During my first two training periods in Boston in 1946 and 1950 I knew the two Bostonian actors of this chapter well, J.W. Strieder as well as Bob Gross the father of the patent ductus arteriosus.

John W. Strieder whom I watched performing lung resections, was one of those excellent early thoracic surgeons, competitor of my chief Overholt, who had been trained at the famous John Alexander School in Ann Arbor and, as far as I can remember, might have had himself a bout of TB. When first meeting him one would not have suspected that this quiet, somewhat withdrawn gentleman, with a pronounced Bostonian accent would have undertaken such a daring operation as an infected ductus. But those were the days of the pioneers and John Strieder, President of the AATS in 1972, was one of them.

Robert E. Gross (1905–1989) (Fig. 11) was a far more complex personality.

As a young resident of 33 years, at the Children’s Hospital under William Ladd, he performed the first successful ligation of a patent duct on August 26, 1938—in fact the date of the beginning of modern cardiac surgery. To prevent recanalization Gross later promoted dividing and suturing the vessel. It is the purpose of my writing to dispense with any details concerning these techniques, which can be consulted in my earlier books as well as in other textbooks. I intend to write down personal impressions and present the real life personalities of these men who will just be names in a few years from now. Bob Gross was one of the surgical personalities who had a great influence on my personal development. On my return from Boston in 1947 as a surgical apprentice I was able to operate the first patent ductus in Switzerland by following the meticulous technique I had learned watching him operate.

Gross was a quiet reserved personality and had the reputation of being unsociable, sometimes even rude and especially unwilling to show his technique to the surgeons coming to his operating room from all over the world. This may have had to do with that famous priority conflict with Crafoord over the operation for coarctation. I said earlier that I don’t believe in that explanation, but rather think that he was simply too absorbed in his difficult work to bother with every visitor. Personally I remember him as a polite person who could be quite friendly out of the operating room. I remain extremely grateful to him for his technical advice and because he was one of my Boston teachers who heartily encouraged me to make thoracic surgery my career choice. He was president of the AATS in 1964, 8 years before he retired in 1972. I very well remember that meeting in Montreal and his presidential address on a vast experience in pediatric, general thoracic and cardiovascular surgery. In closing his report on surgery in small children he said: “For me there have been few things in life, which have been more satisfying than to face a small child struggling for his very existence, to perform some corrective surgical maneuver and later to see
the youngster thriving and healthy, starting out in life, sound in body and mind”. A surgeon to remember!

Clarence Crafoord (1899–1984) was an altogether different personality whom, as a surgeon, I had admired since my visit to Stockholm in 1948 when I had watched him operate. He belonged to the pioneer generation of young surgeons who before World War II and before penicillin wrestled with the problem of pulmonary resection. In other words, as well as his world famous 1944 coarctation operations, his involvement with Bjork, Senning and Engström in the early development of heart-lung machines and respirators, and his resection of a left intraauricular myxoma on cardiopulmonary bypass (1956), his thesis ‘On the Technique of Pneumonectomy in Man’ (1938) is one of the milestones in thoracic surgery. Based on extensive and well-documented animal experimentation Crafoord—somewhat of a ‘Viking’—during the mid-1930s performed 16 total pneumonectomies for benign and malignant disease. Although 10 patients died from postoperative complications 6 survived being followed up to 2 years. Historically the important technical detail was the Crafoord bronchial suture. With a special fine scalpel he excised the distal bronchial cartilage and sutured the bronchial wall by invagination, covering the stump with preserved mediastinal pleura. Together with the Rienhoff technique these bronchial sutures remained the gold standard almost for the rest of the century. After World War II Crafoord, for many years, was the only continental European surgeon to be admitted to the ‘inner circle’ of the North American leaders and the first non-American to become an honorary member of the AATS. Personally I came to know him better in the company of Max Chamberlain, one of his very good friends, and in 1955 or 1956 he visited me in Lausanne where I helped him find an international school for one of his daughters. Relations with Crafoord were always easy and informal because he never ever adopted the somewhat distant behavior of the great professor and pioneer that he was.