ARTHUR STEINDLER:  
FOUNDER OF IOWA ORTHOPAEDICS 
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ARTHUR STEINDLER  
the physician, scholar and teacher  
whose influence spread from a small midwestern city to the far reaches of the world,  
whose compassion fused a kindred bond with the saddened or fearful patient,  
whose humility often withered the prideful countenances of lesser men and instilled humbleness in many of his students and colleagues,  
whose dedication and vision helped to shape a state's system of medical care for the poor,  
and whose name was honored in many foreign lands, bringing honor to his own state and country.  
—author unknown

As we publish the first Iowa Journal of Orthopaedics, it is appropriate to honor Arthur Steindler (Figure 1). He founded the Department of Orthopaedic Surgery at the University of Iowa and directed its growth for thirty-four years. During that time his scholarship, teaching, and clinical work helped Iowa develop into a nationally and internationally recognized orthopaedic center. He personally cared for over 70,000 patients, many of them children crippled by polio, spastic paralysis, scoliosis, congenital deformities, and degenerative neuromuscular diseases. To improve the function of their weakened and deformed limbs, he developed and evaluated many innovative operations. He wrote over 130 papers and 9 books in several languages on the natural history, etiology, and treatment of musculoskeletal diseases and the science of kinesiology. He taught over 250 orthopaedists, including Drs. Albert, Finder, Friedman, Luck, Milgram, Obletz, O'Donohue, Ponseti, Slocum, Soto-Hall, Thornton, and Willis. Thus, through his work and his students, Steindler contributed significantly to the growth of orthopaedics and the scientific foundation of the specialty.

Figure 1. A posed portrait of Arthur Steindler in his later years.

Arthur Steindler was born June 22, 1878, in Graslitz, Czechoslovakia. Shortly thereafter his family moved to Vienna where he spent the early years of his life. His father was a lawyer who valued rigorous classical education. Thus, Arthur's education emphasized literature, language, philosophy, and music. He learned seven languages which enabled him to follow the world orthopaedic and scientific literature closely, translate important papers for others, write for foreign publications, and teach students from many countries. As a young man, Steindler demonstrated considerable musical talent, and expressed an interest in becoming a professional musician, but with his father's advice he chose a career in medicine and entered medical school at the University of Vienna.

In 1902 Steindler graduated from the University of Vienna. After his internship, he focused his attention on the study of orthopaedic surgery. Two European schools influenced his orthopaedic education: initially,
the Vienna School through Edward Albert and Adolf Lorenz; and, later, the Liverpool School through John Ridlon. Ridlon also gave Steindler the opportunity to learn the evolving American approach to orthopaedic problems.

Edward Albert had been professor of surgery at Innsbruck, but in 1873 he transferred to Vienna. An eager teacher and innovator, Albert is perhaps most famous for developing and advocating arthrodesis to improve the function of flail limbs. He emphasized that arthrodesis could eliminate bracing and improve function of limbs that might otherwise be useless. Correcting deformities and stabilizing joints by arthrodesis in patients crippled by polio and other neuromuscular diseases became an important part of Steindler's work. During his years in Vienna, Arthur Steindler was also exposed to the work of Adolf Lorenz. Lorenz was interested in children's problems, including club foot correction, treatment of congenital dislocation of the hip, and management of scoliosis. In 1886 Lorenz had published an extensive monograph summarizing theoretical conceptions of scoliosis, including the effect of posture and asymmetrical weight-bearing. Lorenz also challenged the concept that corsets and braces could correct scoliosis. Steindler later incorporated these ideas into his own approach to scoliosis.

In 1907, five years after medical school, Steindler left Vienna for Chicago to become an assistant to John Ridlon at the Home for Crippled Children. Ridlon was born in Vermont, graduated from the College of Physicians and Surgeons in New York, and worked with Newton Sfricafer in New York. In addition to his American education, Ridlon was profoundly influenced by Hugh Owen Thomas. Thomas' skill in constructing and using braces and splints, such as the Thomas splint, the Thomas collar, and a number of foot orthoses, had earned him considerable fame and a large group of patients. Thomas also taught that most deformities should be corrected by manipulation, rather than surgery, and that the prime method of treating tuberculosis and other conditions must be rest, "enforced, uninterrupted, and prolonged." Ridlon visited Liverpool twice and adopted many of the practices and devices advocated by Hugh Owen Thomas. Ridlon also worked with Thomas' nephew, Sir Robert Jones, and collaborated with Jones on a number of articles describing the principles of orthopaedics expressed by Hugh Owen Thomas. Ridlon considered these principles to be the basis of good orthopaedic practice and stressed their importance to Arthur Steindler.

In 1910, on Ridlon's advice, Steindler accepted the position as professor of Orthopaedic Surgery at the Drake Medical School and began his practice in Des Moines, Iowa. During his years in Des Moines, Steindler formed friendships with a number of people in state government. These friendships facilitated Steindler's later efforts to promote the development of the University of Iowa Hospitals, including Children's Hospital, and state funded services for crippled children and indigent patients. In 1912 he joined the faculty at the University of Iowa and began traveling to Iowa City by train at least once a week to hold orthopaedic clinics and act as an instructor in orthopaedic surgery at the University of Iowa Hospital.

The years 1914 and 1915 brought significant changes in Steindler's life. In 1914 he married Louise Junk, a nurse he had met when they both worked at the Chicago Home for Crippled Children. Although Louise met Arthur Steindler in Chicago, her family was from Dixon, Illinois. In the same year as his marriage, Steindler became an American citizen. At the age of thirty-seven, in 1915, Arthur Steindler moved to Iowa City to become the first professor of Orthopaedic Surgery at the University of Iowa. At that time, he was the only orthopaedist. When Steindler moved to Iowa City, the University Hospital (Figure 2) was located on

Figure 2. The entrance to the first University of Iowa Hospital (now East Hall). A patient with crutches is standing near a brick pillar. St. Mary's Catholic Church is visible in the background to the far left. (F. W. Kent)
the east side of the Iowa River and consisted of clinics, laboratories, operating theaters (Figure 3), and about 240 inpatient beds. This building was the first University Hospital and had been opened in 1898. While commuting from Des Moines, Steindler had recognized that many people with serious orthopaedic problems could not reach Iowa City. Since only two other physicians in the state practiced orthopaedics, many crippled adults and children did not receive treatment. These observations and his interest in crippled children led Steindler to encourage the state to provide support for the medical care of these children. Iowa was fortunate to have a progressive legislature, and in 1915 the Iowa General Assembly approved the Perkins Act which authorized medical treatment for children under sixteen. This led to the development of field clinics throughout the state for the evaluation of crippled children. Those children needing hospital care, therapy, or surgery were transported to University Hospital. Today the State Services for Crippled Children continues to provide field clinics for children in all parts of the state. Arthur Steindler also advocated providing medical care to needy adults. In 1919 the state legislature approved the Haskell-Klaus Act extending state supported medical care to all indigent adults. To facilitate the transporta-

Figure 3. The operating theater in the first University of Iowa Hospital. The scrub sinks, operating table, basins, and seats are visible. (F. W. Kent)

tion of patients benefiting from these acts, Steindler helped organize the hospital car and ambulance system that allowed patients to be picked up at their homes, brought to University Hospitals, and returned to their homes following treatment (Figure 4). The hospital car system still serves orthopaedic and other medical patients today.

Increasing numbers of patients and an expanding staff required newer and larger orthopaedic facilities, and in 1917 construction of Children's Hospital began on the west side of the Iowa River (Figure 5). This building was the first part of what became the University of Iowa Health Sciences Complex. Steindler was influential in both obtaining financial support and designing Children's Hospital. When the building was completed about 1920, he became chief surgeon and head of the growing Orthopaedic Surgery Service. The new facility incorporated many features to facilitate the care of orthopaedic patients. The arrangement of inpatient units allowed patients to be moved outside during favorable weather (Figures 5 and 6). The basement

Figure 4. The 1934 fleet of hospital cars and ambulances. The University Hospitals, dedicated in 1928, are in the background.

Figure 5. Children's Hospital. The Iowa River is visible in the upper right corner. Patients have been moved onto a patio on the left. The structure with the U-shaped roof projecting into the central courtyard is a ramp which allowed patients in wheel chairs or beds to be easily transported to the "gymnasium" in the basement. (F. W. Kent)

Figure 6. Children on a patio next to Children's Hospital. (F. W. Kent)
The operating rooms in Children’s Hospital (Figure 10) were located at the north end of the hospital. Figure 10 shows one of the Children’s Hospital operating rooms in the 1920’s (the schedule written on the blackboard indicates that a shoulder arthrodesis and a shoulder stabilization were to be performed). The Orthopaedics Department was located in Children’s Hospital until 1978 when it moved to the Carver Pavilion (Figure 11).

Soon after the approval of the Haskell-Klaus Act, other medical departments, still located in the first University Hospital, felt the strain of increasing numbers of patients and the need for more modern facilities. In 1924 the state legislature appropriated $2.5 million, matching a grant from the Rockefeller Foundation, to build the new 900 bed University Hospital near Children’s Hospital. The new University Hospital was dedicated in 1928 and is shown in the background of Figure 4.
In the 1920's, Steindler built his own home on a bluff overlooking the Iowa River. The site he selected provided a view of the river and was located within one-half mile of Children's Hospital. He had Horace's quotation, "Ille terrarum mihi praeter omnis angulus ridet" carved in the stone pediment above his door. He had found "the corner of the earth that smiled to him above all others." Mrs. Steindler directed the landscaping of extensive gardens around the house. The Steindlers entertained frequent visitors and relatives. To manage their large home and provide for their guests, they usually had a cook, two maids, and two students who took care of the maintenance work, some of the gardening, and served as chauffeurs. Louise Steindler took charge of running the household and organized the social gatherings at the Steindlers' home to allow her husband freedom to work, study, and write.

The new facilities of Children's Hospital, combined with the additional patients and staff, enabled Steindler to develop a strong program for orthopaedic care and the education of medical students and residents. In 1927 he was named head of the Department of Orthopaedic Surgery which became a separate department within the College of Medicine. Together with Ernest Freund he built a laboratory within the department to study orthopaedic pathology. This laboratory, through the work of Drs. Freund, Luck, Ponseti, and Bonfiglio, has provided excellent contributions to teaching and research. Steindler believed residency should be based on systematic, critical education in the basic sciences and clinical orthopaedics rather than on a purely apprenticeship system. His approach to residency education influenced not only his students and residents, but led other departments to organize similar programs. He established a one-year graduate course in orthopaedics with a required series of lectures. Each year he took a group of approximately ten physicians (many from other countries) as graduate students. The physicians paid a tuition of $50 to $100 a year and received at least one lecture a day, many delivered by Arthur Steindler. At the end of each year, Dr. Steindler would accept two or three of the graduate students into a three year residency. Residents participated in daily conferences organized by Steindler (Figure 12) in which he stressed understanding of the lesions underlying orthopaedic problems and the natural history of diseases, as well as critical evaluation of proposed treatment and of results. He remarked that, "There will always be those who are anxious to find a short cut to results and in their hurry pass by the stations of diagnosis and indications, making specific operative techniques their first step. No doubt they will be disappointed" (IVP). To stress the importance of unbiased reasoning he would say, "I would rather be wrong with an impartial reason than right without one" (JVL, JBJS 41A: 1366-1367 [1959]). Thus, although his lectures were didactic presentations, the conferences encouraged students and residents to participate by expressing their ideas. As he said, "... no justice can be done to the case by adopting a partisan standpoint. All opinions are needed and must be heard and explained" (IVP).

In 1949, at the age of seventy, having served the Department of Orthopaedics at the University of Iowa for thirty-seven years, Steindler became professor emeritus at the University of Iowa and chief of the Orthopaedic Service at Mercy Hospital. At Mercy he remained active in patient care and teaching. During the last years of his life he prepared lectures on the interpretation of pain in orthopaedic conditions and reviewed drafts of this book shortly before his death on July 21, 1959.

In reviewing Arthur Steindler's career, his contributions to the state of Iowa and the University are clear. By founding a strong orthopaedics program, he made possible the orthopaedic education of medical students and residents who later practiced in Iowa. He facilitated the organization of the state services for crippled children and indigent patients, and promoted the development of the University Medical Center. Through these efforts, medical care became available to people who might otherwise have gone untreated.

In addition to his influence on the state and the University, Steindler made important contributions to the field of orthopaedics. He wrote on almost every orthopaedic problem, including back pain, scoliosis, tuberculosis, polio, congenital deformities of the hand, Dupuytren's contracture, upper and lower extremity reconstruction, and foot deformities. Steindler was able to absorb information and ideas from many sources and organize them. Through this process he reviewed many orthopaedic problems and presented the available information, including his own experience, in a concise, systematic form. He also worked to bring many of the
orthopaedic advances from continental Europe to the United States.

Through his teaching, speaking, and writing, Steindler encouraged basic research and incorporation of the basic sciences into orthopaedic education. In his 1933 presidential address to the American Orthopaedic Association, he emphasized the need for basic scientific research in orthopaedics pointing out the need for broad-based study of anatomy, pathology, physiology, and biochemistry (JBJS XV: 567-573 [1933]). In addition to encouraging others in the study of the sciences, Steindler immersed himself in the investigation of human mechanics. He felt that human mechanics represented a virgin field with great potential application and observed that "... biomechanics is a powerful and indispensable ally of the orthopaedic clinician" (JBJS XV: 567-573 [1933]). He frequently stressed that orthopaedic progress would not occur through the pursuit of technical perfection, but rather through advances in the basic medical sciences.

In his study of orthopaedic problems and their treatment, Steindler pointed out the importance of understanding the natural history of diseases and critically reviewing the results of treatment. In his publications he presented and critically analyzed his operative orthopaedic experience, even when the results were unsatisfactory. For example, in Orthopaedic Operations: Indications, Technique, and End Results (Thomas, 1940) he discussed the indications and surgical techniques for each operation. However, unlike many authors of his time he reviewed the results of each operation and suggested reasons for failure. In analyzing the results of his flexor transposition to restore elbow flexion (one of his best known operations), he found 30 percent poor and fair results. He noted that causes of failure included insecure anchorage of the transposed muscles and errors in the indications.

Two problems that Steindler studied over many years were scoliosis and cavus deformity of the foot. His first article dealt with scoliosis (J Amer Med Assoc 52:1572-1573 [1909]), and he continued to study scoliosis throughout his career. As might be expected from his early training, he felt, "... that the proper way of dealing with structural scoliosis is to follow the footsteps of nature and to develop secondary compensating curves, rather than to persist in unsatisfactory attempts at direct correction" (Lancet, July 1, 1926). He described the compensation-derotation treatment of scoliosis (JBJS VIII:570-586 [1926] and JBJS XI:820-830 [1929]) as a three-fold program involving: 1) mobilizing segments of the spine to produce counter curves and restore balance; 2) stabilizing the compensated spine by mechanical support (Figure 7); and 3) developing and educating muscles to maintain the new balance of the body (Figure 13). Despite his strong belief that completion of compensation treatment would enable the patient's muscles to balance the spine, Steindler did point out that established curves might prove incurable and that further bracing or surgery might be necessary. In considering surgical treatment of scoliosis he observed that, "In the advanced deformities of non-compensated cases, it will be the only refuge . . . ." However, the maintenance of compensation, "... is not a problem that is best solved by totally abolishing the mobility of the spine; in other words, by operative fusion, although in many, if not the majority of cases, one has to accept this compromise. In many other cases, however, we have shown that the return to normal balance by way of mobilization and compensation and ultimate re-development of muscle forces of the back, is possible; and furthermore, that such is the most natural and the more desirable solution of the problem" (AS, Diseases and Deformities of the Spine and Thorax, C. V. Mosby, 1929). However, by the 1940's, Steindler had observed that scoliosis could progress even in patients who had achieved compensation (IVP). Although compensation treatment did not ultimately prove to be a satisfactory answer to the problems of scoliosis, Dr. Steindler's interest in scoliosis and his close follow-up of his patients made possible the landmark paper of Drs. Ponseti and Friedman. This study, reported in the Journal of Bone and Joint Surgery (32A:381-395), described the natural history of scoliotic curves, the classification of curves, and their prognosis. These observations significantly advanced understanding of the natural history of scoliosis and made clear the importance of identifying the type of curve to determine the prognosis.

Arthur Steindler found deformities of the foot and resulting problems particularly interesting, and his name is still mentioned frequently in papers dealing with cavus feet. In 1917 (Surg Gynec Obstet, May 1917,
release of the foot. (Surg Gynec Obstet, May 1917, pp. 612-615) At that time, he felt that the short muscles of the foot were responsible for the cavus deformity, and he recommended release of the plantar soft tissues. In 1921 (Arch Surg II:325-337) he returned to the problem of the cavus foot and noted that the results of some of his soft tissue releases were not satisfactory. He suggested that these unsatisfactory results were due to failure of complete correction of the deformity and indicated that complete correction should result from release of the plantar soft tissues combined with correction of the skeletal deformities by cuneiform osteotomy (Figure 15). In 1928 (Surg Gynec Obstet, Oct. 1928, pp. 523-562) he again discussed problems in his patients with treated cavus deformities of the foot. He stated that the poor results of his previous procedures might be due to failure to stabilize the foot after correction of the deformity and recommended combining correction of the deformity (by soft tissue release and osteotomy, if necessary) with stabilizing procedures, such as tendon transfers or arthrodesis.

Certainly, Steindler's close follow-up of his patients and long-term review of the results of treatment were not common practices during his time. Arthur Steindler was clearly an exceptional orthopaedist, but study of his many contributions does not reveal his personality, nor the talents and abilities that enabled him to immigrate to the United States and rapidly become an enthusiastic and successful Iowan and American.

He enjoyed refining and developing his own mind and stimulating others to do the same. He had a striking ability to assimilate and remember large amounts of information coupled with a genuine love of learning. His facility with languages clearly proved an asset in learning of new developments in other countries and in writing for orthopaedists outside of the United States. He continually sought comprehensive understanding of problems, and this search brought him to recognize the importance of scientific investigation and reasoning for future advances in clinical practice. Through his teaching and his example, he encouraged his pupils to seek broad education and develop the habit of life-long learning. When he began his classic studies of human movement in the 1920's, he recognized the importance of higher mathematics and took courses in basic calculus, physics, and engineering. In his last year of life, while seriously ill, he continued to participate in the educational activities of the American Academy of Orthopaedic Surgeons, giving his instructional course and avidly taking notes during the talks of others.

In addition to his interest in learning, Arthur Steindler had unusual energy, a remarkable capacity to organize his efforts, and the will to demand the best efforts from himself and others. Well into his 70's he would arise before 5 a.m. and take a walk to watch the first train of the day pass through the countryside. He then studied until 7 a.m. and usually was in his office by 7:30. At 5:30 he returned home and dinner was at 6:00. He rested until 7:00 and then worked, studied, or wrote until 10:00 when he retired to read in bed. By organizing his time and demanding his own best efforts, he gained the maximum from his talents and opportunities. Undoubtedly, his ability to command his time was aided by his wife, Louise, who protected his time for work and study.

Despite his strenuous work habits and the demands he placed on himself, Steindler was not aloof nor removed from people and events around him. After his immigration from Vienna, he followed the changes in Europe with great concern. Before and during World War II, he brought many friends and relatives to the United States to escape the war and persecution. To his friends, colleagues, and family he was lively, outgoing,
and warm. He was deeply loyal to his students and followed their careers with great interest. To his patients he was a concerned and caring physician. His affection for children was especially strong, perhaps partly because he did not have children of his own. He possessed a great and kindly sense of humor in both telling and enjoying jokes. His after-dinner speeches usually included humorous anecdotes. Occasionally, he took the role of a part of the body, such as the neck of the femur or the intervertebral disc, and defended this part against its bad reputation in orthopaedic circles.

Figure 16. Arthur Steindler with a group of residents.

For relaxation, Arthur Steindler enjoyed walks in the country, reading, music, and conversation with friends. His interest in literature included Virgil, Horace, and Lucretius in Latin, as well as classical and modern German, French, Spanish, and Italian works. In his early years in Iowa City, he was fond of playing the piano and spending a musical evening with friends. During these evenings, he played duets with Professor Clapp who was the head of the Department of Music or Beethoven sonatas with Dr. Byfield who was the head of the Department of Pediatrics and an accomplished violinist. Arthur Steindler also belonged to two dinner clubs where he eagerly engaged in discussions of literature, history, and philosophy. His broad knowledge, retentive mind, and sense of humor made him an especially valued member of these clubs.

Arthur Steindler's documented accomplishments confirm his position as a great orthopaedist, scholar, and teacher (Figure 16). He cared for patients with many types of challenging and complex problems, helped the state of Iowa and University of Iowa Hospitals establish a system of patient care for the poor in advance of other institutions, authored many influential papers and books, and personally taught a number of outstanding orthopaedists. Through his scholarly work and the orthopaedists he educated, his influence spread from the University of Iowa throughout the United States and to many other countries. More difficult to measure are the values he inculcated in his students and established as traditions in his department—excellence in patient care, unbiased review of treatment, study of the sciences, and critical broad-based orthopaedic education.

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Despite Arthur Steindler's wide influence and prolific writing, many of the details of his life and work are not easily available. I would greatly enjoy hearing from anyone who would like to correct, confirm, or expand upon the information and ideas presented in this article.