

# Orthodontics in 3 millennia. Chapter 4: The professionalization of orthodontics (concluded)

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Angle's legacy was assured when his disciples, both in the United States and abroad, boarded the joiners' bandwagon. The first 2 cornerstones of the professional pyramid were laid (education and organization), and the specialty began to pour the third cornerstone: orthodontic literature. Anthropologists, anatomists, histologists, and health professionals laid the foundation for the study of craniofacial growth. (*Am J Orthod Dentofacial Orthop* 2005;128:252-7)

**A**nd everywhere that Angle went, A clique was sure to grow would be how Sarah Joseph Hale (author of "Mary had a little lamb," 1830) might have described the fellowship that Angle inspired in his followers, as he left a trail of organizations behind him. It happened in 1900 with the American Society of Orthodontists (ASO) and again in 1909 with the formation of the Eastern Association. In 1913, after a 3-day course Angle had given on the West Coast, a new organization took form: the Pacific Coast Society of Graduates of the Angle School of Orthodontia. Later, it became the Pacific Coast Society of Orthodontists and admitted non-Angle graduates.

The final alumni group to emerge was the Edward H. Angle Society of Orthodontia, which was organized informally in 1922 at the Pasadena school. When Angle died in 1930, less than a year passed before his followers—as if afraid that Angle's principles might die with him—gathered in Chicago to reorganize. Today's Angle Society of Orthodontists is a prestigious fellowship whose members have not let those principles die. Fellowships though they might have been, none of these groups was a "league of gentlemen": they all had at least 1 woman charter member.<sup>1</sup>

## ORGANIZATIONS ABROAD

Close on the heels of ASO's founding were organizations outside the United States. In Berlin, the European Orthodontic Society took shape in 1907 with 10 charter members, including recent Angle graduate Jane Bunker. The society met every year thereafter, except during the war years. Its journal, the *European*

*Journal of Orthodontics*, is now published in English.<sup>2</sup> The British Society for the Study of Orthodontics was conceived the same year—essentially as an academic group of general practitioners—by George Northcroft (1869-1944) and Harold Chapman (1881-1965; Angle School, 1905). Both were twice president. Another prominent member was E. Sheldon Friel (1888-1970; Angle School, 1909) (Fig 1), who was the first in Britain to specialize, the first to use stainless steel bands, and the first Ketcham awardee outside North America.<sup>3</sup> Today, those orthodontists are represented by the British Orthodontic Society, organized in 1991 by the unification of 5 national societies; its voice is the *British Journal of Orthodontics*.

In 1926, Japanese orthodontists organized with 11 founders. A year later, 8 charter members, including 2 recent Angle College graduates (Paul R. Begg and J. Stanley Wilkinson), established the Australian Society of Orthodontists. The *Australian Orthodontic Journal* has been published since 1967.<sup>4</sup>

Like the ASO, the Canadian Association of Orthodontists was born "after school" at the University of Toronto immediately after one of Strang's edgewise courses in 1947. The original group of 35 members has grown, as of 2000, to 588.<sup>5</sup> Pioneers of early Canadian orthodontics include S. Arthur Roberts (first Canadian specialist [1904]) and Angle graduates George W. Grieve and James A. C. Hoggan.<sup>6</sup>

It doesn't take much of a stretch to see the influence of Angle in these foundings. Today, orthodontic societies exist in some 90 countries. Global organizations were yet to come.

## THEY PUT IT IN WRITING: ORTHODONTIC LITERATURE

With the first 2 cornerstones of professionalization—education and organization—in place, orthodon-

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**Fig 1.** When E. Sheldon Friel opened his office in Dublin in 1910, he became first orthodontic specialist in United Kingdom.

tists were now ready to learn what was going on in their specialty: literature, the third cornerstone.

### Books

Were it not for dedicated authors who took time out from their practices or teaching duties to record the concepts and practices of their time in books and articles—often with a loss of income—we would not be reading this. Although many colorful anecdotes have been passed down by word of mouth, only through the written record do we have a clear window to the past.

Fauchard's *Le Chirurgien-Dentiste* (1728) heralded scientific dentistry. *The Natural History of the Human Teeth* (1771) by Hunter was the foundation of all texts on anatomy of jaws and teeth. Joseph Fox's *The Natural History and Diseases of the Human Teeth* (1814) contained 4 chapters on orthodontics, but the first work devoted exclusively to orthodontics was a book by the Frenchman J. M. A. Schange (1841).

The greats of 19th-century American orthodontics—Kingsley, Farrar, Guilford, and Talbot—all published during the 1880s, but Kingsley's *Treatise on Oral Deformities* was the most complete work on orthodontics up to that time. During the early 20th century, Case, Lischer, Dewey, McCoy, and Strang contributed to the growing body of orthodontic literature, although each stressed his own preferred technique. It was not until 1943 that Salzmans produced the first "neutral" overview, providing comprehensive coverage of the broad spectrum of issues involved in orthodontics. These included evolution, embryology,

somatic and facial growth, biologic age, development of the dentition, and tooth formation and eruption.<sup>7</sup> J. A. Salzmans (1900-92) (Fig 2) came to the United States from Russia in 1906 and trained under Martin Dewey from 1931 to 1933. During his long and productive career, Salzmans was noted for founding the cleft palate clinic at Mount Sinai Medical Center and the first free dental program in the United States (in New York City), working as advisor to the US Public Health Service, and helping to develop the Salzmans index of malocclusion. He edited the *New York Journal of Dentistry* for 26 years and was the Reviews and Abstracts editor for the *American Journal of Orthodontics* for 41 years. One of his 11 books, *Practice of Orthodontics* (1966), met with universal acclaim.<sup>8</sup>

Despite earlier predictions that books would be replaced by computers, we have only to glance at our junk mail to see that publishing houses are still thriving—only the names have been changed. Rather than replacing hard copies, computers are hawking them on Amazon.com.

Now that orthodontics is meshing with such disciplines as periodontics, surgery, esthetic dentistry, implants, biostatistics, and computer applications, the line between what is orthodontics and what is not is becoming increasingly blurred. Many disciplines require many authors, so lone authors are becoming a rarity. And, judging by the weight of some of today's tomes, one would think that textbooks are sold by the pound.

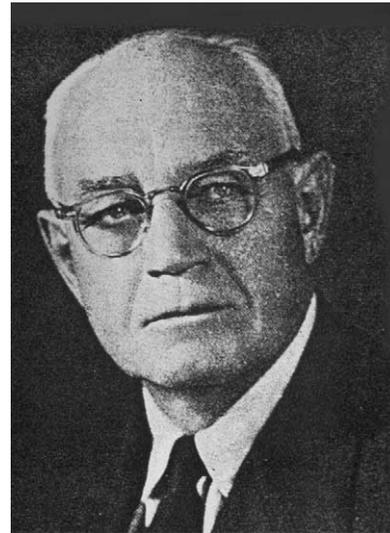
### Periodicals

Today we take the dissemination of professional knowledge for granted. In fact, we are swamped in literature. Thanks to the Web, we hardly need to go to the library for research or await the arrival of our favorite journal because it's right there on our computer screens. There are now some 30 English-language journals whose primary focus is orthodontics; many more could be listed if we included related areas such as oral surgery, cleft palate, and craniofacial science. Those of us too busy to keep up with our reading can subscribe to a kind of Reader's Digest for orthodontists: the review journal.

A hundred years ago, orthodontists did not have a journal of their own. They relied on the dental journals of their day—*Dental Cosmos* and *Dental Items of Interest*—for an occasional article about orthodontics. Dental manufacturers and supply houses also published journals; few others could afford to. The failure in 1912 of Angle's *American Orthodontist* proved that we were still not ready for our own journal. A year later, a physician and publisher, C. V. Mosby, MD, proposed the *International Journal of Orthodontia*. His col-



**Fig 2.** J. A. Salzmänn pioneered public health orthodontics and devised Salzmänn index of malocclusion.



**Fig 3.** H. C. Pollock Sr helped found *International Journal of Orthodontics* (now *AJODO*) and gave it editorial guidance for 53 years.

league, Philip Skrainka, MD, and orthodontists Martin Dewey (also an MD) and H. C. Pollock, Sr (1884-1970; Angle School, 1911) (Fig 3), were cofounders. If the birth of the new journal was attended by 3 physicians, how could it fail?

Well, it almost did. Angle turned down their offer to edit it, so Dewey took the reins, ably assisted by Pollock. Initially, insufficient articles were submitted for publication, so Dewey spent many a night writing his own. He asked dental historian Bernhard W. Weinberger (1885-1960; Angle School, 1909) (Fig 4) to submit some articles on the history of orthodontics, as fillers. Weinberger wrote 36 articles from 1915 to 1922 under the title "Orthodontics: an historical review of its origin and evolution." The series was later published in book form.

The seed for this oeuvre was Angle's suggestion to his disciple to seek the origin of the word *orthodontia*. From then on, Weinberger was hooked on history. Among his output of 250 books, monographs, and articles is the landmark bibliography, *An Introduction to the History of Dentistry* (1948). His prodigious output ultimately earned him the title, "orthodontia's historian."<sup>9</sup> Even this wasn't enough to sustain the young journal. In 1919, another specialty was called in, and the words, & *Oral Surgery*, were added to the title. Six more name changes took place before the present name was adopted in 1986.

Three years before Dewey's death, Pollock stepped up as editor (1931) and guided the journal for 38 more years, making him the longest-standing editor. He promoted a wider view of orthodontics and was instru-



**Fig 4.** Bernhard W. Weinberger, "orthodontia's historian."

mental in making the journal the world's leading orthodontic publication.<sup>10</sup> Other popular orthodontic journals that have taken root since those early days include *The Angle Orthodontist* (1930; official organ of the Angle Society), which has never accepted advertising; *Journal of Clinical Orthodontics* (1967); and *World Journal of Orthodontics* (2000).

#### THE STUDY OF CRANIOFACIAL GROWTH

No concept is more important to the proper diagnosis and treatment of children's malocclusions than an

understanding of growth and development. Over the years, our knowledge has been built up piecemeal by investigators of many disciplines: anthropologists, anatomists, histologists, physicians, and dentists. Before the incorporation of cephalometry into our armamentarium, the phenomenon of craniofacial growth could be studied only histologically or anthropologically, or by animal experimentation.

### Histological studies

John Goodsir discovered the osteoblast (1830), laying the foundation for the study of bone growth. By 1900, physiologists knew that osteoblasts make bone and osteoclasts resorb it, but no tissue-level bone functions were recognized as such before 1964.<sup>11</sup> In 1885, Julius Wolff wrote "Law of the Transformation of Bone," in which he stated that function produces changes in internal architecture. Angle and other non-extractionists seized on this as validation of their theory that expansion of the arches would be followed by new growth of bone. Unfortunately, what Wolff mentioned was only a change in form, not an increase in size. Albin Oppenheim found (1944) that excessive forces eventuated pathology and hindered tooth movements. He also elucidated the dangers of vacillating movements.<sup>12</sup>

Oppenheim (1875-1945, Angle School, 1911) (Fig 5) was a native of Moravia, now the Czech Republic. Typical of that time, he held an MD degree as well as a dental degree. As a result of his research at the University of Vienna, Oppenheim and his friend Joseph Grünberg of Berlin were asked to translate the seventh edition of Angle's *Malocclusion of the Teeth* and invited to teach at Angle's school in New London, Conn. While there, they completed Angle's course. In 1915, Oppenheim was appointed head of orthodontics at the Dental Institute of the University of Vienna. Here he did the first research on monkeys treated with appliances, using headcaps to distalize molars. He was also the orthodontist to Austria's royalty.

Prompted by the work of Ketcham, he found that root resorption was unavoidable in orthodontic treatment, regardless of appliance used (1936). In 1938, anticipating arrest by the Nazis, Oppenheim fled to Switzerland. There he received an invitation, under the auspices of Spencer Atkinson, to teach at the University of Southern California, where he was professor of orthodontics from 1938 to 1945.

In a milestone of orthodontic research, he stressed the advantages of gentle forces applied intermittently. He also wrote on prognathism and reintroduced headcaps in the United States.<sup>13</sup>

Harry Sicher (1889-1974) was another of that



**Fig 5.** Eminent Viennese scientist Albin Oppenheim reintroduced headcaps into United States and researched root resorption, gentle forces, and Class III treatment.

illustrious group of Viennese dental scientists, which included Bernhard Gottlieb, Balint Orban, and Joseph Weinmann, who migrated to the United States when the Nazis came to power. Most found positions in 1 of Chicago's 3 dental schools and helped make that city a mecca for dental learning in the 1940s and 1950s. Sicher, a physician, taught anatomy at the Chicago Medical School until 1942, when he became professor and chairman of the Department of Anatomy at the Loyola University School of Dentistry.

Sicher authored, with Tandler, *Anatomie für Zahnärzte* (1928); he wrote *Oral Anatomy* (1949), in which he emphasized his sutural theory of bone growth. He also wrote more than 120 scientific articles. His work was the basis of oral anatomy in the dental curriculum for many years and was of particular interest to orthodontists in their study of the growth of the head and face.<sup>14</sup>

### Functional matrix theory

This is the defining theory of facial growth. Melvin Moss, in his 1969 article on functional matrices, stressed the dominance of nonosseous structures of the craniofacial complex over the bony parts<sup>15</sup>; that is, growth of the brain or capsule provides the force to separate bones.<sup>16</sup> He was thus instrumental in returning orthodontics to biological considerations and delivering it from its fixation on mechanical innovations (Rutter RR. Orthodontic milestones: 60 journal articles that rocked the specialty [unpublished manuscript]; 1994).

### Animal experiments

John Hunter was first to describe growth sites in the mandible (1778); he contended that the ramus grew backward and was resorbed on its anterior surface, and showed that the eruption of teeth induces growth of the alveolar process.<sup>17</sup> Early in the 19th century, Fox observed that mandibular growth occurs almost entirely distal to the deciduous teeth.<sup>18</sup>

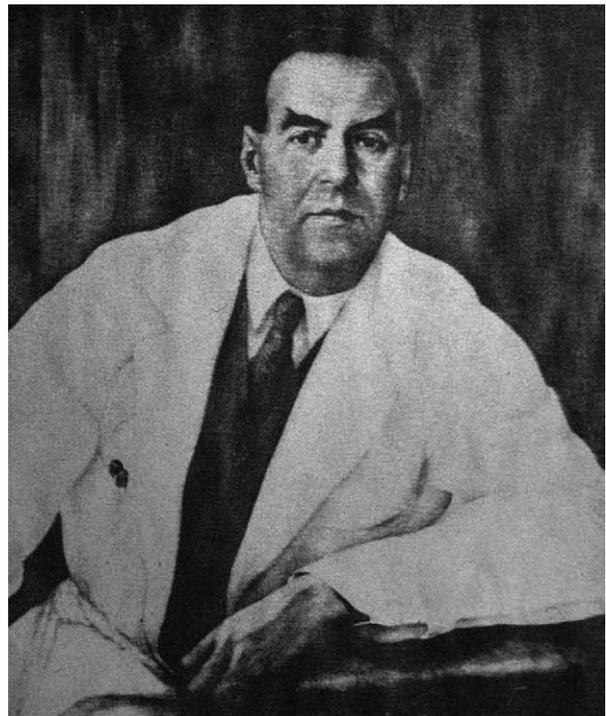
### Anthropologic studies

Blandin made the first attempt to describe facial growth (1836), finding that the pterygoid process backs up to the posterior aspect of the maxilla so that lengthening of the maxillary arch distally causes the face to be pushed forward by growth.<sup>19</sup>

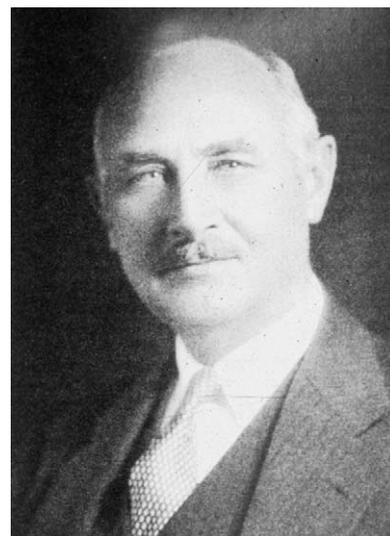
T. Wingate Todd (1885-1938) (Fig 6), an English physician and anatomist, made his greatest contributions to dentistry at Western Reserve Medical School and as director of the Hamann Museum of Comparative Anthropology and Anatomy in Cleveland. In 1926, assisted by Broadbent, Todd undertook a more exact growth study of children than the prevailing studies of weight and stature, x-raying more than 4500 children throughout the whole of their growth periods. He thus established standards of normal growth and development at any period of childhood. He elevated anatomy from a static discipline to a dynamic study of growth and did more than any other nondentist of modern times to advance orthodontics. Todd developed an index of maturation for the hand and wrist (*Atlas of Skeletal Maturation*), brought attention to the influence of the first molar in facial morphology and the existence of growth spurts, developed the Reserve Craniostat (forerunner of the cephalometer), and "brought to orthodontics the principle that the whole growing organism must be considered in treating one of its parts, eg, the dentofacial complex."<sup>20</sup>

Using comparative anatomy and paleontology, Milo Hellman in 1927 demonstrated posterior growth of the face by surface additions to the maxillary tuberosities as the face swings out from beneath the cranium during growth. Hellman (1872-1947; Angle School, 1908) (Fig 7) was a Romanian who came to this country as a teenager. His talent as a flutist won him a seat in the original Pittsburgh Symphony under Victor Herbert, thus helping to finance his dental education.

Desiring to broaden his scientific background, Hellman studied biology, anthropology, and vertebrate paleontology at Columbia University under William Gregory, a renowned anatomist. As a research associate in physical anthropology at the American Museum of Natural History (1917-47), Hellman, in turn, taught T.



**Fig 6.** T. Wingate Todd, physician and anatomist, did more than any other nondentist to advance orthodontics.



**Fig 7.** Milo Hellman introduced anthropologic techniques and cephalometrics into orthodontic diagnosis.

Wingate Todd, B. Holly Broadbent, and Wilton M. Krogman.

Hellman frowned on the then-popular mechanistic approach, insisting that most problems in orthodontics were biologic. Rejecting 1 standard for occlusion, he

introduced concepts of standard deviation and error of difference. He challenged Angle's notion of the maxillary first molar as the "key to occlusion." He called attention to periods of acceleration and retardation in facial growth and established the period when the greatest percentage of growth occurred. Hellman used orthodontics "as a springboard to a broader interest in the basic sciences—in his case, anthropology and paleontology."<sup>21</sup>

The 1920s saw a final burst of anthropologic activity, just before that science would be revolutionized by cephalometrics. In 1922, Keith and Campion, by superimposing drawings of skulls of different ages, found that the face grows mostly forward, a bit upward, and considerably downward, whereas mandibular growth is up and back.<sup>22</sup> In 1924, Brash published *The Growth of the Jaws and Palate*, in which he stated that, when he injected a red dye (madder) into a pig's skull, he found a delicate balance between deposition and resorption, depending on the functional demands made on it. Then, in 1929, William K. Gregory (1876-1970) published *From Fish to Man*, describing changes traced through 10 successive stages of phylogenetic development of the human face. That same year, Wilton M. Krogman contributed an anthropologic comparison between the growth patterns of the anthropoid and the human head.<sup>23</sup> It remained for cephalometrics to carry the ball from there.

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