The Tweed Philosophy: The Tweed Years

James J. Cross

Charles H. Tweed revolutionized clinical orthodontics. His inquisitive scientific mind coupled with his outstanding clinical ability and his unselfish work ethic are legendary. He gave the orthodontic specialist diagnostic and mechanical treatment concepts that have stood the tests of both time and intense scrutiny. (Semin Orthod 1996;2:231-236) Copyright © 1996 by W.B. Saunders Company

Sequential Directional Force Technology which is taught at the Tweed Study Course has been developed over the last half-century. To understand the development of this technology, one must go back to the father of orthodontics, Edward H. Angle (Fig 1). Angle gave the specialty many concepts and ideas, but two of them, the edgewise appliance and his concept of a line of occlusion have had great impact on the specialty of orthodontics.

Angle developed the edgewise appliance from the ribbon arch mechanism and called it the open bracket appliance. He discarded the ribbon arch appliance because of its lack of control in both the horizontal and vertical planes of space. By changing the slot from vertical to horizontal and increasing the size of the slot, he was able to achieve a degree of control never before possible. The new slot was .022 by .028 inches in dimension and was designed to accept a rectangular wire .0215 by .0275 inches in size. For the first time in history, bodily tooth movement and torquing movements were possible. Although Angle invented the appliance, he had only 2 years of his life to perfect its design and its use.

The original edgewise bracket was made of gold alloy and was considerably smaller in size than the ones in use today. Although gold had many good qualities, its softness and malleability caused problems when it was used as an orthodontic appliance. Placing a full-size wire in a small gold bracket would often cause the bracket to open. While the gold bracket was easy to close, several adjustments would result in a broken bracket. Bracket breakage was a major problem during early days of the edgewise appliance. The archwire was also made of gold alloy and was somewhat softer than stainless steel. Because the bands were gold, they were thicker than stainless steel.

Other problems included ligature wires (stainless steel had not yet been invented), broken eyelets (tiny gold rings soldered on the labial surfaces of the bands), and the bands pulling away from the labial surface of the tooth, resulting in enamel decalcification. It is no surprise that the practitioners of that era were reluctant to use the appliance.

The line of occlusion concept led Angle to the premise that the arches should always be expanded to accommodate a full complement of teeth. He believed that arch expansion stimulated bone growth, making extractions unnecessary. A somewhat confusing sidelight is that in one of his texts Angle illustrated extraction treatment. This apparent anomaly is inexplicable because Angle taught and advocated non-extraction treatment.

Tweed applied to Angle’s school in Pasadena in 1925 but was refused admittance. Angle told him to study and to become more serious about orthodontics. He applied again and was accepted. Members of his class were to be: Glen Terwilliger, Ken Terwilliger, Charles DePerteus, and Bruce Curran.

A letter from Glen Terwilliger describes the course of study undertaken by Tweed and his classmates. It also gives insight into orthodontic training during that period in history. The letter,
Preparation for the Angle School was a serious matter, which involved refresher work on basic subjects, such as Embryology, Dental Histology, Osteology, Head and Neck Anatomy, and Dr. Angle's Seventh Edition. Under the supervision by the graduates of the Angle School, Drs. Hahn, Setzer, Huberty, Grover and MacKenzie, preparation was undertaken and continued from four to six months. Other requirements were that we dispose of our general practices and close our offices which had already been attended to, so we were ready for Dr. Angle's school. We had then been joined by Dr. Charles DePertens of San Francisco, and Dr. Bruce Curran, who had prepared in Cleveland, Ohio. When it was time for the class to begin at the Angle school, we were notified that it would be closed—there would be no course given, and perhaps, would remain closed indefinitely. (With all of the fine, formal Orthodontic education available today, it is difficult to realize that Dr. Angle was the only Orthodontist in the country who was concerned with the need for a comprehensive course of training.)

Drs. Hahn, Huberty, and Setzer realized the seriousness of our positions, and offered a plan to duplicate for us a course of training as they had taken it under Dr. Angle in Pasadena. Our group consisted of Charles (Tweed), my brother Ken, Bruce Curran, DePertens and me. Adjoining rooms were obtained in the Koerber Bldg, in Berkeley—one was outfitted with all essentials for the technical training that had been given in Pasadena—the exercises were identical in number and quality—(those done by Charles (Tweed) were mounted and displayed on the wall of his office, and perhaps they are still there.) All exercises were designed to acquaint students with precision appliance requirements, and to develop freehand precision skill.

The second room was for lectures and seminars. Here, we undertook a serious detailed study of the subjects involved in our preliminary preparation. Dr. Akinson furnished material for head and neck dissection, and taught for a week or two—Dr. Furby, who had taught with Dr. Angle in Pasadena, was also with us for awhile. On his way home from the Islands, Dr. Angle was a guest of Dr. Hahn, and gave us two lectures, "The Mill" and "Facial Art."

The duration of our course was 8 months, and approximately 1800 hours. In addition to the scientific studies, Dr. Angle's courses were always accompanied by a reading list with book reviews, and our assignments were:

- Kenilworth, by Sir Walter Scott
- Yosemite, by John Muir
- The Story of My Boyhood Youth, by John Muir
- Two Years Before the Mast, by Richard Henry Dana, Jr.
- Men of the Old Stone Age, by Henry Fairfield Osborn
- The Life of the Bee, by Morris Masterlinck
- A Paper on a Famous Painter
- The Life of Lincoln, by Lord Charnwood
- Papers on Malocclusion
- Orthodontia
- Orthodontic History
- The Line of Occlusion, by Dr. Edward Angle
- The Mill, by Dr. Edward Angle

At the close of our course in Berkeley, it was time for Dr. Angle to be preparing for the presentation of The Edgewise Arch Mechanism (The Latest and the Best). 36 Illustrations were needed. Charles and Bruce Curran went directly from Berkeley to Pasadena, and under Dr. Angle's supervision produced the proper drawings. The SS White Company was to produce the introductory pamphlet and the drawings were sent to them, but as so often happens, there was a hassle. The SS White Company maintained there were too many illustrations. Dr. Angle refused to give in, and he was left without drawings for his slides. I received a telegram asking me to come to Pasadena and create another set of illustrations, which I accepted, and this became one of the highlights of my life—the need was urgent and I was afforded a rare opportunity to observe the warm and humorous side of Dr. Angle's personality that few others have been privileged to enjoy.

Now, after all of this you might like to have answers to your questions.

1. There was no course from Dr. Angle or his school. Our course was held in Berkeley, during 1927 and 1928, under Dr. Hahn, Huberty and Setzer. Duration involved 8 months, and approximately 1800 hours. Dr. Angle gave Charles his diploma (Fig 2) as a reward for his successful efforts in accomplishing the State Board requirements for the practice of

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**Figure 1. Edward H. Angle.**

displayed on the wall at the Charles Tweed Foundation, states:

Dr. Glen Terwilliger
2181 Ptarmigan Drive #1
Walnut Creek, CA 94595

Dr. James J. Cross
Admire Building
Admire, Oklahoma 73401

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The Angle School of Orthodontia
Pasadena - California -
Session 1921-1922

This is to certify that
Charles H. Tweed, Jr.
has completed in a satisfactory manner
one full course of instruction
in The Angle School of Orthodontia
Edward H. Angle M.D. 1863-1924

Figure 2. Tweed's diploma from the Angle school.

Orthodontia in Arizona. I believe the law was in force only one year. It was a tremendous undertaking and Charles and Dr. Angle were together constantly.
2. Five (number in the class)
3. Charles, my brother Ken, of San Francisco, Bruce Curran of Cleveland, Ohio, Charles DePorteous of San Francisco, and me.
4. Drs. Hahn, Huberty and Setzer, outlined, prepared and conducted our course. Dr. Angle gave us two lectures, but gave us no teaching.
5. The course was given in Berkeley, California.
6. The only comprehensive course available was the one we had in Berkeley. There was no Angle course.

Unlimited gratitude should be extended to those graduates from Dr. Angle's School, Drs. Hahn, Huberty, and Setzer, who without remuneration of any sort, and purely in the eyes of science and devotion to our profession, contributed 1 1/2 days, often more, each week to assist us in our training—actually, this group is really responsible for the institution, which through Charles, has influenced the quality of Orthodontic treatment throughout the world.

Those who have passed away:
My brother Ken 1957
Charles 1970
Bruce Curran 1976

We have never heard from Dr DePorteous since the close of our course in Berkeley, and he has never attended our meetings.

Of our instructors:
Dr Setzer passed away in 1942
Dr Hahn divides his time between Monticito and Dutch Flat, California
Dr Huberty resides near Scottsdale, Arizona

I trust this information will serve your purpose.
Sincerely,
G.H. Terwilliger, D.D.S.

Angle and Tweed worked closely together for the last 2 years of Angle's life. Tweed banded his patients with an edgewise appliance and Angle acted as the advisor. The system worked in the following manner: Tweed made progress records of his patients every 4 months. He packed the records in a suitcase and took them to Pasadena where Angle studied them and outlined a treatment plan for the next 4 months. This was repeated every 4 months for the next 2 years. This was a very productive time for Charlie's education and for the evolving edgewise appliance. Angle was so pleased with Tweed's work, that he was instrumental in making it possible for Tweed to be invited to give lectures at several orthodontic meetings.

In 1932, Tweed published his first article in the Angle Orthodontist. It was titled "Reports of Cases Treated with the Edgewise Arch Mechanism." Tweed held to Angle's firm conviction that the practitioner must adhere to the line of occlusion concept and never extract teeth. This conviction lasted for 3 years after Angle's death.

After 5 years of orthodontic practice Tweed became disheartened with his work for two reasons: (1) the protrusive faces that he was creating, and (2) the unstable dentitions. He became so disappointed that he almost left orthodontics. He resolved to study his many failures and his few successes by devoting each morning he was in his office to the making of progress records of his patients. After studying these records, he came to realize that the patients who had pleasing facial balance and harmony also had mandibular incisors that were upright over basal bone. He reached the conclusion that carefully planned extractions allowed him to improve appearance and stability. Tweed wrote, "foresight caught up with hindsight," and the diagnostic facial triangle was born.

In 1936 Tweed presented his first extraction papers to, of all people, the Angle Society. If he was expecting praise, he was sadly disappointed. "Mother" Angle, the editor of the Angle Journal and an Angle Society member, refused to attend the lecture. George Hahn, Tweed's teacher and a leader in the Angle Society, criticized him severely. Almost everyone considered Tweed to be a traitor to the greatest man orthodontics had ever known. He was absolutely crushed by the response. He returned home sadder and wiser, with a steadfast resolve to continue his clinical research.
He worked harder than ever and by 1940 he had records of 100 patients, treated first without extractions, and then retreated with extractions. He put these patient records on display at an American Association of Orthodontists (AAO) meeting (Fig 3). Although it was a tremendous exhibit, he was severely criticized. His daughter, Alice, was to say later that the criticism was so harsh that she preferred to wait outside the lecture hall rather than endure the pain.

It was about this time that Tweed developed one of his favorite phrases. It was fairly typical at one of Tweed's lectures for a listener to stand up and say that Charlie had mistreated a patient or had unnecessarily extracted teeth. Tweed's standard response was "just put your plaster on the table." In other words, let the treatment speak for itself. Thus was born one of the traditions of the Tweed Foundation. To this day, at every Foundation meeting each member brings his/her plaster and puts it on the table. Even in his seventies, Charlie never attended a meeting without his plaster.

Charles Tweed had detractors, but his results were so outstanding that he attracted admirers as well. An example was Dr Robert Strang, who Angle called the "Master of the Ribbon Arch," and who had the reputation of being an excellent wire bender. He was so impressed that he converted his practice from ribbon arch to the new edgewise appliance.

Because of rejections by organized orthodontics, Tweed concluded that his efforts would be more productive with a smaller group. He decided to form a study club. His first "course" was held as a study club meeting in 1941 (Fig 4). Thirty-six orthodontists met for instruction at the first session. The group elected Sam Lewis as president. Copeland Sheldon was elected as secretary-treasurer. In attendance at the first meeting were Robert Strang, Cecil Steiner, Bill Downs, Herb Margolis, Paul Lewis, and Hays Nance. The same group met in 1942. Because of World War II, no meetings were held in 1943, 1944, or 1945. In 1946, the group gathered again. The first week of their session was devoted to instruction for newly interested orthodontists, and the second week to a seminar for the original group. Hays Nance, the president, organized an exceptional meeting in 1947. Wendell Wylie read two papers which were ably discussed by Herb Margolis. At this time, Hays Nance proved himself to be a major essayist with his paper entitled, "The Limitations of Orthodontic Treatment." Tweed read two papers which were analyzed by Robert Strang, Herbert Margolis, and Wendell Wylie. It was at this meeting in 1947 that the organization proposed the founding of the Charles H. Tweed Foundation for Orthodontic Research. The Tweed Foundation's yearly meetings were attended by the giants of orthodontics in the 1950s and 1960s. Tweed's course in Tucson flourished (Figs 5 and 6).

Students in Tweed's course brought their typodont and prepared at least 12 sets of archwires for each malocclusion correction simulation. The technique can be basically described as follows: (1) a maxillary .022 × .028 stabilizing wire was bent to the malocclusion; (2) a mandibular working wire was bent and the mandibular canines and anterior teeth were retracted into the mandibular first premolar extraction sites (if the patient needed extractions, Tweed rarely extracted any teeth other than the first premo-
lars); (3) mandibular anchorage was prepared with Class III elastics; (4) the maxillary premolars were removed, and the prepared mandibular arch was used as an anchorage unit so that Class II elastics could be used to retract the maxillary canines and the anterior teeth. Many archwires were fabricated because the technique was, at best, complicated. Still, it was the best thing that orthodontics had ever seen. Tweed was a master technician and was able to precisely position the teeth to achieve his desired results of esthetics, health, function, and stability.

Tweed, the prolific, indefatigable clinician, teacher, lecturer, and writer lived another 40 years after the death of Edward Angle. Though Tweed departed from Angle’s line of occlusion concept, he remained convinced that the efficient use of the edgewise appliance was synonymous with consistently good orthodontic treatment. Tweed’s last great work, the two volume Clinical Orthodontics, is inscribed “To Dr. Edward Hartley Angle, a dynamic psychologist with the power to mold the character of men; to his devoted wife, Anna Hopkins (Mother) Angle, who guided his career and bathed the wounds of those undergoing his molding procedures; to Dr.

George W. Hahn of Berkeley, California, who directed the Angle School during Dr. Angle’s absence in Hawaii and who more than anyone else developed in me whatever digital skill and love of profession I possess; and to all those members of the Foundation that bears my name, particularly the teaching staff, who during the past 25 years have joined in the effort to elevate the standards of clinical orthodontics, this book is dedicated.”

Tweed (Fig 7) popularized precision appliance adjustment. He perfected first, second, and third order bends. He developed the concept of en masse anchorage preparation. The desire to give the patient a balanced face and stability of the dentition led Tweed to develop his own unique philosophy of treatment. In summary, Tweed’s basic concepts were: (1) a deep and abiding interest in facial esthetics; (2) carefully planned extractions to achieve a predetermined objective. To arrive at the predetermined objective, Tweed had to define the anterior limits of the dentition. He developed the diagnostic facial triangle for this purpose; (3) precision appliance adjustment; and (4) en masse anchorage preparation. Angle gave orthodontics the edgewise bracket, but Tweed gave orthodontists a way to
use it. The orthodontic world beat a path to his door in Tucson. Tweed, the innovative and perceptive diagnostician and master clinician, kept his promise to his mentor, Edward Angle. He devoted all 42 years of his professional life to the use and refinement of Angle’s invention, the edgewise appliance.

References