A History of Gnathology

Victor O. Lucia, D.D.S.
Teaneck, New Jersey, U.S.A.

In 1925 Dr. McCollum demonstrated the existence of a hinge axis in the temporomandibular joint. It turned out to be the basis of Gnathology, and remains the greatest luxury in the treatment of the entire mouth.

It was extremely difficult to make practical use of this information because of the equipment that was available at that time. It was evident that there would be a great deal of work and experimentation necessary before it could be put to practical use.

In 1926 the Gnathological Society of California was formed by McCollum, Stallard, and Stuart. In addition there were about a dozen other men who participated in active research of mandibular movements and the construction of instruments to record and duplicate these movements (Fig. 1). These men gave up a great deal of their time and money to pursue this research. All the men contributed ideas and effort. But it was McCollum—the "Cat-Fish"—that prodded them to work incessantly on these ideas.

In 1927 the first three-piece face-bow was developed, making the location of the hinge axis a very practical procedure. Prior to that, trying to use the existing one-piece face-bow made it almost impossible to easily locate the axis.

The first instruments to duplicate the exact movements of the mandible were designed by McCollum and Stuart in 1930.

In 1934, before the Southern California Dental Alumni Meeting, the Gnathological Society demonstrated that records taken from the patient could be put on the articulator, and the articulator set to follow these records. In turn the controls of the recording apparatus could be set on the articulator and transferred to the patient and they were followed by the patient.

By 1936 the first practical instruments to record jaw movements had been designed. Also an articulator that could be set to these records was developed. It was now practical to accurately record and duplicate jaw movements.
Custom-made restorations could be made in the laboratory. No longer were vertical changes a chairside procedure. No longer was it necessary to make occlusal adjustments in the mouth.

The research report papers were read at the A.D.A. Meeting in Atlantic City in 1937 (Fig. 2). The research report was published in 1938 and remained the Bible for many years. The information therein still is of extreme importance to the student of Gnathology.

Up until this time, Gnathology was exclusively a West Coast endeavor. In 1941 Dr. Granger went to Dr. McCollum's office to study Gnathology. Several 6-week stays during 1941 enabled Dr. Granger to bring Gnathology to the East. He began lecturing and giving demonstrations throughout the country.

Prior to that, the only exposure of Gnathology in New York, was at a meeting at which McCollum was ridiculed by the small minds of New York in 1928.

In 1943, I met McCollum while I was studying with M.M. House. At the Pacific Coast Dental Meeting, McCollum and his entourage encountered Dr. William Crawford, who had just delivered a paper on the casting and fitting of restorations. McCollum was asked how he liked his paper. McCollum answered, “Fine, but when are you going to pay attention to the business end of the restorations?” That was my introduction to B.B. McCollum!
In 1944 I had the opportunity to visit Granger's office, and was greatly impressed with what I saw. I began to get all the reprints that were available from Stallard and McCollum, and spent as much time as possible with Granger, trying to learn as much as possible. He really developed bilateral balance to the fullest. McCollum had the lingual cusps of the lower posterior teeth out of occlusion. Granger even had these cusps in balance.

There were no organized courses anywhere. For a fee McCollum might accept you in his office. This usually was a traumatic experience with lots of abuse. It was a very difficult experience to try to learn Gnathology.

The drop-wax technique was developed by Dr. Everitt Payne. He handled wax better than anyone else and was responsible for the waxing technique that others copied.

By 1946 enough interest had been generated so that McCollum decided to have some equipment made. None was available at that time. Those of us that ordered the equipment put up $1500.00 and the waiting started. The machine shop that was to make the instruments had government contracts and our order was a fill-in. After a year the price was raised a thousand dollars. We waited patiently for delivery. It finally was delivered in the Fall of 1947. It was beautifully made (Fig. 3). Now it was necessary to learn how to use it. Dr. McCollum arranged a meeting in Chicago for Drs. Stuart and McQueen to demonstrate the use of the equipment. They encountered difficulty in getting a complete setting. Privately, McCollum reprimanded them. This may have been due to the fact that Stuart never really approved of the instrument design and already had plans to design a more accurate instrument. Stuart's plans lay dormant while he went to China on his communication deal.
Fig. 4. Tracings cut in wax.

Fig. 5. Tracings cut in wax.

Fig. 6. Tracings etched in glass.

Fig. 7. Tracings etched in glass.

Fig. 8. Tracings etched in glass.

Fig. 9. Tracings etched in glass.
The pantograph was activated by rubber bands, and the stylii cut tracings on wax-covered glass slides (Fig. 4, 5). Hydrofluoric acid was used to permanently etch the lines on the glass slides. We were not aware of it at the time, but the etched lines were a problem, if they were etched too deeply. Unless you constantly lifted the stylii from the glass slides, you might think that you had a perfect setting, whereas it might be that the etched line was making the stylii follow the tracings (Fig. 6, 7, 8, 9).

Balanced occlusion was the order of the day. The articulator was a track instrument with an assortment of condyle paths to pick from (Fig. 10). Many times it was not possible to select a path that had fidelity in every detail. Nevertheless, at that time it was the best that was available.

McCollum had a stroke in 1949 and was no longer the great influence that he used to be.

In 1952 Dr. Stuart announced that he had the idea for a truly
Fig. 13. Granger Gnatholator.

Fig. 14. Granger pantograph.

Fig. 15. Fine pointed lead made tracings.

Fig. 16. Tracings on magic tape.

Fig. 17. Tracings more visible.

Fig. 18. Stuart computer.
frictionless mandibular movement recorder. Gravity activated the stylii that wrote on a layer of powdered chalk on the horizontal plates (Fig. 11, 12). Magnets activated the horizontal stylii that wrote on the posterior vertical slides. This technique had tremendous advantages once you mastered it.

About this time Dr. Granger decided it was time to design an articulator that would do the job and that could be sold at a reasonable price. He brought out the Gnatholator (Fig. 13). It had a serious design problem. Because of the leverage on the condyle balls which were attached to shafts coming from the side of the uprights, there was binding in the movements. When the friction was overcome, then there would be vertical play and as a result you were not sure of the centric position. However, Granger's pantograph was an improvement over McCollum's. He used finely sharpened lead points that scribed lines on white paper covered with magic tape for better clarity (Fig. 14, 15, 16, 17). The pencils were activated with light springs, and there was less friction against the tracings compared to the etched glass slides.

About 1955 Dr. Stuart introduced his computer. This was the first instrument that was not a track instrument (Fig. 18). It had alterable eminentia which, for the first time, allowed perfect fidelity to the patient's tracings. The Bennett adjustment was also easier and more accurate. The angle, once set, did not have to be reset every time you removed it for custom grinding. It could be returned to the same angle every time.

From 1950 to 1960 I assisted Granger in the giving of 3 courses each year at the University of Pennsylvania. More dentists slowly became aware of Gnathology. These were the only reasonably organized courses available at that time. About this time Arne Lauritzen was lecturing and demonstrating some of the Gnathological principles as related to denture construction. He was responsible for spreading increased interest in Gnathology.

Early in 1958, I started to put some information together as a possible book on Gnathology. I had no contract. It was more of a hobby in photography. Nevertheless, it developed into the first book on the subject. It made it easier for someone who was interested to have whatever information was available at the time in an illustrated book that he could refer to at his leisure.

About this time (1955) the cuspid disclusion concept of occlusion was expounded. Considerable confusion resulted when cuspid disclusion was introduced. Dentists thought that if they built up the cuspids, nothing else had to be done. More cuspids were lost in those early days, until they realized that the rest of the mouth had to be treated. Centric relation had to be taken into consideration as well as the other factors of occlusion.
Dr. Stuart built cases in 1927 that had anterior discission. He could not convince Dr. McCollum. Dr. Stallard agreed with Dr. Stuart, and introduced him to Dr. Shaw’s article. Dr. Stallard advised Dr. Stuart to hold it back until they were more certain. Dr. Stuart was sure from 1950 on. They did not report it until 1957 in Houston.

As a result of Granger’s courses at the University of Pennsylvania, many men were encouraged to go into Gnathology. Notably there were Frank Celenza, who became one of the most prolific lecturers all over the world, Pete De-Pietro who made some interesting contributions in the instrument field, Arthur Kahn, who has lectured extensively all over the world, and Max Kornfield, who has contributed two excellent texts on the subject.

It was in 1960 that I met Peter K. Thomas. He had been teaching cusp to fossa carvings. He taught many dentists the new occlusal concept expounded by Stuart and written by Stallard. It probably is safe to say that Thomas has taught more dentists how to carve than anyone else.

Early in 1960 De-Pietro designed another articulator (Fig. 19). It had some innovative concepts, but also had its drawbacks. It could not be adjusted when the medial wall had to be turned outward. In addition, it was difficult to make the necessary alterations to the parts when the pantograph was in place.

However, his pilot model of a pantograph was by far the best. It wrote only when direct current was turned on to the stylii. It lined up fine iron filings (Fig. 20). The pressure on the recording plates was always the same. All the tracings were cut off at the same time when the current was turned off. The end points were always made at the same time, any patient movement while retracting the
stylii in the other systems was eliminated. Unfortunately, it never was produced commercially.

Also at this time the Denar Company got into the picture. Dr. Niles Guichet presented Lectures and Clinics all over the world. Their articulator also had some innovations. It was difficult to set, and in the beginning it had some mechanical problems (Fig. 21).

The Denar pantograph had the capability to end all the tracings at the same time, but the stylii would dig into the paper slides as they were activated (Fig. 22). The clutch system, although simple, had some shortcomings. There was a drag of the bearing screw against the acrylic surface on which it operated. This produced inaccuracy in the registrations.

In the fall of 1961, "Modern Gnathological Concepts" was published by Mosby (Fig. 23). This made it easier for more men to explore Gnathology. For the first time there was a complete reference book covering Gnathology in depth. Fortunately I was exposed to cusp to fossa occlusion early enough to include it in
the book. Otherwise the book would have been out of date before it came off the press.

In 1962 Granger rushed his book to press. It was a compilation of his many papers, and had little coverage of technique in depth.

During the 60's many changes took place. In the early days of Gnathology, articulation was the most important factor in treating patients. Periodontal therapy was given lip service. There may have been a reason for this. Gnathology, being born in the west, paid little attention to the supporting structures. It is possible that periodontal disease was not as prevalent in the west. Perhaps the way of life, the fresh fruit and vegetables, the sunshine, etc., was the reason. Periodontal disease was much more prevalent in the east. As a result, the east was the cradle for the development of periodontal therapy.

Fortunately the old order changeth, and Gnathologists have become aware of periodontal conditions and are doing something about it.

Also, about this time we saw some advances in Orthodontics. The Crozat Technique as taught by Weibrecht added valuable procedures to our treatment of full cases. Their concepts fitted in very well with Gnathological principles. They were successful in making the teeth occlude in centric relation. They subscribed to cusp to fossa occlusion and cuspid protection. We now had the best of all worlds: good tooth position, periodontal therapy, and Gnathological occlusion. Great progress had been made.

Dr. Grub and his technician, Jonsey, in Cleveland, used a small gold casting on the lower anterior teeth to maintain the vertical dimension while they carved the posterior occlusion directly in the mouth. This was quite different than the Lucia Jig, which is used to deprogram a patient before taking the centric relation record.

Clem Bird carved the most beautifully balanced articulation directly in the mouth. However, because he could not control the carvings so that they were in centric, the carvings would usually wear out in about five years. The patients were told this and that is what they expected.

About this time (1961) the ’’Jig’’ was developed (Fig. 24, 25). For those of us who used it correctly, it was more valuable than all the other instruments combined. After all, a correct centric relation record was and still is the most important record in Gnathology. Not that the ’’Jig’’ was the only way to get centric, but the ’’Jig’’ was the only sure way that anyone could capture centric relation.

In 1962 there were many study groups formed by Stuart and
Thomas. Thirty-six study groups met in Mexico City to organize a society. In 1962 Gnathology was introduced to Italy, in Milan. In 1963 in Mexico City 35 men met to form the Gnathological Society. At the San Diego meeting of 1965, 128 men attended.

Dr. Max Kornfield published his first set of books on rehabilitation with emphasis on Gnathology (Fig. 26).

Japan was introduced to Gnathology in 1968, and since then they have made tremendous strides (Fig. 27).

The formal organization of the International Gnathological Society took place in San Diego in 1969.

The Northeastern Gnathological Society was formed in 1969 by Dr. Celenza and his friends. The European Group was formed in 1969.
Fig. 28. T.M.J. instrument.

Fig. 29. Lee articulator.

Fig. 30. 1973-Roof added to condyle paths.

Fig. 31. Grooves prevented accidental loss of centric.

Fig. 32. Reference plates eliminated clutch construction.

Fig. 33. Second set of books on Gnathology by Kornfeld.
During the 60’s there were several other instruments introduced that could be included in the Gnathological group. These included the T.M.J. System and the Lee instrumentation (Fig. 26, 29).

Dr. Stuart made some improvements in his computer in 1973. A roof was added to the eminentia (Fig. 30). This made for more accuracy and greater ease in articulator movements in certain cases. He also had grooves made on the upper and lower members of the articulator so that the centers of the upper and lower members could be more accurately lined up (Fig. 31). There was less likelihood of any movement of these centers while working with the instrument. The sides of the condyles were reduced so that an extreme side shift could be accommodated. In addition, the reference plates were introduced, thus eliminating the stumbling block of clutch construction (Fig. 32).

In 1974 Dr. Kornfield published his second two volumes with more emphasis on Gnathology (Fig. 33).

As the Europeans became more interested in Gnathology, an excellent book by Bauer and Gutowski was published by Quintessence Publishing Co. (Fig. 34).

The Australian Group was organized in 1977, followed by the Asian Group in 1978.

A great deal of credit must be given to Chuck Eller for all the organization work involved.

After 20 years of experience with “Modern Gnathological Concepts” a new book, “Modern Gnathological Concepts – Updated” was published in 1981 (Fig. 35).
Another book on the application of Gnathological principles to denture service was published in 1986 (Fig. 36). Both of these books are published by Quintessence.

In the last 60 years Gnathology has made tremendous progress. In the early days it was criticized as being wrong, unnecessary, too complicated, etc. Today it is the standard to which everything else is compared. Today it is accepted everywhere. Some still say it may not be necessary, or it is too complicated. But no one criticizes it as being inaccurate. Today we have at our disposal all the necessary disciplines to produce the best dentistry in the world.

At present there are over 2500 members throughout the world that belong to the International Gnathological Society.

Periodontal therapy, proper tooth movement, and Gnathological Occlusion are all here to stay.

In my opinion, the Stuart instrumentation is the finest available, Gold occlusal surfaces with porcelain veneers make the best restorations when full coverage has to be resorted to.

With Gnathology becoming more accepted as time went on, the inevitable took place. Simplification and short cuts made their appearance. Compromises in recording techniques and settings of articulators to approximate positions were prevalent. They all tried to adhere to Gnathological principles, so from that standpoint they were better than what went on before the Gnathological era.

Electronic recordings of one kind or another may have some advantages, but it reminds me of the story of the equipment salesman trying to sell a new piece of farming equipment to a
farmer who said "I'm not farming half as well as I know how!"

With the passing of Charlie and Harvey, and Peter K. incapacitated, and with most of the remaining old-timers (including me) getting on in years, it seems to me that the Mantle of Gnathology passes on to Bill McHorris. His youth, energy, ability and willingness to impart his knowledge and experience makes him the logical standard bearer for the future — Bill, you have the ball!!

Note from Author:
The information in this presentation is my personal association with Gnathology for over 40 years.

Because the information is mostly from memory, and some documentation, some individuals may have been overlooked and credit may not have been given to those who deserve it. I assure you that any errors or omissions were not intentional.

If any of you have additional information or any corrections, I will more than welcome them for the future.

Dr. Victor O. Lucia  
Director, Graduate Prosthodontics  
Fairleigh S. Dickinson Jr.,  
College of Dental Medicine  
140 University Plaza Drive  
Hackensack, N.J. 07601 U.S.A.