

**ARTICULATORS THROUGH THE YEARS REVISITED: FROM 1751-1970****ASHISH.R.JAIN MD.ACU.VARMA, MDS<sup>A</sup>***Research Scholar, Saveetha University, Assistant Professor, Department of Prosthodontics,  
Saveetha Dental College and Hospitals, Chennai, India.***ABSTRACT**

There have been a series of articulators that have been introduced if we glance at the past; the numbers are many and the dentist becomes confused as to which one to choose. This Article continues an historical review, begun in the previous issue, on the nature of mandibular movement for the purpose of reproducing these movements in an articulator. Simple hinge articulators became commonplace, but by the turn of the 20th century, the natural variability of the condylar paths, both between individuals and from side to side in the same individual, had begun to be recognized and appreciated as important determinants of mandibular movement. Undoubtedly, the investigators' interpretations of what they observed varied greatly. This is demonstrable in the features of their articulators. From the inspired to the near-genius and from the "ridiculous to the sublime," these articulators simply reflected what was perceived to be the anatomic and kinesthetic characteristics of mandibular movement. are described.

**KEYWORDS:** Fully adjustable articulator, Pantographic tracings, Semiadjustable articulator.**ASHISH.R.JAIN MD.ACU.VARMA, MDS<sup>A</sup>***Research Scholar, Saveetha University, Assistant professor, Department of Prosthodontics,  
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## INTRODUCTION

The history of the development of Articulators is filled with many interesting theories and conflicting concepts. In the last two or three decades, there have been concurrent tendencies either to reduce the articulator to a simple hinge or to make them more and more complex so that to record all Mandibular movements. Many dentists argue that the best articulator is the patient's mouth, because that is where the prosthesis ends up and that is where it has to be adjusted anyway. Contrary to that belief, others state that the articulator is the best means of developing the occlusal scheme because:

1. visibility is best outside of the mouth where not influenced by intraoral factors such as saliva, poor light, and patient cooperation,
2. the patient's closure and eccentric movements can be repeatedly controlled, and
3. Time spent doing intraoral adjustment is greatly minimized, saving both the dentist and patient frustrating moments.

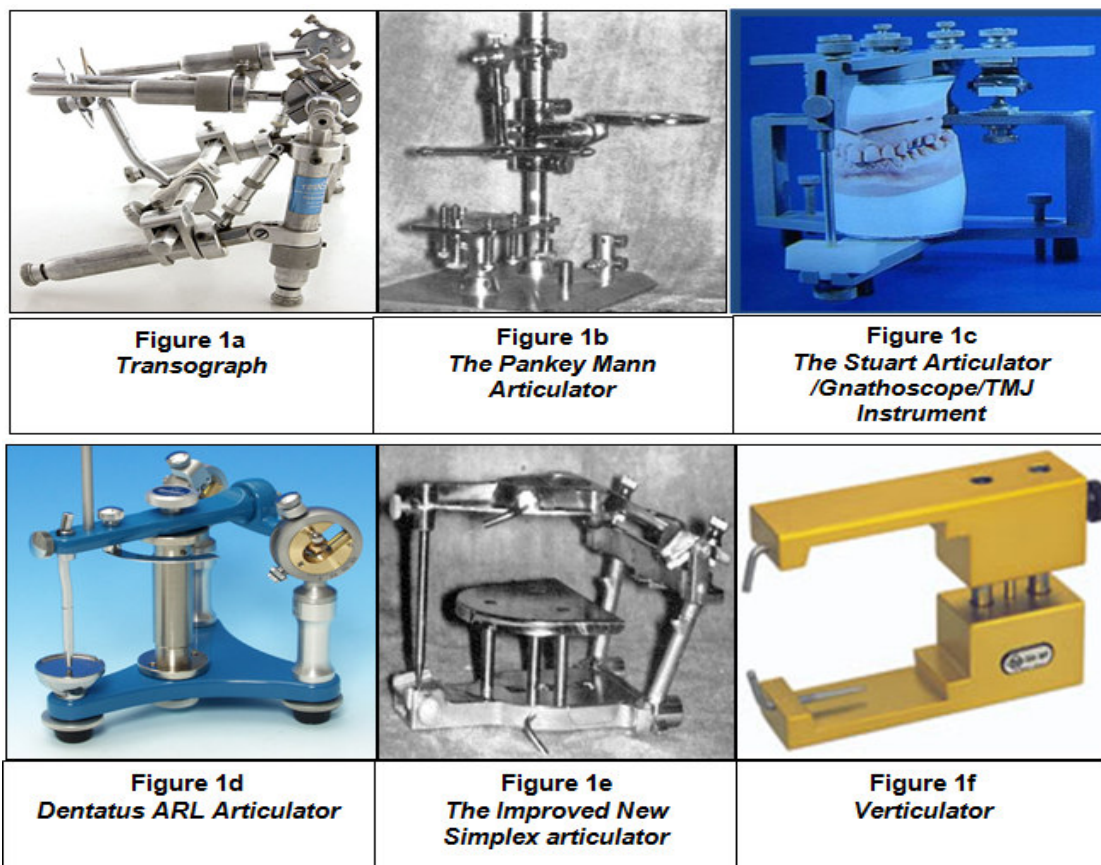
The type of occlusion, which we want to give to patient, governs the choice of Articulator. Selection of Articulators depends upon the clinical situation a lot. In complete denture prosthesis Semiadjustable articulator suffice the purpose, as it is difficult to manor fully adjustable articulators in complete denture patients because the clutches used to obtain the hinge axis and condylar movements are more cumbersome to be used in edentulous patients, which in turn does not provide accurate records. The history of articulators parallels that of varying concepts of occlusion. Attempts were

made to record anatomic relationships to reproduce functional movements of mandible and transfer this to mechanical devices to simulate conception of natural movements. Therefore it was this period were semi-adjustable articulators with three intercondylar adjustments in 1964 and fully adjustable articulators in 1989 designed by Charles Stuart, came into full function. Later Granger, Stuart, Guichet,<sup>1-4</sup> and Ney introduced the pantographic tracings as well.

### ARTICULATORS FROM 1951-1970<sup>1-15</sup>

1. Transograph By Page (1952)
2. Pankey-Mann Articulator (1955)
3. Charles.E. Stuart (1955)-Stuart Articulator Gnathoscope
4. Dentograph By Kilie (1958)
5. Dentatus ARL Articulator (1958)
6. The Improved New Simplex Articulator (1962)
7. Ney Articulator (1962)
8. Verticulator- William Windish for the J. F. Jelenko Co (1962)
9. Hanau model H2 series (1963)
10. Hanau model 130 university series (1963)
11. Whipmix Articulator-Model 8300,8340,8800,8500,9000,9800 (1964)
12. Swanson TMJ Articulator (1965)
13. Duplifunctional Articulator (1965)
14. Simulator-Earrest Granger (1968)
15. Niles Guichet-Denar D4A and D5A Articulator (1968)

### FIGURE LEGENDS INCORPORATED WITHIN IMAGES



**Transograph (1952) (Figure 1a)**

Is a hinge axis facebow introduced in 1952 that can be modified later to serve as an articulator. It has adjustable condylar guides and is a split axis instrument. Theory of transographics states that steep cusps (35° - 45°) should be used in order to minimize or discourage lateral movement and encourage simple vertical movements. In this articulator each condylar axis is independent of the other. The rotation of opening movements can take place through two different axes because of the flexibility of the instrument.

**The Pankey Mann Articulator (1955) (Figure 1b)**

The Pankey Mann articulator was developed in 1955 by Lindsey D. Pankey of Coral Gables and Arvin W. Mann, Lauderdale. It is manufactured by the J. F. Jelenko Company of New Rochelle, New York (Source: Private correspondence with the J. F. Jelenko Company). The Pankey Mann articulator consists of a base that holds a platform for the mandibular cast and a vertical post containing two movable assemblies. The first assembly is made up of a horizontal rod that supports the facebow frame and also has centers of rotation for measuring and cutting calipers. A second movable assembly holds the mounted maxillary cast. By using the Pankey Mann facebow to mount the mandibular cast, and cutting dividers to establish an occlusal plane in the mandibular teeth based on the spherical theory, the entire occlusal plane is engineered before tooth preparation is initiated. Mandibular restorations are completed first and cemented to place. The maxillary teeth are then prepared and the restorations are fabricated to the established mandibular occlusal patterns with the functionally generated path technique.

**The Stuart Articulator /Gnathoscope/TMJ Instrument (1955-1956) (Figure 1c)**

The Stuart articulator was developed by Charles E. Stuart in 1955-1956 and manufactured by the E. C. Bowen Engineering Company of La Crescenta, California. It is fully adjustable articulator. The articulator settings were programmed by using pantographic tracings from the patients. Bennett guides can be adjusted and customized. Numerous plastic condylar inserts are available and they can be customized by grinding if necessary.

**Dentograph By Kile (1958)**

Designed by KILE in 1958 was primarily used for complete denture construction. The vertical dimension

of occlusion is established by use of carborandum and plaster occlusal rims developed in a generated path by the Patterson method.

**Dentatus ARL Articulator (1958)(Figure 1d)**

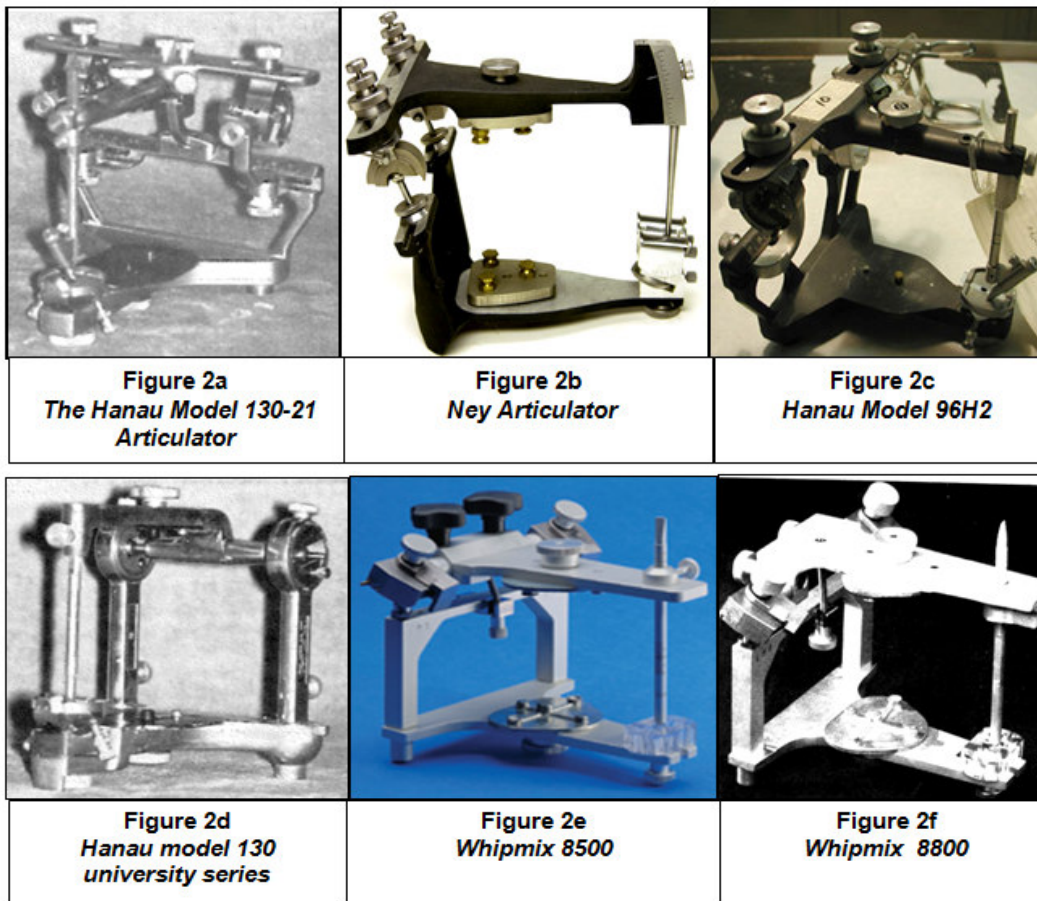
The Dentatus ARL articulator was first manufactured by A. B. Dentatus of Stockholm Sweden, in 1958. It is a refinement of the ARH model, which came out in 1944. The Dentatus ARL articulator is a semiadjustable articulator that is a shaft type of instrument with a straight condylar path and a fixed intercondylar distance. In mechanical principle and design it is similar to the Hanau H2. An adjustable positioning mechanism on the upper member allows the use of a block that standardizes the upper member to the lower member. This allows the transfer of casts from one articulator to another articulator while the same relationship is maintained.

**The Improved New Simplex articulator (1962)(Figure 1e)**

The Improved New Simplex Articulator was distributed by the Dentists Supply Company of New York in 1960. This is an updated version of the Gysi Simplex articulator. The Improved New Simplex articulator uses average movements. The condylar inclination is 30 degrees, with a Bennett movement of 7.5 degrees. The incisal guide table adjusts from 0 to 30 degrees to accommodate various amounts of vertical overlap of the teeth to suit each patient. It has model locking pins to secure the maxillary and mandibular casts in place. A mounting jig, which doubles as an occlusal plane table, is used for arbitrarily mounting the maxillary cast. As an alternate mounting technique, the Simplex plane orientation jig positions the mandibular cast first and can be used for positioning the Gothic arch (needlepoint) tracing table.

**Verticulator (1962)(Figure 1f)**

The Verticulator was developed by William Windish for the J. F. Jelenko Company, which has manufactured it since 1960. (Source: Private correspondence with the J.F. Jelenko Co, New Rochelle, N. Y.) The Verticulator consists of two rigid members that separate and close only linearly in the vertical dimension. It has a positive stop and locks in its closed position. The Verticulator was developed to be used with the functionally generated path technique and Di-Lok quadrant trays. Another model introduced in that will accept full arch casts.



**The Hanau Model 130-21 Articulator (1962)(Figure 2a)**

The Hanau University Series or Model 130-21 articulator was designed and introduced in 1963. The Hanau Model 130-21 articulator is one of a series (University series) of 24 models that vary from a basic equivalent model similar to the Hanau Model H to the more sophisticated Model 130-21. This instrument has the condylar element in the upper member and is a split axis instrument. It has a centric locking device and a mechanism to keep upper and lower members together. It is adjustable to varying intercondylar distances. The condylar paths and Bennett guide paths are straight. The Bennett guide paths that are located near the midline do not allow for an immediate side shift. It will accept all positional records but cannot duplicate pantographic tracings. The incisal guide pin is designed to compensate for changes in the vertical dimension. It is self tripping in an inverted position.

**Ney Articulator (1962)(Figure 2b)**

The Ney articulator was designed by Anthony J. De Pietro of Philadelphia about 1962 and was manufactured by the J. M. Ney Company of Bloomfield, Conn. The Ney articulator is an arcon instrument with no locking device between the upper and lower members for centric position. The condylar elements can be set to varying intercondylar distances. These elements contain metal interchangeable condylar paths, and the elements are adjustable in all three planes to accept all positional records. When the metal condylar elements do not follow or duplicate the pantographic tracings a more precise duplication is possible with custom ground plastic inserts. To facilitate mounting of the mandibular cast the Ney articulator has a self tripping feature in its

inverted position. The maxillary mounting plate has a built in split cast device. A plastic incisal guide table can be used, or a metal incisal guide table that has a provision for making a region of freedom in centric position. The wings of the metal incisal guide table have parabolic surfaces.

**Hanau Model H2 Series (1958-1963)**

The Hanau Model H<sub>2</sub> series were developed in 1958. There are 6 models in H<sub>2</sub> series

- Hanau model 96 H<sub>2</sub>
- Hanau model H<sub>2</sub>-O with orbital indicator attachment.
- Model H<sub>2</sub>-X with extendable condylar shafts.
- Model H<sub>2</sub> PR with calibrated adjustments to protrude or retrude the condyles upto 3mm.
- Model H<sub>2</sub> – XPR (combination of above models).

**Hanau Model 96H<sub>2</sub>(Figure 2c)**

The principal feature of the Hanau Model 96H<sub>2</sub> articulators was an increased distance between the upper and lower members from 95 mm to approximately 110mm. In addition, the orbital indicator was added to the upper member. It remained a semiadjustable articulator. This articulator was deemphasized in 1963, when the University series was introduced.

**Hanau model 130 university series (1963) (Figure 2d)**

There are four models currently being produced.(130-21,22,28,30)

**130-21 model**

It is an arcon articulator intended for occlusal reconstruction. It has intercondylar width adjustment from 94 to 150mm. A split vertical and lateral compound axis permit adjustments from -30 to +30 degrees in both

planes .The lateral condylar angle is adjustable from 0 to 40 degrees .The upper member may be separated from the lower member by loosening a retention lock.

**130-22 model**

It is a non arcon articulator used primarily for the restoration of natural teeth. It has variable intercondylar width settings of 94 to 150mm. The upper and lower members can be separated.

**130-28 model**

It is an arcon check bite articulator. It is suggested for standard fixed and removable partial Prosthodontic situations. It has an intercondylar width adjustment capability of 94 to 150mm, condylar inclination adjustments of 0 to 60 degrees and lateral adjustment of 0 to 40 degrees.

**130-30 model**

It is the same as 130-28 with the addition of a special retrusive progressive condylar adjustment.

**Whipmix Articulators-Model 8300, 8340, 8800, 8500, 9000, 9800 (1964)**

The WhipMix articulator was developed by Charles E. Stuart in 1964 and manufactured by the WhipMix Corp. of Louisville, Ky.The WhipMix articulator is a simplified version of Stuart's fully adjustable articulator. It was designed for complete dentures, and was intended to be useful as a diagnostic instrument and as a teaching aid. This is a semi adjustable arcon articulator that has three intercondylar adjustments: small, medium, and large. These are selected by means of the accompanying Quick Mount facebow that uses the external auditory meatus as a posterior landmark. This facebow has a nasion anterior guide that establishes an anterior point of reference for maxillary cast positioning. The condylar element of the Whipmix articulator is adjustable about the vertical and horizontal axis but not the sagittal axis.

It therefore cannot be set to all positional records. The condylar and Bennett guide paths are straight. There is no provision for timing in the Bennett movement. There is no centric position locking device, and the upper and lower members cannot be attached mechanically. The articulator is stable in an inverted position and is constructed of anodized aluminum. The Whipmix Quick Mount Facebow and Articulators permit the user to quickly and easily mount casts. The simplicity and speed with which the necessary registrations are obtained and transferred has led it to wide acceptance. Denar, Hanau, and Panadent have produced versions using many of the same principles.Several models of Whipmix articulators that vary slightly in dimensions and capability are available.

**Model 8500 (Figure 2e)**

The condylar elements on the lower frame are adjustable to three positions. The narrowest distance is 96 mm, the intermediate distance is 110 mm, and the widest distance is 124 mm. The condylar guides in the upper frame are aligned with the condylar elements of the lower frame by either removing or adding the appropriate number of spacers on the shaft of the condylar guides. The condylar guides can be adjusted for a 0° to 70° horizontal condylar inclination. The medial walls are adjustable from 0° to 45° to provide a progressive side shift. The posterior walls are straight. The standard articulator includes a flat plastic incisal guide table.

**Model 8800 (Figure 2f)**

Articulator provides an additional ½ inch space to mount the maxillary cast. This is more suitable in situations with extremely steep plane of occlusion or when osseous defect exists in the maxilla. Model 9800 combines the upper frame of model 8800 and with the lower frame of model 9000 to provide the greatest distance between the upper and lower frames.

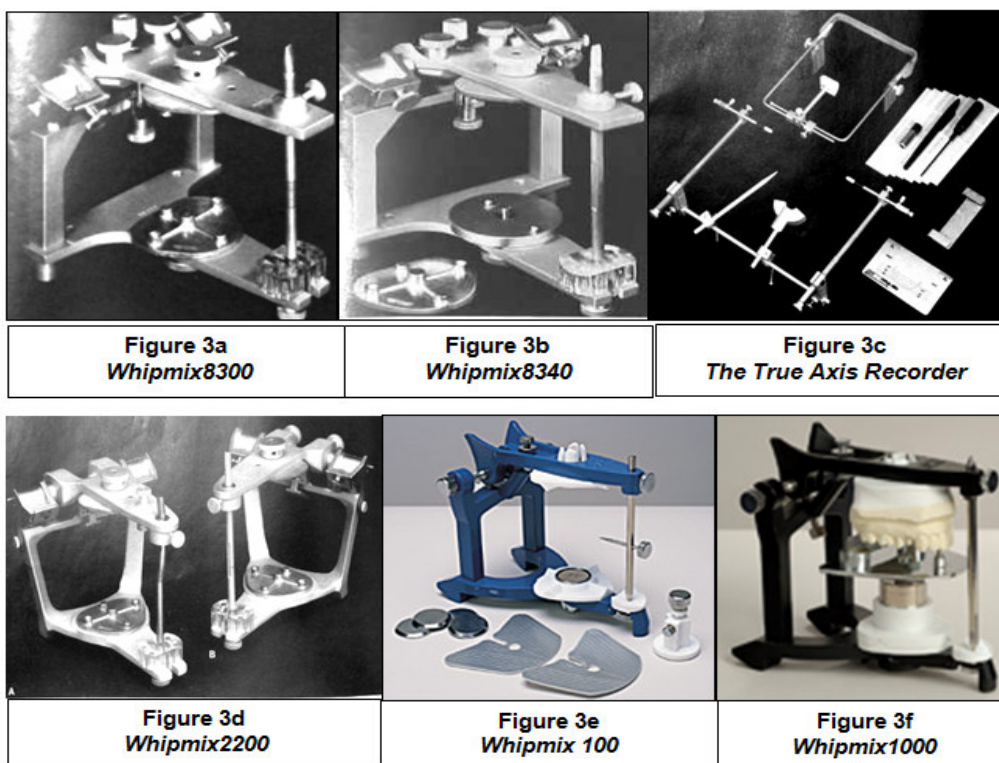


Figure 3a  
Whipmix8300

Figure 3b  
Whipmix8340

Figure 3c  
The True Axis Recorder

Figure 3d  
Whipmix2200

Figure 3e  
Whipmix 100

Figure 3f  
Whipmix1000

**Model 8300 (Figure 3a)**

Articulator reflects the work of Lundeen, Wirth, Lee, and others. The condylar guides have 3/4th inch curved superior walls and a medial wall immediate side shift adjustment from 0 to 4 mm with a progressive angle of 7½ degree. It has the condylar locking screws, a centering guide pin, and the condylar elements are fixed at 110 mm. Although positional records or average values can be used to program the articulator, the Quick Set Recorder or the True Axis Recorder are available to more accurately record the protrusive and mediotrusive condylar path and to measure the amount of side shift.

**Model 9000**

Is similar to model 8500 except that the lower frame is half inch taller to provide more space for mounting the mandibular cast. Some dentist prefers this for complete dentures.

**Model 9800**

It combines the upper frame of model 8800 with the lower frame of model 9000 to provide the greatest distance between the upper and lower frames. All the above models can be ordered with condylar locking screws, which can be positioned against the condylar elements to permit hinge action only. This feature is beneficial during mounting procedures. Models with this feature are designated as 8500A, 8800A, 9000A and 9800A.

**Model 8340 (Figure 3b)**

Model 8300 is modified so that casts are interchangeable between articulators. During manufacturing each articulator has a special mounting plate table precisely attached to the lower frame using a special fixture called "accumount". The relationship between the upper and lower frames is then individually checked to verify precise alignment. This assures that casts can be interchanged between any models 8340 articulator without loss of accuracy such a feature has many advantages. The True Axis Recorder also has the potential to record the mandibular hinge axis, as does the Quick Analyzer (Panadent), Mini Recorder (Denar), and Mandibular Movement Recorder (TMJ).(Figure 3c)

**Model DB 2000 and DB 2200 (Figure 3d)**

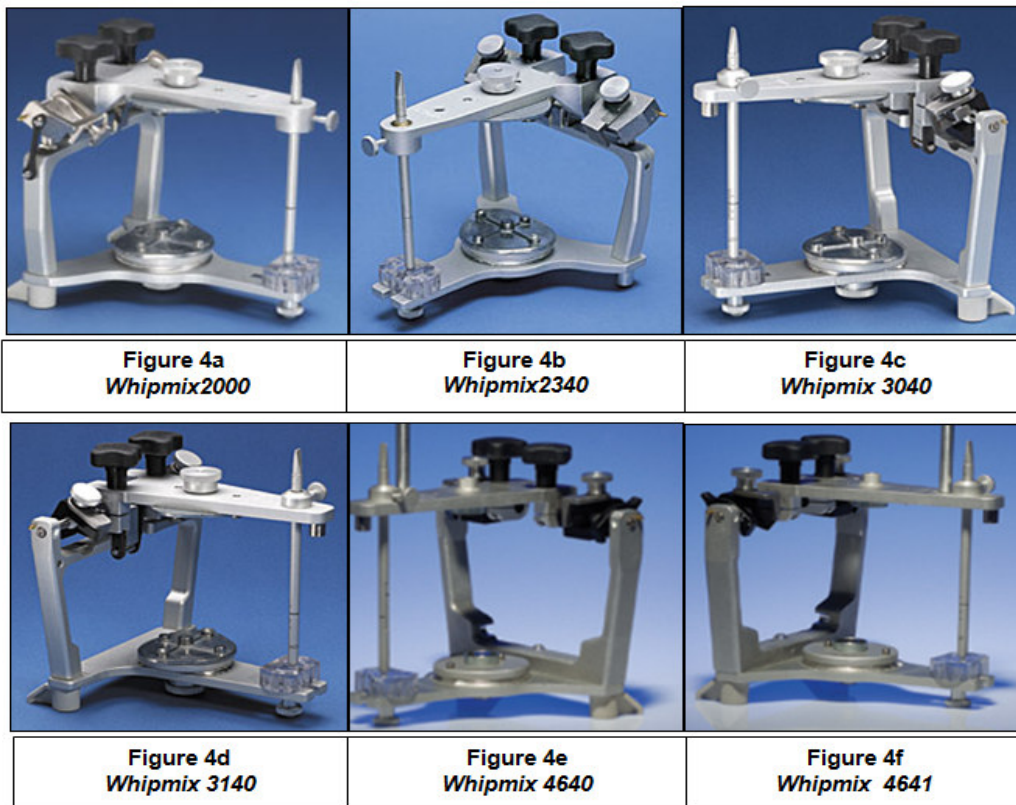
These are latest articulators. There is also an interchangeable 2240 model. All three instruments feature an entirely new ergonomic upper and lower frame design. The posterior viewing and access space has been increased. The additional interframe distance has been increased to 114 mm (4 ½ inches) to provide more space for bulky casts. The models 2200 and 2240 are identical with the exception that the 2240 features the Accumount System. The model 2000 articulator is the same as the model 2200 except that it features a modification of the medial guide wall of the condylar assembly. The medial wall is curved at its end to provide for a curvilinear movement of the orbiting condylar path. Shims of 1mm and 2mm thickness are provided. The 1mm shim, when in place, allows 1 mm of curvilinear side shift in the first millimeter of advancement. The 2mm shim allows for 2 mm of curvilinear side shift in the first 2 mm of advancement. Without the shims, the mechanical features of the condylar assembly are identical to the 2200 and 8300 series.

**Model 100 (Figure 3e)**

This Simple Articulator features an easy to use mounting system, Stable tripodization of upper frame when inverted for lower cast mounting corrosion resistant parts with indexed magnetic mounting plates and reusable metal mounting disks. The Condylar inclination of 20 degrees with Incisal Guide Table lateral inclination of 15 degrees. It has smooth lateral and protrusive movements With Ample interframe distance of 75 mm

**Model 1000 (Figure 3f)**

The Whipmix Model 1000 – Occlusal Analyzer Articulator is easy to use, durable and designed for complex full mouth restorative cases. Stable tripodization of upper frame when inverted for lower cast mounting. Its parts are Corrosion resistant. A retractable anterior leg for optimum tabletop viewing, model is stabilized with the Magnetic Incisive Papilla Pin. It has lightweight aluminum frame. Retaining ring on incisal guide pin to accurately maintain zero position with a posterior stop which allows the user to remove the incisal guide pin. A locking screw to prevent the upper member from moving in a protrusive or lateral direction. Metal Disks can be easily placed on the Indexed Mounting Plate. Ample interframe distance of 90 mm.



**Model 2000 (Figure 4a)**

It has adjustable condylar inclination with fixed intercondylar distance of 110 mm. It has Immediate side shift.

**Model 2340 (Figure 4b)**

The Model 2340 Articulator combines the same condylar guidance of the Model 8500 articulator with the innovative frame design of the Model 2240 articulator. Interframe distance of 4-3/16 makes the Model 2340 an excellent instrument for orthodontists and oral surgeons. It has adjustable condylar inclination with fixed intercondylar distance of 110 mm. It has Progressive side shift.

**Model 3040 (Figure 4c)**

Tracking fossae which allow upper and lower frames to remain together during excursive movements. It has wide posterior access which gives enhanced visibility and lingual access with generous interframe distance for bulky casts and die systems. Accumount System of interchangeability which allows accurate interchanging of casts between articulators. Condyle release mechanisms to permit easy separation of upper and lower frames, if desired

**Model 3140 (Figure 4d)**

The model 3140 is identical to the model 3040 articulator, but offers a different type of condylar guidance. Each condylar guide assembly has the lower wall reduced which allows the articulator to function like an open fossa articulator during excursive movements and a closed tracking articulator during simple hinge movement.

**Model 4640 (Figure 4e)**

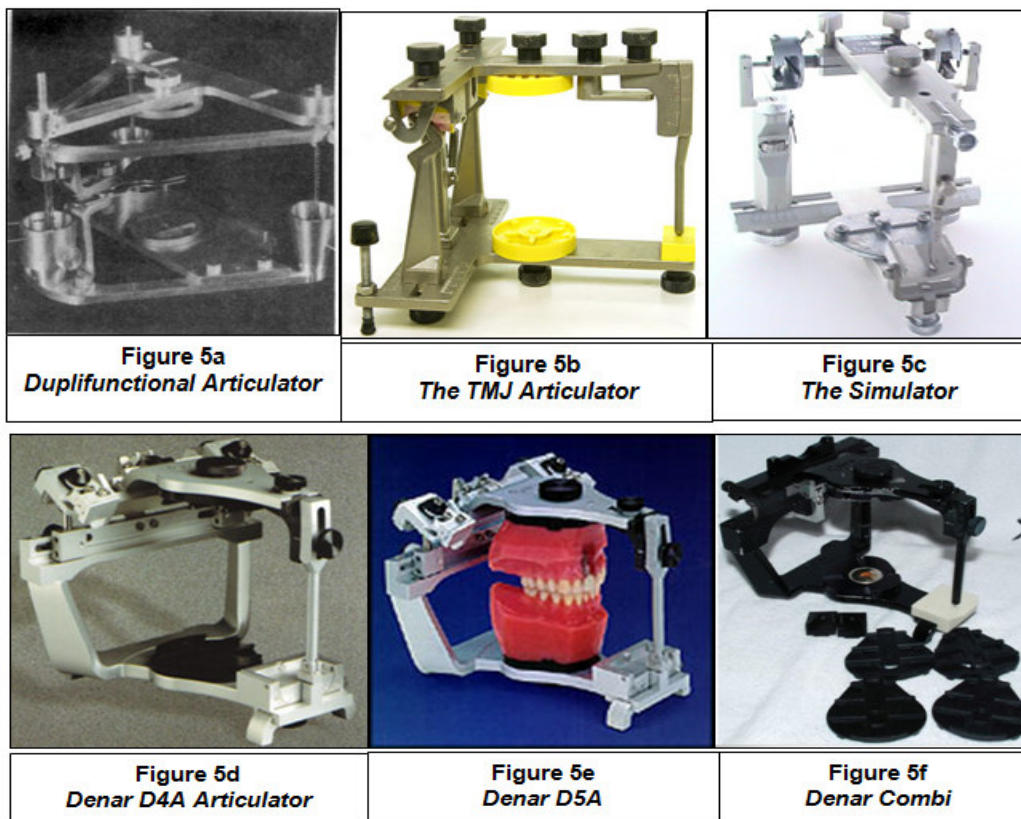
Has tracking fossae which allow upper and lower frames to remain together during excursive movements. The Condylar elements provides silky smooth condylar movements. Fully open access from the lingual position for easy access during denture setup

**Model 4641 (Figure 4f)**

The Model 4641 is identical to the Model 4640 Articulator, but offers a modified type of condylar guidance.

**The Quick Mount facebow (Whipmix)**

Permits a convenient, quick, and surprisingly accurate method of securing the average axis location. It employs specially designed ear plugs that are placed in the external auditory meatus of the ears. The anterior support is attained by positioning a curved plastic block into the deepest part of the nasion. The plane of reference is automatically created 25 mm below the nasion and through the center of the left and right external auditory canals. This plane approximates very closely the axis orbital plane. All the articulator models have pins on the outer flanges of the condylar guides. Corresponding holes on the medial side of the ear pieces of the facebow record to the articulator. The pins on the articulator are related to the articulator's axis in the same way the patient's external auditory canals relate to the mandibular axis when the guides are set at 30° (a different setting is used on the 8300 model). The axis of the articulator is 6 mm anterior to and 2 mm below the pins supporting the facebow. Hinge axis transfer fixtures are available to use a kinematic bow. The model 8300, 2000, and 2200 series were designed to set the condylar guidances either by anatomic averages or from values obtained from the Quick Set Recorder or True Axis Recorder.



#### ***Duplifunctional Articulator (1965) (Figure 5a)***

Designed by Irish and presented in 1965. Primarily for use in complete denture construction. It has two main purposes, first it records each patient mandibular movements and then without further convertive procedures serves a 3D tripod type of articulator upon which dentures may be constructed and then occlusion balanced.

#### ***The TMJ Articulator (1965) (Figure 5b)***

The TMJ approach to dental articulation was designed by Kenneth Swanson in 1965. To operate this articulator, one needs a custom analog fossa formed from intraoral stereographic tracings. A series of five premade fossa analogs are also available. The TMJ articulator system has the capabilities to meet the instrumentation needs for all types of prosthodontic procedures.

#### ***The Simulator (1968) (Figure 5c)***

The Simulator is manufactured by the J. Aderer Company of Long Island City, N. Y. and was developed by Ernest R. Granger in about 1968. The Simulator evolved from the Granger Gnatholator. It is a fully adjustable articulator that can be set from pantographic tracings, positional records, and other tracings. There are curved condylar paths, but the unique feature of the articulator is a condylar path that rotates inwardly, a broken axis, and a mechanical timing element that combine to reproduce mechanically the Bennett movement and Fischer's angle. The Simulator has condylar path locks that can be released so that the upper member can be separated from the lower member. The incisal guide pin is curved. The articulator can be inverted and the mandibular cast can be mounted without a remount stand.

#### ***Niles Guichet Denar D4A and D5A Articulators (1968)***

##### ***Denar D4A Articulator (Figure 5d)***

The Denar D4A articulator was developed by Niles Guichet and manufactured by the Denar Corporation of Anaheim, California in 1968. DENAR means: Dentistry Applied Research. The Denar D4A articulator is programmed from tracings made with a pneumatically controlled pantograph that was developed and introduced by the same company. The D4A articulator is a fully adjustable instrument that uses interchangeable condylar guidances that can be adjusted. It has a definite centric lock and has accommodations to hold the casts in an open position. The curved incisal pin assembly can rest on a mechanical or plastic incisal guide table.

##### ***Denar D5A (Figure 5e)***

The current model is the D5A, which is a refinement of the original model. Adjustments to the guidance surfaces are possible in all three planes of space. The side shift (Bennett Movement) adjustment is in the medial wall and has provisions for both immediate and progressive settings. A precurrent (angular) insert is available for the medial wall. There are also nylon or acrylic resin inserts available for the superior wall. An adjustable metal incisal table and a custom incisal platform are available for the D5A. The incisal platform can be used to hold self curing acrylic resin in adjusting the horizontal and vertical overlaps of the anterior teeth. Anatomic landmarks are used with many articulators and techniques to establish the posterior and anterior reference points. The Denar Reference Plane Locator and Marker is useful for this purpose. With it the anatomic points can be relocated accurately. Many clinicians feel that the Denar clutch former and pantograph greatly simplify the recording system. A digital recorder (Pantronic) is also currently available.



The condylar guidance settings are automatically determined, thus saving the time and effort necessary to manually transfer the recording and program the articulator.

#### **Denar Combi (Figure 5f)**

The Denar Combi, an anatomical articulator system, is designed for ease of use needed in today's cost sensitive dental office. This versatile system is ideal for cases requiring mounted casts whether they are restorative, orthodontic or surgical. It has Combination system with interchangeable condylar inserts for use as a non-adjustable, semi-adjustable or fully adjustable articulator. Determinant Index System allows the articulator to be used in a semiadjustable model due to a selection of condylar angles. The condylar inserts for non adjustable function have a 20 degree protrusive angle; 15 degree progressive side shift; rear wall inclines posteriorly 20 degrees and flat top wall, and for fully adjustable function have a 0 degrees protrusive angle. Part IV of this article, to be published in a later

issue of THE JOURNAL and, will be devoted to a discussion of articulators introduced from 1971-1990 and currently in use.

## **CONCLUSION**

Numerous articulators are available for the fabrication of dental restorations. Some are very simple in design with limited movements, while others are very complex with numerous attachments and adjustments. There is a considerable controversy as to which articulator is 'best' for a particular dental procedure. The success or failure of the final restoration is more dependent on the operator of the Articulator than on the Articulator itself. In other words, a semi adjustable articulator in the hands of a knowledgeable clinician may be of greater assistance in treatment than may a fully adjustable articulator in the hands of an inexperienced operator.

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