An Analysis of the Most Important Diagnostic Methods Used In Orthodontia

(Continued from Vol. I, No. 3.)

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An Analysis of Simon's System

In the first installment of this paper the Angle system was lightly treated and only the important points were discussed. Since the work of Angle has been severely criticized on several occasions, it is not necessary to enter into greater detail regarding his system, for in that which follows the importance of his basic principles will stand out in relief. It must be mentioned, however, that Angle was unfairly criticized, especially by Simon, and here attention is called to the unjust means of criticism which is in vogue amongst the research workers of orthodontic diagnosis. It is to be made clear, however, that this statement is not recorded in the form of a reproach, but rather in the form of enlightenment, so that in the future we may avoid misunderstandings and be able to more easily evaluate newly proposed diagnostic methods.

To be more specific, the above statement refers to the method of comparison, where an older diagnostic system is proved to be incorrect by comparing it with the newly proposed method, using the latter as a standard. It is needless to say that such comparisons are valueless so far as the proving of the newer system is concerned, for it involves false logic. A new system must be taken up on its merits, a mere comparison with an older system from which it shows a deviation does not necessarily prove that the new system is correct or that the old one is wrong. The deviation in the final results shows only that the two systems do not agree, and the possibilities that either one of the systems is right or that both are wrong, still remain, no matter how often such comparisons are repeated. It is to be noted that even if one of the systems is right, there is nothing in the method of comparison that indicates which one of the two systems thus compared

is right, except the enthusiasm of advocates. And here it is expressly stated that, since comparison should only be made with a standard (or absolute) method, which at the present time we do not possess in orthodontia, the method of comparison can not be used to disprove the merits of an old or a newly proposed diagnostic system.

This error is constantly made in our work and Simon in his book on a 'Systematic Diagnosis of Dental Anomalies' used his own method as a standard to disprove the contentions of Angle. On the other hand Stanton read a paper before the American Society of Orthodontists in which the work of Simon is discredited by attracting attention to the deviations in the results obtained by diagnosing several cases by the Stanton and Simon Methods. In this case the Stanton method was used as a standard. Such a comparison is not justifiable for the very same drawings used by Stanton in his article* may be used by his opponent to disprove Stanton's contentions, for it all depends upon the method selected as a standard. At present neither of the methods in question may be used in that capacity, and each one must be accepted or rejected upon its merits.

The author is satisfied that these errors are made in all sincerity to advance orthodontic science, but in the heat of enthusiasm the above limitations of such criticisms are overlooked and the efforts of other men are unwarrantedly minimized. When passing judgment upon the works of others we must bear in mind that there must be some element of truth in every system proposed for general use, and we can not dismiss an extensive study without further inquiry, regardless of how wrong it may appear.

Simon has many advocates, but there are equally as many, or perhaps more, who can not subscribe to his teachings. It is a radical departure from the Angle method, but in an extended fundamental conception only. The meaning of his work is not understood, and perhaps Simon himself is responsible for this misunderstanding. His glaring criticisms of Angle conveyed the thought that, in the light of his system, the Angle classification has outlived its usefulness, and in his enthusiasm he overlooked the fact that even with his system, although with more information, the Angle system stands just the same as before. The discovery of the 'canine law' does not alter the Angle classification. If the canine law is correct it only places a broader interpretation on Angle's conception, and it may aid orthodontists in deciding on the probable outcome of their cases. The

*A Critique of Simon's Diagnostic Methods, By F. L. Stanton, International Journal of Orthodontia, January, 1928.

canine law implies that in normal cases the maxillary canines are always in a definite relation to selected points on the cranium. It is found that in a number of orthodontic cases applying for treatment, this condition is not satisfied. A further implication is that since the canines show a variation in position from the normal, the permanent first molars must also show the same variations in position. Now, according to Simon, since the first molars are not always in the proper position as it was hypothetically assumed by Angle, the classification must be discarded. This is where Angle is misinterpreted, and in order to clear this point definitely let us quote again from Angle.

"These classes are based on the mesio-distal relations of the teeth, dental arches and jaws, which depend primarily upon the positions mesio-distally assumed by the first permanent molars on their erupting and locking."

It is clear that the classification consists of groupings showing definite deviations from the normal, and it must be particularly noted that it concerns itself with the malrelation of the arches. Not having a more definite point of reference the first molars were chosen. In order to establish normal occlusion this malrelation of the arches or jaws must be corrected whether done by Angle or by Stanton or by Simon. The lower and upper teeth must be brought into normal relationship. Whether the upper arch or jaw is 5 or even 10 mm. displaced from its normal position, theoretically this condition must be entertained. Angle did not know how to determine the position of the upper arch with respect to the cranium, and he assumed the first molars always to be correct. Simon gives us a method by which this can be determined, and, if his work can be proven correct, it is a very simple matter to relate the theoretical change in the position of the jaws as determined by the Angle method, to the information thus obtained, and determine the actual change in jaw relations that must be brought about. Frequently the change thus indicated cannot be accomplished by orthodontic means, but the probable outcome of the case may be decided with greater certainty, or a compromise treatment may be suggested.

Thus it appears that if the work of Simon is correct, it would be of great value in a large number of cases. It involves a great many details, but the only important point to consider at this time is the 'canine law' which will be fully investigated in the succeeding paragraphs.

In presenting his method Simon divides his text into:—

1. A Theoretical Part.

2. A Practical Part.

The theoretical part begins with an introduction dealing with the method of investigation, the purpose of which is to justify the means employed in arriving at his conclusions. Here, it is explained that since the "denture of man is an object positioned in the head cavity" its location with respect to the cranium can only be determined if it is related to a coordinate system of three intersecting planes. For convenience these planes are selected to intersect each other at right angles, thus establishing the most commonly used rectangular system of coordinates. It is expressly stated elsewhere that any other system may be used, but the use of the rectangular system is more advantageous, which must be conceded.

Then an extensive description of the "Three-plane system is entered into, and the three planes are selected as follows."

1. The Median Sagittal Plane.
2. The Frankfort Horizontal Plane.
3. The Orbital Plane (suggested by Simon).

The Median Plane:—It is stated on page 54* that "bilateral symmetry is a most manifest morphological characteristic of the body and especially of the head. Accordingly under normal conditions, the denture displays a very correct and almost mathematically accurate division into congruent right and left halves."

"This division is measurable from the sagittal median plane, which is usually termed the median plane. It is impossible to evade it".

In order to determine the median plane, various points on the head are considered as possible points of reference, which could be used on the living with assurance and accuracy. The basion, nasion, and the nasospinale are the usual points on the median plane that are used in craniometry but, since on the living subject these points are not accessible, only the nasion is retained as a possible point to be used in gnathostatics.

It is evident that a plane cannot be determined by one point. For this reason other points on the sagittal plane are investigated and, after a seemingly logical study, the median raphe is accepted. The reason for its selection is, "that although it lies in the middle of an area which is often affected by anomalies, it can only be influenced by intrauterine forces; secondary

*A Systematic Diagnosis of Dental Anomalies, P. W. Simon.

anomalies, or extrauterine acquisitions, do not produce any effect on the position of the median raphe. Furthermore not all the intrauterine forces which could displace the upper jaw would cause the raphe to deviate. Only transverse forces, from right to left or vice versa, would be efficacious; not the sagittal or vertical stresses. For this reason the sum of its deviation possibilities is greatly reduced." It is admitted that there are many cases on record with so called "deviations of the upper median line, namely, lateral deviations of the incisors, but the main portion of the raphe is never involved."

Simon especially impresses upon his readers that since all points on the head are subject to physiological asymmetries, and since we are not able to accurately determine the natural median plane on the living, the median plane used in gnathostatics should be an artificial construction from the raphe, discounting the fact that it may not necessarily lie in the median plane of the skull. Thus from the two possible measuring points only one is retained, namely the raphe, and the nasion is relinquished.

It is interesting to note the line of thought which dominates Simon's presentation. Now let us see how his conclusions may be evaluated. Granting that his observations and studies are correct, into which we need not inquire at this time, the accuracy of this particular selection of the raphe and the construction of the median plane must be questioned. It is important to consider in detail his preference because this particular point has a far reaching influence on the practical results obtained. Since the problem was placed on a mathematical basis, this imposition of mathematical conditions must not be made without reservations or just for convenience. Therefore it is not permissible to relinquish the nasion as a point of reference in order to satisfy a hypothetical geometric condition. It must be noted here that during the discussion, the sagittal plane is termed by Simon as a "more or less bent surface."* It is especially impressed that the various reference points may or may not be accurately situated on the plane of sagittal symmetry. This is evidently done for convenience, in order to satisfy the hypothetical condition that the sagittal plane must be perpendicular to the Frankfort horizontal plane or to the Ear-Eye plane, as used in gnathostatics. Theoretically this condition may exist, but as far as practical results are concerned, the basic conception must be criticized. As it will be shown later, the Ear-Eye plane is subject to lateral inclination in either direction. If we attempt to construct a median plane through the raphe, perpendicular

*Page 56. A Systematic Diagnosis of Dental Anomalies, P. W. Simon.

to the Ear-Eye plane, it is clear that only in exceptionally rare cases would this artificially constructed plane pass through the nasion. The description in the text leads us to believe that this is due to physiologic asymmetry, but here it is emphatically stated that this is a gross misunderstanding. If it is due to physiologic asymmetry, it must be conceded that even in relation to the artificially constructed median plane, the various points which theoretically should be on the sagittal plane, must be *evenly distributed on either side.* But it is to be observed that in gnathostatics the median plane will pass completely to *one* side of all those points. It is recommended that this be carefully studied by means of the Simon apparatus, and determined in how many cases the artificially constructed median plane really does pass through the average line drawn through the various points on the sagittal plane. This is an extremely important condition to determine, for in this method we resort to the process of projection from a plane to a distant point and the precision of the method must be increased, in direct proportion to the distance through which the point is projected. In the Angle system the diagnosis is made in the plane of occlusion, and an error of 1 or 2 millimeters remains just that amount, while in the Simon system the diagnosis is made from a distant plane and an error of 1 or 2 millimeters will be greatly magnified when projected upon the occlusal plane. This is a point that touches upon the merits of the Simon system, and we must never lose sight of the fact that an ocular examination may often be more accurate than an apparently accurate scientific method. The possible errors in manipulation should be given due consideration and their effect on the final results evaluated. If the median plane should be an artificial construction, as it is contended, then the construction must approximate the true conditions, for the final deductions are in reference to the true or average median plane.

On page 60 of Simon's book we find the following statement:—

"It may be remarked, parenthetically, that perhaps some critic, whose opinion is 'free for the asking' would like to know how he might take shelter in the existing inconsistency of the measure points; and this has occasionally been tried. But there is no sense and there can not be any in a malicious effort to glorify a certain uncertainty. We suggest that such critics make a real attempt to improve the matter. But since they cannot succeed, they ought to realize that a continued uncertainty is wholly unjustified, in view of the practical consequences."

Just what is meant by this paragraph the author is at loss to understand. It appears like an effort to intimidate critics, by stating if they can

not do better they have no right to criticize. This may be true in regard to questions which do not influence the well being of our patients in general, but when it is applied to theories which may inflict injuries to a number of individuals who come to us for treatment, it is not only permissible, but becomes the duty of one who sees apparent errors in the new conception, to inform the profession and warn orthodontists against the acceptance of such teachings. It will be shown later that such injuries can be inflicted by adhering too closely to Simon's teachings.

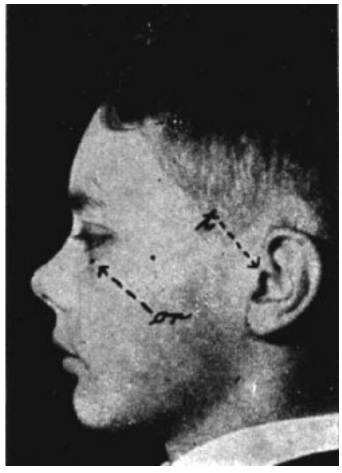

Figure 1 (Simon)*

Criticism may be constructive or destructive. Destructive criticism is not permissible, but when a theory indicates dangerous procedures, it must be severely criticized, even if no other theory can be recommended to take its place.

The inaccuracy of an artificially constructed median plane will be more apparent when the inaccuracy of the other dependent factors is established.

The Frankfort Horizontal Plane: This plane, in gnathostatics, is determined by the eye points and the ear points. The eye points represent the lowest points on the inferior margin of the orbits. The ear points are located at the intersection of the helix and the margin of the tragus of the ear. Fig. 1.

*Figs. 1 to 13 inclusive are reproduced from plates furnished through the courtesy and co-operation of The Stratford Co., Boston publishers of "A Systematic Diagnosis of Dental Anomalies" by P. W. Simon and with permission from Dr. Ralph Waldron.

Simon states* that the right and left eye-ear lines rarely lie on the same plane. Viewed from the side they usually intersect each other at an angle which, as Martin says, may amount to four degrees. Simon and Martin are of the opinion that this is so negligible that it is of no practical consequence.

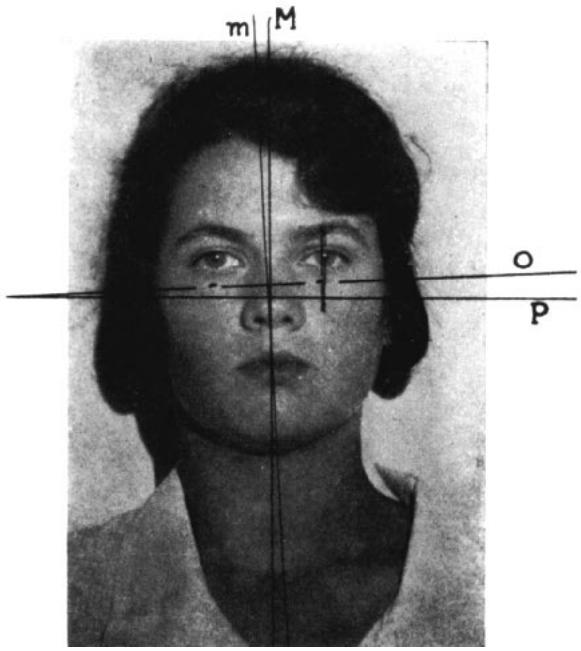

Figure 2 (Simon)

On page 159 (Simon) we find that "the position of the orbitale may be determined within 1 or 2 mm."

The ear-eye plane is the gnathostatics plane of reference. The other planes are constructed perpendicularly to it. If there is no asymmetry in the location of the measure points, then by inference, according to Simon, the position of this plane can be determined within 1 or 2 mm, provided of course, that the ear points are also correct. On the other hand, we must assume that the same degree of precision applies to the determination of the ear points. Since the error in their determination may be either negative or positive, we conclude that the possible tilt of this plane as determined, with respect to its actual position, may be equivalent to +4 mm., which

*A Systematic Diagnosis of Dental Anomalies, P. W. Simon, page 63.

represents 8 millimeters of range on one end so far as the angular variation is concerned. If an asymmetry in the location of the measure points exists, this range may easily be doubled. That such asymmetries do occur is clearly shown by Simon's own illustration, Fig. 2, on which the author drew the line "O", joining the orbital points marked by Simon, and "M", the apparent median plane. Line "P" is perpendicular to "M", while line "m"

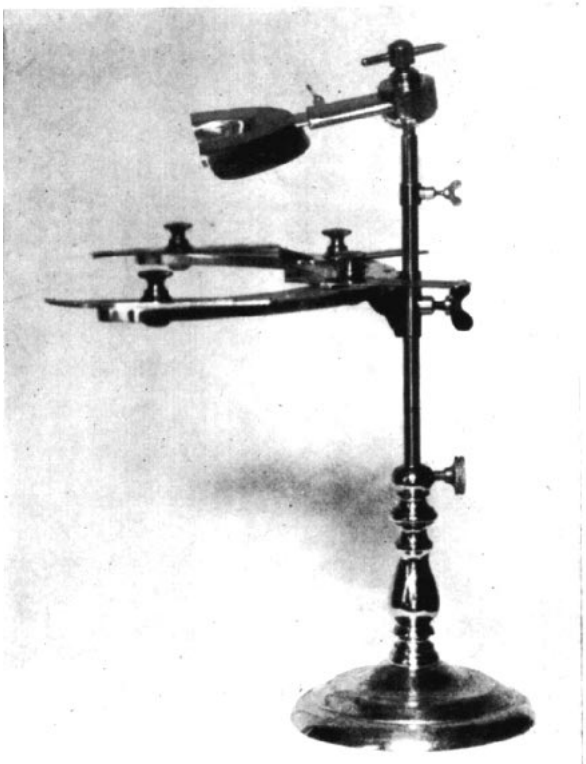

Figure 3 (Simon)

is perpendicular to "O". It is to be noted that line "m" is drawn from about the point from which the constructed median plane is taken.

The Orbital Plane: This is perpendicular to the ear-eye plane, and the median plane. It is determined by this geometric condition and it passes through the point where the line joining the orbitalia intersects the constructed median plane. Hence it is necessary to observe that the position of this plane depends upon the position of the ear-eye plane and conse-

quently even if it is possible to determine the position of the orbital points exactly, any error in the determination of the ear-eye plane will have a corresponding effect on the antero-posterior tilt of the orbital plane. Since it has been shown that even under the best conditions, as regards the symmetrical arrangement of the measure points and also within the limits of Simon's admission of a possible error in the location of these points, the determined position of the ear-eye plane may show a variation from the true position, up to about 8 mm., on one end. Therefore it follows that due to the errors in manipulation alone, the orbital plane must show a corresponding displacement of + or — 2 mm., or a range of 4 mm., in the region of the canines. This is due to the fact that the perpendicular distance between the lines which join the two ear points and the two eye points is approximately twice as long as the distance from an orbital point to the canine region on the same side. Furthermore the position of this plane is subject to other errors in its determination. By construction it is also placed perpendicular to the median plane, which has been shown to present deviations from the true position. Any error in the determination of the median plane will have a corresponding effect in further displacing the orbital plane from its true position. This additional amount of variation may be quite as large as that produced by the deviation of the ear-eye plane.

It must be pointed out that these errors are due only to those factors that are definitely admitted by Simon to be present and the correctness of the canine law has not been questioned so far. The discussion up to this point has been confined to errors in manipulation which, under the influence of personal equation, may easily reach beyond the limits set by Simon's skill and experience. In addition we must add the possible variation in the position of the measure points which, as will be shown, have a much greater influence on the final results than the errors made in locating them. This brings us to a point where the range of possible error is even greater than the width of the canine, and where we are compelled to inquire how much reliance can be placed upon the 'canine law'.

The Practical Part of Simon's Text: If we carefully analyze Simon's practical procedures we will come to the conclusion that the inaccuracy of the system is clearly shown by the attempt to force the existing conditions to conform to a hypothetical relationship, This part of the work consists of denture reproduction in such a manner that the various diagnostic landmarks are definitely indicated. For this purpose the following appliances are required.

1. The Gnathostat.
2. The Orbital Measuring Beam.

3. The Symmetrograph with
4. The Slide Calipers.
5. The Diameter.

The Gnathostat: The gnathostat, Fig. 3, is composed of the following

1. An upper impression tray filled with compound, which is inserted in the mouth and firmly held in place for several minutes.

2. A round, metal rod about 20 cm. long which is adjusted to the handle of the tray through the medium of a ball and socket joint.

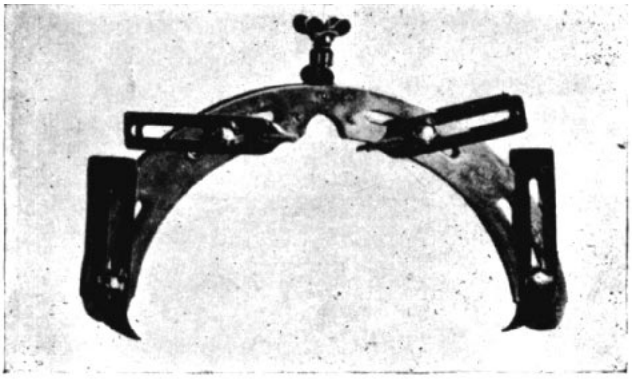

Figure 4 (Simon)

3. A semicircular plane bow, Fig. 4, which is adaptable to the metal rod, and can be fixed securely at any height. This is provided with four pointers that are adjustable in the horizontal plane of its surface, because the bow and the pointers are slotted and provided with set screws. In the brief period during which the impression compound is hardening, this bow is applied and the four pointers are adjusted so that their ends are in contact with the two tragia and the two orbitalia; they are then securely fixed with their set screws. Each of the two anterior (orbital) pointers is provided with a perpendicular ridge on its lower surface, 1 cm. long, the front edge of which forms a right angle with the plane of the orbital pointer and is in accurate confluence with the point.

Two trays are provided (a large and a small one, which are sufficient for our purpose) and their handles are exactly the same size and machined in accordance with an accurate, rectangular pattern. The lower portion of the ball-and-socket joint contains a rectangular, tube-like projection which accurately fits the tray handle and can be firmly fixed with a setscrew. The ball-and-socket joint is also provided with setscrews, so that fixation at any

desirable angle is possible. An adjustable fixation ring is also placed on the perpendicular rod. All of these parts are easily recognized in the illustration. (Simon).

A metal plane or table, with adjustable screw, a heavy metal stand, and finally a three legged, metal table, belong to this equipment. Their use will be described below.

The orbital points should previously be marked with a blue pencil, such as dermatologists use (Faber's "Dermatograph"). For a more definite marking of these points a small piece of black, adhesive paper (about 1.5 to 2 mm.

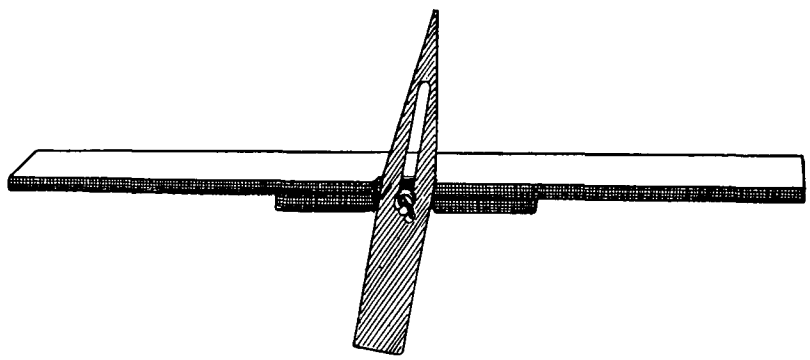

Figure 5 (Simon)

square) is placed on the patients skin. The headrest is adjusted so that the patient's head is in proper balance. The eye-ear plane will then be horizontal. The patient is then requested to look straight ahead; it is usually best to select a definite point on the wall for the patient to look at. The operator then feels for the lower bony margin of the orbit with the blunt point of the blue pencil, using it in the manner of a small burnisher. At the same time he visualizes a perpendicular line drawn downwards from the center of the pupil. At a point where this line intersects the orbital margin a horizontal mark is made with the pencil (from nasal to lateral) and thus are located the orbital points. (Simon)

The previously described impression tray is now filled with the impression compound and applied to the mouth, without any of the attachments. The assistant assumes a position behind the patient's head and holds the impression firmly against the patient's teeth, using two fingers of each hand.

The gnathostat is then adjusted and the tray handle is securely fastened by means of the tube-like projection with the set screw on its side. The

plane-bow can now be placed on the rod of the gnathostat and temporarily fixed at a convenient point, after which the setscrew of the ball and socket joint is released. The upper end of the perpendicular rod is held with the thumb and index finger of the left hand which rests gently upon the patient's forehead. (Simon)

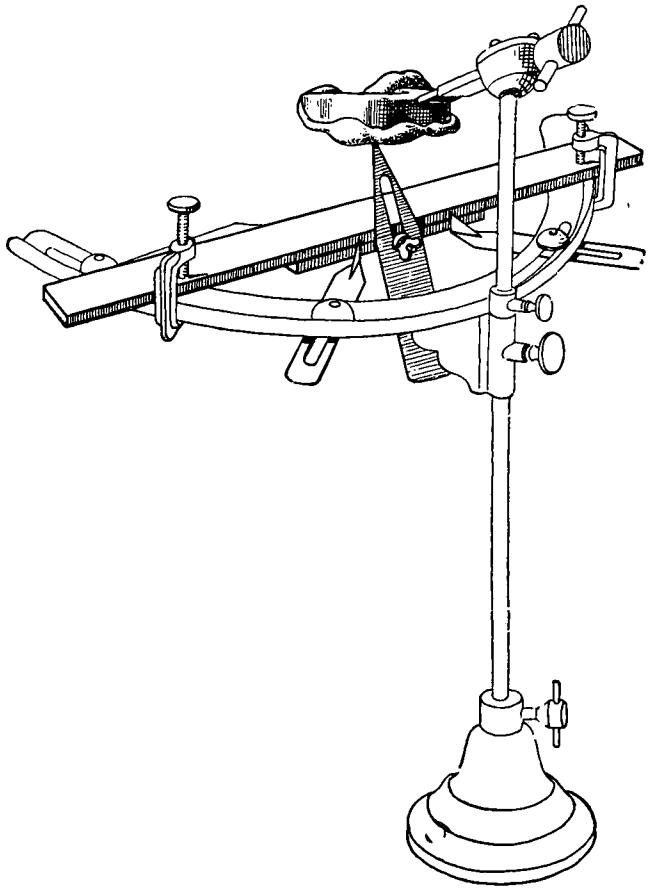

Figure 6 (Simon)

After going through several steps of adjustment, the plane-bow and the four pointers are fixed in such a manner that the two anterior pointers are on the orbital points while the two posterior ones are on the ear points, as accurately as possible.

After the patient is dismissed, the individual variation in distance between the eye-ear plane and the upper jaw is marked on the gnathostat

with the aid of the fixation-ring, which lies between the ball-and-socket joint and the plane-bow. This ring is now brought in contact with the bow and securely fastened with its set screw.

Before the plane-bow is removed from the rod, a very important task remains. The direct projection of the orbital plane on the palatine portion

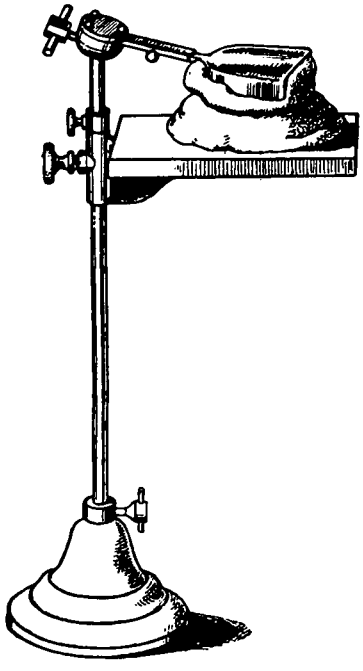

Figure 7 (Simon)

of the impression. For this step the orbital measuring beam is used. (Simon)

The Orbital Measuring Beam: With the aid of this instrument the operator is able to accurately mark the line of intersection of the orbital (frontal) plane on the palatal portion of the impression. It consists of a rectangular finely machined metal beam 20 cm. long, 12 mm. wide and 5 mm. thick. Midway, in one of its square edges, a depression 3 cm. long and 2 mm. deep is accurately machined for the market. This marker contains a slot and an adjustable screw. The marker is moveable, from left to right on the plane, and also up and down, and is filed into the form of an accurate point. This point can only be moved in desirable directions on the plane. Fig. 5. (Simon)

This instrument is used as follows:

After having completed the last step previously described, namely, the execution of the gnathostatic impression of the patient's denture and the fixing of same in the heavy metal stand in inverted manner, the orbital beam is now placed on the plane-bow so that the strip carrying the "orbital marker"

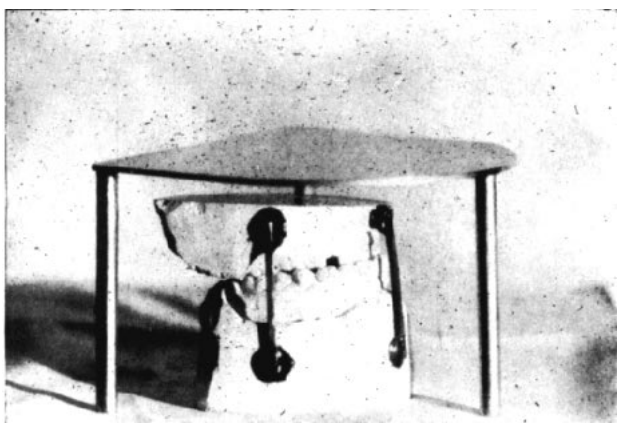

Figure 8 (Simon)

comes in gentle, yet accurate contact with the ridges of the orbital pointers which were previously pressed against the orbitalia on the patient's face. It is best to have the beam placed in such a manner that the marker will be midway between the ribs of the orbital pointers. The beam is then fastened to the bow with two small clamps provided for this purpose. Fig. 6. The 'orbital marker' is now moved upward until its point touches the palatal surface of the impression and then, if movements to the right and left are executed, a fine mark will be scratched into the impression at right angles to the raphe. This mark need not be more than 5 mm. long, but should intersect the raphe. (Simon)

One must comprehend the situation to be as follows: The horizontal plane-bow is identical with the Frankfort (eye-ear) horizontal plane of the patient, the upper impression bears the natural relation to it, and the point of the orbital marker moves in the orbital plane when the line is scratched into the impression. (Simon).

The completion of the casts is executed in the laboratory. The plane-bow having been previously removed, the metal plane-table mentioned above is put in its place. This table is about 10-12 cm. in area and provided with a tube with a setscrew on one of its narrow sides which accurately fits the

perpendicular rod. This table is therefore parallel to the horizontal plane and when brought into contact with the fixation ring, it occupies the same relation to the impression as the natural horizontal plane. The free end of the rod is now reinserted in the base of the stand and securely fixed with the setscrew. Fig. 7. The impression tray is now removed and the impression poured with this plaster, after which it is replaced. A portion of the soft

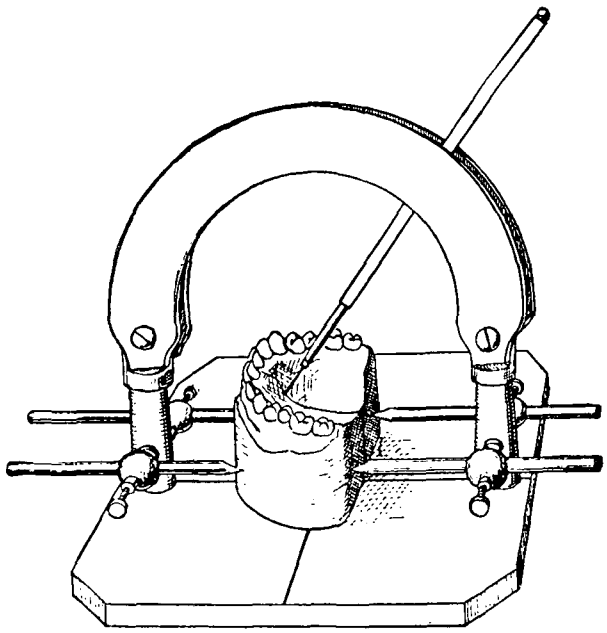

Figure 9 (Simon)

plaster is also placed on the small metal table which is pushed upward into contact with the fixation ring. The two plaster masses then combine to form the base of the cast. While the upper cast is hardening the lower cast is poured in the usual manner. The surface of the lower cast is of no special concern up to this point and after separation from the impression is roughened with the plaster-knife. The lower cast is then placed in correct occlusion with the upper and fixed in position with the aid of two or three matches and some sticky wax.

This pair of casts are now inverted on a glass slab, or other smooth surface, so that the upper is in complete contact with the same. A portion of freshly mixed plaster is placed upon the roughened base of the lower and the three legged table is pressed down upon it. Fig. 8. This procedure pro-

vides a new base for the lower cast which is definitely parallel to the base of the upper and exactly 8 cm. distant from it. (Simon).

The Symmetrograph: The symmetrograph consists of a strong, rectangular, 14 x 16 cm. metal base on which two straight lines are drawn which form a cross. At the ends of the longest of these two lines, perpendicular posts, 4

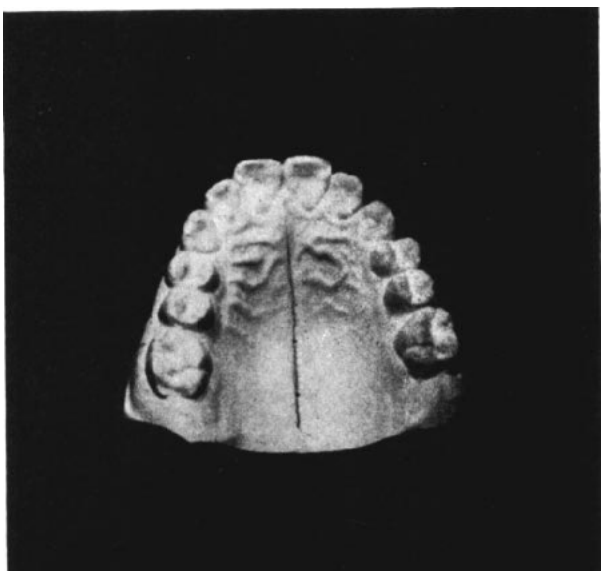

Figure 10 (Simon)

em. long, are attached and these are united with two metal arches, which are parallel to each other, and form a torus, the plane of which is at right angles to the base. Fig 9. In the slot between these two arches which are slightly sprung toward each other, a square, steel marker is inserted and this can be moved in either direction but only in a vertical plane. Near its sharp point this marker is milled into a perfectly round shaft.

Further attachments are provided near the base. These consist of four adjustable rods placed about 1 cm. above the base, with which the plaster cast may be securely fixed in position. The instrument is used for marking the median line on the cast as follows:

The raphe is always visible on a good cast of the upper teeth and palate. With a sharp pencil two marks (about 1.5 to 2 cm. apart) are made on the raphe, and the cast is then placed in the symmetrograph in such a position that the steel pencil will pass through the two marks when moved

back and forth in the slot. The cast is then securely fixed in this position with the four adjustable rods and the median line is scratched on it from base to base, including the labial or gum portions, the palate, and the posterior border. (Simon). Fig. 10.

The next step consists in projecting the orbital plane on the upper cast. The latter is placed on the base of the symmetrograph in such a manner that its median line falls exactly on the cross line marked on the metal base; the

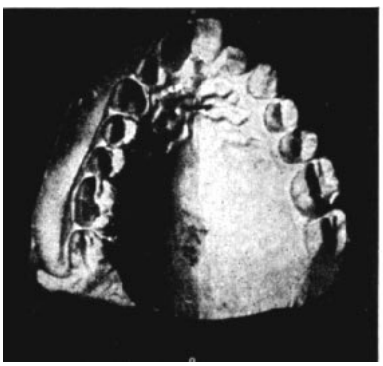

Figure 11 (Simon)

cast is also placed at 90 degrees to its previous position on the symmetrograph, is then moved to the left or right until the point of the steel pencil touches the fine ridge on the palate resulting from the marking with the pointer on the orbital measuring beam. Fig. 11. After the cast is securely fastened, a line is marked around the cast in this position as far as possible. This line lies in the orbital plane of the patient. (Simon). Fig. 12.

At this point we must disagree with Simon, for the last line mentioned does not lie in the orbital plane of the patient, this is a different line, one obtained by construction, and this contention can be shown to be correct by the following considerations.

It is clear that when the orbital measuring beam is used to project the orbital points onto the impression, the pointer of the beam does move in the orbital plane of the patient. The question may be asked, why cannot the whole length of the line of intersection of the orbital plane with the impression be scratched into the impression at this time? The answer to this is found in Simon's statement that in order to allow for physiologic asymmetry of the orbital points in the antero-posterior direction, we use the geometric mean, and apparently this is what is intended. But on further reflec-

tion we will observe that this is more than a correction for physiologic asymmetry. It is a correction for the possible deviation of the raphe median plane, to which our corrected orbital plane is forced to be perpendicular by construction. It is doubtful that the constructed orbital plane and the actual existing orbital plane, which can be indicated by the orbital marker, ever coincide, and this is the reason why a scratch of only 5 mm. long is made in the impression. The constructed orbital plane, in addition to the errors

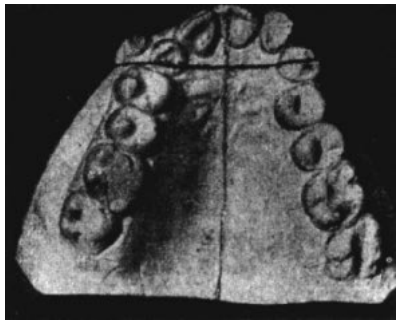

Figure 12 (Simon)

gained from the ear-eye plane, carries with itself all the errors involved in the determination of the raphe median plane, and cannot be considered correct. Hence the conclusion cannot be regarded as carrying any weight other than a rough estimate.

Again, in order to be logical, the orbital plane, as determined by the orbital points, must be nearer to the true position than the plane constructed perpendicular to the raphe median plane and the author is at loss to understand why this must be sacrificed in order to satisfy a hypothetical geometric condition. The difference between these two orbital lines is only a partial index to the inaccuracy of the system, if we further consider that the point projected on the palate has already been shown to be in error.

The rectangular planes of reference in this case are not used purely in that capacity, they are made to actually represent conditions in conformity with the propounded theory and this is not permissible. If rectangularity is not found to exist between the planes which pass through the various points or land-marks on the head, we must determine which one of these planes is likely to be incorrect. To assume that the ear-eye plane is always correct, is not logical, for it has been shown that the constructed raphe median plane seldom coincides with the anatomical sagittal plane.

Of all planes, the sagittal plane must be given the first place of importance, for if we speak of symmetry it is always with respect to that plane. To correct the sagittal plane by constructing the raphe median plane in its place so that we may satisfy the imposed condition of rectangularity with reference to the ear-eye plane, seems not to be permissible. Such a procedure is very similar to an attempt to change the direction of a suspended plumb-line by constructing a new theoretical line of direction for it. Mathematically the rectangular planes of reference are correct provided the first anatomically determined plane is also mathematically correct. In a biological object like the head it makes a great deal of difference whether the sagittal plane is used as the first plane of reference, or whether it is the ear-eye plane that is so used. Theoretically these planes must be perpendicular to each other, but they are very seldom found so with mathematical exactness. Since the sagittal plane divides the body into two, more or less symmetrical halves, it is more logical to use it as the main plane of reference than any other plane which is only secondary to it, for if the secondary plane depends upon points, which as a rule are more or less asymmetrical, we lose all claim to speak of symmetries and asymmetries with respect to the sagittal plane.

The width of the maxillary canine is about 8 millimeters, and since the error in the determination of the constructed orbital line on the model may reach that amount (+ or -- 4 mm.) even under the best conditions, the conclusions regarding the position of the maxillary arch with respect to the cranium must be very cautiously drawn. The illustrations given in Simon's book, where reference is made to extreme cases, are not conclusive, for such cases are recognized as difficult or hopeless cases to treat even by those who have only limited experience in diagnosis. The prognosis in such cases is the same, with or without gnathostatic considerations, and they will easily be isolated by the followers of any system of diagnosis.

The importance of Simon's fundamental conception is apparent in cases where such anomalies exist to a mild degree only and the application of the conception to the easily recognizable extreme cases is not important.

The author does not wish to minimize the value of Simon's work. It must be admitted that in many cases the existence of a malrelation of the denture as a whole, with respect to the cranium, is possible. The main purpose of this criticism is to show that just in those cases in which the method could have the greatest amount of usefulness, the system fails to be reliable. And this is where the canine law is lacking in proof. It is nothing but a generalization, which gives the approximate position of the denture in relation to the head, without recognizing variation which must necessarily occur. The principle involved is not in conformity with the

principles of accepted orthodontic procedures, and Simon's attempt must be looked upon as only a beginning to a better understanding of conditions. Simon knows, and others feel, that dental anomalies are not confined to the teeth alone and that the denture must be considered in relation to the head. The establishment of a standard relationship for all individuals is

Figure 13 (Simon)

only a first attempt, just as Hawley's method of arch predetermination was a beginning for the more accurate methods of arch predetermination. In the beginning Hawley designed a standard arch form for all individuals and later this was changed to account for individual variations. The problem of arch predetermination can not be considered solved, but at present we possess more flexible methods which may lead to an absolute solution of the problem. The recognition of the fact that the denture as a whole may be malposed is in itself a great advance. Earlier research workers made attempts to connect such conceptions with the Angle classification. In this connection the work of Case may be mentioned. But the acceptance of a rigid rule as to the location of certain points is similar to Hawley's attempt.

It is useful in so far as it attracts attention to a different phase of our problem, but its universal adoption cannot be recommended because in its present form it is dogmatic and is likely to do a great deal of harm especially in those cases where the conclusions, from the application of the rule, indicate the extraction of two or more teeth. If this objection could not be raised against the system, inaccuracy would not be sufficient to reject its provisional acceptance.

The Hawley arch is not applicable to many individuals but its universal acceptance at the time it was proposed was logical, and even at present, the Hawley charts are used to great advantage by many practitioners. Here we must note, however, that besides the help the charts may give to an orthodontist, they can do no possible harm, and in the absence of better methods of arch predetermination, the Hawley charts must be accepted with all their recognized fallacies.

But this is different with the Simon system. The acceptance of a dogmatic rule regarding the position of a tooth, which is determined by faulty construction, may lead us to unwarranted procedures, and a definite number of patients would suffer in consequence. For this reason the system should be subjected to further study and research without adopting it in practice. It has been established by others experimentally,* that the 'Canine Law' is not true, but this does not necessarily mean that the system must be discarded. A further investigation may point the way to a more accurate and reliable system, which will involve similar procedures to Simon's. The opinion of the author is that the final solution of this phase of our problem will depend upon a study of the mechanism of mastication and the basic principles involved in its construction. The position of the denture with respect to the head is determined chiefly by the functional activity of the mandible, and also by the relative measurements of the teeth, maxilla, mandible and other associated parts.

—To be continued—

*Broadbent—Cosmos, Aug. 1927 and Proc. First International Orthodontic Congress.