



The Golden Divider

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The golden divider may be used for morphologic analysis of the teeth, the skeleton and the soft tissues of the face (Fig. 1). It is based on the "Golden Section" also called the "Divine Proportion". Upon widening the divider, it will be noted that a short side and a longer side will be measured off proportionally as the divider is extended (Fig. 2). The longer side is 1.618 times the shorter side and the shorter side is 0.618 the length of the longer. In turn, the longer side is 0.618 the length of the total outer measurement. The golden relation (1:1.618) is called Phi and given the Greek symbol ϕ . This relation is based on underlying laws of mathematics, geometry, and physics.

The use of this instrument applies to esthetic values, because so many relations found to be beautiful to the human eye or comforting and pleasing to the human psyche follow these proportions. But, of greater significance are the biologic implications, as many things in nature follow the principle in proportionality of the golden section, the golden triangle, and the golden rectangle. The proportion is linked to growth and it relates to optimal function. Hence, it can be used for analysis of structural harmony and balance, and can be applied for treatment planning of the tooth, bone, and soft tissue

relationships for all forms of dentistry, maxillofacial and plastic surgery.

Tooth Relationships

Useful parameters for the teeth start with the lower central incisors (Fig. 3). Thus, the total of both lower centrals (10.8mm) is golden to both upper centrals (17.5mm), which starts a series of harmonic units in the occlusion (Fig. 4). The next golden relation (across the arch, not in direct width of teeth) is the measurement between the distals of the two upper lateral incisors (28.3mm) as related to the upper centrals (17.5mm). The next progression is the width to the buccal surfaces of the upper first bicuspid (45.7mm), which is golden to the width through the lateral incisors in the normal beautiful arch. This is generally lacking in patients with malocclusion in all three types.

Another series is observed in Figure 5 from the width of the lower four incisors (on the arch) at 22.1 mm. The upper intercanine width measured at the cusp tips at 35.75mm is found in a golden relation to the lower incisors. Finally, the width at the mesial of the upper second molars (57.8mm) will be found to be in the golden relation to the intercanine width in beautiful

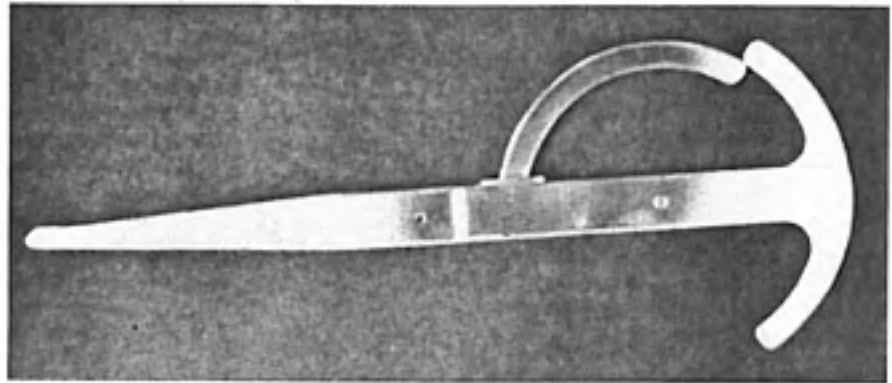


Fig. 1 The Golden Divider

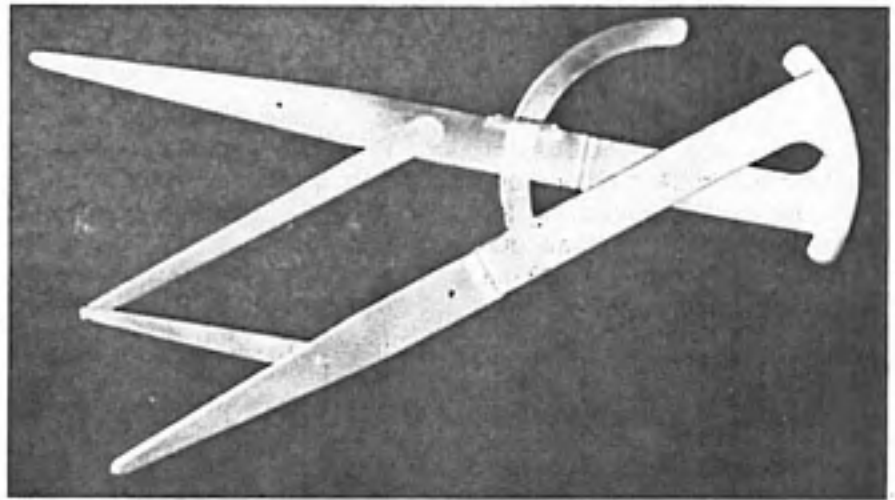


Fig. 2 Widening the divider produces two measurements in a ratio of 1:1.618.



Fig. 3 Occlusion to demonstrate values described in Figures 4 and 5.

arches, which helps in assessing arch form. A third relation is seen in Figure 5. The distance between the distals of the lower canines (31.5mm) is golden to the distance between the lower first molars (50.2mm) at the buccal grooves.

Soft Tissue Relationships

For the face, a connection is apparent in the smile, as the intercanine width is observed to be the same as

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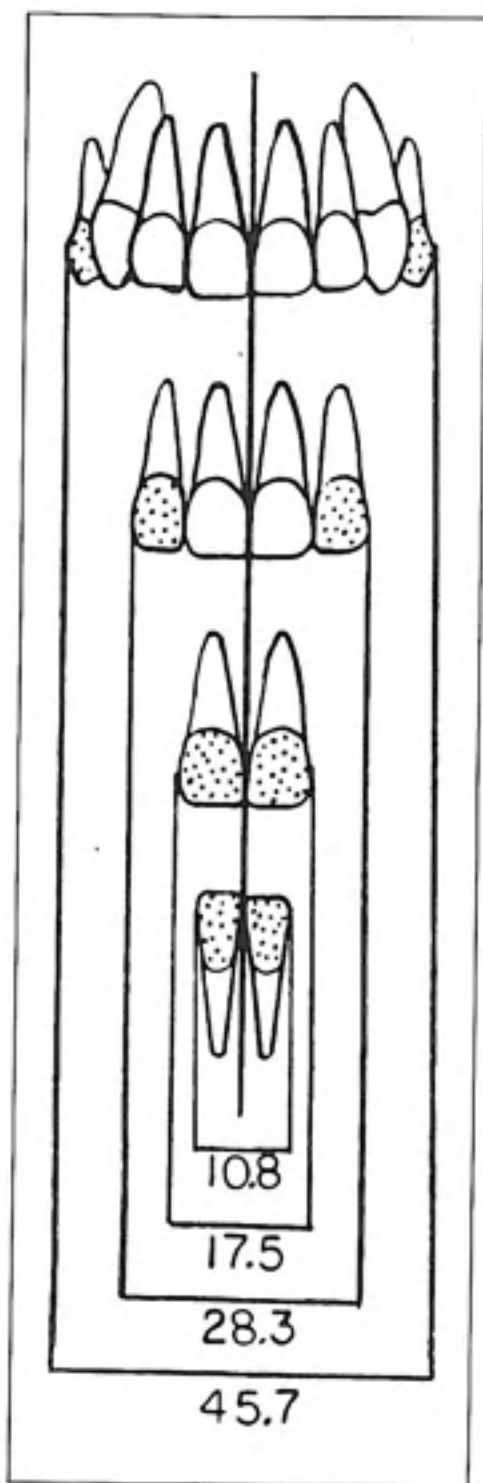


Fig. 4 Golden progression from the lower central incisors.

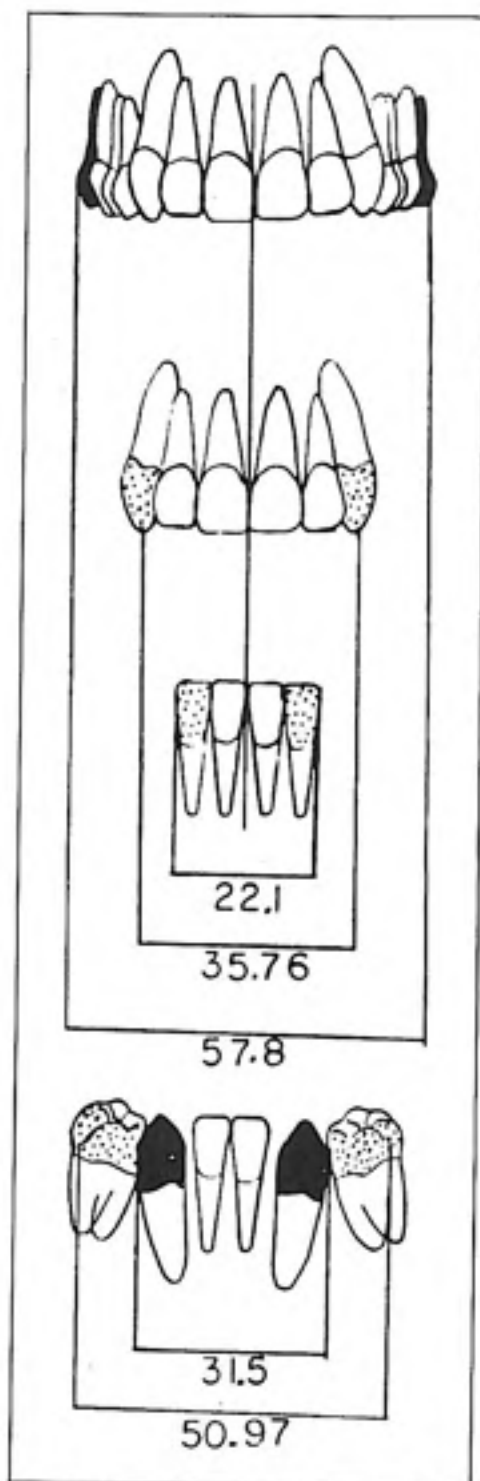


Fig. 5 Golden progression from the four lower incisors, and from distals of lower cuspids.



Fig. 6 Relation of the teeth at the intercanine width to the width of the nose at the alar rim in the smile.

the width of the nose at the alar rim as seen in a glamorous model (Fig. 6).

For the width dimensions in the soft tissue, the nose, mouth, eyes and face are related (Fig. 7). If the lateral rim of the nose (LN) width is taken as a unit of 1.0, progressively the mouth

(CH), lateral canthus of the two eyes (LC), and the width of the head at the level of the eyebrow (TS) is a progressive golden series (Fig. 8).

For vertical relations, it is best to start with the underlying skeleton as seen in the lateral cephalometric head plate. Eight golden relations were identified from composites of 30 beautiful normal male subjects with ideal normal occlusions (Fig. 9). For the vertical location of the lower incisor, the Point A (at subspinale in the maxilla) and the Point Pm (at the mental protuberance of the mandible) is used. In centric occlusion, if the distance from Point A to lower incisor tip is taken as 1.0, the height of the lower incisor to Pm is 1.618 (Fig. 10).

For relation of A to Pm itself, a golden proportion is seen to the Frankfort plane (porion to orbitale). If the level of orbitale (lower rim of the orbit)

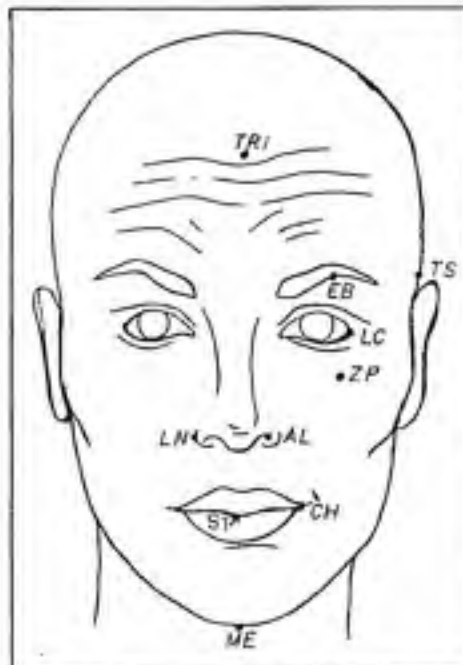


Fig. 7 Points on soft tissue used in this study.

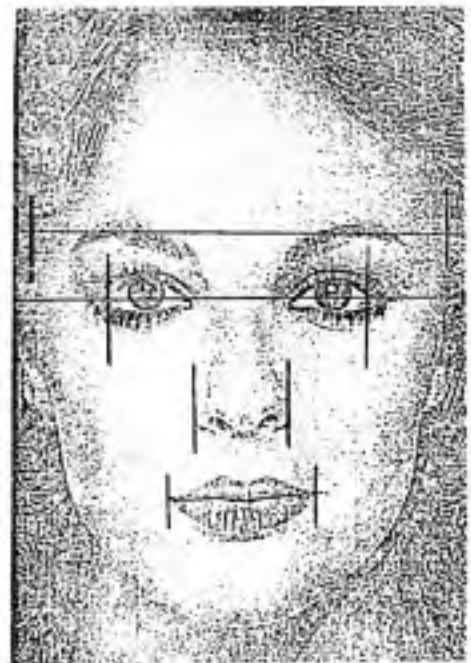


Fig. 8 Progression in soft tissue from nose to mouth to eyes to head.

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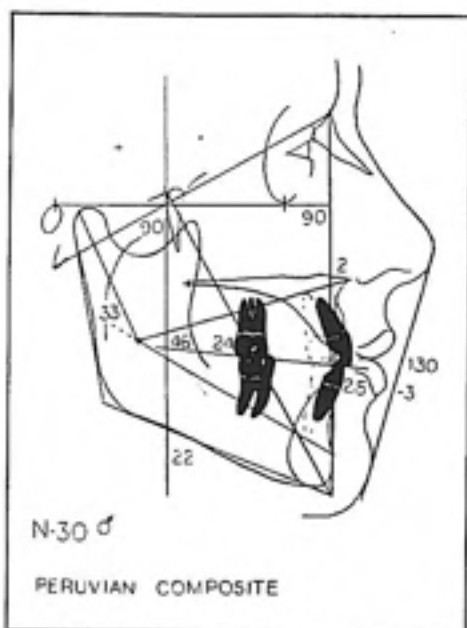


Fig. 9 Composite of ideal occlusions in lateral headplate tracing.

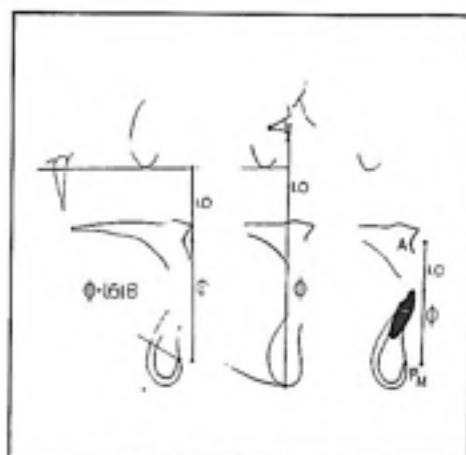


Fig. 10 Ideal position for lower incisor is golden to A-P_M.

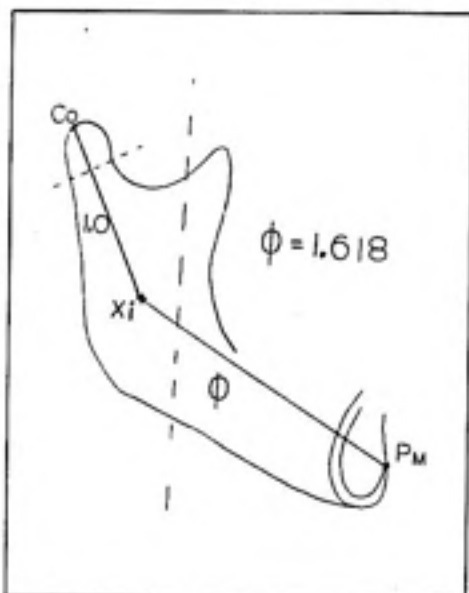


Fig. 11 Golden proportion in the mandible (XiP_M-XiCo or corpus axis to condyle axis).

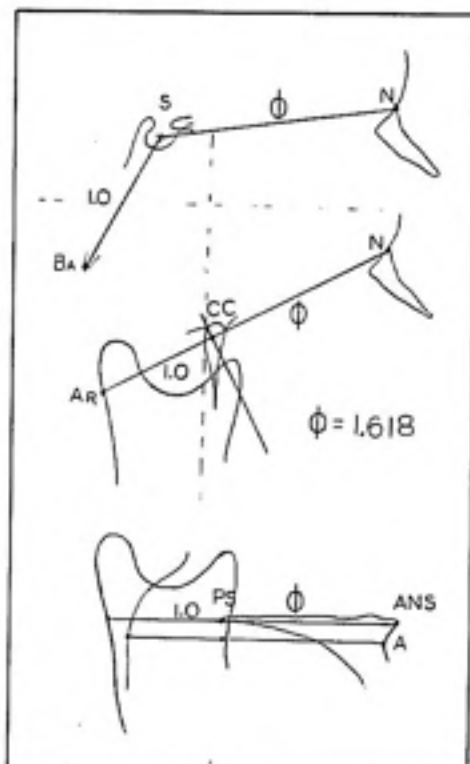


Fig. 12 Golden proportion in cranial base and maxilla.

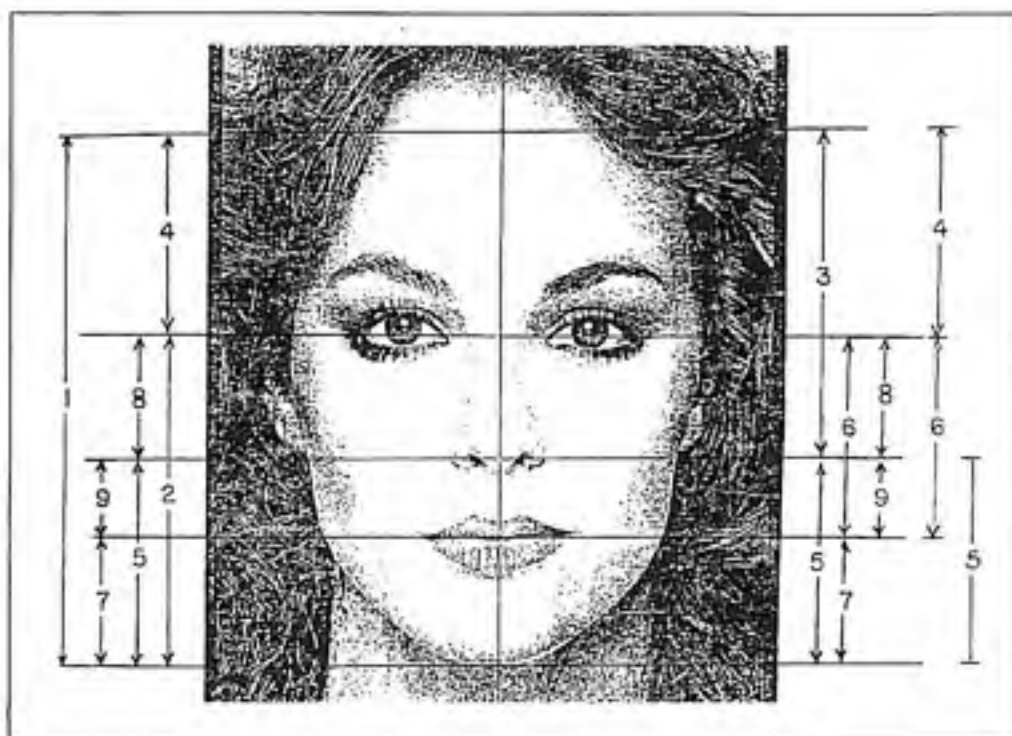


Fig. 13 Frontal golden analysis.

to Point A is taken as 1.0, the vertical height of the denture is 1.618, suggesting normal denture height (Fig. 10).

Other values for surgical or orthopedic corrections are seen as the corpus axis (Pm to Xi point) is golden to the condyle axis (Xi to Condylion) or posterior superior aspect of the condyle head. The Xi point is the geographic center of the ramus (Fig. 11). Also, maxillary depth is golden to pharyngeal depth (Fig. 12). The cranial structures are seen to be golden in the anterior and posterior base S-N (1.618) + SBa (1.0). Nasion to cranial center (CC), at 1.618, is golden to cranial center to articulare on the Basion-Nasion plane.

For vertical facial relation in the soft tissue, another progressive series

is seen as confirmed from composites of normal beautiful faces (Fig. 7). Here, starting with the larger value, the face height is taken from Trichion (at the top of the wrinkled forehead or near the hair line in the young) to the bottom of the chin (soft tissue menton). If the lateral canthus level to Trichion is taken as a unit of 1.0, the height of eye to chin is in the golden proportion, if the face is beautiful (Fig. 13). Inversely, from chin upward, the distance of the chin to the curve of the ala of the nose is taken as a 1.0 value and 1.6 is seen from the nose to Trichion. This makes nose length (lateral canthus height to alar height) a congruent or reciprocal area or the "center" of the face.

From the eyes downward, a golden relation is seen from the nose (1.0)

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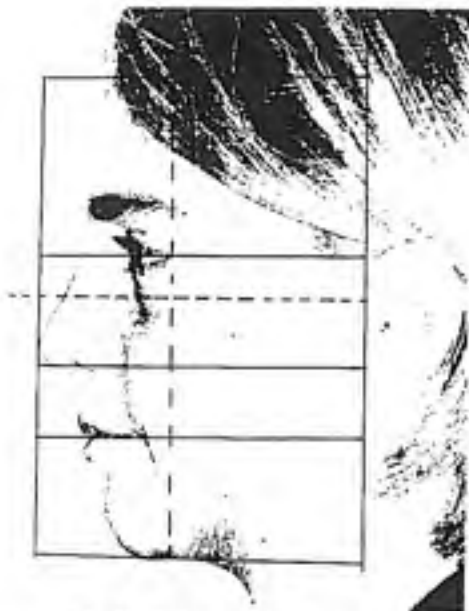


Fig. 14 Lateral golden analysis.

to the chin (1.618). Inversely, the bottom of the chin to the mouth at 1.0 leaves a 1.6 proportion from the mouth to the eye. Like nose length, the upper lip length is a reciprocal or an overlapping congruent area between the eye-nose-mouth-chin proportions.

If the alar rim to the upper lip (to

stomion or lip embrasure) is taken as 1.0, the distance to the chin is 1.6 and the same distance to the eye is 1.6. This finally shows that three equal areas of the face are very nearly the same in beautiful faces. These are forehead to eye, eye to mouth, and nose to chin (Fig. 13).

For locating golden proportions in the profile aspect, the same limits of vertical proportions were found useful. It appeared that the base of the ear lobe was the posterior limit to the face (Fig. 14). To nose tip these formed three golden rectangles like the foregoing equal areas, i.e. Trichion-eye, eye-mouth, and nose-chin. As the horizontal nose-tragus base is studied, a golden section falls at the lateral canthus of the eye! Taking the eye-mouth vertical as 1.6, the canthus to nose rim is 1.0. Figure 15 shows the golden divider applied to the eye-nose-chin for facial height. Figure 16 shows the divider on the ala of the nose, lip embrasure and chin to determine denture height and lip position.

For greater detail and background to the Golden Section and Divine Proportion, other publications may be consulted.

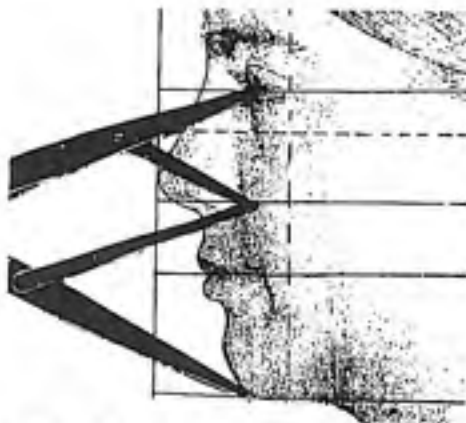


Fig. 15 Golden proportion from eye-nose-chin.

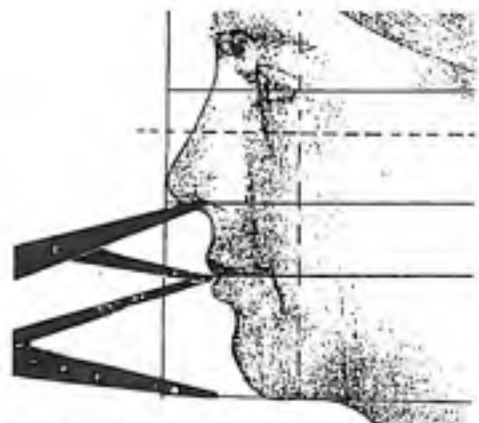


Fig. 16 Golden proportion from nose-mouth-chin.

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