The Angle Orthodontist: **Vol. 68, No. 1, pp. 29–36.**

The form of the human dental arch

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ABSTRACT

The human dental arch form is shown to be accurately represented mathematically by the beta function. The average correlation coefficient between measured arch-shape data and the mathematical arch shape, expressed by the beta function, is 0.98 with a standard deviation of 0.02. Forty sets of casts—15 Class I, 16 Class II, and 9 Class III—were examined. A precision machine tool device was used to record the X-, Y-, and Z-coordinates of selected dental landmarks on all casts to 0.001 mm accuracy. The coordinates were processed through a computer curve-fitting program. The Class III mandibular arches had smaller arch depth and greater arch width (beginning in the premolar area) than the Class I arches. The Class II mandibular arches exhibited generalized reduced arch width and depth compared with the Class I arches. Maxillary arch depths were similar in all three groups. However, the Class III maxillary arch widths were greater from the lateral incisor-canine area distally compared with the Class I maxillary arch, and the Class II maxillary arch form was narrower than the Class I arch form from the lateral incisor-canine area distally. The beta function more accurately described the dental arch form than representations previously reported.

KEY WORDS: Arch form, Mathematical formula, Beta function.

Submitted: March 1996
Accepted: September 1996.