A Concept of Facial Esthetics

HARVEY PECK, D.D.S., M.Sc.D.

SHELDON PECK, D.D.S., M.Sc.D.

The subject of facial esthetics is preeminently important to orthodontists. But more than this, it is a subject which interests and embraces all people everywhere. As orthodontists, we often lose sight of this fact. We tend to forget that the ultimate source of our esthetic values should be the people, not just ourselves.

With this in mind we shall first examine some of the nonorthodontic aspects of facial esthetics and then attempt to develop a meaningful orthodontic concept. However, before attempting to identify a present-day concept of facial esthetics, it is imperative to develop a historical perspective of the subject. Accordingly, each great era of our esthetic heritage will be examined to reflect the esthetic tastes of that period.

THE ESTHETIC HERITAGE

Prehistory

Man, perhaps subconsciously, has been aware of facial esthetics for a long time. Unfortunately, early man had little time to contemplate natural beauty seriously. Life in the Stone Age was a formidable task; survival was everyone's preoccupation.

As early as 35,000 years ago, Paleolithic man discovered that his mental agility made hunting and survival less arduous.[1] It was probably in this period that man found the leisure to develop his esthetic awareness and sensitivity. This sensitivity is preserved in primitive art, paintings, figurines, and representations discovered in recent times. Most early Paleolithic art depicts hunting themes. Prehistoric paintings such as those of animals discovered in the Lascaux Caves in southern France show a remarkable appreciation of anatomic form.

In the few samples of human representations from this period, the human form is portrayed as grotesque or distorted, apparently for reasons of superstition and fear (Fig. 1). Von Koenigswald[2] suggests that representations of the head were "left vague, probably in order to avoid any resemblance to actual people." From reconstructed fossil remains, however, the craniofacial characteristics of Paleolithic man appear to include a robust face, alveolar prognathism, a well-developed chin, and most of the facial features of a modern European.[3] This description suggests that 35,000 years ago man possessed no less potential for facial attractiveness than now. Nevertheless, the conscious consideration of esthetics was probably minimal among a people whose daily existence still demanded rapt attention to earthy necessities.

The Egyptians

It was not until the development of the Egyptian culture in the Nile valley approximately 5,000 years ago that esthetic attitudes were abundantly recorded in art. The statuary of Egyptian royalty found in monuments and tombs tends to display the Egyptian ideal of beauty, harmony and proportion, while maintaining vague resemblance of the persons represented.[4] The idealized Egyptian of the Old Kingdom (ca. 2,600-2,000 B.C.) exhibited a round, broad face with a sloped forehead, weak brow ridge, prominent eyes, evenly con-

Department of Orthodontics, Boston University School of Graduate Dentistry.

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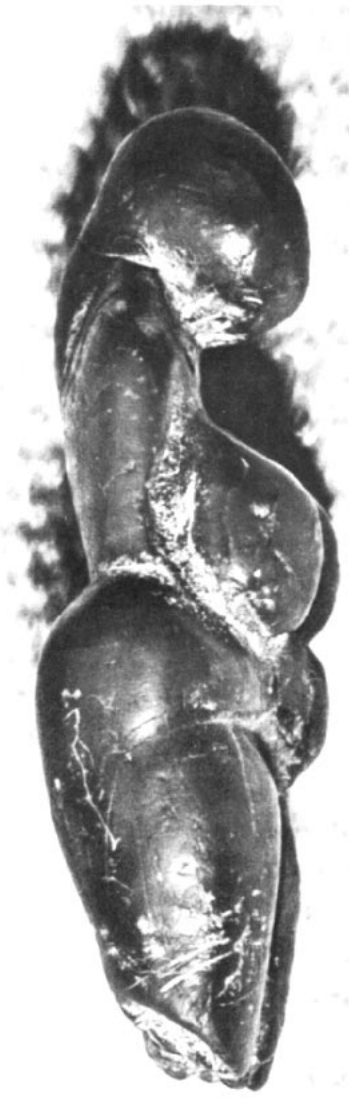


Fig. 1 "Venus of Balzi Rossi," representative of Stone Age sculpture. Facial features are neglected and the head displays a characteristic forward inclination. (Musée de l'Homme, Paris)

toured nose, thickened lips, and a mild yet positive chin (Fig. 2). These soft tissue contours were further stylized with ornamental headdress and, on males, chin beards.[5]

While the kings were portrayed with

Fig. 2 Egyptian King Mycerinus carved to the idealized profile of his day, ca. 2580 B.C. (Museum of Fine Arts, Boston)

"ideal" proportions, lesser nobles were more realistically carved.[6] One of the finest known portraits from the Old Kingdom is of Prince Ankh-haf (Fig 3). Though showing some minor damage, this tapered, expressive face could well be of a contemporary American. As with almost all of the Old Kingdom sculptures, bimaxillary dentoalveolar prognathism is evident in the lower face. This characteristic was probably far from detestable to Egyptians since the idealized kings were also carved to this profile. In a continuing University of Michigan research study,[7] x-ray examination of the mummified remains of ancient Egyptians appears to confirm a high incidence of bimaxillary prognathism within the population.

Perhaps the ethnology of the ancient Egyptians may shed some light on their facial characteristics. Anthropologists have traced the origins of the Egyptian

Fig. 3 Prince Ankh-haf, ca. 2600 B.C. A very realistic portrait demonstrating the early Egyptian tendency toward dentoalveolar prognathism. (Museum of Fine Arts, Boston)

people for thousands of years before the Old Kingdom.[6] The Nile valley swamps were originally settled by a succession of people from Africa and Asia. So at the dawn of the Egyptian civilization, the population was largely an admixture of Negroid African stock and Caucasoid Asian stock. With this background it is easy to understand early Egyptian facial esthetics as a composite of Negroid and Caucasoid features.

The famous Queen Nefertiti represents a period over 1,000 years after the Old Kingdom (Fig. 4). The Queen's alluring facial profile, balanced features, and well-developed mandible have been extolled as modern standards of beauty. Though this sculpture may epitomize the real starting point for Occidental facial beauty, Brophy[8] has cautiously advised that Nefertiti was probably more important to her contemporaries "merely as royalty, than as a great beauty."

The Greeks

Many centuries later Egyptian sculpture matured to a visible realism, though never attaining the mastery of the newly flourishing Greeks. Just as

Fig. 4 Queen Nefertiti, ca. 1350 B.C., Egyptian. (Berlin Museum)

ancient Egypt appears as the first culture to have captured facial resemblances in stone, classical Greece emerges as the first to express sensitively the qualities of facial beauty through philosophy and sculpture.

The brilliant Greek philosophers, notably Plato and Aristotle, questioned the intrinsic meaning of beauty and introduced "aesthetics" as both the study of beauty and the philosophy of art. Plato asserted that "the qualities of measure and proportion invariably . . . constitute beauty and excellence."[9] Aristotle's concepts of the formal nature of beauty were premised largely on Plato's original thoughts.[10]

The philosophers felt that beautiful creations respected certain geometrical laws, since true beauty necessarily displayed harmony.[11] As harmony was the "due observance of proportions," it seemed reasonable to assume that these proportions were fixed quantities. Of

course, "aesthetics" as introduced by the Greeks and expounded by modern philosophers encompasses more than simply physical or natural beauty. The beauties of human emotion, existence, and experience are manifestly important to the aesthetician. (At this point the orthodontist must recoil. He is at a loss to program these tenuous "gray areas" into scientific language. So the orthodontist rightfully has streamlined "aesthetics" to "esthetics" and has limited its scope to only those criteria tractable to objective analysis.)

While Greek philosophers formalized the study of beauty through "aesthetics," the sculptors implemented the expression of beauty in their art. Grecian sculpture blossomed in the fourth and fifth centuries B.C., often called the Golden Age of Greece. Canons or rules were set forth for ideal bodily proportions and harmonious anatomic relationships in human representations.[12]

In sculpture the classic Greek face is oval, slightly tapering toward the chin (Fig. 5). The basic facial features of male and female appear to be treated identically. In profile the face exhibits an *anteriorly prominent* forehead. (In contrast a *high* forehead was not considered a sign of beauty by the Greeks according to Bax.[13] Hair effectively masked off a sizable portion of the upper face of the Greeks and their statues. It is interesting to note the apparent revival of this ancient practice today.) Also characteristic is a straight sweep from the forehead to the nose tip, allowing only a faint concavity at the root of the nose.[14, 15]

Generally, the lower face seems well-proportioned and within the orthodontic concept of the orthognathic profile. The classic Greek mouth is framed by an undulating upper lip (later serving as the model for the Roman bow of love—Cupid's bow) and a slight lower lip roll.[15, 16] The somewhat pursed lips

Fig. 5 The classic Greek profile, fourth century B.C., representing the finest embodiment of Greek esthetic ideals. Detail from Aphrodite of Melos (Louvre, Paris)

are often mildly parted in Greek sculpture suggesting animation. Between the lower lip and the convex, fleshy chin is a well-defined mentolabial sulcus or hollow.

The facial esthetics embodied in classic Greek sculpture strongly appealed to many of the early orthodontists. Angle, intensely aware of facial art through his association with the noted art teacher E. H. Wuerpel, considered the Apollo Belvedere and the Aphrodite of Melos (Venus de Milo) paragons of facial beauty. Of Apollo he says, "Every feature is in balance with every other feature and all the lines are wholly incompatible with mutilation or malocclusion."[17] Case[18] and Lischer[19] concurred in the admiration of the Greek ideal. But, like Angle, they viewed any attempt to adapt *one* standard to *all* faces as "impractical" and "impossible." More recently, Wilson[20] has totally dismissed the facial esthetics of

Greek sculpture calling it erroneous and exhibiting "retrusion of the lower third of the face."

It must be remembered that in their best works the Greek sculptors portrayed godly beings. They personified their deities in much the same manner we tend to visualize Biblical characters—as representing perfection of form, character, and virtue. Whether or not the geometrically patterned face imposed on Greek sculpture represented the actual facial morphology prevalent in the population is of little significance. What is important to us is the evolution of the first "ideal" composition of human facial form conceived in balance and harmony and executed to classic proportions through the genius of artists such as Phidias and Praxiteles. It is this standard which was hailed by all Greeks, was imitated by their successors, and remains exemplary of esthetic excellence to people throughout the modern world.

Fig. 6 Head of Augustus, first century A.D., Roman. (Museum of Fine Arts, Boston)

After the Greeks

Soon after the Golden Age, Greece under Alexander became an Empire with vast geographic boundaries and new worldly ideals. The sculpture of this so-called Hellenistic period reflects this awareness in its break from "classical" beauty to a "show it like it is" rendering.[4] The conquering Romans continued in the artistic vein of Hellenism.

While our esthetic heritage owes much to the classical Greeks for brilliantly interpreting beauty, it is indebted to the Romans for profusely documenting beauty. By copying or reworking Greek sculptures and by carving original subjects also, the Romans left us a plethora of Greek and Roman faces to study.

Unfortunately, Roman sculpture was never really formalized or idealized, so no new concepts of facial esthetics are related in these works.[21] Faces of men like the Emperor Augustus were represented quite faithfully and lifelike (Fig. 6). The many museum pieces depicting Roman citizens, rulers, and deities show a range of facial features, harmony, and proportion not unlike that seen in the Occidental population today.

By the end of the fourth century A.D. new religious zeal gripped all of Europe. Physical beauty was out; spiritual beauty was in. Harmonious facial proportions in art were no longer governed by nature but by principles of moral hierarchy. All that Greece and Rome had contributed to the understanding of beauty was condemned as pagan and mythical. Armed with this new esthetic sense, early religious fanatics physically destroyed many classical works of art.[21]

The Dark Ages had now begun. Through the ensuing Middle Ages any consideration of physical beauty and human bodily proportions continued to be suppressed. Almost all of the me-

dieval descriptions of the lower face valued a small inconspicuous mouth with "thin red lips and small even teeth."[13] It was not until the Renaissance in the fifteenth century that realistic esthetic values once more concerned Western civilization.

Renaissance to Present

In his time Michelangelo strongly influenced the direction and spirit of the Italian Renaissance movement. His sculpture identified with the classical traditions of Greece and Rome.[21] His treatment of the face was natural and exactly proportioned as typified in his famous *David* (Fig. 7). Heroic *David* expresses the highest aspirations and esthetic ideals of Michelangelo's Florentine audience.

The path of sculpture from the Renaissance to the present seems to trace a recurring pattern of "classical movement" followed by "anticlassical movement." Only recently has sculpture not provided much insight into esthetic preferences in facial beauty. Many of the faces rendered in modern sculpture and art seem to defy objective analysis, at least in orthodontic terms.[22] They tend to be abstract interpretations rather than concrete representations.

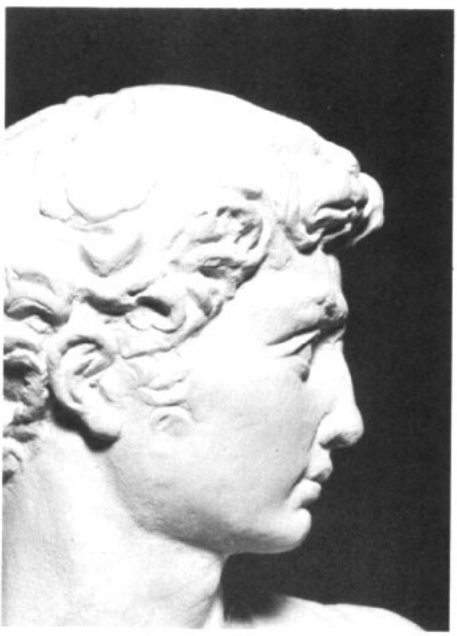


Fig. 7 David by Michelangelo, completed in 1504. (Accademia delle Belle Arti, Florence)

With the rapid development of printing during the Renaissance, treatises on beauty and esthetics began to appear. In the early sixteenth century an Italian named Firenzuola[23] wrote a book detailing feminine beauty. Of the perfect profile he wrote, "When the mouth is closed, the lips must meet in such a way that the lower projects no more than the upper, nor the upper than the lower; and at the corner they must diminish so as to form an obtuse angle. . . ."

The physiognomists of the seventeenth, eighteenth, and early nineteenth centuries studied and wrote about facial esthetics with an enthusiasm far exceeding their scientific resources. They promised to uncover profound personality traits and biologic truths by examining facial features. Some of their crafty conclusions were that the width of the mouth indicated the breadth of the stomach; that the mouth was the coarsest part of the face, being the greatest distance from the brain; that abundant facial folds and dimples labeled a wildly temperamental individual.[24,25] Furthermore, lip drape and lip protrusion were related to "animal passion": the shorter or more protrusive the lips, the more bestial the person.[25]

In contrast, a rather objective study of human facial esthetics was introduced by a Britisher, Woolnoth,[26] in 1865. Of facial classifications he wrote:

> The general form and outline of all faces, especially as they are seen in profile, are of three orders—the straight, the convex, and the concave. The straight face is considered the handsomest, and may be [detected by drawing] a straight line from the top of the forehead to the bot-

tom of the chin without intersecting more than a portion of the nose and a very small part of the upper lip. A line in like manner drawn down a convex face, from the top of the forehead to the lower part of the chin, would intersect all the features, leaving the forehead and chin behind, and throwing the nose forward. . . . A line drawn down the concave face, from the top of the forehead to the bottom of the chin, would seem to shut in the features and nearly escape them all. Convex faces . . . have this ulterior advantage, that they retain a youthful appearance beyond the natural periods, and are found by observation and experience to last much longer than the concave or straight. Concave faces give young persons somewhat of an old fashioned appearance, and most unfortunately bring the face too soon to its maturity.

Sociology, Psychology, and the Face

Should we leap one hundred years from Woolnoth's time to the present, we find the consideration of facial esthetics subject to many new scientific disciplines. The formalized studies of psychology and sociology have helped transform esthetic judgment from simply a visual "feeling" to an understandable exercise in visual perception. While the study of the face as the "esthetic stimulus" is still important, of equal significance now is the nature of the "esthetic response," the observer's perception.

Perception and Esthetic Attitudes

What exactly is perception? Technically, perception is a single, unified awareness derived from sensory processes while a stimulus is present.[27] Psychologists say that our perception of forms depends on the development of "form concepts."[28, 29] For example, ever since dental training our perception of occlusion hinges on the concept that the maxillary teeth are observed above the mandibular teeth. Any departure from this orientation we usually find quite confusing. Form concepts, likewise, influence our perception of faces. The more frequently we observe a particular facial pattern, the more likely we perceive it as "correct."

Often, by selective conditioning, people make presumptive judgments in their perception of faces. For instance, the public frequently assumes that the bearer of a severe Class II or Class III pattern is a slow, dull individual. Similarly, the public unconsciously assigns youth to people with "braces" and maturity to people with glasses, independent of actual ages.

Orthodontists, too, can be victimized by selective conditioning. If all of us began practicing indiscriminate extractions on all patients, surely we would soon perceive a new "beauty" in the "dished-in" profile.

Obviously, the orthodontist does and should play a decided role in determining the esthetic destiny of a patient's face. There is an increasing tendency today for the doctor, be he a general dentist, orthodontist, or plastic surgeon, to dominate completely the esthetic considerations of his particular treatment. The patient and his family are seldom asked to express their esthetic viewpoint or concept. This attitude is justifiable and often essential in severe, emergent, or functionally debilitating cases. But in elective, nonhandicapping, or cosmetic procedures (which constitute a large share of American orthodontics) the doctor may do well to acknowledge the patient's and parents' perception of the face before planning treatment.

What may we as orthodontists learn from studying parent and child esthetic sensitivities? Perhaps a review of some research in this field will prove enlightening.

In a nationwide survey questions about the importance of dental appearance were asked to a sample of 1862 persons, twenty years and over.[30] At one point in the questioning each subject

was asked to imagine the following problem:

> The Green family has been saving money for a long time to buy a house. They have finally found one they like and can afford, but their thirteen-year-old son has begun to be self-conscious because his teeth are so crooked. When they visit the dentist, he says that the teeth can and should be straightened. This would use up most of their savings and they could not meet the down payment on the house.

Each subject was then asked to choose between the house or the son's orthodontics. Eighty per cent of the sample chose the orthodontics. The reasons this group gave for their choices were revealing. Almost one half chose the orthodontics out of empathy for the boy's self-consciousness. The rest just mentioned concern for the boy's health without alluding to his sensitivity.

When the sample was grouped according to education received, there was a sharp positive correlation between the respondents' educational level and their awareness of the boy's self-consciousness as a factor in prescribing orthodontics. The least educated group more frequently justified the treatment solely on a "crooked tooth" basis without regard to psychological trauma. However, the highly-educated participants were almost unanimously motivated by the psychological aspects of the malocclusion.

So here we see two groups, poorly educated and highly educated, each seeking the same orthodontic treatment but with noticeably different motives. The poorly educated seem simply interested in correcting the physical abnormality, while the highly educated appear equally concerned with the child's accompanying psychosocial sensitivity.

Similar conclusions were reached by Kohn[31] in a study of social class and parent-child relationships. He found that working-class parents want their child to conform to externally imposed standards, while middle-class parents are far more attentive to his internal dynamics and feelings.

How may we project this difference in values to our own patients in our clinical practices? Perhaps during the orthodontic case presentation we may suspect the working class parent silently demanding, "Make my child physically acceptable," while the upper middle class parent may silently insist, "Make my child happy!"

Facial Preferences

Aside from these psychological considerations, what do we know of the public's facial esthetic tastes today? What may we say of the American public's "eye" for facial beauty? Do most people like the same faces or are their esthetic preferences as random and diversified as their backgrounds and experiences?

To answer these pertinent questions let us first go to the orthodontic literature. Here we find occasional reference to the difficulty of reaching agreement over facial esthetics. As Alton Moore[32] has stated, "Disagreement between orthodontists in their concepts of what constitutes facial esthetic improvement accounts for many of the differences of opinion when treated results are evaluated. In some instances, what is pleasing esthetically to some is displeasing to others."

The question now appears to be: Does the general public share with us this discord over facial preferences? The answer seems to be *no*.

Wendell Wylie[33] once remarked that the layman's opinion of the human profile is every bit as good as the orthodontist's and perhaps even better since it is not conditioned by orthodontic propaganda.

Sociological research seems to back up Wylie's contention. It has been dem-

onstrated that the general public expresses remarkable agreement in its judgment of facial esthetics. British psychologist A. H. Iliffe[34] conducted an interesting study of preferences in feminine beauty. He arranged with a major London newspaper to publish twelve photographs of female faces taken under uniform conditions. The girls, ages twenty to twenty-five, were carefully selected to represent various facial types. Nearly 4300 Britons responded to the request to rank the twelve faces according to their pleasing facial esthetics or "prettiness." Each response was correlated as to the age, sex, and occupation of the respondent. The positive correlations were significantly high in this study suggesting that a common basis for judging facial beauty indeed existed, and it was shared by men and women of all ages in all parts of England in most all occupations.

A parallel investigation using the same twelve facial photographs was conducted in the United States by sociologist J. R. Udry.[35] Appearing in a nationally circulated "Sunday Supplement," the study drew over 100,000 responses from Americans. When the results were compiled, not only was there a significant agreement among the replies as to who were the prettiest, but there was international agreement as well. The three top choices in the American study were identical with the British results. Beyond the first three girls the esthetic selection order in both studies differed only slightly.

Similar international and transcultural esthetic agreement has been reported by several investigators using works of art instead of faces as their testing medium.[36, 37] They appear to substantiate the observation that people do share a common basis for esthetic judgment regardless of nationality, age, sex, or occupation.

Now what about racial differences? We might have assumed that racial differences within the population would naturally produce a double or triple standard for evaluating facial beauty. But this is not the case.

Standardized orthodontic records were taken of two popular black celebrities (Figs. 8 and 9). On analysis, neither beauty seemed to exhibit the anthropologic characteristics of her race. Indeed, each possessed many Caucasian-type features. Work by sociologist James Martin[38] explains this phenomenon.

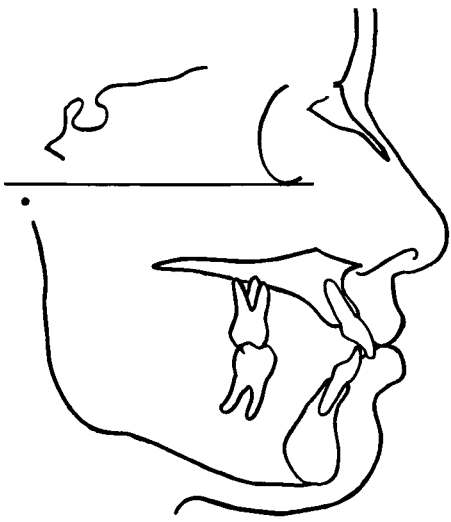
Martin examined the relationship between racial group membership and judgment of female beauty by males. He asked a panel of judges to rank ten facial photographs of black females from the least Negroid to the most Negroid. The least Negroid type was understood to have the most Caucasian appearance. After the judges ranked the photographs, three groups of men, fifty American whites, fifty American blacks and fifty African (Nigerian) blacks were asked to rank the photographs according to attractiveness.

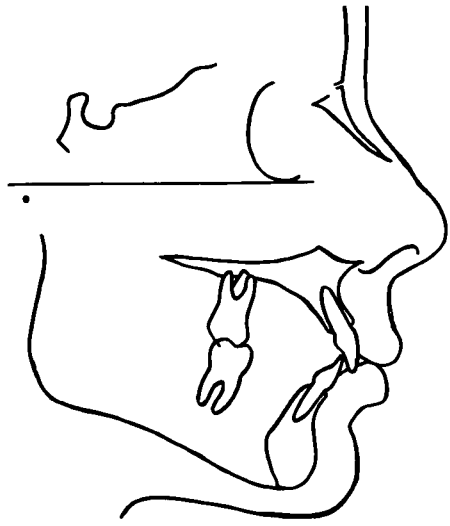
The results were striking. They strongly support the proposition that American whites and American blacks share a common esthetic standard—the Caucasian facial model—for judging beauty, at least of the female face. Also confirmed by this study is the thesis that Caucasian features are considered more attractive than Negroid features in American society today. However, the African group rated Caucasian facial features less often attractive than did either American group.

The uncanny esthetic agreement among Americans is not by sheer coincidence. Instead, it is largely the product of many cultural mechanisms and reinforcements operating in our society. Obviously the mass media are very influential in unifying people's tastes. Television, motion pictures, newspapers and magazines all provide daily

Fig. 8 Barbara McNair, television and stage star.

Fig. 9 Leslie Uggams, television and stage star.





reinforcement for facial stereotypes. Seldom can a member of society completely insulate himself from these ubiquitous influences.

The orthodontist is subject to cultural biases and reinforcements like everyone else. However, his interest in facial esthetics is more academic than emotional. Therefore, he must have and does have at his disposal many objective methods for evaluating the face.

Orthodontic Standards

One method we constantly rely on is cephalometric analysis. Each analysis incorporates a set of reference values for its various linear and angular measurements. Often these values become our clinical standards or "norms", playing an important role in orthodontic diagnosis and treatment planning.

It is interesting to examine just how our standards and reference values are derived. Who and what do they actually represent? From 1937 to 1969, approximately thirty-five studies[39-73] describing normal dentofacial, craniofacial or soft tissue relationships have appeared in the American orthodontic literature. We must remember that the term "normal" as used by orthodontists refers not to the average of the population but more nearly to the average of the best of the population. So as we may expect, each of these normal studies really analyzes occlusions and faces considered "satis-

TABLE I

THE BASIS OF SAMPLE SELECTION IN

STUDIES* OF NORMAL FACIAL PATTERNS

NO DOCUMENTED SAMPLE: ISOLATED CASES AND OPINIONS	ORTHODONTIST'S JUDGMENT OF OCCLUSION ONLY	ORTHODONTIST'S JUDGMENT OF OCCLUSION AND FACE	ORTHODONTIST'S JUDGMENT OF FACE ONLY	ARTIST'S JUDGMENT OF FACE	GENERAL PUBLIC'S JUDGMENT OF FACE
Wuerpel (1937)	Hellman (1939)	Margolis (1947)	Tweed (1946)	Burstone (1958)	Riedel (1957)
Muzj (1939)	Tarpley (1939)	Downs (1948)	Stoner (1955)	Goldsman (1959)	
Majoral (1945)	Speidel, Stoner (1944)	Cotton, Takano, Wong, (1951)	Poulton (1957)		
Hambleton (1964)	Wylie (1947)	Steiner (1953)	Merrifield (1966)		
Baum (1966)	Bushra (1948)	Altemus (1963)			
Ricketts (1968)	Riedel (1950)	Lusterman (1963)			
	Baum (1951)	Taylor, Hitchcock (1966)			
	Moorrees (1953)	Nanda, Nanda (1969)			
	Altemus (1955)				
	Sassouni (1955)				
	Stifter (1958)				
	Neger (1959)				
	Gresham (1963)				
	Horowitz, Thompson, (1964)				

*AMER. J. ORTHODONT. AND ANGLE ORTHODONT., 1937-1969.

factory" to "excellent," not just "average."

A breakdown of exactly how the subjects were selected for the thirty-five articles is tabulated in Table I. Six studies examined characteristics of the normal facial pattern without presenting a documented sample. The authors seemingly based their judgments on clinical experiences, isolated cases and "hunches." Forty per cent, or fourteen of the thirty-five studies, were based on samples chosen by orthodontists on the merit of occlusion only. Eight samples were selected by orthodontists on the basis of both good occlusion and good facial esthetics, while four samples were picked for qualities of good facial esthetics alone. Professional artists were responsible for the selection of excellent faces for two investigations of normal facial patterns.

Finally, only one published study since 1937 has attempted to reflect the general public's judgment of the face in selecting a normal sample for orthodontic analysis. This study published in 1957 by Richard Riedel used thirty beauty contest winners for its sample.[73]

It appears from the previous sociological and psychological evidence that the general public does have a rather consistent, demonstrable concept of facial preferences. Furthermore, we strongly feel that the orthodontist is obligated to study facial beauty, balance, harmony, and proportion as perceived through the eyes of the general public, not his own eyes nor those of other professionals. We must try to recognize and understand the general public's esthetic concept above our own esthetic prejudices. To this end, a representative sample of publicly recognized American faces was gathered for study and evaluation.

The Sample

The sample for our study consisted of fifty-two young adult subjects (See photographs at end of paper). Each participant had been acclaimed previously in some manner by a segment of the general population as possessing those qualities of facial esthetics which are the most pleasing. The sample included professional models, beauty contest winners, and performing stars noted for their facial attractiveness.

Table II

Ethnic origins of 52 subjects. Combined maternal and paternal (2N = 104)

English	25
Irish	15
Russian	13
French	10
Italian	10
German	9
Scandinavian	9
Scotch	5
Lithuanian	3
Polish	2
Czech	1
Dutch	1
Greek	1

Forty-nine of the subjects were female, while three subjects were male. The average age was 21 years, 2 months.

Racially, the sample was all white. Thirteen European backgrounds were represented in the maternal and paternal ancestries of the subjects (Table II).

To the question, "Have you ever had orthodontic treatment?", twenty-five per cent of the sample (13 subjects) answered "yes." From a cursory examination of occlusion, Class I (Angle) molar relationships of varying degrees were observed in all fifty-two participants.

After completing a brief questionnaire each subject was placed in a Margolis cephalostat in both the frontal and right profile positions. X-ray and photographic records were taken. A sagittal cephalogram was recorded with each subject in centric occlusion. Frontal and right profile photographs were taken with the subject in repose. Each participant was instructed, "Let your teeth

MARGOLIS ANALYSIS

Measurement*	MARGOLIS Mean	S.D.	SAMPLE Mean	S.D.
N	62.8	2.4	64.3	1.9
M	67.4	2.8	67.3	2.7
X	49.6	3.3	48.4	3.5
IMA	90.0	3.2	92.7	3.9
M-Occ	0.0	-	+3.8	2.6

*Bolton plane is used as the cranial base.

Table III

DOWNS ANALYSIS

Measurement	DOWNS Mean	S.D.	SAMPLE Mean	S.D.
Facial Angle	87.8	3.6	85.7	2.8
Angle Convexity	0.0	5.1	+3.4	3.3
A-B Plane to Fac. Plane	-4.6	3.7	-5.9	2.6
Mand. Plane Angle	21.9	3.2	23.9	4.6
Y-Axis to Frankfort	59.4	3.8	61.3	3.6
Occl. Plane to Frankfort	9.3	3.8	8.7	3.6
$\underline{1}$ to $\overline{1}$	135.4	5.8	133.5	8.2
$\overline{1}$ to Mand. Plane	91.4	3.8	94.9	4.2
$\overline{1}$ to Occl. Plane	+14.5	3.5	+20.3	4.4
$\underline{1}$ to A.P. Plane (mm)	+2.7	3.0	+5.0	1.8

Table IV

STEINER ANALYSIS

Measurement	STEINER Mean	S.D.*	SAMPLE Mean	S.D.
SNA	82		82.4	2.9
SNB	80		79.8	2.7
ANB	2		2.6	1.5
SND	76		77.5	2.6
$\underline{1}$ to NA (mm)	4		5.0	2.1
$\underline{1}$ to NA	22		21.6	6.7
$\overline{1}$ to NB (mm)	4		5.1	1.6
$\overline{1}$ to NB	25		23.7	5.4
Po to NB (mm)	*		3.0	1.8
$\underline{1}$ to $\overline{1}$	131		133.5	8.2
Occl. Pl. to SN	14		13.5	3.5
GoGn to SN	32		29.5	4.2
SL (mm)	51		57.4	6.2
SE (mm)	22		25.3	3.1

*NOT ESTABLISHED

Table V

rest slightly apart with your lips relaxed and lightly touching." An additional frontal photograph was taken with the subject in centric occlusion and "smiling broadly."

Cephalometric Analysis

Analysis of the sagittal cephalograms demonstrated what may have been expected: Fine faces generally possess equally fine skeletal foundations.

The sample of publicly-selected beauties was cephalometrically analyzed using the Margolis,[74] the Downs[60] and the Steiner[62] analyses. Means and standard deviations were derived from the cephalometric data. These values were compared with the standards commonly associated with each of the three analyses (Tables III, IV, and V).

Generally speaking, most of the twenty-nine measurements recorded fell within range of the pre-established standards. However, one interesting tendency was apparent from the data. The sample means almost always favored a fuller, more protrusive dentofacial pattern than our cephalometric standards would have liked to permit.

Downs' angle of convexity and A-B plane to the facial plane, and SNA of Riedel and Steiner may all be considered indexes of maxillary position. In the data all three of these measurements exhibited increases over the pre-established standards thereby pointing to maxillary protrusion. The angle of convexity showed the biggest difference, from 0.0 to +3.4°. The A-B to facial plane relationship increased by 1.3°, while SNA increased minimally by 0.4°. The fact that the increases are accompanied by relative reductions in standard deviation (S.D.) further makes these discrepancies notable.

On the other hand, the cephalometric indicators of mandibular position did not show a clear-cut tendency toward mandibular protrusion. While Margolis' angle at N increased 1.5°, Steiner's SND increased less, and Downs facial angle actually showed a decrease when compared with the existing standards.

However, our indexes of dental position revealed an incisor protrusion and procumbency in the sample of beauties which is not recognized in our present cephalometric standards. The inclination of the lower incisors is considered in three measurements: (1) The incisor mandibular angle of Margolis; (2) Downs' lower incisor to mandibular plane; and (3) Downs' lower incisor to occlusal plane. All three measurements

were notably larger in the sample than in the standards, indicating procumbency. Downs' upper incisor to AP plane measurement reflects upper incisor position. It, too, increased indicating a protrusive pattern by our traditional standards. In the Steiner analysis the indicators of dental position relate the upper incisors to the NA line and the lower incisors to the NB line. The mean values for these measurements were more suggestive of a forwardly *positioned* dentition than of a forwardly *inclined* dentition.

Though we may justifiably take issue with some of our cephalometric reference values, we certainly have no complaints against cephalometrics' over-all reliability. We can confidently say that esthetically pleasing faces demonstrate fine skeletal patterns in x-ray analysis.

But what of the converse statement? Does a desirable skeletal pattern imply desirable facial esthetics? If we observe a "good" bony pattern, do we necessarily have a pleasing profile by public standards?

We have all been guilty at one time or another of prejudging a face as "good" or "bad" solely on the weight of the sagittal cephalogram. Many of the thirty-five studies referred to previously have not clearly separated the concept of a good facial pattern from the concept of good facial esthetics. In fact, they sometimes unintentionally obscure this distinction. Purely esthetic terms like "harmony, balance, and proportion" are often used in describing skeletal patterns in x-ray cephalographic studies. Soon we begin to sprinkle our everyday x-ray talk with adjectives like "well-balanced, harmonious, and well-proportioned." And in a short time we become conditioned to label a profile as "desirable or not desirable" largely on the basis of the hard tissue analysis. Consequently, there is a prevailing tendency among orthodontists to develop in our minds a concept of *internal* facial esthetics—that is, with too little *direct* consideration of the actual soft tissue relationships.

In contrast, the layman's concept of facial esthetics is developed strictly from *external* observations. We are all aware that the average person looks at a face and can instantly decide if it appears pleasing or not so pleasing. For the general public this is largely a subconscious, unstructured decision.

For orthodontists, however, esthetic decision-making should involve a conscious, well-structured thought process. We like to limit our esthetic judgments to two views of the face: the frontal aspect and the lateral profile aspect. Our efforts to translate in objective terms what we see in these two facial views we have come to call "soft tissue analysis."

The remainder of this paper will attempt to examine some of the soft tissue qualities and quantities seen in the esthetically-pleasing face. Photographic records will be used exclusively.

Symmetry and Balance

The frontal or anterior view of the face illustrates the degree of facial symmetry and balance. *Symmetry and balance* when applied to facial esthetics have been given a variety of often confusing definitions. Essentially, though, they mean the same thing. They refer to *the state of facial equilibrium: the correspondence in size, form and arrangement of facial features on the opposite sides of the median sagittal plane.* We may represent this plane on the frontal photograph by measuring the interpupillary distance and recording its midpoint. This point and the midpoint of the upper lip, Cupid's bow, are then connected to form the median plane of the face.

Frontal photographs of several of the subjects in this study were divided

Fig. 10

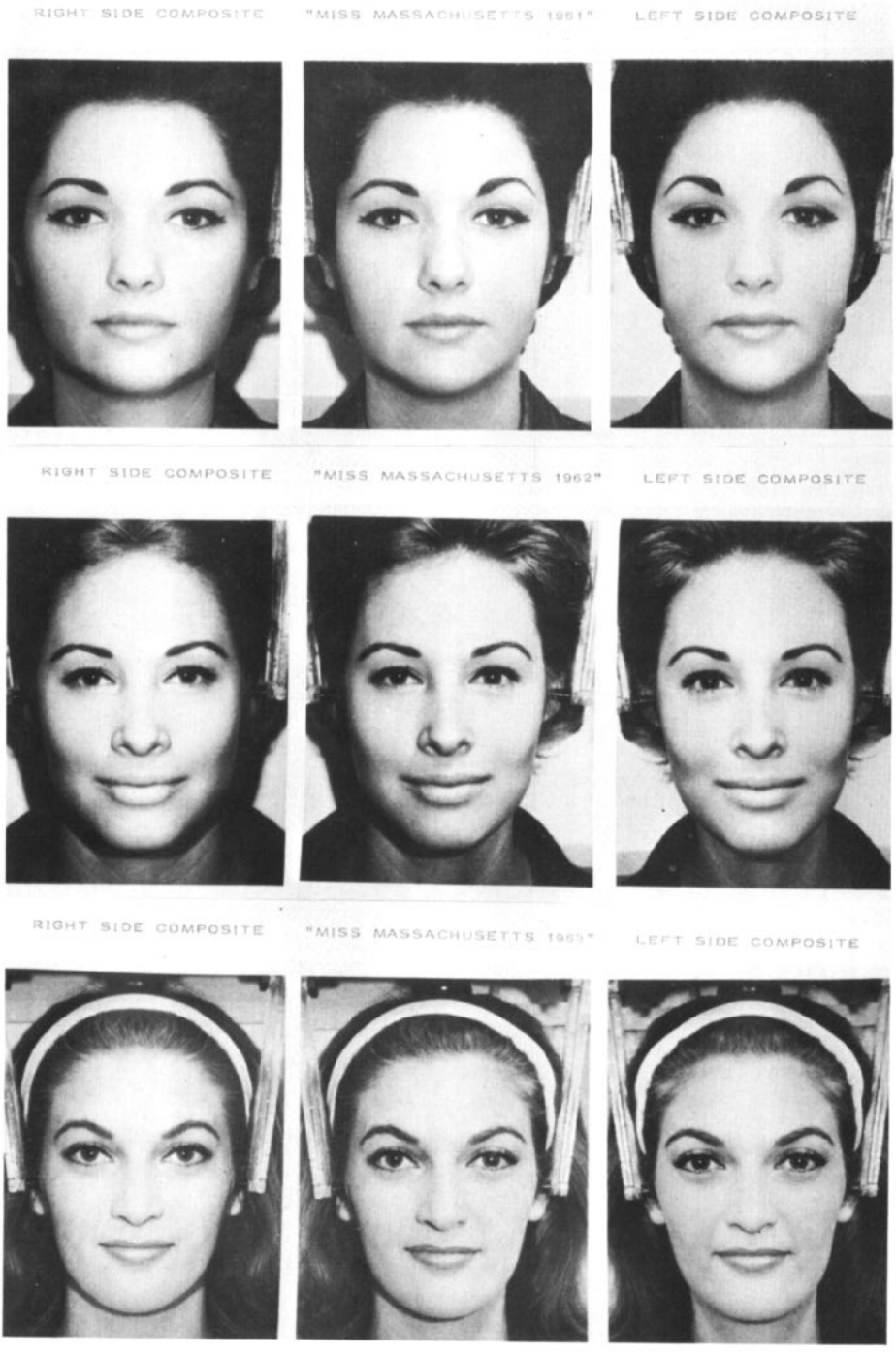


Fig. 11

along the median plane and reprocessed photographically to yield composite faces (Figs. 10 and 11). The right side was paired with its mirror image to yield one face, while the left side was paired with its mirror image to produce another.

Asymmetries in facial width became most noticeable in the composite photographs. Apparently, the disposition and development of the facial musculature are chiefly responsible for this soft tissue imbalance.

We may see from these photographs that a concept of facial esthetics can tolerate a detectable degree of soft tissue asymmetry. We must understand, however, that this degree of asymmetry serves to characterize and individualize the esthetically pleasing face, rather than to disfigure it.

Harmony, Proportion and Orientation

Now we proceed to the most significant aspect of the face orthodontically —the lateral profile view. With the lateral surface of the face oriented perpendicular to the camera, the profile along the median sagittal plane may be recorded photographically. Using the profile view exclusively we shall attempt to clear up some of the misunderstanding commonly associated with the catchall phrases "facial harmony and facial proportion." Facial orientation will also be considered.

Facial harmony, the most subjective term of the three, is defined in this study as *the orderly and pleasing arrangement of the facial parts in profile.*

A descriptive analysis of facial harmony should begin on the simplest level. Diagrammatically, the profile can be broken down into eleven component points (Fig. 12). Each of these points happens to be an anthropologic landmark. Starting at the top of the profile, they are Trichion (Tr), Glabella (G),

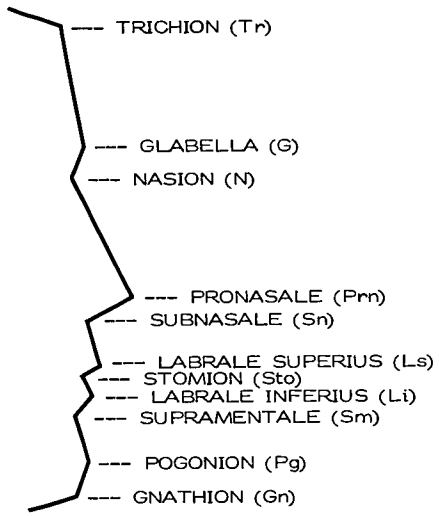


Fig. 12 Diagrammatic profile landmarks.

Nasion (N), Pronasale (Prn), Subnasale (Sn), Labrale superius (Ls), Stomion (Sto), Labrale inferius (Li), Supramentale (Sm), Pogonion (Pg) and Gnathion (Gn). These landmarks are defined on the basis of soft tissue configurations, regardless of the underlying skeletal anatomy.

But the points themselves are meaningless. Ultimate appreciation of the profile depends upon the manner in which these points are connected. Harmonious *profile flow* may be visualized as a series of waves or reversed "S's" on the right profile (Fig. 13). The largest of these extends from the forehead to the dorsum of the nose. The next continues from the nasal apex to the philtral ridge. And the last reverse S forms the lower lip and the mentolabial sulcus. Convexities representing the upper lip and chin complete the natural profile flow.

Regularity and evenness are essential traits or lineaments of the esthetically pleasing profile. Irregularities or acute curves, though often tolerated especially in males, tend to disrupt an otherwise harmonious profile. A nasal hump or

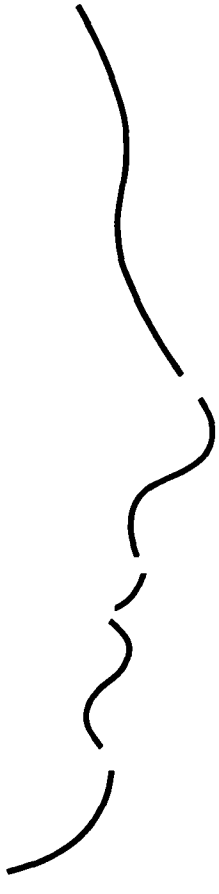


Fig. 13 Harmonious profile flow.

very angular lips, for example, concentrate the observer's attention, much like a discolored anterior tooth focuses our attention away from the rest of the teeth.

Three depressions or concavities are seen in the harmonious soft tissue profile (Fig. 14). There is one at nasion (N), another at subnasale (Sn), and the last at supramentale (Sm).

When the relative severity of these three depressions was measured on each of the fifty-two subjects, the following data were compiled: In over one half of the sample (28 subjects), Sn showed a steeper curvature than Sm, which was in turn more acute than N. In

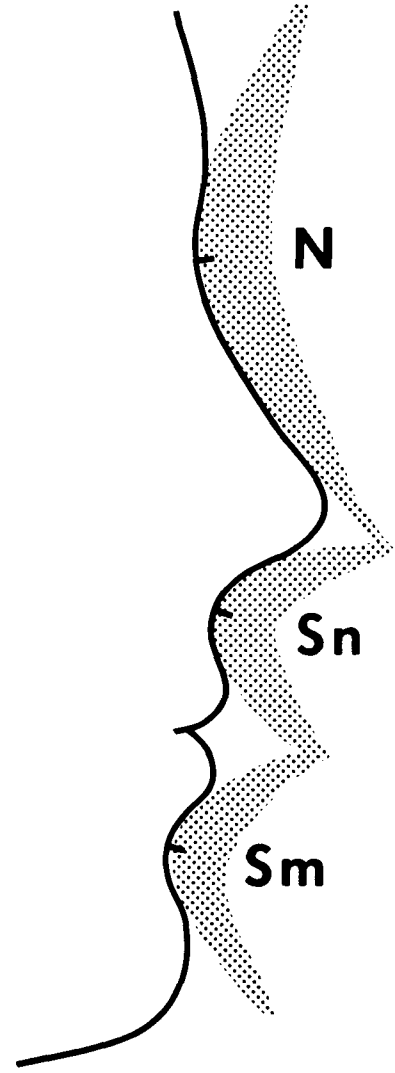


Fig. 14 Facial harmony. The relative profile concavity observed at nasion (N), subnasale (Sn), and supramentale (Sm) affects total profile harmony.

almost forty percent of the sample (19 subjects) the curvatures at Sn and Sm were practically identical, both exceeding the measurement at N. In three of the subjects the Sm curvature exceeded the Sn curvature. And in two of the subjects Sn demonstrated the most acute bend, but N curved more abruptly than Sm.

Unlike harmony, the qualities of proportion and orientation are rather easy to identify and measure. We shall define *facial proportion* as *the comparative relation of facial elements in profile. Facial orientation* on the other hand *is the relation of facial profile elements to the head.*

Orthodontists were numerically expressing soft tissue proportion and orientation over forty years ago. Pioneers like Paul Simon[75] and Milo Hellman[76] advocated systematic measurement and analysis of the face. They constructed lines, angles and relationships directly from the patient and from photographs for use in orthodontic diagnosis and classification. After the clinical introduction of x-ray cephalometrics, however, the profile photograph soon lost all its diagnostic charm. It then became, and unfortunately remains, a rather passive facial record.

And yet, a soft tissue profile analysis can provide valuable information in the development of a meaningful concept of facial esthetics. Furthermore, as a supplement to our other diagnostic records, a photographic profilometric analysis can yield useful clinical data.

Profilometric Analysis

The profilometric analysis used in this study employs the following four essential profile landmarks:

(1) nasion (N)—the most posterior point at the root of the nose in the median sagittal plane

(2) pronasale (Prn)—the most anterior point of the nose in the median sagittal plane

(3) labrale superius (Ls)—the point at the superior margin of the upper membranous lip in the median sagittal plane

(4) pogonion (Pg)—the most anterior prominent point on the chin in the median sagittal plane.

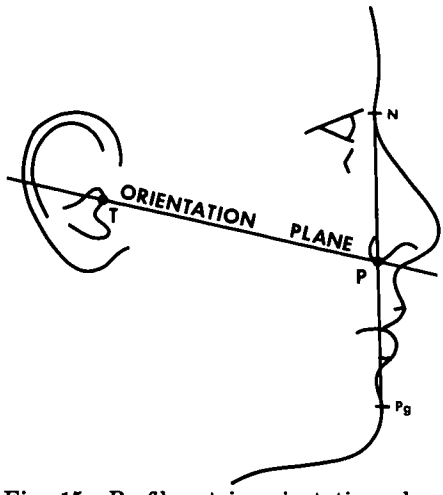


Fig. 15 Profilometric orientation plane constructed from tragion (T) to point P, the midpoint of the facial line (NPg).

These points envelop the profile elements of greatest orthodontic interest, namely, the nose, lips and chin. In addition, tragion (T) is used as a cranial reference landmark for profile orientation. Tragion is defined as the most anterior point in the supratragal notch of the ear.

The profilometric analysis is preferably constructed on oriented head photographs showing the right sagittal profile. In this way the orthodontist may evaluate subjective factors such as facial topography, muscle contours, and the structural elements of the side of the face while constructing the angular measurements. It is also advisable that the frontal and lateral photographs be taken with the subject in a cephalostat. Standardized head positioning is thus assured for comparative purposes.

As an alternate method, the profilometric analysis may be traced directly from the sagittal cephalogram. Obviously the cephalogram must have excellent soft tissue definition. In this case porion replaces tragion as the cranial landmark in the analysis.

The orientation of the profile is measured from a soft tissue orientation

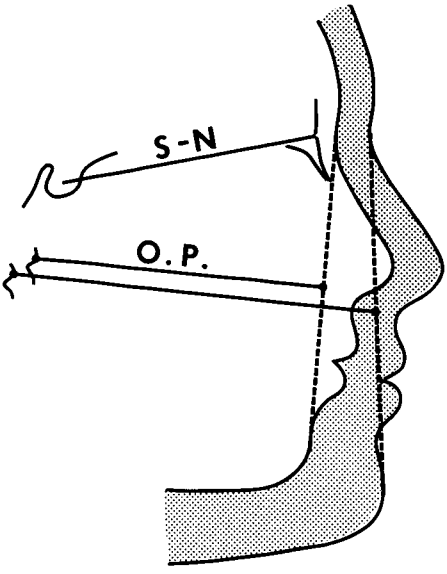


Fig. 16 Angular stability of the orientation plane (O.P.) relative to cephalometric SN.

plane (Fig. 15). To construct this plane on the profile photograph, we must first draw the facial line from nasion to pogonion (N-Pg) and bisect it. The midpoint (P) is then connected with tragion (T) to form the orientation plane (O.P.). Why must we follow this procedure?

If we superimpose on cephalometric SN registered on S, we observe that craniofacial growth appears to shift porion and its soft tissue equivalent, tragion, slightly downward and backward (Fig. 16). In contrast, the soft tissue profile is noticeably displaced downward and forward. By using the midpoint of the NPg facial line in conjunction with tragion, we essentially stabilize the soft tissue orientation plane relative to SN. This is especially important in interpreting the first angle, the facial angle.

The facial angle (F) is formed by the intersection of the orientation plane with the facial line at point P (Fig. 17). It is read as the inside inferior angle and serves as an index of profile orientation. In our sample of fifty-two young adults with esthetically pleasing faces, the mean facial angle was 102.5° with a standard deviation of 2.7°. The values ranged from 96.0° to 106.5°.

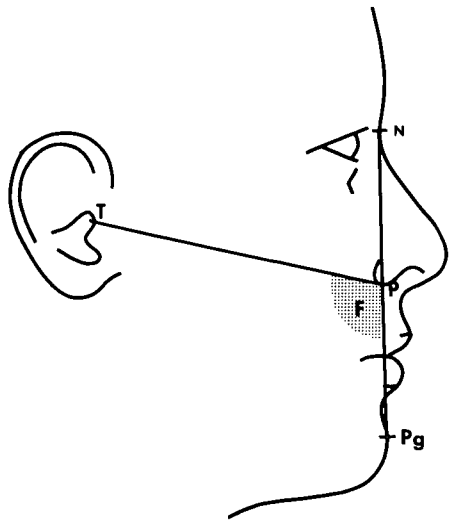


Fig. 17

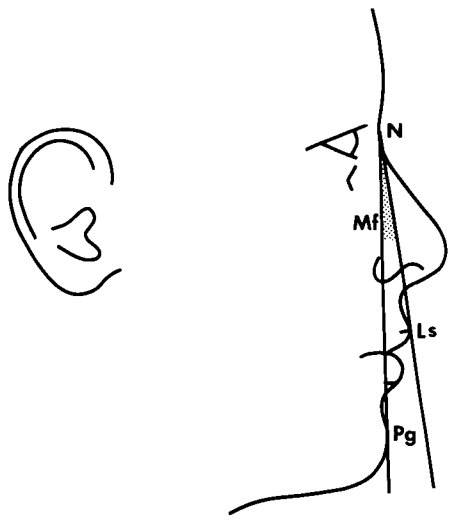


Fig. 18

The remaining angular measurements in the profilometric analysis offer assessments of the esthetically pleasing profile in both horizontal and vertical dimensions.

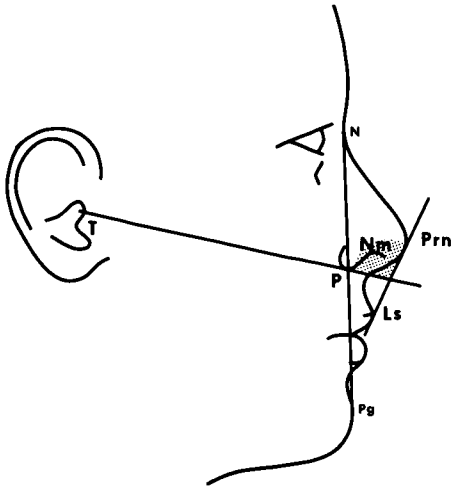


Fig. 19

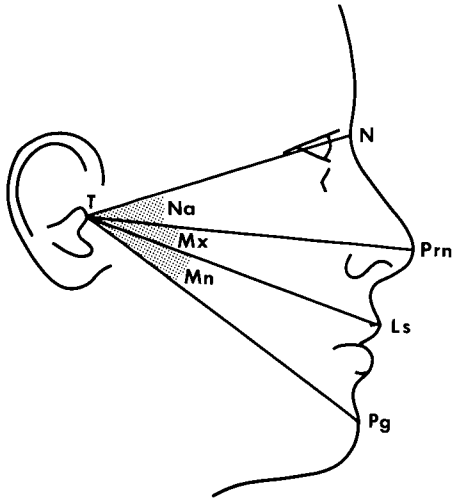


Fig. 20

The maxillofacial angle (Mf) relates the upper lip to the chin, horizontally (Fig. 18). It may be considered a soft tissue analog to cephalometric ANB introduced by Richard Riedel. The mean value obtained for this angle was 5.9° with a standard deviation of 1.7°. The range of values among the fifty-two subjects was 2.5° to 9.5°.

We now relate the upper lip to the nasal apex by drawing a line through labrale superius and pronasale (Fig. 19). At the intersection of this line with the orientation plane, the inside superior angle is read. This measurement, the nasomaxillary angle (Nm), had a mean value of 106.1° and a standard deviation of 3.9°. Its values ranged from 97.0° to 114.5°.

The nasal angle (Na) measures nasal height from nasion to pronasale; the maxillary angle (Mx) measures maxillary height from pronasale to labrale superius; and the mandibular angle (Mn) records mandibular height from labrale superius to pogonion (Fig. 20). The vertex of all these angles is at tragion.

From our sample of fifty-two young adults, the following values were obtained: The mean nasal angle was 23.3° and the range was 20° to 27°. The mean maxillary angle was 14.1° with a range of 12° to 17°. The mean mandibular angle was 17.1° ranging from 14° to 20°.

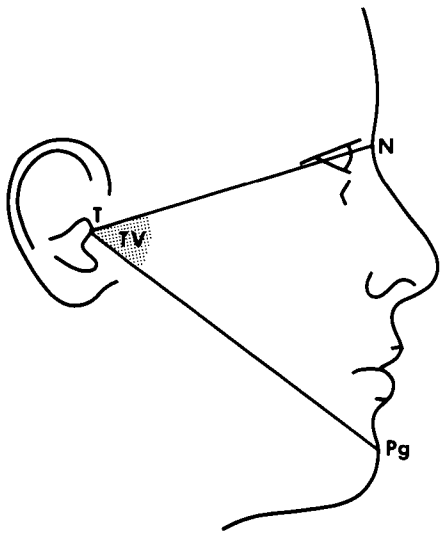


Fig. 21

A composite angle representing the total vertical (TV) dimension from nasion to pogonion is also constructed (Fig. 21). The total vertical angle had a mean value of 54.5° with a range of 47° to 62°.

The photographic profilometric analysis just described is not constructed to give profound answers to diagnostic questions. Nor is it proposed as a substitute for our time-tested cephalometric methods. Just as cephalometrics gives us an objective view of the skeletal profile, profilometrics provides an objective view of the facial profile.

Since the profilometric analysis integrates the stability of cephalometric SN into its soft tissue orientation plane, a new meaningfulness is accorded the profile photograph. The facial angle (F), utilizing the orientation plane as one of its sides, gives a quantitative assessment of the *actual* profile orientation. This value often differs markedly from the *skeletal* profile orientation routinely traced from the cephalogram.

Perhaps even more significant is the profilometric consideration of the nose. Though it is probably the most commanding feature of all the profile elements, the nose still receives little serious attention in orthodontic analysis. The nasomaxillary angle (Nm) with the orientation plane as its base is sensitive to both horizontal and vertical variations in nasal-labial relationships.

In future work the clinical aspects of profilometrics will be examined. At present, however, this analysis is primarily constructed to focus attention on the important structural characteristics of the esthetically-pleasing profile, toward developing a meaningful concept of facial esthetics.

Summary

From ancient Egypt through the Renaissance, Western civilization has recorded in sculpture many refined concepts of facial esthetics. Common to all these concepts was public recognition of the "esthetic ideal" of each period.

Society today, also, possesses ideals of facial esthetics. The disciplines of psychology and sociology now help us identify popular esthetic preferences. Studies show that there is significant agreement among the population regarding facial preferences. Nevertheless, the orthodontic community has largely neglected to study the public's esthetic viewpoint. With only one exception, no published American study since 1937 has attempted to reflect the general public's judgment of the face in selecting a "normal" sample for orthodontic analysis.

This prompted our study of fifty-two young adult subjects, each acclaimed previously in some manner by a segment of the general population as possessing those qualities of facial esthetics which are the most pleasing. The sample included professional models, beauty contest winners, and performing stars noted for their facial attractiveness. Standardized cephalograms and photographs were taken of each subject. Cephalometric appraisals using the Margolis, Downs, and Steiner analyses were compiled. When our sample means were compared with the standard means associated with each analysis, the following conclusion became evident: The general public admires a fuller, more protrusive dentofacial pattern than customary cephalometric standards would like to permit.

To identify further the public's concept of pleasing facial esthetics, a soft tissue analysis was undertaken utilizing standardized photographs of the subjects. The facial qualities of symmetry, harmony, proportion and orientation were defined and examined. A photographic profilometric analysis was described to focus attention on the important structural characteristics of the esthetically pleasing profile.

Obviously, there is no such thing as an equation for facial beauty. No numbers or devices can totally express the complexities of facial esthetics. In essence, this study attempts to refresh the

Subjects 1-6. *Top left,* Miss Shamrock 1964. *Top right,* Miss Massachusetts 1964 (Miss America Pageant). *Center left,* Miss Boston, 1966. *Center right,* Photographic and Fashion Model. *Bottom left,* Miss Rheingold National Finalist 1961. *Bottom right,* Miss Teenage Boston 1965.

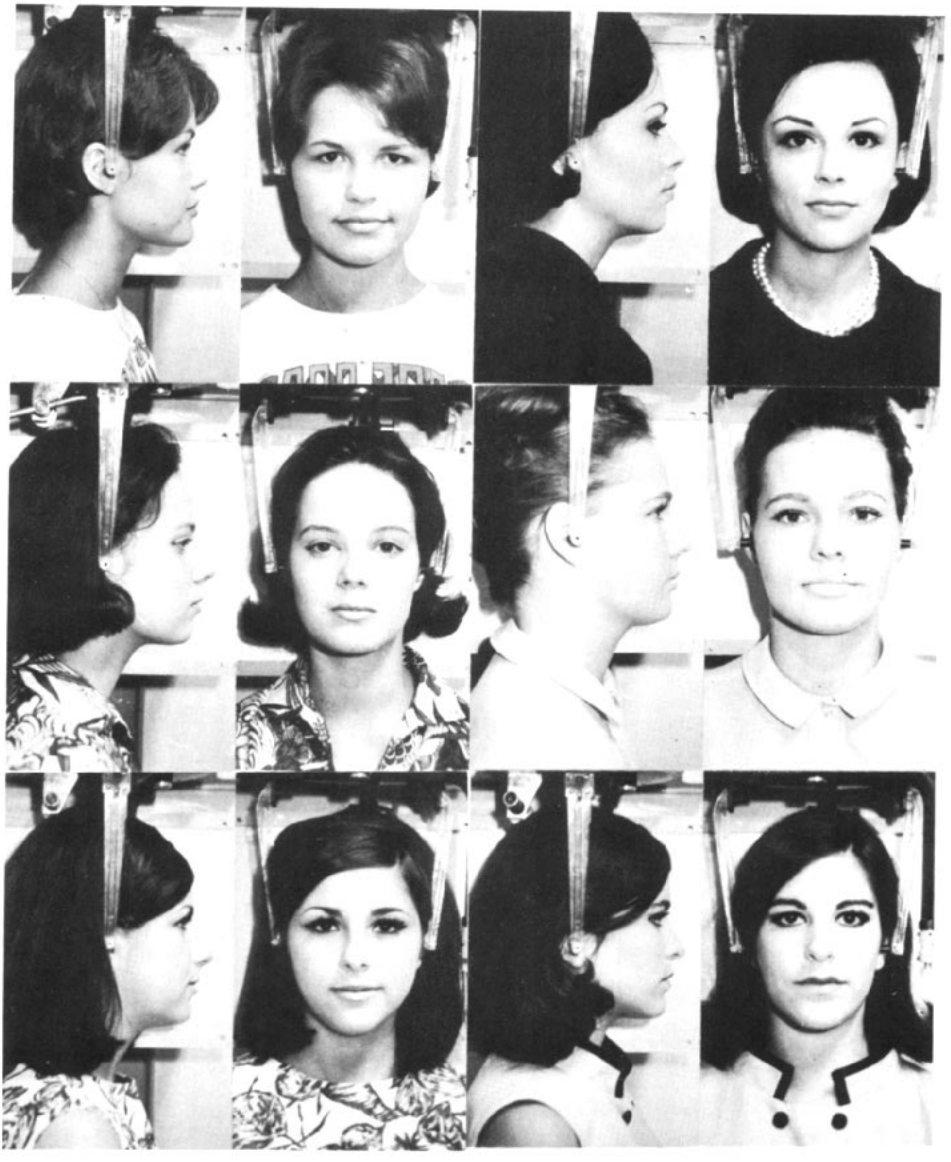
Subjects 7-12. *Top left*, Miss Coast Guard 1962. *Top right*, Troy Donahue, Television and Motion Picture Star. *Center left*, Winter Carnival Queen 1962. *Center right*, Miss Massachusetts Junior Miss 1961. *Bottom left*, Miss Massachusetts 1966 (Miss World Pageant). *Bottom right*, John Raitt, Stage and Motion Picture Star.

Subjects 13-18. *Top left,* Miss National Bonnie Lassie 1962. *Top right,* Miss Rheingold 1963. *Center left,* Miss Teenage America 1963. *Center right,* Robert Goulet, Stage and Motion Picture Star. *Bottom left,* New England Boat Show Queen 1964. *Bottom right,* Glamour Magazine Girl 1960.

Subjects 19-24. *Top left*, Photographic and Fashion Model. *Top right*, Miss Massachusetts 1963 (Miss Universe Pageant). *Center left*, Photographic and Fashion Model. *Center right*, Photographic and Fashion Model. *Bottom left*, Miss Junior Achievement 1964. *Bottom right*, Photographic and Fashion Model.

Subjects 25-30. *Top left,* Photographic and Fashion Model. *Top right,* Playboy Magazine Fashion Model. *Center left,* America's Junior Miss 1963. *Center right,* Photographic and Fashion Model. *Bottom left,* Miss Teen New England 1964. *Bottom right,* Boston Herald "Cover Girl" 1963.

Subjects 31-36. *Top left,* Miss Rheingold National Finalist 1959. *Top right,* Miss Massachusetts 1962 (Miss Universe Pageant). *Center left,* Photographic and Fashion Model. *Center right,* Miss Massachusetts 1965 (Miss Universe Pageant). *Bottom left,* Univ. of North Carolina Beauty Queen 1961. *Bottom right,* Miss Massachusetts 1961 (Miss America Pageant).



Subjects 37-42. *Top left*, Photographic and Fashion Model. *Top right*, Photographic and Fashion Model. *Center left*, Miss Massachusetts High School 1964. *Center right*, Miss New England College Queen 1963. *Bottom left*, Miss Methuen 1964. *Bottom right*, Photographic and Fashion Model.

Subjects 43-48. *Top left,* Photographic and Fashion Model. *Top right,* Miss Lexington 1964. *Center left,* Seventeen Cover Girl 1966. *Center right,* Miss Charm 1962. *Bottom left,* Miss New England College Queen 1964. *Bottom right,* Photographic and Fashion Model.

Subjects 49-52. *Top left*, Miss Medfield 1964. *Top right*, Miss Massachusetts 1960 (Miss America Pageant). *Bottom left*, Miss Quincy 1963. *Bottom right*, Photographic and Fashion Model.

orthodontist's esthetic awareness and to reorient his thinking toward developing a realistic concept of facial esthetics.

311 Commonwealth Avenue
Boston, Massachusetts 02115

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Discussion

DR. GUY A. WOODS

I would like to thank Dr. Peck for the unselfish work he has done in bringing this material to us. I appreciate his consideration in getting the manuscript to me well in advance of this meeting. As a discusser, I do not intend to give another paper. Nor are my remarks intended to be critical, but rather to emphasize certain points that have been made, and to think out loud in those areas where questions arise in my mind.

I am primarily interested in clinical orthodontics. With that in mind I would like to reiterate what Dr. Peck said in the beginning as well as at the end of his paper, that we must consider the patients' and parents' wishes as far as we can in planning our treatment, rather than a stereotyped ideal we have in our mind. For example, there are borderline extraction cases that could be treated nonextraction, thereby producing a more protrusive profile than if four premolars were removed. In the handling of extraction cases, buccal segments can be brought forward as well as anteriors retracted.

In going over this work, it seemed to be divided into three main areas: (1) a statement of the problem, (2) the presentation of his sample for study and its evaluation and, (3) a new method of analyzing profiles.

The first section included a review of the literature, and I would like to skip hurriedly over this and devote the time your committee has given me to other aspects of this paper.

The sample for the study was primarily young adult females, forty-nine out of fifty-two. Their skeletal growth is essentially completed by the time our treatment is over. Therefore, I would assume the same results would have been obtained if girls in the twelve to fourteen age group had been used. However, as the male skeletal development often continues for several additional years, there could be considerable differences between individuals at age twelve and twenty-one. In my office, retention of orthodontic results is more of a problem during the ages of fourteen to eighteen in boys than in girls.

The question that also arises in my mind when examining faces is, "What about hair, eyes, complexion, etc.?" I wonder what the results would be if these faces were examined by viewing from below the eyes and anterior to the ears? Or, stated another way: Do we arrive at a position for finishing our cases because of facial harmony or because of stability of results?

The only examination of the occlusion of the individuals involved in this study was to determine that they had normal anteroposterior relations of the molars. Therefore, I assume there was more or less malocclusion exhibited. The cephalometric analysis of these individuals demonstrated a more protrusive profile than the standards which we

have considered "normal." From this are we to conclude that teeth in malocclusion are more protrusive than those with proper alignment? If this is the case, then clinically should we accept the relapse that could occur in cases treated to this more protrusive position?

This sample also showed a basically good skeletal relation. The question then arises, from a clinical standpoint, "How should we treat those patients who do not have this desirable bony pattern? Might we not be able to handle our therapy in such a fashion as to disguise an otherwise unfavorable situation?"

The third point of the paper points out that possibly we have ignored one of our basic orthodontic tools in recent years, the photographic. With the advent of modern cephalometric techniques, photographs have been neglected as a diagnostic aid. I am sure we have all examined the head films and felt that they did not match the photographs of that patient. Of course, this is also true of other records we use, and one must not ignore any of them. How often have you clinically examined a patient and arrived at a tentative diagnosis and treatment plan, only to have to revise it completely after additional study?

The analysis of the photographs as presented uses a number of angles, similar to cephalometric analysis. I am particularly interested in the nasomaxillary angle. This angle relates the upper lip to the nose. As this is not analogous to any of our cephalometric measurements, it could give us additional information. The questions that come to my mind are, "What about differential growth, and does the external nose grow more than the upper lip?" If so, it might be necessary to have different standards for different age groups.

In conclusion, I would again like to thank the essayist for his presentation and hope that some time in the future he will show us the results of using this analysis clinically, both from an orthodontic diagnosis and treatment planning aspect and from the point of view of an appraisal of orthodontic results.