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## **Man's face and mimic language**

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II The human cranium and the facial skeleton

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## II The human cranium and the facial skeleton

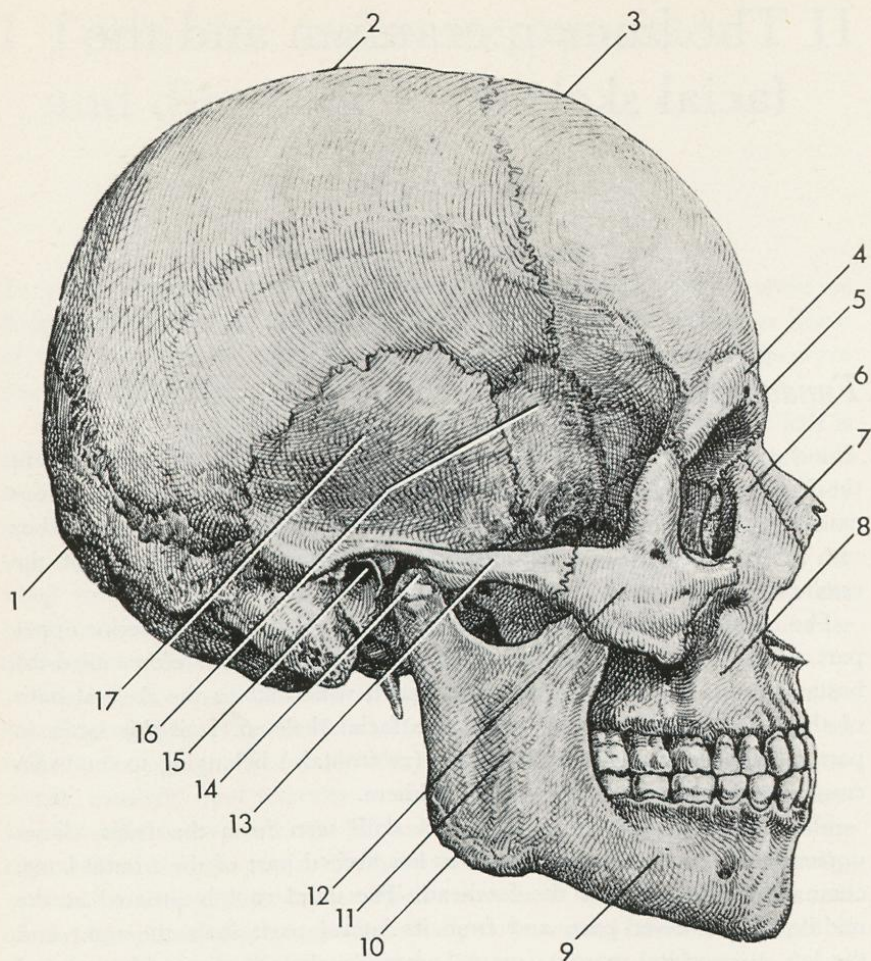
### *Fundamental structure*

The shape of a person's skull (cranium) influences to a considerable extent the impression given by the face. Because decisive and important relations exist between the facial soft parts and the skeletal basis upon which they rest, a short survey is given here of the fundamental structure of the cranium.

The cranium consists of two main parts (Fig. 3 & 4); a posterior upper part, which houses, among other things, the brain and is therefore called the brain cranium, and an anterior lower part, which forms the skeletal basis of the face and is therefore called the facial skeleton. It is this latter in particular, as well as the frontal bone (*os frontale*) belonging to the brain cranium, that is to some extent discussed here.

The frontal picture (Fig. 4), i.e. a skull seen from the front, shows uppermost the shovel-shaped, more or less arched part of the frontal bone, commonly referred to as the forehead. The nasal root is situated at the middle of the lower part, and from its lateral parts issue the right and the left supraorbital margin (*margo supraorbitalis*) in a somewhat curved course. These supraorbital margins form the lower edge of the forehead. From their lateral parts, an arched ridge formation rises upwards-backwards, which is the anterior boundary of the temporal area. Immediately above the root of the nose lies a part that plays an important role in anthropology, where it is referred to as glabella. This part, particularly in males, can be fairly strongly protruding. Parallel with and somewhat above the supraorbital margins run the superciliary arches (*arcus superciliares*) more or less well formed, but in the female often altogether missing. The reverse applies to the frontal bosses (*tubera frontalia*), situated somewhat higher up: these are usually better developed in women and children.

The lateral margin of the eye-socket (*orbita*) is formed by the zygomatic bone (*os zygomaticum*). In some people, this bone curves rather strongly laterally and is the skeletal basis for the cheekbone. Backwards, this bone is drawn out in a process which is included as the anterior part in the formation of the zygomatic arch below the temporal area. Sometimes, this

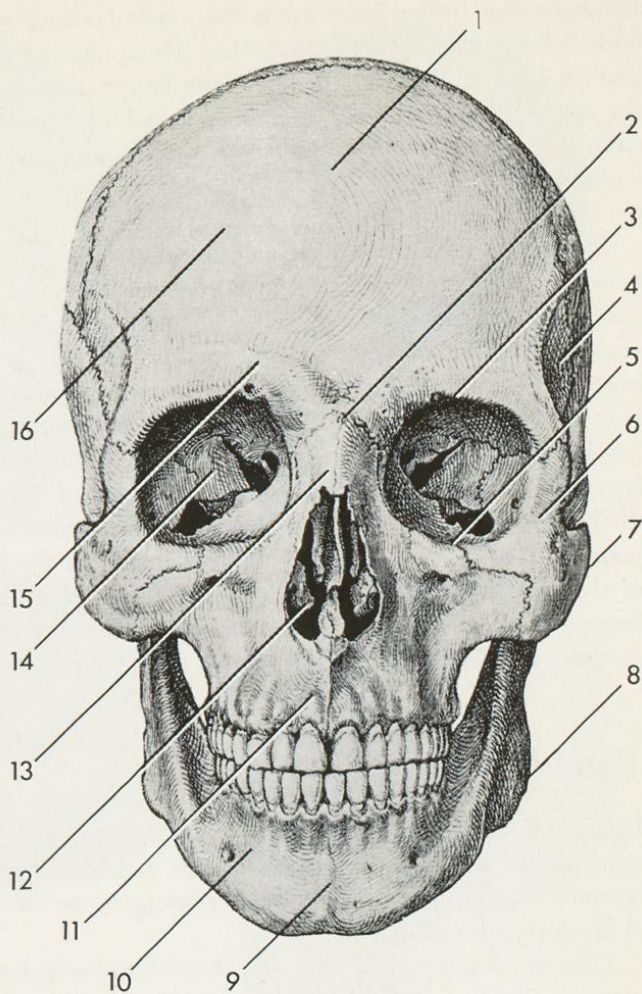


**Fig. 3.** Cranium, lateral view, profile picture (according to T. Petrén 1960).

- |   |                       |                   |
|---|-----------------------|-------------------|
| 1 Occipital bone                            | 7 Nasal bone          | 14 Jaw joint      |
| 2 Parietal bone                             | 8 Upper jaw           | 15 Auditory canal |
| 3 Frontal bone                              | 9 Body of lower jaw   | 16 Temporal area  |
| 4 Supraglabellar furrow                     | 10 Angle of lower jaw | 17 Temporal bone  |
| 5 Glabella                                  | 11 Ramus of lower jaw |                   |
| 6 Frontal bone process of the upper jawbone | 12 Zygomatic bone     |                   |
|   | 13 Zygomatic arch     |                   |

zygomatic arch curves outwards or bends laterally. The zygomatic bone, however, also forms the lateral part of the infraorbital margin (margo infraorbitalis). The medial part of this margin, as well as the medial margin of the eye-socket, on the other hand, belongs to the upper jawbone (maxilla) and to the frontal process of this bone, which latter extends up to and combines with the frontal bone at the root of the nose.





**Fig. 4.** Cranium, frontal view (according to T. Petrén 1960).

- |                       |                      |                      |
|-----------------------|----------------------|----------------------|
| 1 Frontal bone        | 7 Zygomatic arch     | 13 Nasal bone        |
| 2 Root of nose        | 8 Angle of lower jaw | 14 Eye-socket        |
| 3 Supraorbital margin | 9 Chin boss          | 15 Superciliary arch |
| 4 Temporal area       | 10 Lower jaw         | 16 Frontal boss      |
| 5 Infraorbital margin | 11 Upper jaw         |                      |
| 6 Zygomatic bone      | 12 Nasal cavity      |                      |

The upper jawbone is thus the bone that lies medially to the zygomatic bone. In the lower parts, the jawbones of both sides join, but higher up, there is a pear-shaped opening which reaches up to the root of the nose. This opening is the nasal cavity. In the upper part, it is closed by the two nasal bones, which join in the median line forming the nasal bridge. Immediately below the infraorbital margin lies the outlet of a nerve canal

and somewhat further downwards the upper jawbone sometimes shows a fairly marked hollow, the fossa canina. Those parts of the upper jawbone that lie on a level below the zygomatic bones and the nasal cavity form the upper jaw — in a limited meaning. Its width is barely half of that between the zygomatic arches. The teeth of the upper jaw are situated in the lower edge of the upper jaw and have their roots set into oblong cavities, the alveoli. These cause ridges (*juga alveolaria*) on the outside of the bone.

The frontal picture is completed by the lower jaw (*mandibula*). Its foremost part, in many persons, protrudes somewhat and forms a chin boss, which is sometimes distinctly cleft. Otherwise, each half of the lower jaw consists of two shanks, the branch (*ramus*) and the body (*corpus*). The branch is the upwards-standing shank in the posterior part of the lower jaw; highest up at the back, it carries the joint head, which is part of the jaw joint. The body is the anterior, more horizontally-standing shank of the lower jaw; in its upper part, it contains the teeth of the lower jaw. Similar to the teeth in the upper jaw, these have their roots set in alveoli. The posterior contour line of the branch together with the lower contour line of the body forms an angle of approximately  $120^{\circ}$ . That portion of the lower jaw where this angle formation is found is called the lower jaw angle (*angulus mandibulae*). In many persons, it is distinctly curved outwards.

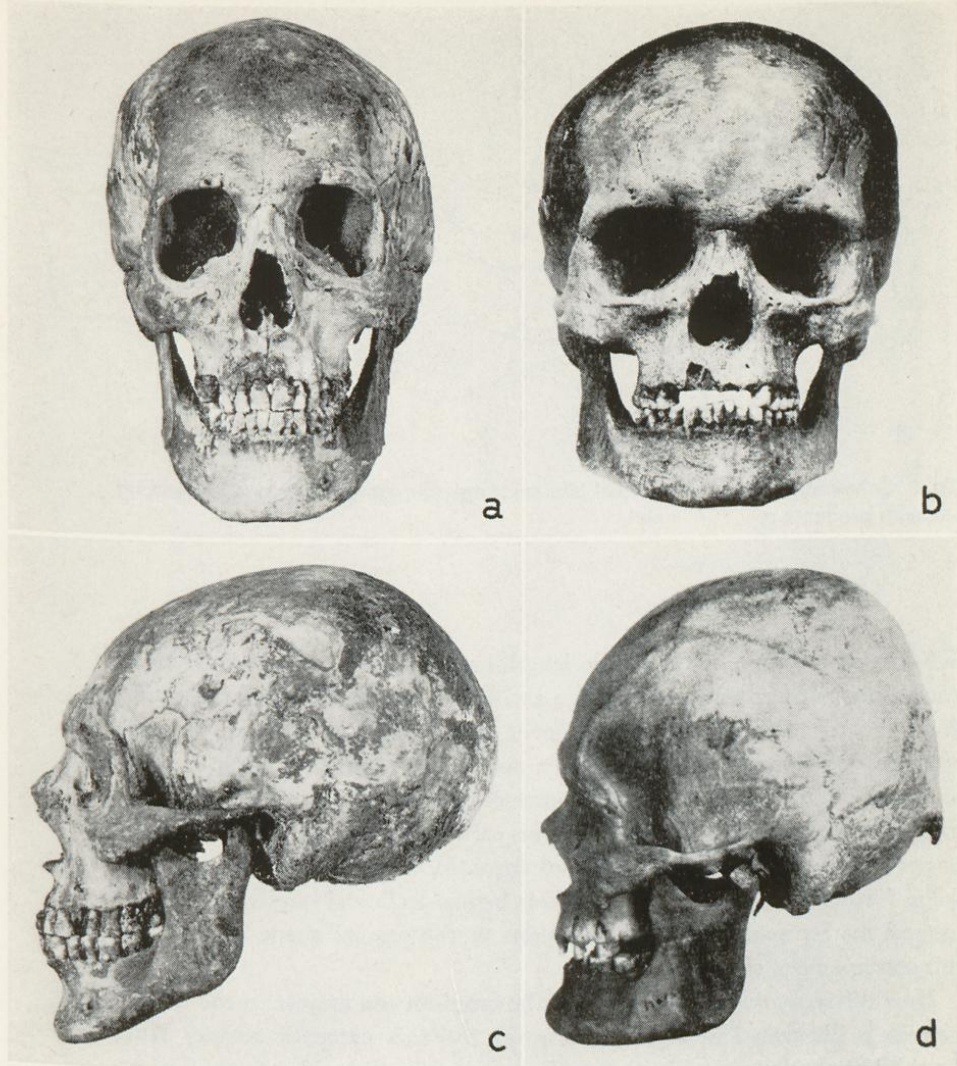
## *Variations*

Large individual variations due to age, sex, race, and hereditary factors, occur in the shape of the cranium. Such variations have for a long time been the object of profound study; they belong to the more central problems in physical anthropology.

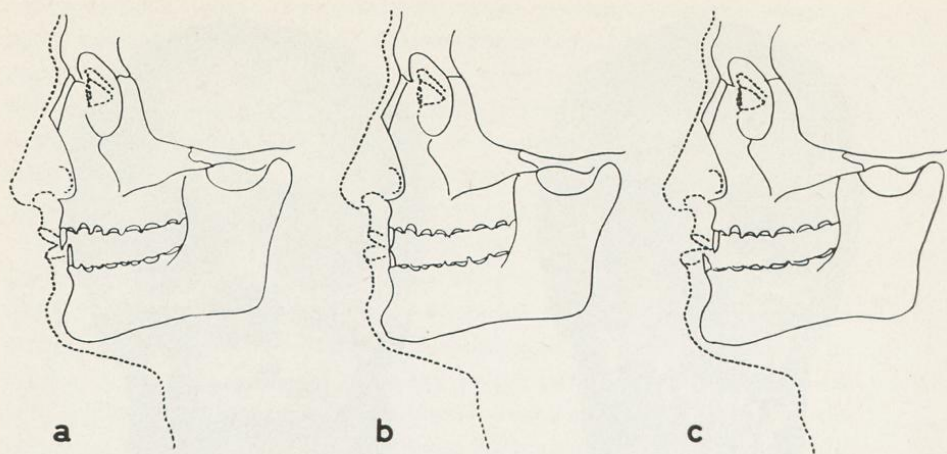
Thus the object has been to find decisive measurements that produce a representative expression for various lengths, breadths, and heights, both in the cranium considered as a whole and in its two main parts: the brain cranium and the facial skeleton. So that the measurements of such dimensions could be consistently made in a standardized manner, special anthropological measurement points are referred to, whose position on the cranium are meticulously defined and internationally approved. Some measurements cannot be made until the cranium has been orientated in the Frankfort plane, which means that those points situated highest up at the external orifices of the auditory canals and the point that is situated lowest down on the left infraorbital margin must be found on the same horizontal plane.

Certain of the anthropological characters of the cranium can be determined directly without the necessity of referring to the obtained measurement results. In most cases, however, the anthropological characters are obtained with the aid of an anthropological index, which is usually based on two linear measurements expressed in percentage of each other. A





**Fig. 5.** Cranium of King Erik XIV of Sweden, sixteenth century: frontal picture (a), profile (c). Cranium of Gothland viking from the Iron Age: frontal picture (b). Cranium of Tibetan from East-Turkestan: profile (d). (According to N. G. Grejvall, C. H. Hjortsjö & T. Romanus 1962 (a, c), G. Retzius 1899 (b), and C. H. Hjortsjö & A. Walander 1942 (d).)

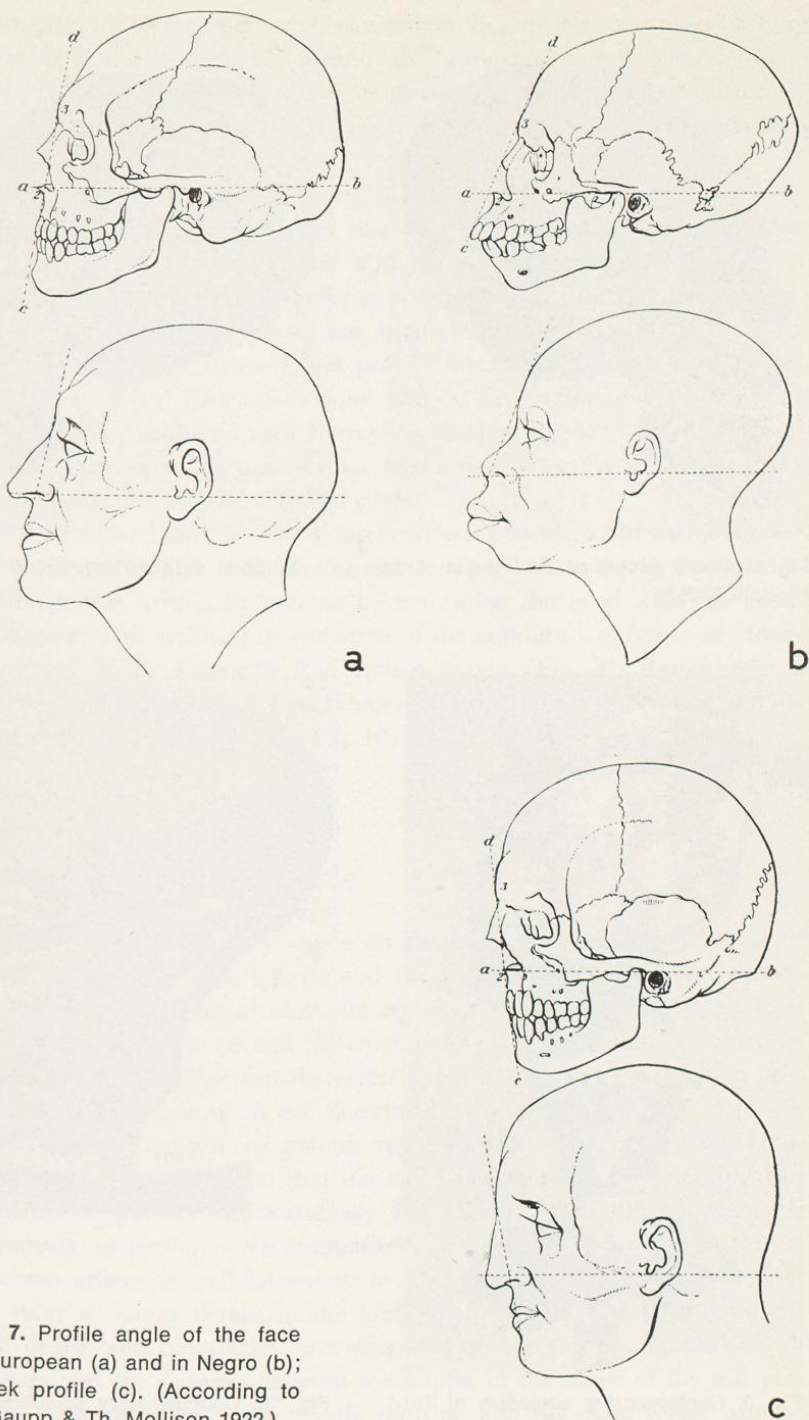


**Fig. 6.** Schematic drawing of normal bite (a), edge-to-edge bite (b), and underhung bite with prognia (c).

well-known example of this is the length-breadth index of the skull, introduced into anthropology as long ago as 1842 by the Swede Anders Retzius. With regard to the numerical value of this index, a distinction is made between dolichocephaly, mesocephaly, and brachycephaly. A large number of similar indices have during the course of time been constructed; it can be mentioned that the present author in his own anthropological investigations has usually worked with about 30 of these. However, it is unnecessary to delve further into these purely anthropological-technical questions; we will instead merely pause at some variations in the cranial shape that can in this concept be of special interest.

How different the general form of the cranium can appear in the frontal picture is illustrated in Fig. 5, where the Swedish sixteenth century King Erik XIV's skull (a), with its long face, is shown alongside the skull of an Iron Age viking from Gothland (b), with its low, broad face. The great variation in the profile picture is illustrated by Erik XIV's skull (c) alongside a Tibetan skull from Sven Hedin's East-Turkestan material (d). The fairly gracile structure and the longish shape of the former skull here contrast glaringly with the massive construction and the flattened back of the Tibetan skull.

When the teeth are clenched, the front teeth of the lower jaw normally sit somewhat behind those of the upper jaw (Fig. 6 a). If these teeth meet, there is an edge-to-edge bite (Fig. 6 b). Sometimes, however, the teeth of the lower jaw shoot in front of those of the upper jaw; we then have an underhung bite (Fig. 6 c). This variation in the shape of the jaw naturally presents a specially characteristic feature, not only to the facial skeleton,



**Fig. 7.** Profile angle of the face in European (a) and in Negro (b); Greek profile (c). (According to E. Gaupp & Th. Mollison 1922.)





**Fig. 8.** South American Red Indian crania with artificial deformation. (According to C. H. Hjortsjö 1958.)



**Fig. 9.** Contemporary sculpture of Tutankhamen's deformed head as a child. (According to V. Laurent-Täckholm 1951.)



**Fig. 10.** Contemporary sculpture of deformed head of child, a daughter of Amenhotep IV. (According to Swedish encyclopedia, Vol. 8, 1948.)

but to the whole facial shape, because then the underlip and the chin often protrude rather strongly: the person has a progenia. This anomaly seems to be largely hereditary and was a dominant feature in, among others, the Habsburg dynasty, which Velázquez hints at in his well-known portrait of Philip IV of Spain.

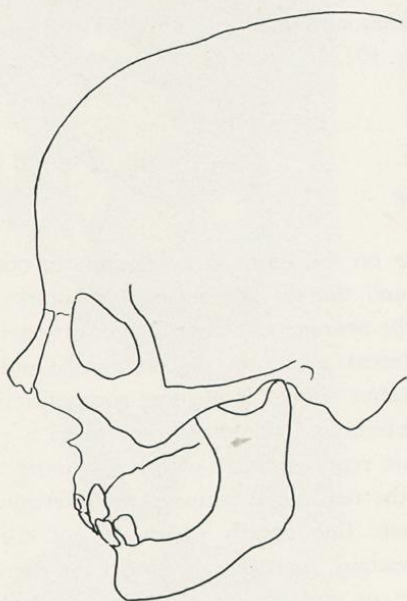
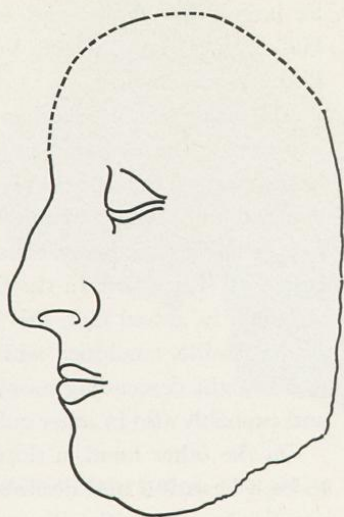
The angle of the facial profile is also of particular interest. It is formed between a line drawn from the root of the nose to the most protruding lower part of the upper jaw and a line passing through the upper part of the auditory canal and the lowest part of the nasal cavity. The angle in a European is practically always less than  $90^\circ$  (Fig. 7 a) and in a Negro, even less (Fig. 7 b). In the Greek profile, the angle exceeds  $90^\circ$  (Fig. 7 c), although in actual fact, this is quite rare. As the name indicates, this angle of the profile, combined with a steeply ascending forehead and in line with it a straight descending nasal bridge, was a sign of beauty in ancient Hellas and probably also in other cultural circles.

On the other hand, a sloping forehead was considered in many quarters to be a beautiful and desirable feature. If a person was not so equipped by nature, it was artificially created by deforming the head with the use of bandaging. This artificial deformation of the cranium was frequently found in certain South American Red Indian crania (Fig. 8). Reminiscent of these are the sculptures of Tutankhamen's head as a child (Fig. 9) and one of Amenhotep IV's daughters (Fig. 10).

## *Cranium and appearance*

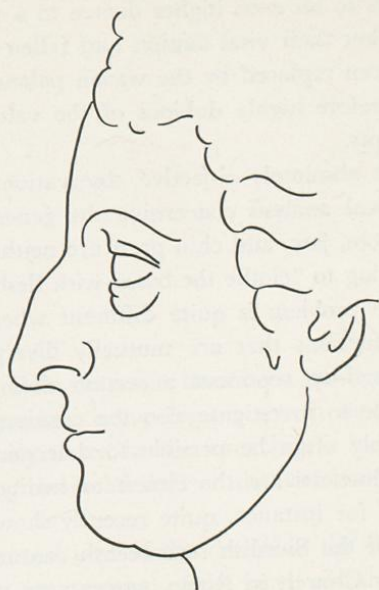
Several attempts have been made on the basis of a cranium to obtain a plastic picture of the soft parts and thereby the appearance of the individual. It is possible to calculate the average thickness of the soft-part layer in various ways from several different points on the cranium. Guided by the obtained values, we can thereafter either "lay" some composition on a casting of the cranium in the determined thickness, or add to a profile picture of the cranium the graphic representation of the soft parts. However, we must bear in mind that the real facial features are determined by numerous subfactors and extremely fine details which, if not correctly reproduced or perhaps even emphasized, immediately distort the picture of a person otherwise well known to us and give it a foreign character. It can refer to minor details in the high forehead, or the character of the hair, beard, and moustache, eyebrows, eyelids, the position and setting of the eyes and the distance between the pupils, in the shape of the soft part of the nose, the cheeks, the mouth, the lips, and the chin. Every painter, artist, and photographer who works with portraits, and every actor are well versed with these conditions. A person who, after a long and wasting illness,



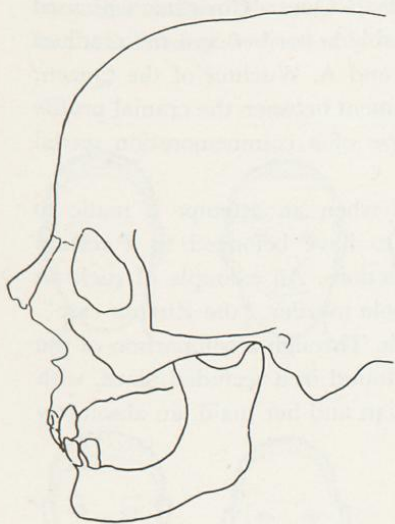


**Fig. 11.** Silver face mask of Queen Christina of Sweden, seventeenth century, (a, b, d) compared with a profile drawing of her cranium (c, d). (According to C. H. Hjortsjö 1967.)

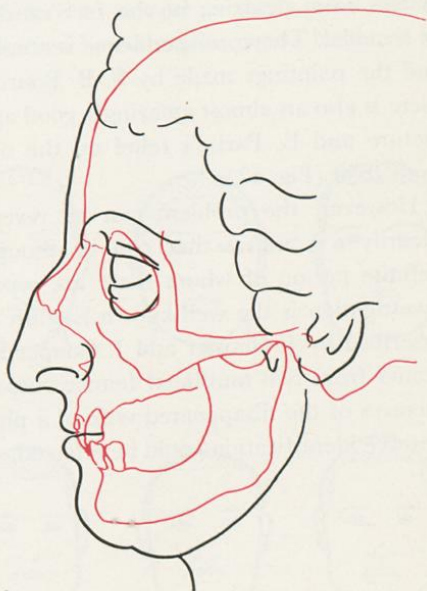




b



c



d

**Fig. 12.** Profile of Queen Christina on a commemoration medal (a, b, d) compared with a profile drawing of her cranium (c, d). (According to C. H. Hjortsjö 1967.)

lies in extremis often has something strange in his appearance. The same applies to an even higher degree to a newly-dead person when the tissues have lost their vital tension and fallen together and when the flush of life has been replaced by the waxen paleness of death. The author personally is therefore highly dubious of the value of the mentioned reconstruction attempts.

The absolutely objective observations that can be made by an anthropological analysis concerning the general shape of the face, its forehead, eye, nose, jaw, and chin parts are neither more reliable nor more complete by trying to "clothe the bones with flesh" by such reconstructions.

The problem is quite different when we have access to a number of reproductions that are mutually divergent, despite the fact that all are supposed to represent a certain definite person. If in such cases it is possible to investigate also the cranium of the person in question, it can probably often be possible to determine, at least reasonably well, which reproductions are the closest to reality and which are false. The author could, for instance, quite recently show that the silver mask covering the face of the Swedish seventeenth century Queen Christina, interred in St. Peter's Church in Rome, agrees very poorly with her cranium (Fig. 11). The deviations, as a matter of fact, are so great that it must be seriously questioned whether, on the whole, it represents a death mask, i.e. whether in this case a casting of the face of the dead Queen Christina was used as a model. The correspondence is considerably better between the cranium and the paintings made by S. B. Bourdon and A. Wuchter of the Queen; there is also an almost amazingly good agreement between the cranial profile picture and E. Parise's relief on the obverse of a commemoration medal from 1650 (Fig. 12).

However, the problem can be reversed when an attempt is made to identify a cranium that can be thought to have belonged to a certain definite person of whom there are reproductions. An example of such an investigation is the well-known English double murder, "the Ruxton case", described by J. Glaister and J. Couper Brash. Through a comparison of the crania from two mutilated female corpses, found in a secluded place, with pictures of the disappeared wife of a physician and her maid, an absolutely positive identification could be effected.