were appointed for the purpose (see p. 6), but they accomplished nothing substantial. The interest in the subject was however well aroused by this time, and the anthropologists meeting in 1906 with the XIIIth International Congress of Prehistoric Anthropology and Archeology in Monaco, undertook seriously and in a large measure successfully the formation of an International Agreement on Anthropometry. The work thus auspiciously begun was continued by the anthropologists meeting with the XIVth Congress, in 1912, at Geneva. The task thus undertaken is not yet finished; but what has been done furnishes a sound and large nucleus for further developments. At the occasion of the XVIIIth International Congress of Americanists, at London, in 1912, foundations were laid for the formation of an international association of anthropologists,[1] and one of the essential features of such an association must be a permanent International Anthropometric Board, which will deal with all questions relating to the harmonization of anthropometric methods, instruments, and procedures.

The results in anthropometric unification thus far attained are embodied in two reports, published originally in French in 1906, and in the French, English and German in 1912. As these agreements are of fundamental importance to every worker in physical anthropology, and as they are not as readily available as desirable, they will be here republished. In translating the French report of 1906 there were found a number of points which needed a few words of explanation and this report, therefore, is annotated.

THE INTERNATIONAL AGREEMENT FOR THE UNIFICATION OF CRANIOMETRIC AND CEPHALOMETRIC MEASUREMENTS

REPORT OF THE COMMISSION APPOINTED BY THE XIII INTERNATIONAL CONGRESS OF PREHISTORIC ANTHROPOLOGY AND ARCHEOLOGY, AT MONACO, 1906

BY DR. G. PAPILLAULT, REPORTER OF THE COMMISSION

Translated from Dr. Papillault's report in L'Anthropologie, 1906, XVII, 559–572, by A. H.

On the motion of MM. Hamy, Papillault and Verneau, the Organizing Committee of the XIIIth International Congress of Prehistoric

[1] See Marett, R. R. Report of an International Conference, etc. Proc. XVIIIth Intern. Cong. Amer., London, 1913, I, LXXXVI.

Anthropology and Archeology had included among the questions a consideration of which by the members of the Congress was regarded as of the greatest importance, the subject of unification of anthropological measurements.

At the opening session of the Congress, which took place at Monaco on the 16th day of April, 1906, Professor Hamy, as President, called attention to the urgent need of an international agreement on anthropometric technique. But he also called attention to the almost insurmountable difficulties which would be met with if the numerous measurements which had been employed to date were to be examined in the open session of the Congress, and to the consequent necessity, if satisfactory results were to be obtained, of appointing a Commission which would specially occupy itself with the subject during the time of the session and at the last meeting of the Congress present some project of unification for approval by the Congress.

This proposition was adopted, and the commission was named immediately, comprising the following:

Giuffrida-Ruggeri, Secretary of the Anthropological Society and Assistant to the Chair of Anthropology, Rome;

Hamy, Professor of Anthropology at the Museum of Natural History, and member of the Institute, Paris;

Hervé, Professor of Ethnology at the École d'Anthropologie, and former President of the Anthropological Society, Paris;

Lissauer, President of the Anthropological Society, Berlin;

von Luschan, Professor of Anthropology, University of Berlin;

Papillault, Assistant Director in the Laboratory of Anthropology of the École des Hautes-Études, and Professor at the École d'Anthropologie, Paris;

Pittard, Private Docent at the University of Geneva;

Pozzi, one of the Professors of the Faculty of Medicine and former president of the Anthropological Society, Paris;

Sergi, Professor of Anthropology and Director of the Anthropological Institute, Rome;

Verneau, Assistant to the Chair of Anthropology, at the Museum of Natural History and Temporary Professor at the École d'Anthropologie, Paris; and

Waldeyer, Professor of Anatomy, and permanent Secretary of the Academy of Sciences, Berlin.

The Commission met immediately after its nomination to elect its officers and arrange the program of its activities. Professor Waldeyer

was chosen President, Professor Sergi Vice-President, and Dr. Papillault Secretary and Reporter.

Dr. Papillault read a letter which he had received from M. Chantre, in reply to the demand which he [Dr. Papillault] had made for his [M. Chantre's] report on the efforts for the unification of anthropological measurements undertaken by the International Congress of Anthropology of Moscow. The main part read as follows:

"I have been, in fact, charged with such a report at the Congress of Moscow for the Congress of Paris. But as the quest on [of unification of anthropological measurements] had not been made a part of the regular program at the Moscow meeting, Professor Virchow, Chairman of the International Commission of Craniometry, in accord with some of our colleagues, asked that the said report should not be presented until at the following [Paris] session."

In M. Chantre's report on anthropology at the Moscow congress, we read that two Commissions were named for the purpose of unifying anthropological measurements. They were:

1. *The Anthropometric Commission*, appointed following a communication by M. Zograff on "Anthropometric Methods as Practiced in Russia, and on the Necessity of Forming an International Agreement for Anthropometric Research." This commission was to "endeavor to unify as far as possible the methods of anthropometric observations," and to report at the next session. It was composed of MM. Anoutchine, Bogdanoff, Chantre, Kollman, Malieff, Sergi, Tikhomiroff, Virchow, and Zograff. M. Bogdanoff was elected its President and M. Zograff the Secretary and Reporter. The headquarters of the commission were with the Imperial Society of Natural Sciences and Anthropology of Moscow.

2. *The Craniometric Commission.* On the motion of Professor Kollman of Basle the Congress named also a commission to revise the Convention of Frankfort, with the object of securing for anthropology an international system of craniometric measurements. This commission consisted of MM. Anoutchine, Bogdanoff, Chantre, Kollman, Malieff, Sergi, Virchow, and Zograff. Professor Virchow was elected its President, Professor Anoutchine its Secretary-Reporter.

The letter from M. Chantre shows further that neither of these commissions has reached any appreciable results. The Anthropometric Commission, it seems, has never met; while the Craniometric Commission held only two meetings during the session of Moscow, without reaching any ageement.

M. Papillault insists on the necessity of the present Commission meeting at least twice a day during the entire session, in order to subject the various techniques actually employed in anthropometry to a serious revision and to reach an agreement. The matter is urgent. The Frankfort agreement has been abandoned by most of the German scientists themselves, and the French method is no longer uniform. At Paris the disciples of Broca retain perhaps the illusion of still following a uniform technique, but a little inquiry shows divergencies which render all comparison of the results of some of their measurements quite incorrect. The school of every country presents probably divergencies of method among its different members which equal and even exceed those that separate it from other schools. This simple statement should banish from our debates all motives that may be foreign to science. None of us would endeavor to defend a national tradition which has proved incapable of preserving a unity of doctrine, and such a tradition in fact exists no more. In its selection of a technique the commission should be guided solely by fitness, simplicity, precision, and the biological value of the various measurements.

On the motion of Professor Waldeyer the commission decided to limit its activities to the measurements of the head [and skull] which are so numerous as to claim all the time that might be at the disposal of the Commission. Every measurement which has gained even a limited usage, together with the principal variations in its technique, should be submitted by the Secretary for revision to the Commission. In every case where an agreement will be reached, the Secretary shall edit the definition and technique of the measurement in question between the sessions of the Commission, and submit the text for the approval of the latter.

The Commission terminated its work Saturday, April 21, and the Secretary announced to the Congress that the report was ready in a neighboring room where it could be freely consulted. At the same time he offered to give the members of the Congress whatever explanations might be found necessary. At the end of this day's session, the report in its final form was presented to the Congress by the President, and received a *unanimous approval.* It here follows:

Project of an International Agreement on Craniometric and Cephalometric Measurements

Preliminary remarks: The Commission classed as *optional* certain measurements which appear interesting, but concerning which the

Commission does not possess sufficient details which would permit it to fully gauge their importance and advise their regular employment. In cases of this nature the Commission has contented itself with a statement concerning the technique of the respective measurements, without giving advice as to their use.

In connection with each measurement is given an indication as to the instrument which should be employed. The abbreviations are as follows:

c.g.—*compas glissière*, the sliding compass;

c.e.—*compas d'épaisseur*, the spreading compass;

m.t.—metric tape. This should be made of decidedly pliant material, but without possessing in the least degree the quality of stretching. Slightly starched cloth is of the best; and frequent testing of the tape by a metal standard is indispensable.

I. Craniometry

A. The skull

1. *Maximum length of the skull or greatest antero-posterior diameter; c.e.*

This is the maximum glabello-occipital diameter of the vault.[1]

Landmarks: Anteriorly—the most prominent point of the glabella; posteriorly—the most prominent point on the occiput as shown by the maximum determinable spread of the branches of the compass.

2. *The Iniac antero-posterior diameter* (optional); *c.e.*

Taken in the sagittal and median plane of the vault.

Landmarks: Anteriorly—the most prominent point of the glabella; posteriorly—the inion, the individual peculiarities of which should be discounted.[2]

3. *The maximum breadth of the vault, or the greatest transverse diameter; c.e.*

This is the greatest horizontal and transverse diameter which can be found on the vault by the spreading compass.

Landmarks: Determined solely by the maximum breadth of the skull above the supra-mastoid and zygomatic crests.

[1] The French text reads: "C'est le plus grand diamètre dans le plan sagittal et médian du crâne." This definition is somewhat erroneous, for it seems to direct that the measurement be taken to a point in the median line of the skull, while a little further on this point is defined as "le point le plus saillant du sus-occipital donné par le maximum d'écartement des branches du compas." As a matter of fact the point of maximum distance from the glabella is seldom strictly in the median line of the occipital, even in absolutely normal specimens. The correct definition should read as given above. A. H.

[2] "dont les variétés individuelles devront être évitées."

4. *Heights of the vault:*

(*a*) *The basilo-bregmatic height; c.e.*

Landmarks: Inferiorly—the basion, or median point of the anterior border of the foramen magnum (avoiding the exostoses that are sometimes found at this place); superiorly—the bregma, or median point of the coronal suture.

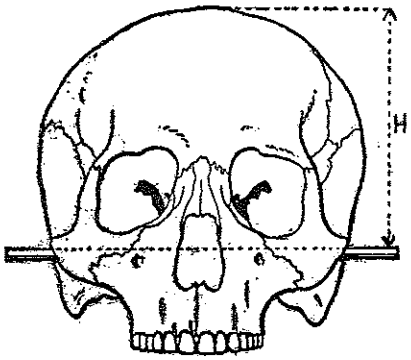

FIG. 1

(*b*) *Auriculo-bregmatic* height (*H*, fig. 1).[1]

This is the distance between the bregma and a line connecting the superior borders of the auditory meatus.

Landmarks: Inferiorly—the point where the imaginary line uniting the superior borders of the two *meatus auditorius* intersects the median part of the skull; superiorly—the bregma.

5. *The smallest frontal breadth or minimum frontal diameter, c.g.*

This is the shortest horizontal diameter between the two temporal crests on the frontal bone.

6. *The maximum frontal breadth or maximum frontal diameter; c.g.*

This is the largest horizontal diameter of the frontal squama (the bistephanic diameter of Broca is abandoned).

7. *Maximum bimastoideal diameter* (m.m. fig. 2); *c.e.*

Landmarks: The external surface of each mastoid process at the level of the center of the meatus auditorius. At this level search with the spreading compass for the maximum diameter.

8. *The maximum bizygomatic diameter; c.g.*

Landmarks: The most widely separated points on the external surface of the zygomatic arches. The object is to find the greatest diameter.

[1] See p. 64.

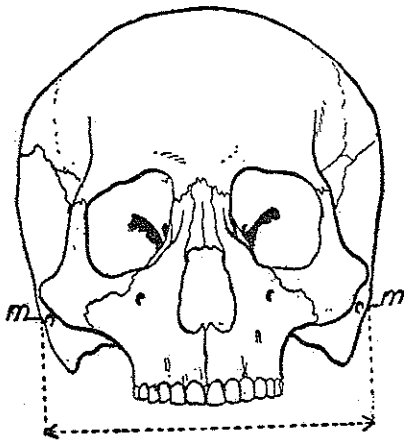

FIG. 2

9. *The naso-basilar diameter; c.e.*

Landmarks: Anteriorly—the nasion, or median point of the naso-frontal suture; posteriorly—the basion.

10. *The basio-alveolar diameter; c.g.*

Landmarks: Anteriorly—the alveolar point, or median point of the anterior border of the alveolar arch; posteriorly—the basion.

11. *The nasion-menton diameter; c.g.*

Landmarks: Above—the nasion; below—the inferior border of the lower jaw, in the median plane.

The mandibula to be in place, the jaws brought in apposition, the condition of the teeth [in relation to wear, especially] to be noted.

12. *The naso-alveolar diameter;*[3] *c.g.*

Landmarks: Superiorly—the nasion; inferiorly—the lowest point of the alveolar border between the two median upper incisors.

13. *Nasal height; c.g.* (N E fig. 3).

Landmarks: Superiorly—the nasion; inferiorly the middle of a line connecting the lowest points of the two nasal fossae.

If instead of the border there is a gutter, measure to the level of the floor of the nasal fossae [*i. e.*, to the upper limiting line of the gutters].

[3] The facial index is expressed by the following formula:

$$\frac{\text{Naso-alveolar diameter} \times 100}{\text{maximum bizygomatic diameter}}$$

14. *Breadth of the nasal cavity; c.g.*

Landmarks: The lateral borders of the nasal aperture. Find with the compass the greatest diameter of the aperture in horizontal line.

15. *Inter-orbital breadth; c.g.*

Landmarks: Bilaterally—the point where the posterior lacrymal crest meets the inferior border of the frontal.

16. *Orbital breadth.*

Landmarks: Mesially—the dacryon, or point of meeting of the sutures formed by the frontal, the lacrymal, and the ascending part of the superior maxillary bones;

(If the dacryon is obliterated, or in an abnormal situation, take the point where the posterior lacrymal crest meets the inferior broder of the frontal);

Distally—the external border of the orbit, at the point where the transverse axis of the orbit meets the border, and parallel as far as possible to the superior and inferior borders.

17. *Orbital height; c.g.*

Landmarks: The superior and inferior borders of the orbit, avoiding the superior and inferior notches, when they exist. Take the maximum distance between the two borders along an axis perpendicular to the preceding measurement [orbital breadth].

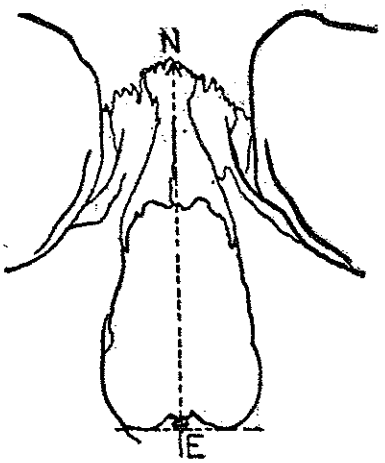

FIG. 3

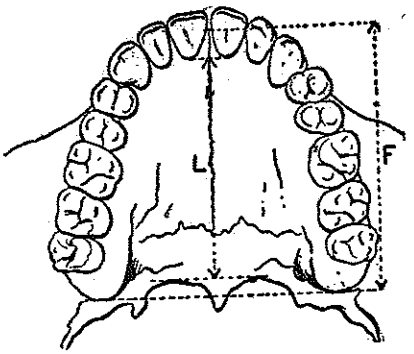

FIG. 4

18. (*a*) *Breadth of the upper alveolar border; c.g.*

Landmarks: The external surface of the alveolar border, on each side.

If there are any exostoses on the border they are to be avoided by placing the points of the instrument above the same. The measurement to be taken is the maximum transverse separation of the alveolar borders.

(*b*) *Length of the alveolar arch; c.g.* (F, fig. 4).

Landmarks: Anteriorly—the anterior surface of the alveolar border between the two median incisors; posteriorly—the middle of a transverse line connecting the posterior extremities of the alveolar border.

[This transverse line is obtained easily by placing a wire as deep as possible on each side in the notch which separates the alveolar border from the pterygoid process.][4]

19. *The bony palate: c.g.* (optional).

(*a*) *Length of the palate* (*L*, fig. 4).

Landmarks: Anteriorly—the median point of a line tangent to the posterior alveolar border of the median incisors; posteriorly—the median point of a transverse line connecting the most anterior points of the notches in the posterior border of the palate.

(*b*) *Breadth of the palate.*

Distance between the [internal] alveolar borders between the second molars.

20. *Orbito-alveolar height; c.g.* (optional).

The minimum distance between the lower border of the orbit and the alveolar border.

21. *Foramen magnum; c.g.*

(*a*) *Length.*

Landmarks: Anteriorly—the basion; posteriorly—the opisthion, or median point of the posterior border.

(*b*) *Breadth.*

Landmarks: Points of maximum separation, in transverse line, of the lateral borders of the foramen.

22. *Sagittal arc of the vault; m.t.*

Landmarks: Anteriorly—the nasion; posteriorly—the opisthion.

Intermediary: Apply tape to the surface of the vault along the sagittal line.

The arc is divisible into three principal parts which should be recorded separately and which correspond to the three bones composing the vault, namely the frontal, parietal and occipital.

[4] The maxillo-alveolar index will be:

$$\frac{\text{Maximum breadth of the alveolar border} \times 100}{\text{Length of the alveolar arch}}$$

[This subdivision is not seldom vitiated by the presence of intercallated bones, especially at lambda.]

23. *Transverse arc; m.t.*

Landmarks: Measure from the most prominent point on each zygomatic crest, directly above the meatus; the tape to be applied transversely over the vault in such a way that it will pass over the bregma and connect the two preceding points.

(*b*) *Circumference, or Horizontal Arc; m.t.*

Landmarks: Anteriorly—above the supraorbital ridges; posteriorly—over the upper portion of the occipital, so as to obtain the maximum measurement; care necessary that the level of the tape is the same on both sides.

24. *Capacity.*

Without making a selection from the different methods and while recognizing the value of the method of Broca, the commission advises that there should always be at hand standards or skulls of control, of considerably differing capacities, with which the exactness of the individual procedure should be verified; the commission also advises, however, the utilization as far as it may be possible of the direct measurement of cranial capacity by water with a rubber bag or container.

B. LOWER JAW

25. *Bicondylar breadth; c.g.*

Landmarks: The most external points on each condyle; the separation of these points constitutes the measurement.

26. *The bigoniac breadth; c.g.*

Landmarks: The gonions, or points of the angles formed by the ascending branches with the body of the lower jaw.

The separation of the angles is measured by applying the compass to their external surface.

27. *Length* [*i. e.*, height] *of the ascending branch; c.g.*

Landmarks: Superiorly—the uppermost point of the condyle;[5] inferiorly—the gonion; but as frequently it is very difficult to determine this point, it is best to take the intersection of the lines prolonging the inferior and posterior borders of the bone.

[5] The French original says "bord superieur du condyle," which doubtless means the transverse ridge of the condyle on which the uppermost point is generally located. See illustration.

The measurement is obtained by permitting the lower jaw to rest on its inferior border, and placing the rod of the sliding compass along the posterior border.

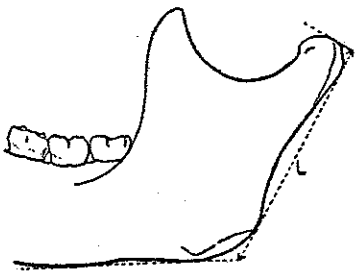

FIG. 5

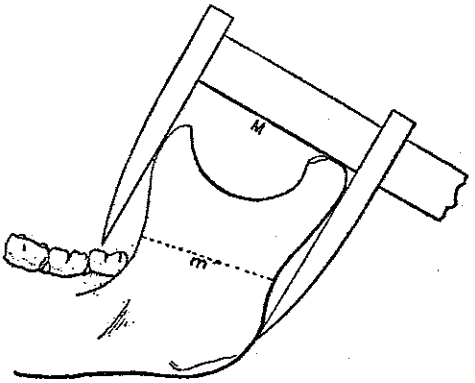

FIG. 6

28. *Breadth of the ascending ramus; c.g.*

(*a*) *Minimum breadth* (m, fig. 6): The minimum distance between the anterior and posterior borders of the ramus.

(*b*) *Maximum breadth* (M, fig. 6) (optional).

Landmarks: Anteriorly—the most prominent point on the anterior border of the coronoid process; posteriorly—the farthest point on the posterior border of the bone.[6]

The measurement is obtained by applying one of the branches of the sliding compass tangently to the posterior border of the lower jaw, and bringing the other branch in contact with the anterior border of the coronoid process.

29. *Height of the symphysis; c.g.*

Landmarks: In the median plane: superiorly—the highest point of the alveolar border [bet. the median incisors]; inferiorly—the inferior border of the symphysis.

Measure the actual distance between the two points, not in projection.

30. *Height of the body of the lower jaw; c.g.*

The same technique, but the measurement is taken in a vertical plane, between the first and the second molars.

[6] Really, as well seen from the illustration, the line connecting the most posterior point of the condyle and the point of the angle of the jaw. *Tr.*

31. *Maximum thickness of the body of the lower jaw* (optional).
The maximum separation of the internal and external surfaces of the bone in the plane between the first and second molars.

32. *Mandibular angle.*
The angle between the posterior and inferior borders of the bone. To be measured by Broca's *goniomètre* and according to the technique advised by that author.

II. Cephalometry

1. *Maximum length of the head,* or *the maximum antero-posterior diameter;*[7] *c.e.*
The same technique to be followed as on the skull; do not press.[8]

2. *The maximum breadth of the head or maximum lateral diameter; c.e.*
Same technique as on the skull.

3. *Height of the head* (head erect). Instrument: The anthropometric square.
Landmarks: Superiorly—the vertex; inferiorly—the superior border of the auditory opening, which ordinarily corresponds (but the point should always be verified) to the parts of the notch between the tragus and helix.[9]

4. *The minimum frontal breadth; c.e.*
Same technique as on the skull.

5. *Maximum bimastoidal diameter; c.e.*
Same technique as on the skull, the observer standing behind the subject.

6. *Maximum bizygomatic diameter; c.e.*
Same technique as on the skull. The maximum should be searched for with care, for it is often located more posteriorly than one would expect.

7. *Bigoniac diameter; c.e.*
Same technique as on the skeleton. The fleshy parts of the masseters are to be avoided.

[7] In all measurements on the living taken with the spreading compass it is indispensable to search for the greatest spread of the branches, then fix the latter in their position with the screw and replace them over adjoining parts to verify if the spread has really been maximum. [If proper care be taken the awkward fixation of the branches by the screw is not necessary. *Tr.*]

[8] A moderate amount of pressure is of course necessary; the instruction is directed against hard pressure. *Tr.*

[9] The height from the middle of the line connecting the floor of the external auditory canals, to bregma is now more in vogue. See p. 64. *Tr.*

8. *Height of he face, total; c.g.* (optional).[10]

Landmarks: In median plane, superiorly—the hair line; inferiorly—the inferior border of the lower jaw. A slight pressure is to be used, to discount the soft parts.

9. *Menton-nasion diameter; c.g.*[1]

Same technique as on the skull, and using slight pressure, as with preceding measurement.

Look for the nasion by passing the nail along the ridge of the nose until it encounters a slight ridge which is formed by the inferior border of the frontal [or the depression of the nasion itself].

10. *The naso-buccal diameter; c.g.*

Landmarks in the median plane: Superiorly—the nasion; inferiorly—the line between the lips.

11. *The naso-alveolar diameter; c.g.*

Same technique as on the skull. It is always easily possible to turn the lips up so that the free border of the gums can be seen.

12. *Height of the nose; c.g.*

Landmarks: Superiorly—the nasion; inferiorly—the nasal septum where it joins the upper lip. Do not press.

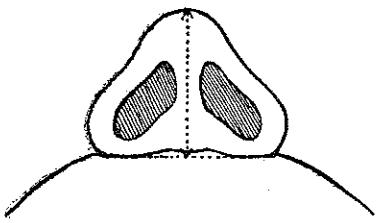

FIG. 7

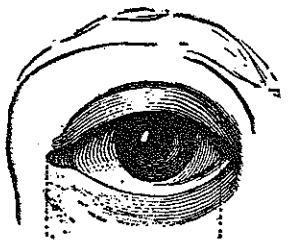

FIG. 8

13. *Breadth of the nose; c.g.*

Landmarks: The external surface of the alae of the nose. The maximum breadth to be determined without the exertion of any pressure.

14. *Prominence of the nose at its base* [*i. e.*, length or height of the septum] (fig. 7).

Landmarks: Anteriorly—the most prominent part of the point of the nose; posteriorly—the point where the septum is intersected by a transverse line joining the deepest points of the two naso-labial furrows.

[10] Can be more readily taken with the spreading compass. *Tr.*

To take this distance the two landmarks should be well exposed [by bending the head well backward]; use instrument appropriate for the purpose.

15. *External bipalpebral breadth; c.g.* (*E*, fig. 8).

Landmarks: The external angle of each palpebral fissure, deeply, where the lines touch the eyeball.

With the eyes of the subject wide open and the visual axis fixed slightly above the horizon, the two points are approached by the branches of the compass supported on the cheeks of the subject.

16. *The internal palpebral breadth; c. g.* (*I*, fig. 8).

Landmarks: The internal angle of each eye, without regard to the caruncula.

17. *Breadth of the mouth; c.g.*

Landmarks: The commissures of the lips [angles of the mouth], at the point where the mucous membrane joins the skin. The distance to be taken while the mouth is in its medium position [*i. e.*, naturally closed without tension].

18. *Bilabial height; c.g.*

Landmarks: Superiorly—the uppermost points on the curves of the arc of the upper lip; inferiorly—the lowermost point on the curve of the lower lip.

The rod of the compass should be held vertically, its branches tangent to the summits of the curves.

19. *The ear.*[11]

(*a*) *Length, maximum; c.g.* (fig. 9, line designated).

Landmarks: Superiorly—the highest point on the border of the helix; inferiorly—the lowermost point on the lobule.

The rod of the compass should be held parallel to the long axis of the ear with its branches tangent to the points indicated; use no pressure.

(*b*) *Length of the cartilaginous ear* (fig. 8, interrupted line).

Landmarks: Above—as with preceding; below—the inferior border is the cartilaginous concha.

The compass is to be applied as in the preceding measurement, but the lobule is slightly pressed backward with the lower branch of the instrument, in order to include no more than the cartilaginous part.

[11] Measurement of the left ear is to be preferred as much more handy than that to the right. *Tr.*

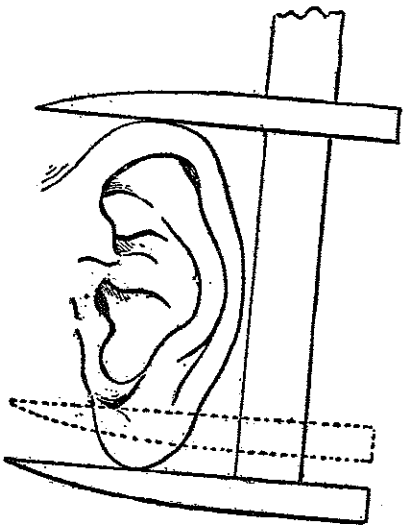

FIG. 9

(c) *Breadth.*

Distance between two lines parallel to the long axis of the ear, one of these lines being tangent to the anterior, the other to the posterior border of the helix.

The above outlined technique of each of the measurements was, after a discussion, unanimously adopted.

(Signed)
President, WALDEYER. Vice President, G. SERGI.
Members of the Commission: GIUFFRIDA RUGGERI; E. T. HAMY; G. HERVÉ; LISSAUER; VON LUSCHAN; PITTARD; POZZI; VERNEAU.
G. PAPILLAULT, Reporter.