ANTHROPOMETRY ON THE LIVING.—INSTRUMENTS

The *instruments* used in measurements on the living, with the exceptions of the compasses and the tape, are different from those used in measuring skeletal material. Also, there is not yet as complete uniformity in these instruments as might be desirable. Matters of this nature in all branches of science are largely those of evolution and the eventual survival of the fittest.

Most of the anthropometric instruments or their prototypes owe their development to the pioneers of the École d'Anthropologie, Paris, and more particularly to Paul Broca, the first director of the École and the father of anthropometry. The ingenuity and great service of Broca in this regard have not yet received a due appreciation. The instruments are partly non-metallic and partly metallic, partly fixed and partly free, and in some instances they differ somewhat according to whether they are to be used in the laboratory or in the field.

The instruments essential for measurements on the living are the planes or rods for measuring the stature, sitting height and the span; the spreading and the sliding compasses or calipers, for measuring the head, the facial parts and the hands; the large sliding compass for measuring the diameters of the chest, pelvis and feet; the anthropometric tape for measuring circumferences of the head, body and limbs; and certain accessories such as the dynamometer, color scales etc. They may briefly be described as follows:

1. *The Anthropometric Plane of Broca.*—Made of thoroughly seasoned wood, 1 meter high, 12.5 cm. broad, 1.5 cm. in thickness, stained dull yellow, varnished; graduated in centimeters full across, in half-centimeters one-half or two-thirds across, and in millimeters along the left or both margins. Marking plain, easily legible. The upper edge provided with two eye-screws or other device for hanging; and the plane may be hinged at the 70 or 75 cm. mark for easier transportation (A. H.). 1*a*. *Square* (Adjunct).—Two pieces of light wood, 18 cm. long by 12 broad by 1.2 in thickness, joined at right angles, and provided on the inside, in the middle line, with a narrow strip serving as a handle; stained and varnished as 1.

Use: for measuring stature and sitting height. In the laboratory it is of some advantage to use a separate plane for each of the two measurements, the plane for measuring stature being fastened one meter above the floor, while that for measuring sitting height is fastened directly above the bench on which the subject sits for this measurement. In the field, one plane fastened one meter above the floor or a level piece of ground, will do for both measurements, the height of the bench in the case of sitting height being subtracted from the total measurement obtained.

Modifications.—In the original planes of Broca, at a distance of 1 cm. from the left border, there was a fairly deep groove, which served for a graduated sliding square by which one could measure the stature as well as the ear and shoulder heights, and, together with another appliance, also the facial angle; all these have now become obsolete.

Paper or Cloth Plane or Tape.—At the occasion of certain recommendations made by the Committee on Anthropology of the National Research Council, in connection with the impending measuring of large numbers of recruits for the United States Army, the author proposed[1] that instead of the more costly plane, special inextensible linen or paper strips be printed to take its place. A strip of this nature, 8 to 12 cm. broad, printed accurately on inextensible and unshrinkable paper or other material (ordinary materials change considerably!), is easy to work with and has the advantage of cheapness as well as ease of transportation. They may be made in segments of 50 cm. In cases of necessity a scale may be improvised on the wall or other vertical, or on a strip of paper; or the ordinary anthropometric tape may be fastened to the wall, rod, etc. An improvised stout paper scale should be well varnished on both sides, to prevent puckering, shrinking or extension. All scales must be tested by standards.

2. *Anthropometer.*—A number of related instruments are embraced under this name. Their common principle is that of a graduated rod, single or in sections, fixed to a pedestal or with a free lower end, and provided with a sliding horizontal branch. They are used for measuring stature and sitting height, instead of the above described plane, and are particularly advocated for work in regions where no vertical such as a wall or tree may be found on which the plane might be fastened.

[1] Am. J. Phys. Anthrop., 1918, I, 81.

The most useful modifications of this instrument are the *Anthropomètre* and the *Toise anthropométrique* of Topinard,[1] and the metal rod of Martin. The terminal part of the last named has both a fixed and a sliding branch and may serve for the purposes of both the anthropometer and a large sliding compass.[2]

These instruments are of value and continue to be employed by various investigators, particularly those of the Zurich school; but they are not as handy, easy of manipulation or accurate as the fixed plane. Moreover, there is a rather important difference in their mode of employment by the different observers, some using them in the same way as the plane, which secures a standard posture of the subject, while the followers of Martin place them in front of the subject, which makes the regulation of posture uncertain.

The writer advocates the use of the plane, for the fastening of which one can always find or provide some vertical.

Individuals met with on the road, in the fields, etc., may be measured against any suitable object and the height determined by the ordinary tape.

3. *Horizontal Plane* (Accessory).—For laboratory purposes and for field work where numerous subjects are to be measured, this is a useful accessory facilitating the measurement of the span. It consists of a light wooden plank, or paper strip, 30 cm. broad by 60 cm. in length, graduated from 140 to 200 cm. For the purposes of measuring the span a vertical wooden strip is fastened on the wall 80 cm. from and parallel with the left edge of the vertical plane, to serve as a "point d'appui" of the longest finger of the right hand of the subject. The horizontal plane is then fastened to the wall at a distance of 140 cm. from this vertical strip (or 47.5 cm. to the right of the vertical plane), and serves for the determination of the span length, the exact manner of taking which will be described under "Methods." A serviceable scale of this nature may be improvised on the wall. A paper scale must be well varnished.

4. *Wooden Bench* (Accessory).—For measuring height sitting (and other purposes). For laboratory use and in measurements on American people (who on the average are tallest of all Whites), the most serviceable bench is one of 50 cm. in height, 50 cm. in breadth, and 32

[1] Élém. d'Anthrop. gén., 8°, Paris, 1885, 1116–20. Made by both Mathieu and Collin, Paris.

[2] Made by P. Hermann, Zurich.

cm. antero-posteriorly. For work among shorter peoples, and especially among children, the bench must be lower, the aim being for the thighs of the subject to be flexed at right angles to the trunk. In the field, any convenient well-made box may be used.

The laboratory bench is stained light mahogany or other suitable color, and varnished. It should be made of well seasoned wood, to prevent appreciable changes in particularly dry or damp weather.

5. *Plumb and Level* (Accessory).—When using an anthropometer, various measurements on the body, such as the sternal height, shoulder height, etc., may be taken direct, but unless the subject stands against some vertical there are always chances of error owing to uncertainty as to correctness of position. When using the Broca plane we may get all these measurements in a simple and more accurate way with the help of a small level and plumb. The level is made in the laboratory. It consists of a narrow glass tube, 16 cm. long, filled with alcohol containing a small bubble of air, and marked with a red ring at the middle. The plumb is a pointed piece of lead or other metal, suspended on a strong linen or silk thread. The subject stands against the plane in the same position as for the determination of stature; the level is applied to the landmark from which the measurement is to be taken, and held there horizontally by the left hand; the plumb is then dropped to the floor, without any slack, and the thread is pinched by the thumb nail and forefinger at the height of the lower edge of the level. The subject then steps aside, and the measurement taken is ascertained on the scale of the plane. The procedure is quite simple.

6. *The Spreading Calipers* (*Compas d'épaisseur*).—This is one of the indispensable and most useful instruments in Anthropometry. It is manufactured in several varieties. These are, (1) the small compass of Broca, made by Collin in Paris, as well as—with slight modifications—by Hermann in Zurich; (2) the standard larger compass of the Paris École d'Anthropologie, made for many years before the war by Mathieu as well as by Collin, in Paris; (3) the Bertillon compass, made by Collin; and (4) the Hrdlička compass made in France (Collin) and United States (Fig. 10).

The several instruments differ in usefulness. The small compass is more adapted for work on the skull than for that on the living, although it is also used for the latter purpose. The larger standard compass is an excellent instrument for ordinary anthropometric work on the living, as well as that on the skull. The Bertillon compass is

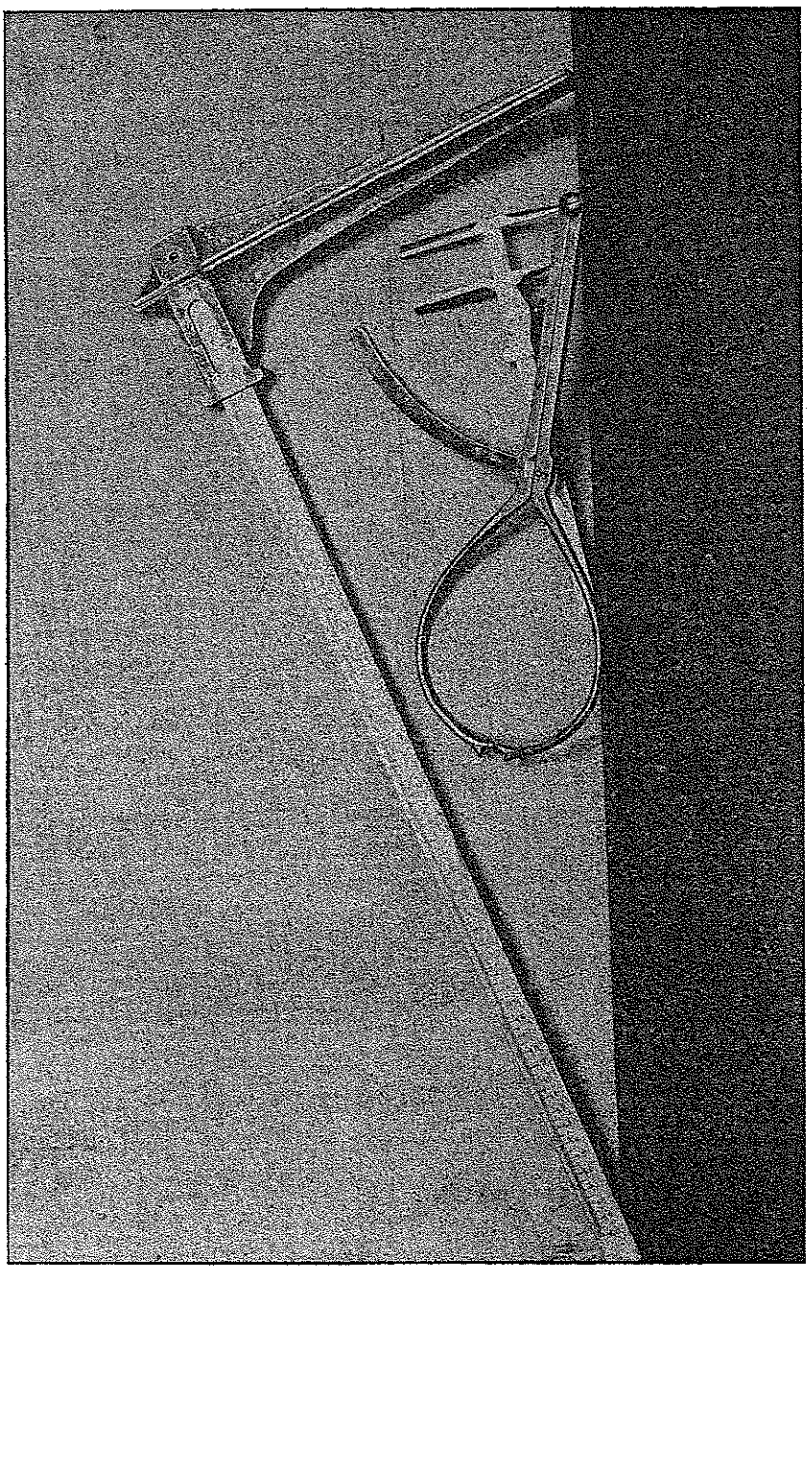

FIG. 10. The Anthropological Compasses. U. S. National Museum.

practically the same as the preceding, but is marked by a greater rigidity as well as bluntness of the branches, and a reduction of the scale. The Hrdlička compass possesses certain adaptations and needs a special description. Of the three older forms of calipers only one, the standard compass of Mathieu, could be used in measuring the height of the head. This measurement is one of growing importance and various methods as well as instruments have been devised in the past for securing it on the living. One of the easiest of methods, for many years practised by the author, was to introduce the branches of the standard compass into the auditory meatus, bring the scale of the instrument over the bregma, note the spread, determine with the rod of the sliding compass the distance from the bregma to the lower edge of the scale, and by a simple arithmetic procedure, obtain the height of the head. But these older instruments had certain disadvantages when used for this purpose, which were a somewhat inadequate size of the branches in the cases of large heads, an oblique direction of the terminal parts of the branches, particularly when sufficiently dilated for introduction into the ears, and the facility with which the branches penetrated deeper into the ear than required. To obviate these disadvantages, the writer in 1912 visited MM. Collin in Paris and gave directions for making compasses with slightly larger branches, with the terminal parts horizontal at the spread of 10 cm.; and with a guard on the lower portion of each branch 8 mm. from the point, to regulate the distance of introduction into the meatus. The resulting instrument is but imperceptibly heavier than the older standard compass of Mathieu; it serves with equal facility the same purposes; and in addition it is thoroughly well adapted for measuring the height of the head.

7. *The Sliding Compass* (*Compas glissière*).—This instrument is too well known to need special description. Figure (10) shows the compass of Collin, which is almost identical with that of Mathieu and is a well-balanced and most useful instrument. The Martin sliding compass shows slight differences, which appear to be matters of personal choice rather than those of additional usefulness.

8. *Large Sliding Compass.*—There are several instruments of this nature, some made of wood (Paris, American), others of wood with steel branches (Topinard, Manouvrier), and still others wholly of metal (Martin, Hrdlička). Except the wooden and the author's instrument, they have in common the disadvantage of narrow branches, which in measuring the thorax are liable to be pressed into the inter-

FIG. 10. The Anthropological Compasses. U. S. National Museum.

costal spaces; and not seldom, especially in the wooden compasses, the branches are not rigid enough, which results in some error of measurement.

The writer's instrument consists of a hollow rod, 70 cm. long, 2.2 cm. broad and 0.8 cm. thick, made of well nickeled and welded brass strips; and of aluminum branches, 26 cm. long (in the free) and 3.5 cm. broad. It is light, very serviceable, as well as durable, easy working, and accurate (fig. 10).

9. *Tapes.*—The best anthropometric tapes are made in Paris by instrument makers who stand in connection with the École d'Anthropologie. They are made of linen, painted grayish-white, are accurate and non-elastic. The layer of paint and varnish on each side is light and does not crack. One of these tapes gives months to years of service.

Steel tapes are easier to obtain but less advantageous. They are not so easy to manipulate and read; they are cold and sometimes they break. The steel tape may be used, however, with some advantages on skulls and bones.

10. *Standard Meter* (Accessory).—A strong lamina of brass, 1 meter long, graduated in centimeters and millimeters, standardized in France. Obtainable through the French manufacturers of anthropometric instruments. Very useful for testing accuracy of tapes and graduated planes. A laboratory instrument.

11. *Standard Block* (Accessory).—Block of wood or preferably metal, aluminum or brass, for testing the accuracy of calipers, at 5, 10, 15, and 20 cm. spread. The best appliances of this nature are made of metal. They are laboratory accessories.

12. *Dynamometer* (Collin or Mathieu).—Description unnecessary. No handles requisite for ordinary tests.

Other dynamometers are made, particularly in England and in the United States, but the results obtained by these are not strictly comparable with those obtained by the classic French instruments, and the latter are to be preferred on account of their simplicity, long use in anthropometry, and their handiness.

13. *Weighing Scales.*—The question of weighing scales in Anthropometry is one of considerable difficulty, for in general they are heavy and difficult if not impossible of transportation. In the United States and in England, moreover, we have practically no metric scales and must use those of the old system, which necessitates a subsequent conversion of the figures. Suitable weighing scales for infants in

both the old and the metric system are obtainable in Europe as well as in this country, but even these are heavy for transportation. Fortunately, weight in adults, on account of its great variation, is not a measurement of prime importance.

14. *Standards for Colors of Skin, Eyes, Hair* (Accessories).—Though generally satisfactory observations on skin, eye and hair color are possible without the use of standard color scales, the difficulties of nomenclature and of uniform instruction in different laboratories, have nevertheless caused a strong desire for a series of standards with which the colors found could be matched, and by the number or name of which they could be recorded. The result has been the preparation, by various workers, of scales of colors intended to facilitate this important part of anthropological observation. None of these scales represents all that could be wished for, but all have their uses.

Skin Colors.—There are several scales for matching skin color. The best known and one that has been most used is that of Broca,[1] the others being those of von Luschan,[2] Rudolf Martin,[3] and Gustav Fritsch.[4] Also there are other methods,[5] among them direct painting in the field of the shades observed, a procedure which meets with only limited success on account of the changes in the color of the pigments during drying.

Until an international agreement on some one scale is reached, the observer may use either of those now in existence, it being understood that in his report he will state which one he employed. Or he may use simple descriptive terms which will be given under "Methods" and which in most cases are quite sufficient.

Color Standards for Eyes and Hair.—The color of the eyes and the hair, as that of the skin, may be determined by unaided observation, and with many primitive tribes in general the task is quite simple.

[1] Printed originally in his "Instructions générales pour les recherches Anthropologiques," *Mém. Soc. d'Anthrop.* Paris, 1864, II; 2e éd., 16mo., Paris, 1879; repr. on larger scale in Hrdlicka (A.)—Directions for collecting information and specimens for physical anthropology, Bull. U. S. Nat. Mus., Pt. R. No. 39, Wash., 1904; also, in part and with different numbers, in the "Notes and Queries on Anthropology," of the B. A. A. S.

[2] v. Luschan's scale consisting of a series of colored glass tablets, is made by Hermann, Zurich.

[3] Mentioned by G. Fritsch.

[4] Fritsch's colors, on painted paper strips, may be had from W. Pfund, Berlin; the method is described in the *Mitt. Anthrop. Ges.* Wien, 1916, XVI, 183–5.

[5] Gray (J.), A new instrument for determining the color of the hair, eyes and skin (Man, 1908, VIII, 54); the Bradley's color top; the trade color scales; etc.

But among mixed groups, and particularly very mixed Whites such as the Americans, these procedures become more difficult and call for careful instruction as well as experience, or for the use of adequate standards. Such standards exist both for the eyes and the hair.

For the eyes there are several color scales, such as that of Broca,[1] Bertillon,[2] the Medical Department U. S. A.,[3] etc. In addition we have the artificial eyes of commerce, the glass eye standards of Galton,[4] and the "Augenfarbentafel" of Martin.[5] For hair, samples of actual human hair have been used (f. e. by Pearson—*Biometrica*, 1907, v, 474); and since 1907 we possess the good though still not fully sufficient artificial-hair standards of Eugen Fischer.[6]

15. *Additional.*—Occasionally it may be found necessary or advisable to use certain accessories in anthropological work on the living, such as the finger-print outfit, or the apparatus for determining blood-pressure, chest capacity, sensibility, etc.; but these are well-known medicolegal or physiological instruments which do not call for a specific description in this place.

Selection of Measurements

As already mentioned, the number of practicable measurements on the human form, both in life and on the remains, is infinite. Moreover, every one of these measurements may be of anthropological value if taken by the same method on sufficiently large numbers of individuals of various racial, environmental, social, or defective groups. But it is self-evident that for practical purposes we must make for each separate piece of investigation a careful selection of those measurements which on the one hand will fulfill the objects of our study, and which on the

[1] Échelle chromatique des yeux. Instructions Anthropologiques générales, 2 ed., Paris, 1879. Consists of four series of colors, brown, green, blue and grey, with five shades to each.

[2] *Bull. Soc. d'Anthrop.*, Paris, 1892, 384–7; also, Tableau des nuances de l'iris humain, Paris, F. Durand.

[3] Twelve shades, on black strips; Queen & Co., Phila. Same firm furnishes 31 "Standard Colors for Artificial Eyes," which are slightly more useful.

[4] Obsolete.

[5] To be had through the Anthropologische Institut der Universität, Zurich. Consists of a case with aluminum plate and 16 glass eyes which protrude from eyelid-like apertures in the plate.

[6] Made by F. Rossett, Freiburg i. B. Consist of a metal case containing 30 different colored samples of artificial (cellulose) hair. Desc. by Fischer in "Die Bestimmung der menschlichen Haarfarben," *Korbl. d. d. Anthrop. Ges.*, 1907, xxxviii, 1–7.

other hand will enable us to secure observations on the largest possible number of individuals, and not impede a prompt preparation of the data for publication.

The selection of the measurements for a particular piece of study is not as difficult as might seem, once we are well conscious of the exact aims of the study to be undertaken. If it is to be a study of the laws of growth in the child, we shall naturally devote our attention mainly to the dimensions of the body as a whole and to those of its main segments, the head, neck, trunk and limbs. We may disregard in this case the growth of the secondary parts such as the ears, nose, mouth, hands and feet, and possibly even the development of the face as a whole, which should form the subject of special studies. Should our object be racial comparison, the main attention will be centered in stature, sitting height, possibly the span, and the dimensions of the head, face, nose and perhaps also the ears. But if the object of the research is to be a comparison of two or more environmental or social groups, then it will be necessary to pay close regard, besides the measurements just mentioned, also to those of the shoulders, chest, hands, and feet, and possibly also to those of special parts of musculature. Same rules will naturally be observed in work on the skeleton.

Besides such more general studies there will be occasions for research on single parts or organs, which will call for detailed measurements of these, together with those on parts that stand in important correlation. Finally, in the study of individual variations of parts, we may practice detailed measurements which will be used on no other occasion and which it would be of no use to complicate by measurements on unrelated parts or organs.

In preparing for measuring the living, the student must consider, in addition to the interests of the work, also the sensibilities of his prospective subjects. He must particularly bear in mind that modesty, though it may differ in shade or degree, is a universal virtue which cannot be offended with impunity. Fortunately, measurements which would call for exposures likely to be resented are in general those of secondary value only. Moreover, a light garment will in no way interfere with the accuracy of measurements, as for instance those of the chest, the maximum breadth of the pelvis, etc. To demand more than an accustomed exposure would spoil the chances of success of the investigator in many a tribe of primitive people, and might even prove dangerous. Clean mind and clean work are both requisites, as well as great tonics.

Blanks.—The subject of blanks has already been covered in the main (p. 40). Anthropological literature contains many examples of proposed universal blanks, from those of Broca, Topinard, and the British Association, to those of von Luschan and the overcomplex ones of Török or Rudolf Martin. The essentials are however the same in all, and if any rule should be given the student in this connection it is to begin his independent work with these essentials, and let experience advise him as to extensions.

The general type of blanks used on the living by the author are reproduced on the next pages. Though based on long experience and seeming to him satisfactory, they are not given here to be blindly followed. He himself modifies them according to occasions. He may add, for instance, the sternal notch height, breadth of shoulders, and breadth of the pelvis; he may eliminate the span, the ear measurements and other determinations. The blanks relating to skeletal material will be dealt with later. Author's general blank for children, which on account of the diversity of ages is printed on an individual sheet, is also here shown. It is equally subject to modifications, according to circumstances. Both sets of the blanks here given will be seen to lack various measurements which have been used more or less extensively in anthropometry, such as the various subsidiary heights (to shoulder, nipples, xiphoid, umbilicus, pubis), those that apply to the various segments of the limbs, etc. The reason is that except in special studies none of these measurements is of prime importance, and in many cases either the exposures they call for or the uncertainty of their landmarks, offer serious difficulties to effective, accurate work. In case of exceptional opportunity or special interests of the observer, any of these measurements may, of course, be included in the general scheme.

LANDMARKS AND METHODS

So far as measurements on the living are concerned, it will be of advantage to speak of landmarks and methods jointly. Moreover, only those measurements will be considered in this place which are practiced in the anthropometric work of the Smithsonian Institution. Information as to others may be readily obtained from Broca,[1] Topinard,[2] Martin,[3] and the existing International Agreements.

[1] Broca (Paul), Instructions anthropologiques générales. 12mo, 2 ed., Paris, 1879.
[2] Topinard (Paul), Éléments d'Anthropologie générale. 8°, Paris, 1885.
[3] Martin (Rudolf), Lehrbuch der Anthropologie. 8°, Jena, 1914.

ANTHROPOLOGY ——— Expedition ———

Measurements:

Tribe.

A.

No.	Name	Sex	Approx. Age	Deformation of Head	Stature	Max. Span	Excess of Span Over Height	Sitting Height	Sitting Height, per cent. of Total Height	Head: D. Ant. Post. Max.	D. Lateral Max.	Cephalic Index	Height Base of Meatus Line to Bregma	Mean Cephal. Height Index	Cephalic Module	Cephalic Modulе vs. Height	Face: Menton-nasion	Menton-crinion	Height of Forehead (Nasion-crinion)

B.

No.	Diam. Bizygom Max.	Facial Index	Physiognomic Index	Diam. Frontal Min.	Diam. Bigonial	Nose: Height to Nasion	Nose, Width Max.	Nasal Index	Mouth Breadth	Chest, D. Lateral	Chest, D. Ant. Post.	Chest Index	Left Hand, Length	Left Hand, Width	Hand Index	Left Foot, Length	Left Foot, Width	Foot Index	Left Leg Circum. Max.

ANTHROPOLOGY

———————Expedition

Tribe. Inspection: C.

No.	Skin Color	Hair				Moustache and Beard		Eyes		Forehead	Supra-orbital Ridges	Eye-slits	Malars
		Color	Character	Gray	Lost	Color	Character	Iris	Conjunctiva				

D

No.	Nasion Depression	Nose	Nasal Septum	Lips	Alveolar Prognathism	Chin	Angle of Lower Jaw	Body and Limbs	Toes	Breasts

ANTHROPOLOGY

———————Expedition

Tribe. Physiological: E

No.	Temperature (sub-Lingua)	Pulse	Respiration	Time of the Day	Present State of Health, etc.	Left Ear			Teeth	Hand Pressure		Weight
						Height	readth	Index		Right	Left	
						Max	*Max*					

CHILDREN.

SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM

People.....
Tribe..... Locality..... Sex.....

Measurements

No..... Age (real)..... (appar)....
Deformation of head.....

BODY:
- Stature.....
- Max. finger reach.....
- Height sitting.....
- Height to sternal notch.....

HEAD:
- Length.....
- Breadth.....
- Height (biaur. l.-bg.).....

FACE:
- Length to nasion.....
- Length to crinion.....
- Breadth, bizygom.....
- Diam. front min.....
- Diam. bigonial.....
- *Nose:*
  - Length to nasion.....
  - Breadth.....
- *Mouth:*
  - Breadth.....
- *Left Ear:*
  - Length.....
  - Breadth.....

MISCELLANEOUS:
- *Chest:*
  - Breadth at nipple height.....
  - Depth at nipple height.....
- *Left Hand:*
  - Length.....
  - Breadth.....
- *Left Foot:*
  - Length.....
  - Breadth.....
- *Left Leg:*
  - Girth, max.....
- *Weight of Body*.....

(With shoes and dressed, but without outer garments.)

OBSERVATIONS

- Color of skin.....
- Color of eyes.....
- Color of hair.....
- Nature of hair.....
- Forehead.....
- Supraorb. ridges.....
- Eye-slits.....
- Malars.....
- Nasion depress.....
- Nose.....
- Nasal septum.....
- Lips.....
- Alveol. progn.....
- Chin.....
- Angle of l. jaw.....
- Body and limbs.....
- Toes.....
- Breasts.....
- PHYSIOLOGICAL:
  - Pulse.....
  - Respiration.....
  - Temperature.....
  - Time of day.....
  - State of health (see tongue).....
  - Strength:
    - Pressure { r. hand..... / l. hand.....

TEETH:
- 1st
  - upper { r.—i. 1, 2, c, pm. 1, 2 ..... / l.—i. 1, 2, pm. 1, 2
  - lower { r.—i. 1, 2, c, pm. 1, 2 ..... / l.—i. 1, 2, pm. 1, 2
- 2d
  - upper { r.—i. 1, 2, c, pm. 1, 2, m. 1, 2, 3 ..... / l.—i. 1, 2, c, pm. 1, 2, m. 1, 2, 3
  - lower { r.—i. 1, 2, c, pm. 1, 2, m. 1, 2, 3 ..... / l.—i. 1, 2, c, pm. 1, 2, m. 1, 2, 3

MEASUREMENTS OF THE BODY

The directions to be given will for the most part strictly follow those of the International Agreements, as far as these go; but for the benefit of the student there will be a number of explanatory changes in the wording, and also a number of additions, all of which will be plainly indicated.

Stature—The stature is to be measured on the anthropometric plane of Broca, or an equivalent strip or tape (see under Instruments), with a square. The subject stands erect, on level surface, with heels together, and with these, the buttocks and the shoulders applied to the vertical (wall, rod, tree, etc.) on which is fastened the anthropometric plane, while the head is held so that the visual as well as the biauricular axis are horizontal. The occiput will frequently touch the vertical in this position, but it is not obligatory that it should do so. The arms hang in natural position. The height of the vertex is ascertained by means of the square. Observer stands slightly to the left of the subject, manipulates the square by holding it lightly in the left hand, and reads the measurement on the right margin of the plane. The square is applied to the head horizontally twice or three times in succession, to facilitate correct reading, and with sufficient impact to feel the skull resistance. Care must be exercised not to make an error in the reading.

The method as given here differs slightly from the Geneva agreement in that it provides, through the application of the heels, buttocks, and shoulders to the vertical, of a strictly standardized posture which will also serve for other measurements. There is no appreciable difference in the measurement by the two methods if taken with sufficient care; but the modification here given assures a greater uniformity of results as well as a greater ease of procedure. It is moreover strictly speaking the method of Broca[1]; and it is the method of the Geneva International Agreement for sitting height (q. v.). It would be incongruous to take the total height in one standard position and the sitting height in another.

Should the development of the buttocks interfere, as may occasionally happen in women, the subject is not forced against the vertical, but allowed to stand slightly in front of the same.

2. *Height to the Supra-sternal Notch.*—Instruments: A level and a plumb, or the anthropometer. The level has already been described

[1] Instructions, etc., 119. "Le *vertex* est le point culminant de la tête, lorsque le sujet debout et adossé au mur regarde droit devant lui. La hauteur du vertex n'est autre chose que la taille du sujet. On la mesure en faisant descendre la grande équerre sur sa tête."

(p. 55). In the absence of the specially made tube, use may be made of a flat piece of wood, such as the ordinary tongue depressor, which is applied edgewise into the notch. Method: Subject retains position held during measurement of stature. The level is pressed into the deepest part of the sternal notch, brought to and supported in horizontal position, the lead is dropped to the floor or ground with the string just clearing the abdomen, the cord is pinched by the thumb and forefinger nails at the lower edge of the level, the subject steps aside, and the measurement is read off against the vertical plane.

With the anthropometer the measurement is taken direct, with the instrument in front of the subject.

3. *Shoulder Height.*—This is an unsatisfactory measurement, on account of the frequency of a faulty holding of the shoulders. It should be taken on both sides, record being made either of both the measurements or of their mean. Landmarks: the upper surface of the outermost part of the acromion. Method: Similar as with measurement from sternal notch.

4. *Span.*—The horizontal distance from tip of medius to tip of medius, in maximum extension of the arms. Instruments: A vertical molding (or wall) against which to apply one of the fingers, and a broad horizontal scale on which to take the measurement (see under "Instruments"). Method: The subject whose stature and perhaps also sternal or shoulder height have just been measured, extends one of his arms horizontally until the medius is applied to the provided vertical, and raises the other arm into a similarly horizontal position. The observer applies his thumb nail to the medius of the free arm, and watching the subject, as well as the continued application of the medius of the arm first raised to the vertical, he directs him or her to expand the arms as much as possible. As the expansion takes place the thumb of the observer is pushed along the scale, until the maximum is reached. That the latter has been reached can usually be told from the attitude and expression of the subject. The arms are then dropped and the measurement indicated by the nail of the observer's thumb is read on the scale. The whole procedure is quite simple. Normality of the parts entering into the measurement is of course essential.

5. *Sitting height.*—The Geneva Agreement stipulates as follows: "*Sitting height.*—The subject sits on a horizontal and resisting seat about 30 to 40 cm. high (this height being proportionate to the stature of the subject); the knees are flexed; the dorsal aspect of the trunk is

to make contact with a vertical plane, or with the anthropometric rod at two points, viz., in the sacral region and again between the shoulder blades; the axis of vision is horizontal. The height of the vertex above the surface of the seat is to be measured."

The directions here given need no alteration. The height of the bench for American adults, whose average stature is superior to that of most other Whites, should not be lower than 45, and may conveniently be 50 cm. (see under "Instruments"). In taking the measurement special care must be taken in each case that the sacral region be well applied to the vertical. The occiput in this position generally touches the vertical plane.

MEASUREMENTS OF THE HEAD

Length.—The maximum glabello-, occipital diameter of the vault.

Instrument: The spreading compass or calipers (compas d'épaisseur, Broca or Hrdlička).

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 (Intern. Agr.).

Method: According to older methods (see Bertillon, Martin), the end part of each branch of the instrument was held in one hand, as in measuring the face. For measurements of the head this is somewhat clumsy. A better method is to hold the compass so that its butt (or joint) rests on the hypothenar eminence of the hand, the two proximal parts of the branches reposing respectively on the ball of the medius and on the second joint of the forefinger, while the thumb holds the instrument to the hand. The observer applies the thumb and middle finger of his left hand, in contact, to just below the glabella, places the free end of the left branch of the compass on these fingers so that the point touches the glabella, and applies the left forefinger over the end. This gives a ball-and-socket arrangement which enables the measurer to hold the point of the left branch of his compass steadily over the glabella without fear of displacement. This branch of the instrument needs no further attention. The right hand is now moved partly around the proximal part of the compass, so that the two branches rest on the ball of the fourth and on the second joint of the middle finger, and are held and controlled by the ball of the thumb and the ball of the forefinger. This hold permits not only an easy handling of the instrument with perfect control,

but affords also a great facility for regulating the pressure. The free end of the right branch is then applied over and somewhat to one side of the median line of the most prominent part of the occiput, and is moved up and down in saw-tooth fashion from side to side of the occiput until the maximum length is encountered. The eyes watch only the scale. The ease of manipulating the instrument when handled in this manner is very gratifying. (Fig. 11.)

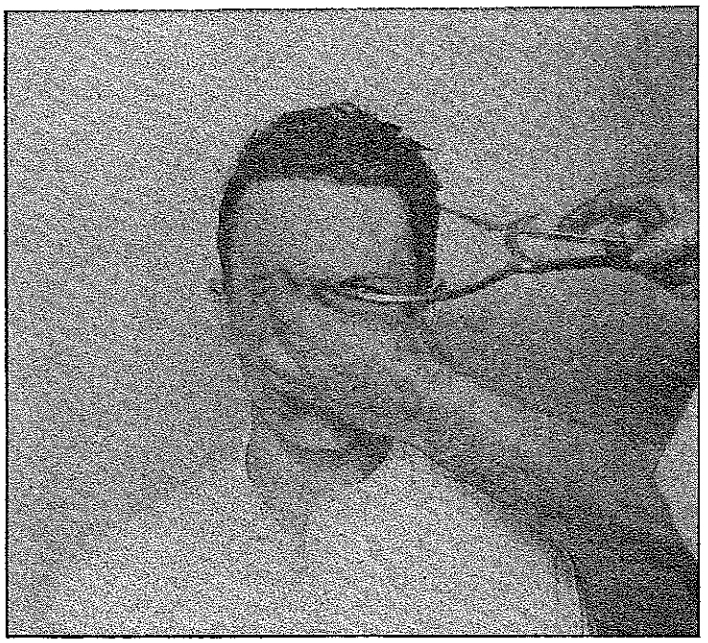

FIG. 11. Method of holding instrument in measuring the length of head.

Breadth.—The greatest transverse diameter in horizontal plane which can be found on the vault by the spreading compass (compas d'épaisseur, Broca or Hrdlička).

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

Method: The instrument is held as in first position for measuring the length, and this position is retained. The left hand is placed lightly on the top of the head of the subject, assisting in bringing the latter into the most convenient position for taking the measurement; the instrument is applied horizontally somewhat above what appears

to be the maximum breadth, and is moved in a zigzag way antero-posteriorly, descending and again ascending by zigzags, until the maximum breadth is found. The eyes watch only the scale. It is necessary to repeat the movements in an ascending and possibly once more in a descending direction, until the observer is positive that the maximum breadth has been ascertained.

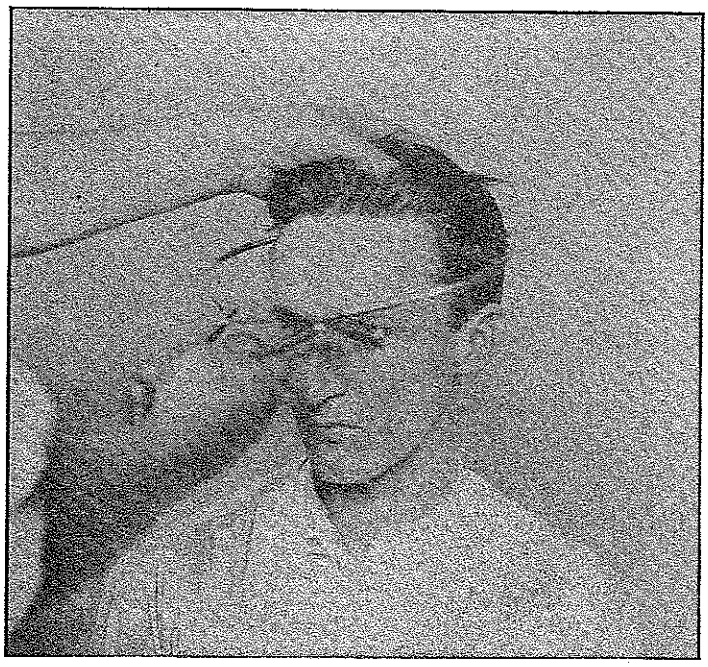

FIG. 12. Method of holding instrument in measuring the breadth of head.

Height.[1]—The height from the middle of the line connecting the floor of the auditory canals to bregma.

Instrument: The spreading compass of Hrdlička (Fig. 10).

Method: The instrument is held by the right hand just below the joint. The head of the subject being steadied by the left hand, one branch of the instrument is gently introduced into the left ear as far as the guard permits, and the same is followed with the right ear.

[1] The Monaco Agreement stipulates that the height of the head be taken from "the superior border of the auditory opening" to the "vertex"; but no satisfactory method for taking the measurement is offered or has ever been devised. The method here described has been practiced by the author since 1898 and found effective.

The compass is then slightly raised to assure penetration as far as the guards allow, is taken hold of a short distance above the scale by the left hand, allowed to sag down by its own weight, and held in position. The ulnar side of the hand that holds the compass should for greater steadiness repose on the head of the subject behind the instrument. The scale of the compass is now brought as near as possible

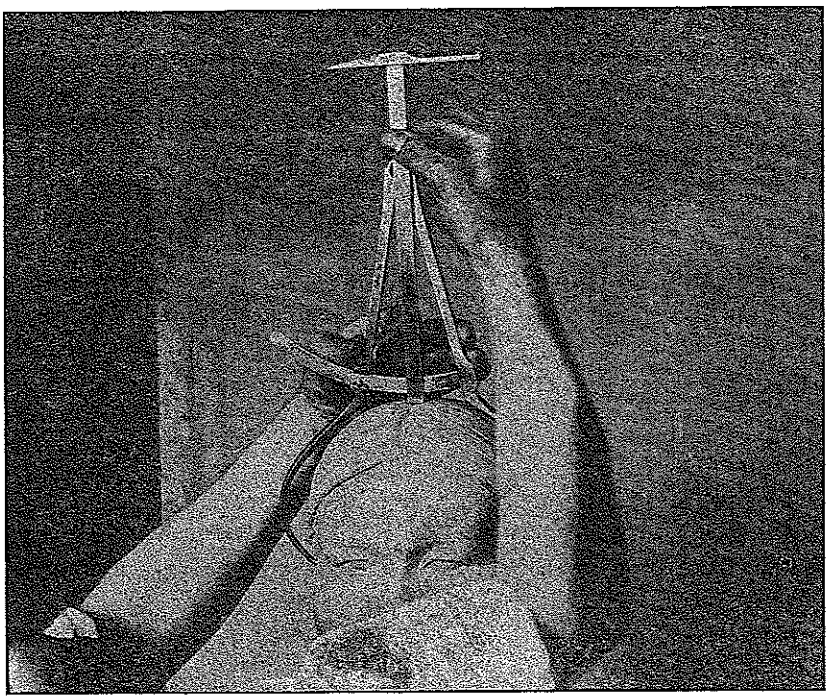

FIG. 13. Method of holding the instrument in measuring the height of the head.

over the bregma, the spread of the branches of the compass is noted on the scale, the distance from bregma to lowest part of the scale is carefully ascertained by the rod of the sliding compass, and the operation is completed. All that is now necessary is to read off on a previously prepared scale the total height from the base line of the points of the compass to the lowest part of the scale of the same at the spread observed in the subject at hand, and to deduct from this the distance between the bregma and the scale. Special care must be exercised that neither of the branches (particularly that in the right ear) slip out of the meatus. (Fig. 13).

This method is readily learned and causes the minimum of inconvenience to the subject (particularly if the points of the instrument are warmed in water or by the breath of the observer before introduction), and with due care it gives results which vary within less than 3 mm. The time required is scarcely more than the average time for ascertaining the head length. The external portions of the floor of the meatus, while not as perfect landmarks as could be desired, give with this method and instrument, in the author's experience, results that are more satisfactory than those obtained by any other method or instrument so far devised for taking this important measurement of the head. The preference of bregma to the vertex for the superior 'point de repère,' is in accordance with the Geneva Agreement, which stipulates two heights of the vault and both to the bregma.

MEASUREMENTS OF THE FACE.

The face in the living can hardly be considered without including the forehead, which contributes in an important way to the physiognomy. In consequence certain measurements of the "face" include the frontal part of the head up to the line of the hair.

The essential measurements on the face are its anatomic and physiognomic heights, and its greatest breadth; but generally it is also advisable to include the smallest frontal and the bigonial diameter.

Instrument: The spreading compass (Broca or Hrdlička).

Preliminaries: The location of the *nasion*, and the middle point of the hair line (*crinion*), may with advantage be marked beforehand by aniline pencil.

The *nasion* should correspond as closely as possible to the anatomical nasion, *i.e.*, the mid point of the naso-frontal suture. In a certain proportion of subjects this point may be felt by the observer's finger nail or the point of a pencil; but in the majority we must rely on knowledge of its location derived from extensive observation on skulls and dissecting room material. It is always situated above a horizontal line connecting the two inner canthi.

The *crinion* is the mid point of the hair line, where this forms a regular arc. Occasionally a more or less marked V-shape extension of the hair downward in the median line will mar this arc, in which case it will be requisite to extend the lateral parts of the arc until they connect and mark the crinion in the middle of this line. But little difficulty will be experienced in this connection.

Face Length, Anatomical.—The distance from the menton (the lowest point in the middle of the bony chin), to the nasion.

Method: Hold large spreading compass so that the points repose on the balls of the two forefingers. Ascertain with the projecting part of the left forefinger the lowest part of the chin, apply to it the point of the compass, and hold in position by the forefinger. Open the instrument sufficiently, apply little finger of the right hand to the head of the subject for support, bring the right forefinger with the end of the right branch to the forehead a short distance above the nasion, and without moving the skin up or down apply the point of the instrument carefully to the nasion, at the same time reading the scale.

Height to Crinion.—Method: Without removing the hands or instrument after the measurement to nasion has been secured, the upper branch of the compass is elevated until it touches the crinion, and the measurement is read off.

The manipulation is simple and the values of the two measurements are easily carried in mind until they can be recorded.

Face Breadth.—The maximum bizygomatic diameter.

Landmarks: The most widely separated points on the external surface of the zygomatic arches (Intern. Agr.).

Method: Hold instrument as in measuring facial heights. Bring over zygomatic arches, feel with forefingers their maximum convexity, apply points of instrument with sufficient pressure to feel resistance of the bone, and pass forward and backward in up and down zigzags, watching the scale; repeat process in opposite direction, and perhaps once more forward and backward, until the maximum breadth is ascertained.

Diameter Frontal Minimum.—The minimum frontal breadth, or the shortest horizontal diameter between the two temporal crests on the frontal bone.

Instrument: Compas d'épaisseur, Broca or Hrdlička.

Method: Hold instrument as for measuring the facial heights and breadth. Search with forefingers above the lateral angular processes of the frontal for the deepest part in the curve of each temporal line; when found slip the points of the forefingers behind the lines, apply points of compass to the same, and read measurement.

Diameter Bigonial.—Instrument: Compas d'épaisseur, Broca or Hrdlička.

Landmarks: The gonions or points of the angles of the lower jaw. The separation of the angles is measured by applying the compass to the most prominent points on their external surface.

Method: Hold instrument in same way as for the other facial

measurements; ascertain most prominent points of angles with tips of forefingers, slip these a little behind, apply points of compass to the points just ascertained and read off the measurement.

Height of Forehead.—The height of the forehead is the difference between the menton-nasion and the menton-crinion diameters.

MEASUREMENTS OF THE NOSE, MOUTH, AND EARS

Nose: Length.—The length (or "height") of the nose from the nasal septum where this joins the upper lip, to the nasion (Intern. Agr.).

Instrument: The sliding compass.

Method: Apply left hand over the head of the subject in such a way that the thumb is a short distance above the nasion. Place the fixed branch of the compass against the thumb, and with this bring gently to touch the nasion. Push movable branch of compass to point where the line of the septum joins the skin descending from the nose to the upper lip, remove instrument and read measurement.

In cases where no point of demarkation between the upper lip and nasal septum exists it will be necessary to press slightly on the lower branch of the instrument in the line of the septum, until the requisite point is reached. The student bears in mind that his object is to ascertain the correct length of the nose alone.

Breadth.—The maximum normal external breadth of the nasal alæ, determined without the exertion of any pressure.

Instrument: The sliding compass.

Method: Hold instrument in right hand, with thumb on the sliding branch and points upward. Place dorsal parts of the third and fourth fingers of the left hand on the subject's chin, with the forefinger free; apply distal branch of compass to your forefinger, and with this acting as a support bring to the most prominent part of the right nostril; push sliding branch gently to most prominent part of left nostril, turn instrument slightly forward and backward to ascertain that both branches are touching and not compressing the skin, remove and read measurement.

Remarks.—The position of the left hand of the observer in connection with both measurements on the nose is of considerable importance and assistance, assuring a safe, quick and accurate measurement, and giving the subject a sense of confidence. In measuring the breadth of the nose, care must be taken that the nostrils of the subject are not

dilated; a more or less unconscious dilatation will take place in some subjects when the measurement is to be taken.

Mouth.—Breadth: The distance between the angles of the mouth at points where the mucous membrane joins the skin, with mouth naturally closed, without tension.

Instrument: Sliding compass.

Method: Apply forefinger of left hand to the chin and the medius below the chin. Place fixed branch of instrument on forefinger,

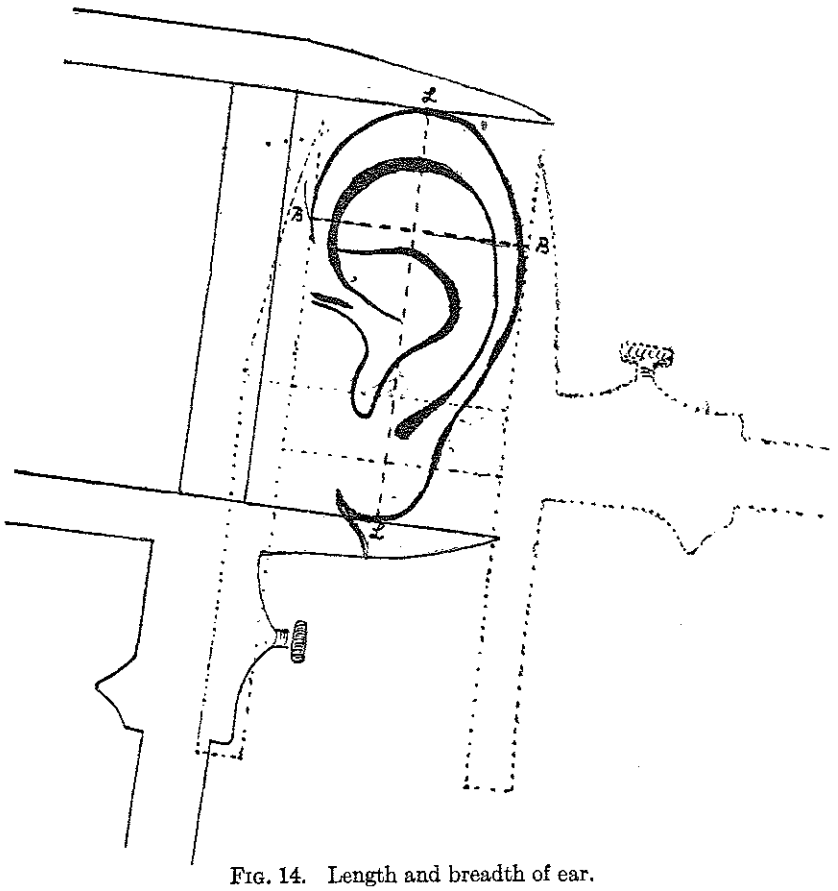

FIG. 14. Length and breadth of ear.

apply to right corner of the mouth, bring point of sliding branch to left corner (without exactly touching either), remove instrument and read measurement.

Left Ear.—The left ear for a right handed observer is much easier

to be measured and should therefore be the ear measured on all occasions. The two measurements to be taken are the greatest length, and the greatest breadth at right angles to the length. Both are taken with the sliding compass (Fig. 14).

Length Maximum.—Landmarks: Superiorly the highest point on the border of the helix; inferiorly the lowest point on the lobule. The rod of the compass should be held parallel to the long axis of the ear; use no pressure (Intern. Agr.).

Method: Place third, fourth and fifth fingers of left hand above the ear, apply fixed branch of compass to ball of the medius, bring it gently with this to the uppermost part of the ear, push sliding branch to lowermost point of lobule, holding instrument parallel to the long axis of the ear, and read measurement.

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 (Intern. Agr.).

Method: Place three fingers of left hand above the ear as for preceding measurement. Apply fixed branch to ball of the free thumb, and with this bring to the anterior limit of the cartilage of the helix, which can be done most readily by applying a little pressure on the point of your instrument so that this sinks in front of the helix. Hold the fixed branch parallel to the long axis of the ear, bring sliding branch to the outermost part of the ear, and read measurement.

MEASUREMENTS OF THE TRUNK AND LIMBS

Breadth of Shoulders.—The most satisfactory breadth is that between the great tuberosities of the humeri, which are easily ascertained in all subjects.

Instrument: Large sliding compass (Topinard, Martin, or Hrdlička).

Method: Apply branches of compass to points indicated with sufficient pressure to feel the unyielding resistance of the bone, and read measurement. The arms in natural pendent position.

Diameters of the Chest.—The most satisfactory level for measuring the diameters of the chest is that at the height of the nipples in men, and at the corresponding height of the upper border of the fourth chondrosternal articulation in women. The developmental and racial variations at this point appear to be better marked than they are in any other part of the thorax.

Instrument: The large sliding compass (Topinard, or Hrdlička).

Method: Transverse diameter: Subject stands in natural, easy, erect position. The forearms are flexed at about right angles, and the arms are lifted forward and upward to about 30 degrees from the body. They are directed to be held limp without any tension, and the examiner satisfies himself that there is no tension by lightly taking hold of the forearms and moving the arms slightly up and down. The object of the position is on one hand to relax all the thoracic muscles, and on the other to permit the application of the instrument. The same position in every respect is preserved for the antero-posterior diameter.

The large compass is now applied to the chest in such a way that its rod lies directly over the nipples (or corresponding line in women), the fixed branch is pressed against the thorax until it meets with the resistance of the ribs, and the movable branch is applied repeatedly to the opposite side of the thorax, with equal pressure, during inspiration and expiration, until the medium between the two can be arrived at. It is the medium which is recorded. The instrument is held so that its plane is at right angles to the vertical plane or axis of the thorax.

The *antero-posterior diameter* is taken so that the fixed branch of the compass is applied to the nipple line, the rod of the instrument to the ribs on the left side, and the movable branch to the posterior part of the thorax, the instrument being held again at right angles to the vertical axis of the chest. Here also we take repeated measurements until the medium between normal inspiration and expiration is ascertained, and this is recorded.

Measurements of the Limbs.—It is advisable to measure the left hand, left foot, and left leg, partly because of greater convenience, partly because in a large majority of persons the left limbs are less affected by work, and possibly also, at least in the case of the hand, by injuries.

Left Hand. Length.—The International Agreements have nothing on the measurements of the hand or foot; but measurements of both are indicated in Topinard's Eléménts etc., 1134–35, as well as in Martin. Those practiced by the author may be defined as follows:

The length of the hand in the living extends from the middle of the line connecting the proximal limits of the thenar and hypothenar eminences, to the end of the medius, with the hand in full extension.

Instrument: Sliding compass.

Method: Take a sheet of blotting paper, apply to points just given (which if indistinct can easily be ascertained by flexing the hand upon

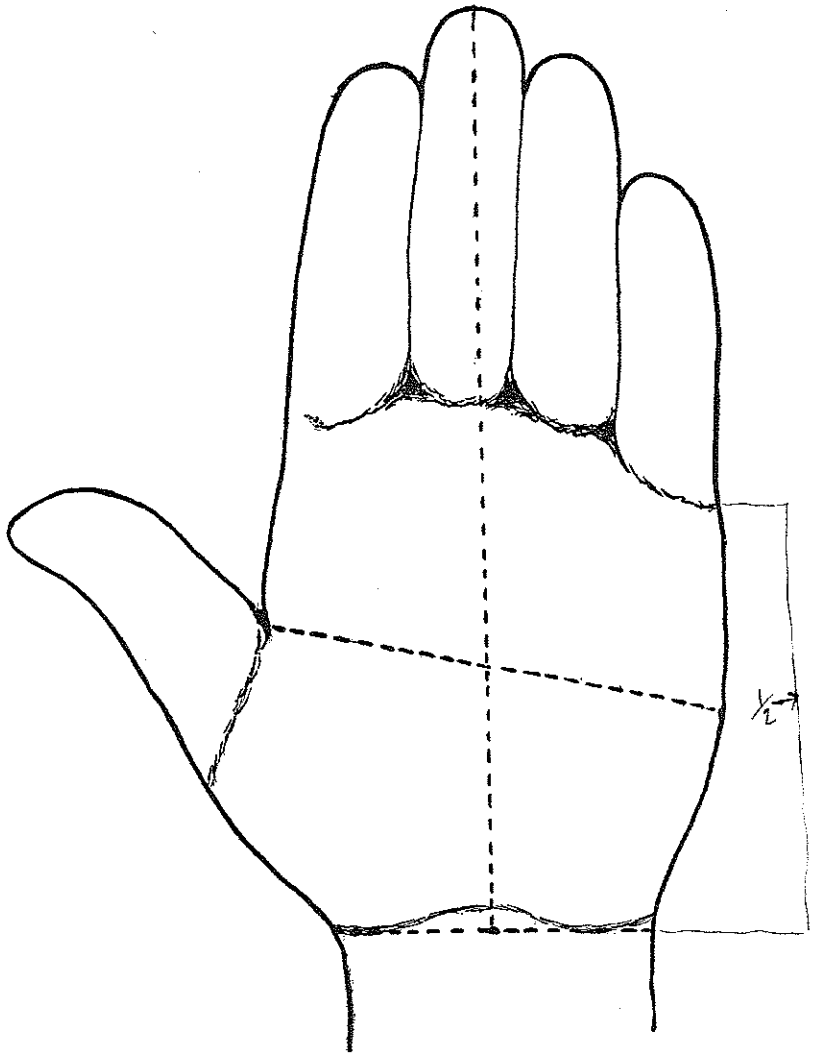

FIG. 15. Length and breadth of hand.

the forearm), mark mid-point with aniline pencil, and secure measurement with hand in full extension.

The easiest way to take the measurement is by placing observer's left hand under that of the subject with thumb close to the point from which the measurement is to be taken; applying the fixed branch of the compass to the observer's thumb and with this to the marked point at the wrist; seeing to it that the hand is fully extended, and bringing movable branch into light contact with the point of the medius. The rod of the compass is held parallel to the wrist-point—medius line.

Breadth.—The most expressive breadth of the hand is that across the palm, at nearly right angles to the length.

Instrument: The sliding compass.

Method: With hand in full extension, apply fixed branch of compass to the angle formed by the thumb and the radial side of the palm, and if necessary compress skin lightly until the point on which the instrument rests is in straight line with the radial surface of the forefinger and palm. The rod of the compass lies applied across the palm, and the moving branch is brought to a point on the ulnar side of the palm midway between the basal (metacarpo-phalangeal) groove of the little finger and the line limiting the hypothenar eminence.

The most satisfactory way of taking this measurement is for the observer to place his left hand under that of the subject so that the tip of his medius is just below the junction of the thumb and palm, and his thumb is on the palm itself. The point of the movable branch of the compass is now applied to the ball of the observer's medius, is brought with this to the required position in the palm-thumb angle of the subject's hand, and the fixed branch is brought slowly to the requisite point of the ulnar side of the palm. This latter point may be marked beforehand, but its location can be easily estimated. The breadth thus obtained is nearer the maximum, more logical, and easier to take, than would be that at strictly right angles to the length and is much more characteristic than the breadth across the metacarpo-phalangeal articulations (Fig. 15).

Left Foot. Length.—Length maximum, parallel with the long axis of the foot.

Instrument: The large sliding compass.

Method: The easiest way to secure this measurement accurately is to direct the subject to place his left foot upon the bench (usually that which has been used for determining the height sitting), without pressure, putting all his weight on the right limb. The large sliding compass is then applied so that its rod lies parallel with the long axis of the foot, its fixed branch touches the heel, and its movable branch is brought lightly to the most distal part of the longest toe.

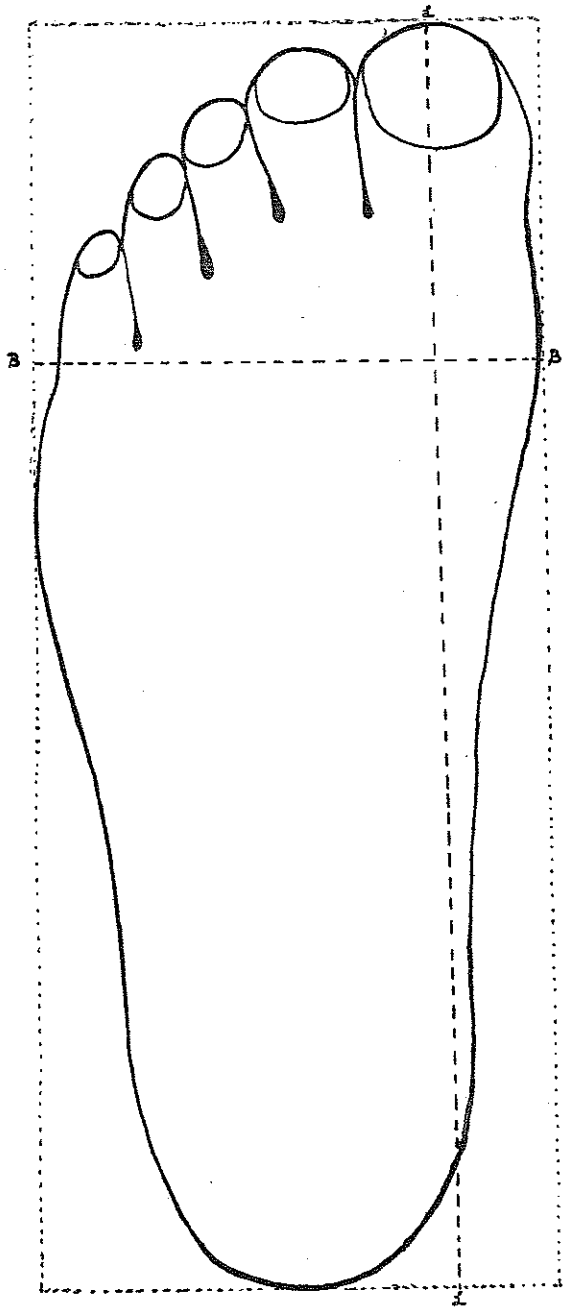

FIG. 16. Length and breadth of foot.

Breadth: The maximum breadth of the foot, at right angles to the length.

Instrument: The large sliding compass.

Method: Apply fixed branch of instrument to inner side of foot parallel with its long axis, and bring movable branch lightly against most prominent part on the outer side of the foot (Fig. 16).

Girth of Calf.—Maximum circumference of calf. Measurement useful racially, and also in general for comparison of musculature.

Instrument: Anthropometric tape.

Method: The left foot is placed on a bench, as for measurements of the foot itself, and it is brought forward so that the leg forms a little larger than a right angle with the thigh, to insure relaxation of all muscles. The tape, held between the thumb and fore-finger of each hand, is then applied somewhat above what appears to be the maximum bulge of the leg, and is brought snugly around the leg but not tightly enough to cause an impression, and a mental note is made of the measurement. The tape is then moved, with a side to side motion, slightly lower and the measurement is observed again; and the process is repeated until the maximum girth has been determined.

OBSERVATIONS ON THE LIVING

As in the case of measurements so in that of visual observations there is possible a great range of detail, which on special occasions and in studies of single organs may be fully justifiable and even necessary, but which has no place in work of more general, routine nature. Thus in the case of the nose there is a possibility of making interesting detailed notes on the height and nature of the septum, on the characters of the point, on the shape of the nostrils, on the stoutness and other characteristics of the root; in the case of the eyes, on the detailed characteristics of each lid and canthus, with almost endless details on the coloration. All this, however, is impossible under the usual stress of work both in field and in the laboratory. Here again, as in the case of the measurements, we must subordinate whatever is not essential to the number of subjects, and the possibility of prompt elaboration of data. But there are certain minima which the observer ought not to pass if his work is to be fairly rounded out, and it is on these that attention will here be concentrated.[1]

[1] For greater minutiæ the student may be referred especially to the outlines of the anthropometric work on Austria's prisoners carried on during the war by Rudolf Pöch, published in 1915–17 in the *Mitt. Anthrop. Ges.*, Wien.

Important features in this connection are the order of procedure, and especially the mode of recording. The procedure should be as far as possible logical, the eye passing from organ to organ in the most natural order; and the recording is best done in definite, steadily adhered to abbreviations, which are recorded like measurements in columns and can eventually be summed up and analyzed in much the same manner.

Another important subject is the characterizing of certain observations, such as for instance the thickness of the lips, size of the eye aperture, quantity of beard, etc. To properly describe such variations we are in absolute need of definite, well-known standards or media, and the most available and intelligible standards to us of the white race are those of our own, the white people. To become properly acquainted with these "means" must therefore self-evidently be one of the main aims of the worker in physical anthropology.

All observations should be made in good and as far as possible even (northern) light, never in dusk or in direct sunlight; and at the most effective visual distances for the student. And of course, where possible, the observer will use well-known artificial standards.

The following classification of characteristics agrees in essentials with that of anthropologists in general, differing only in a few details, as indicated by prolonged experience on varied races. For the sake of brevity it is given in a somewhat schematic form, which will need but little explanation.

As to abbreviations, the student is free to adopt such as will best suit him. The author has thus always used the easily made and read sign of + for "medium," "average," "normal," for which we have no other symbol. Terms often called for, such as "slight" (sl.), or "slightly" (sl.), "some" (sm.) or "somewhat" (sm.), "moderate" (mod.) or "submedium" (subm.), "considerable" (cons.), "marked" (mk.), or "pronounced" (pron.), and "excessive" (exc.), are easily understood by all and easy to record.

COLOR OF SKIN

Remarks: Observations best taken on chest, back, or upper portion of arms. Color standards useful on dark races, but of very limited utility with whites. Student should bear in mind that pathological conditions, particularly those which affect the blood, may alter for the time being the color of the skin, even in very dark individuals; and also that even dark skins may be perceptibly changed by sunburn or long exposure to the sun.

DESCRIPTIVE TERMS

Class of Color. *Shades.*

WHITE—florid—light—medium—brunet—dusky—light brown.
YELLOW—pale yellowish or sallow—tawny (brownish yellow)—dusky yellow.
BROWN—light—medium—dark—chocolate (solid).
BLACK—brown black—bluish black—greyish black—ebony black.

EYES

What is generally observed about the eyes is the direction of the palpebral fissure or eye-slit, a presence of epicanthus, and the color of the iris. Any other feature found to characterize an anthropological group should of course be noted. The color of the conjunctiva is more of age than racial significance.

COLOR OF EYES

Remarks: Good soft light and close attention are necessary. In Whites, and particularly Americans, a large majority of eyes are mixtures, or blends, of the blues and browns, and both parental colors may be represented, the brown aggregated about the pupil, in lake or spots, the mostly more or less modified blue outside. In rare cases the brown may be present in the form of a wedge-shaped segment; and the two eyes may be of a different shade. Eyes change in color from infancy to childhood and again during senility; and in mixed populations the change may even be from brownish to grey or bluish or *vice versa*. Mixed shades may also change perceptibly with physical condition and mental state of subject. In recording, the student may either restrict himself to noting the prevailing color (*i.e.*, that of the more distal zones of the iris), or record both this as well as the presence of the brown color or spots about the pupil.

EYESLITS

Direction: horizontal;

oblique { ext. canthi higher { slightly; / moderately; / markedly. / ext. canthi lower { slightly; / moderately; / markedly.

"mongolic" fold (epicanthus).

EYE COLORS

Classes:

Blue—light ("forget-me-nots"), medium, rich blue, slate blue.

Subclasses

Green—often merely "greenish"; commonly associated with some brown; frequent in United States.

Gray—common among northern Slavs.

Brown—light, medium, dark, very dark.

Black—really extreme of brown, appearing black, in Negroes.

Conjunctiva — bluish, pearly white, yellowish, dirty or reddish yellow.

HAIR

In quantity, the hair may be "normal" or "medium," "thick" (term in vogue among men) or "rich" (term in vogue among women and applying to length as well as profusion).

In character, it may be naturally "straight," "wavy" (slightly or markedly), "curly" (slightly, markedly), "frizzly," "wooly," or "peppercorn" (en rouleux).

HAIR-COLOR

Remarks: Among lighter Whites hair color, like eye color, changes with growth, as a rule darkening from infancy onward; it also varies perceptibly according to the state of blood and in certain pronounced mental conditions of the subject, and may present parts (particularly postero-inferiorly), strands, or tufts of more or less different shade. The color recorded is the prevailing one, with special note, if advisable, on variations. In gray-haired subjects record original color, as far as ascertainable, as well as degree of greyness ("few gray hairs," "some," "abt. ⅛, ⅓, ½, most, nearly all, all gray"). In dark races grayness rarely reaches pure whiteness and the hair will be yellowish. A special shade that may be difficult to classify should be described in observer's own words. Hair color may also be affected by exposure to sun, washing with alkalies, or by staining; what will be recorded will, of course, be the natural color.

HAIR-COLORS

Classes:

Blonds—Pigmentless, flaxen, straw, dull yellow, golden yellow; specials.

Intermediaries—Light brown, ashy, medium brown, medium reddish-brown.

Brunets—Dark brown, near black.

Blacks—Rusty-black, bluish-black, coke-black, black.

Reds—Light brownish-red (sandy red), medium brownish-red, brick-red, saffron red, chestnut red (or auburn); specials.

MUSTACHE AND BEARD

Remarks: The mustache (in particular) and also the beard, frequently differ in density, color, and waviness, from the hair of the head. (The pubic hair also frequently differs, but with that the observer in general is not concerned.) The mustache is often more scanty, or coarser, and in non-brunet Whites is commonly of a more reddish color than the hair on the scalp, while the beard is often more wavy. Both mustache and beard offer some interesting differences from the hair of the scalp in greying. Observations on mustache and beard among many peoples are regrettably made difficult by the practices of depilation or shaving, while those on hair are occasionally made difficult among Whites by extensive calvitia and by various artifices.

DESCRIPTIVE NOTES, MUSTACHE AND BEARD

Quantity: scarce—medium—thick.
short—medium—long.
Color: Character:

EYEBROWS

Color: Quantity: scanty—medium—bushy—connected.

FOREHEAD

Height: low—medium—high.
Breadth: narrow—medium—broad.
Slope backward: none—slight—moderate—pronounced.

SUPRAORBITAL RIDGES

Development: Imperceptible—traces—slight—moderate—medium—pronounced—excessive—supraorbital arch.

NASION DEPRESSION

Character: shallow—medium—deep; narrow and impressed; wide; combinations.

NASAL BRIDGE

Character: Straight
- Concave: slightly / moderately / markedly
- Convex: slightly / moderately / markedly
- Concavo-convex (wavy).

NASAL SEPTUM

Inclination: Horizontal
- Directed upward: slightly / moderately / markedly
- Directed downward: slightly / moderately / markedly

MALARS

Prominence: none—slight—medium—above medium—pronounced.
Size: small—submedium—medium—large.

ALVEOLAR PROGNATHISM

Grade: none—small—medium—above medium—pronounced.

LIPS

Thickness: thin—medium—above medium—thick.

CHIN

Prominence: submedium—medium—pronounced.
Form: ordinary—square—pointed.

Note: What is commonly called receding chin is generally so only in appearance.

ANGLES OF LOWER JAW

Prominence: submedium—medium—prominent.

NECK

Size: thin—medium—thick.
Length: short—medium—long.

BODY AND LIMBS

General state: thin—lank—medium—very muscular—plump—obese.
Asymmetries:

EARS

Marked peculiarities:

FINGERS AND TOES

Length: short—medium—long.
Position: normal—standing apart—crowding.
Peculiarities and Anomalies:

BREASTS

(in women who have had no children)

Shape: conical—intermediate—hemispherical.
Size: small—medium—large.
Anomalies:

PHYSIOLOGICAL OBSERVATIONS

Pulse: Subject sitting, at rest, and not soon after a meal or during fasting, after a long walk or other strenuous exercise, after or under excitement. A good method is for the observer to count by quarters of a minute, repeating until right count is ascertained.

Respiration: Same general rules as for pulse. Count immediately after taking pulse and without attracting subject's attention (important). Count by minutes.

Temperature: Same general rules as for pulse. Taken invariably under the tongue, the thermometer being introduced before we begin to take our visual observations and count the pulse; these give plenty of time for a correct record with even a slow thermometer.

Remarks: In connection with pulse, respiration and temperature, record time of day, and also invariably the condition of the tongue. A coated tongue often tells of temporary or chronic derangement which modifies the temperature, pulse, and perhaps even respiration. No records of subjects with coated tongue should be included in the eventual analysis into the "normal" series.

HAND PRESSURE

Dynamometric observations may well be restricted to pressure with each hand, leaving out traction, lifting strength, etc. The object

of the observer is to secure the maximum effort in each hand and he must stimulate the subject to a maximum exertion. As a rule at least two tests are to be made with each hand, after which fatigue ensues.

Combined with these tests may be made an inquiry into right- and left-handedness, but this is not as simple as may be thought at first and will require some special preparation.[1]

MISCELLANEOUS

Other physiological observations, such as those on blood-pressure, lung capacity, acuity of perception and response, etc., may be added to the above, but are scarcely fit for a general routine examination.

TEETH

The examination as to the condition of the teeth fits best perhaps at this place. We examine for state of eruption; for abnormalities (crowding, impaction, etc.), and anomalies (persistent teeth of first dentition, congenital absence, supernumeraries, etc.); also for decay. Morphological observations are best made the subject of special study.

Combined with examination of the teeth may be that of the palate, but it is preferable to make a special study also of that structure.

WEIGHT

Except in recruiting and army camps, we are obliged, or find it advisable, to weigh our subjects with a certain amount of clothing, the weight of which may readily be approximated and eventually subtracted. The author finds it most convenient to weigh his subjects in their ordinary clothing and shoes, but without coats, wraps or hat.

[1] See Beeley (A).—Left-handedness: *Am. J. Phys. Anthrop.*, 1919, II, No. 4, 389-400.