

THE SIGNIFICANCE OF CERTAIN FEATURES AND TYPES OF THE EXTERNAL EAR.

IN these days the search for some characteristic of the human body which will give unequivocal evidence of the mental nature of the individual still goes on as merrily as ever. To some men the bumps of the head tell everything; to others the lines of the palm are hieroglyphic expressions of the qualities of the brain, not to speak of what they tell of things past and events to come; in fact, there is scarcely a feature of the human body that has not, at one time or another, been advo-

consideration. The first of these is the school of workers founded by Lombrosa, which believes that a *certain class* of criminals are criminals because of an imperfection in the development of their brains. It is probable, as this school supposes, that such imperfectly developed brains will be wrapped in defective bodies; by the presence of bodily defects, and they have used very largely those of the external ear as an index, the imperfections and unbalanced nature of the brain may be detected. It is clearly a matter of the utmost moment for a State to be able to recognise its criminals, who are criminals because of their constitutional imperfections, and this undoubtedly is the aim of

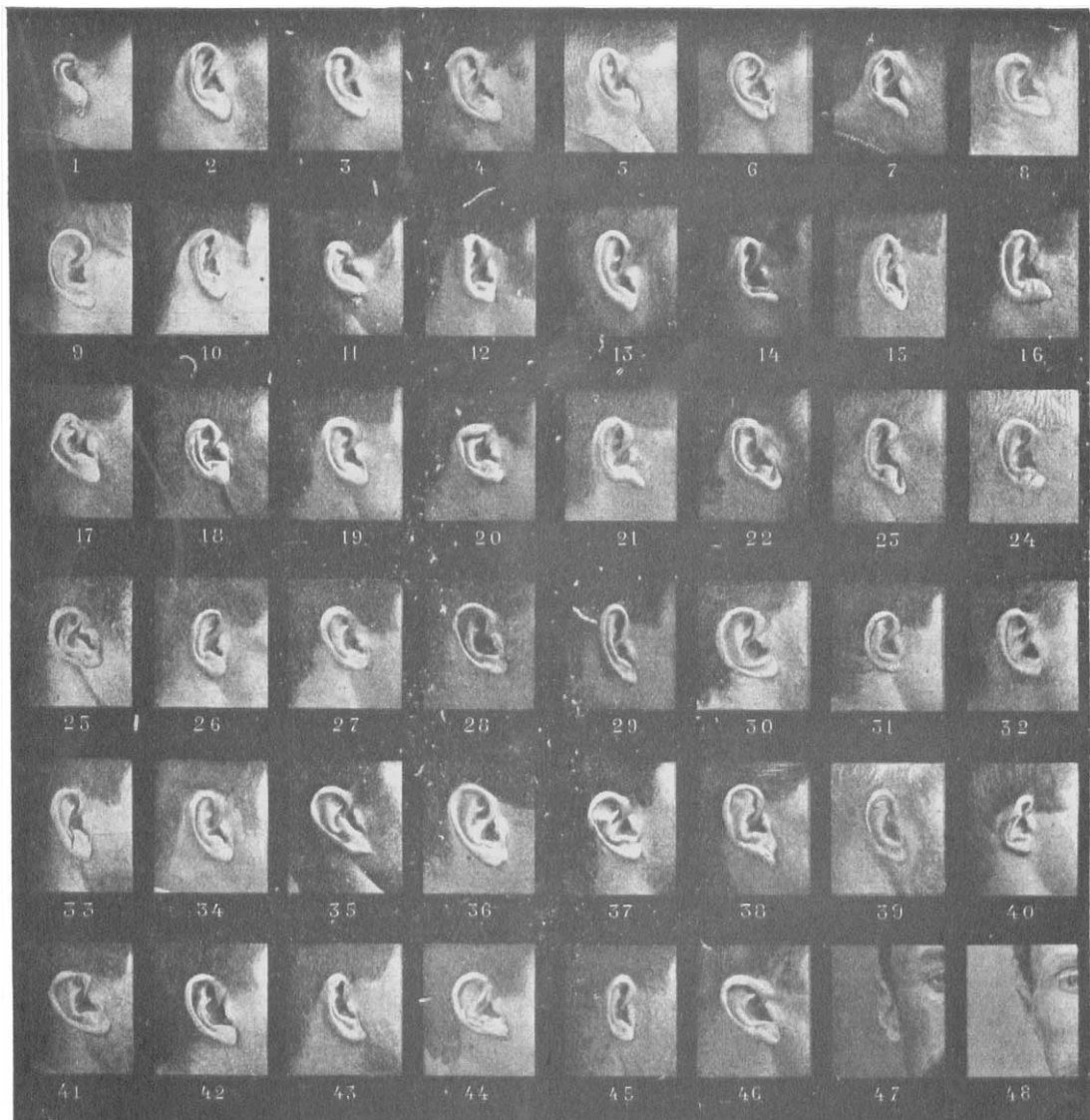


FIG. 1.—Illustrating certain types of ear referred to in the text.

cated as an index of certain faculties, and now it is the turn of the external ear. Although not one of these many pretensions has ever stood the test of scientific investigation, or even that of a casual every-day experience, yet their advocates continue to thrive and abound unabated. If those handmaidens of the brain—the muscles of expression—those that set the eye and strengthen the mouth, fail to yield a clue, then it is vain to seek for it in any other structure of the body.

There are three classes of observers, however, which have made a special study of the external ear, deserving of the utmost

the Lombrosa school. In their investigations of the external ear they found certain features to exist in those of the criminal and insane classes with a much greater frequency than in the sane. With their results I wish to compare a wide series of observations made on the criminal and insane classes of this country.

The second class of observers, which deserves attention, is that which has contributed to our knowledge of the development, anatomy and evolution of the human external ear. Its contributions make up quite an extensive literature. Prof.

Schwalbe, who may be regarded as the chief of this class, gives references to 145 papers¹ in his latest work on the ear—most of which deal only with the external ear.

The third class is that of which Bertillon² is the chief. To this class the characters of the external ear are important only so far as they may assist in the identification of the criminal. Its system of observation is purely empirical, and the large masses of facts which it has accumulated are useless for the scientific advancement of the subject.

In a paper contributed recently to *La Nature*,³ from which Figs. 1 and 2 are borrowed, Mr. Henri Coupin remarks that

way, for I suspect that most people, as well as the novelist, find a lack of descriptive terms by which the numerous varieties of the external ear may be fully indicated.

There are two types of ear which everyone must have noticed, although they have found no name for them. They are contrasted types and mark the opposite poles of ear development. One of these is that which the novelist occasionally condescends to notice, describing it as "a beautifully modelled, small, shell-like ear." Popularly it is regarded as a sign of high breeding. Examples of this type may be seen in Fig. 1, Nos. 1, 5, 8, 11, 18, 20, 25, 27, and in Fig. 2, Nos. 8, 12, 16, 19, 25, 34, 35.



FIG. 2.—Illustrating certain types of ear referred to in the text.

writers of fiction, while describing with a fulness of detail the features of the eye, mouth, nose and hair of the heroine or hero, carefully abstain from any mention of the external ear. Yet there is no doubt that the ear is a subject of common remark among friends and acquaintances, but often in an inarticulate

An example of the same type will be seen in Fig. 3, which is a tracing from a photograph of a typical ear of the orang. For the reason that the chief features of the orang's ear are present in the type of ear I have just cited, I have named it the "orang-type" of human ear.

The type of human ear contrasted to this is one never alluded to in fiction, but is frequently the subject of everyday remark. It is large, expansive, and projects like "wind-sails from the port-holes of a steamer in the tropics." A very good illustration of it is seen in Fig. 2, No. 45, but further examples may

¹ "Handbuch der Anatomie des Menschen" von Bardeleben. Abtheil ii. Band v., 1898.

² "The Bertillon System of Identification." Translated by McClaghry.

³ "Notre Oreille," *La Nature*, p. 138, July 27, 1901.

be detected in the same figure, Nos. 13, 17, 31, and in Fig. 1, Nos. 9, 13, 15, 28, 29, 30, 35, 36, 38, 46. An ear of the same type is shown in Fig. 4; it is a tracing from the ear of "Sally," the chimpanzee, and is typical of her species. This may be called the "chimpanzee type" of human ear.

This nomenclature, of course, does not imply that people with the orang-type of ear are related any more to the orang than the chimpanzee-type indicates an affinity to the chimpanzee. The resemblances are due to the fact that in the orang the external ear has undergone marked retrograde changes; in the chimpanzee the ear has retained its pristine development. The one marks

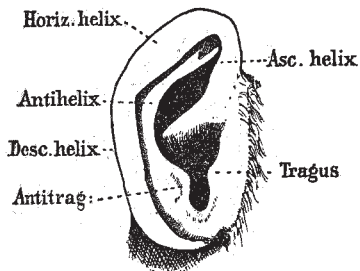


FIG. 3.—An Orang's Ear.

the ebb tide of retrogression, the other the full tide of development; the corresponding types in man mark the same extremes. The anatomical parts of the ears of the three great anthropoids and man are the same (see Figs. 3, 4, 5 and 6), but in men are found types exemplifying the retrograde changes which have overtaken the ears of all orangs, and also examples of the full development which marks the ears of chimpanzees. Curiously enough the gorilla, like man, shows an amplitude in the variations of its ear, but on the whole it inclines towards the orang-type.

But what is meant by retrogression, and what by full development of the ear? The explanation entails a reference to the seven parts which compose the outer ear. Each of the seven springs as a separate part round the opening of the ear in the embryo, and by the fourth month they have fused to form the whole structure.

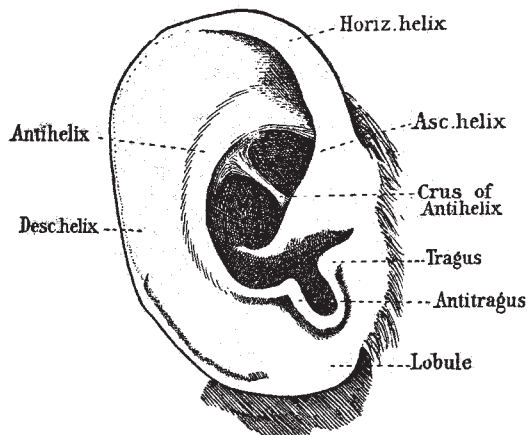


FIG. 4.—Ear of Chimpanzee.

Three of these parts surround the concha, or cavity, and opening of the ear-passage, viz. the tragus, the antitragus and the antihelix (see Fig. 5). The remaining four parts form the circumference of the ear, viz. the ascending helix—in front and above; the horizontal helix—above; behind, forming the wide posterior border of the ear—the descending helix; and below—the lobule. Now only one of these seven parts suffers *markedly* from progressive or retrogressive changes, and that is the descending helix. In Fig. 5 a human ear is represented—somewhat diagrammatically with the descending helix fully developed; that is to say the descending helix is wide, expansive, and its margin is not inrolled;

the ear of the chimpanzee (Fig. 4) shows similar characters in its descending helix. On the other hand, the orang's ear (Fig. 3) shows the descending helix not only markedly reduced, but its margin, like that of a cankered leaf, is inrolled. A reference to the orang types in Fig. 1 (such as No. 11) and Fig. 2 will show inrolling of the margin of the descending helix, similar to that in the orang. The various degrees to which the inrolling may be carried is shown diagrammatically in Fig. 5. Four degrees of inrolling are recognised, viz. 0, 1st, 2nd or 3rd degree. It should be remarked, however, that the reduction in size of the descending helix and inrolling of its margin do not constitute all the characters of the orang type—with these the development of the ear as a whole also shows reduction in size. The height of the ear of a chimpanzee is nearly twice that of an orang, yet the orang is the larger animal of the two.

There is one prevalent conception of the human ear which I believe to be a mistaken one, and which I wish to correct now. It is usual to speak of it as a decaying structure. This is remarkable, if true, for with the introduction of speech the means of catching sound are more needed than ever. Although the helix, especially the descending helix, which in mammals generally makes up the greater part of their trumpet-shaped ears, has undergone and is undergoing retrogression in man, that part of the ear which bounds and deepens the concha, the antihelix (Fig. 5), has reached a development in man which it never had before. At least, no other primate shows such a development. That is the change which appears to be going on in man now,

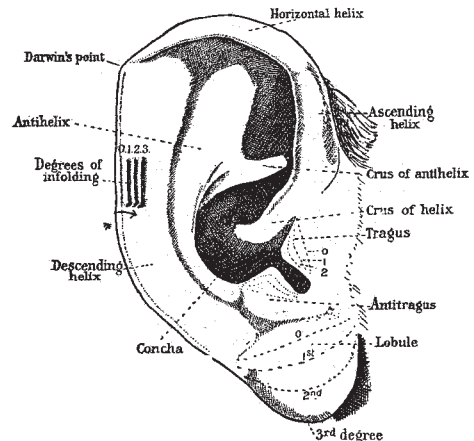


FIG. 5.—Diagram of the human ear.

viz., that in him a new type of ear is being evolved in which the antihelix plays the chief part in collecting sound-waves, while the circumference—the outer helix—undergoes retrogression. In this the orang-type of the human ear differs from the ear of the orang; in the orang the antihelix is in as retrograde a condition as the other parts of the outer ear, even the crus of its antihelix is only occasionally developed (Fig. 3); in the orang-type of the human ear the antihelix is especially well developed.

I should like to proceed at once and inquire into the relationship which those two types of human ears bear to the mental bias of the individuals in which they are found. But in order to avoid the mistakes made by the followers of Lombroso on the Continent, it is necessary to allude to certain factors which have a powerful influence in determining the type of the external ear. I need not allude to age; that influences shape to some extent, but its effect is principally on its size. Schwalbe found that, on an average, the length of the ear increases 20 mm. from the twentieth to the eightieth year and the breadth at a corresponding rate. The ears of old people are always large and hence in my statistics I excluded those over sixty. This increase is a factor which those who use the ear for identification purposes should remember more than they do.

Sex is a powerful factor. The following table (table 1), in which are given the number of ears observed, the locality in which they were observed, the sex of the individual and the percentage in which the orang- and chimpanzee-types of ear occurred, will show its influence.

TABLE I.

Place.	No. of observations.		Orang-type.		Chimpanzee-type.	
	Male.	Female.	Male.	Female.	Male.	Female.
Aberdeenshire ...	1135	776	27	40	14	5
London, E. ...	700	492	17	44	13	2
Jews (London) ...	109	62	16	51	17	8
Kerry ...	281	205	18	41	34	1
Carmarthen ...	296	256	18	48	19	6
Peterborough ...	306	227	19	50	19	6
Cork ...	256	245	24	50	28	3
Dublin ...	478	268	22	38	33	7

The table shows that the orang-type occurs in from 38 to 51 per cent. of women, while in men it varies between 16 and 27 per cent. Taking the average of this table, the orang-type may be said to occur in 18 per cent. of men and 45 per cent. of women. The chimpanzee-type, on the other hand, occurs four or five times more frequently in men than in women. That the orang-type should be characteristic of women and the chimpanzee of men is what one may expect; for in bodily characters, always excepting those of a sexual nature, woman apparently foreshadows the coming characters of the race.

My statistics are not sufficiently wide to allow of more than a partial statement as to the orang-type of ear being a sign of aristocratic birth, but of eight peeresses I find five have ears of this type, which certainly lends some support to the popular supposition. On the other hand, of five leading lady singers only one shows this type of ear.

Race, too, has an influence on the proportion with which the two types occur. That may be seen from Table I. The prevalence of the chimpanzee-type in Kerry, and the orang-type amongst the Jewish women may be noted. The orang-type occurs in about 90 per cent. of Hottentots; it is very frequent, although of a characteristic type, in certain races of negroes.

The ear-types, too, are correlated with the colour of the hair. In Table II. statistics are given of observations made at twenty-seven different localities of the United Kingdom.

TABLE II.

	No. of observations.		Orang-type.		Chimpanzee-type.	
	Male.	Female.	Male.	Female.	Male.	Female.
Fair-haired ...	2015	1127	31.3	46.7	15.8	4.1
Black-haired ..	1796	1463	15.8	40.3	36	4.7

The individuals with hair of intermediate shades of brown are omitted, and only those with distinctly fair or distinctly black hair are included. It will be seen that the orang-type occurs in fair-haired men twice as frequently as in black-haired men; the chimpanzee-type occurs in exactly the reverse proportion. Curiously enough the colour of hair scarcely affects the ear of the woman; black and fair show both types with an equal frequency. Both this table and the last draw attention to the fact that the variations in one sex are not necessarily correlated with those of the other.

It will be readily seen how necessary it is to consider those various factors which influence the ear before proceeding to consider the ears of those who have their liberty temporarily or permanently suspended because they are no longer able to conform to recognised social standards of conduct. The variation according to race or locality is wide (*vide* Table I.); sex and other qualities are influencing factors. In the following table (Table III.) are given the proportions with which the orang- and chimpanzee-types of ear occur (1) in habitual criminals, obtained through the courtesy of Dr. Garson; (2) the insane of four asylums in different parts of the kingdom; (3) congenital idiots.

TABLE III.

Locality.	No. of observations.		Orang-type.		Chimpanzee-type.	
	Male.	Female.	Male.	Female.	Male.	Female.
Scotland Yard ...	326	208	35	33	15	12
Aberdeen Asylum ...	190	211	23	40	16	8
Durham Asylum ...	211	208	26	40	18	3
Cork Asylum ...	202	205	12	37	19	3
Dublin Asylum (Richmond) ...	189	204	29	33	12	3
Congenital idiots ...	27	9	26	66	4	0

Taking the insane first, it will be observed (compare Tables I. and III.) that on the whole the insane, so far as relates to the prevalence of the two types of ears, do not show a marked deviation from the sane of their neighbourhood and that there is no constant difference between the two classes. The insane men of Aberdeen and Cork show the orang-type less frequently than the sane; in Dublin the case is the reverse. In the insane women a similar variation is shown in the prevalence of this type; in one case it is lower, in another higher and in still another the same. It is so also as regards the chimpanzee-type. We must, therefore, conclude, so far as concerns these two types of ears, that there is no correlation between them and a bias towards insanity.

The congenital idiots show a prevalence of the orang-type, considerably above the average, and an occurrence of the chimpanzee-type below the average, but the number of the observations is too small to allow of any certain conclusion.

When, however, the confirmed criminal class is dealt with a striking departure from the normal is encountered—quite unlike the statistics gained from any other series of observations. The sexual ratio becomes inverted; the orang-type, instead of occurring in the female twice as frequently as in the male, which is the normal ratio in the sane, occurs with the greatest frequency in the male. So, too, with the chimpanzee-type, it is found almost as frequently in the female as in the male. In short, male criminals show a preponderance of the orang-type, female criminals of the chimpanzee-type. There is a reversion of the normal sexual ratio.

Thus it will be seen that, taken as a class, not as individuals, criminals show a departure from the sane in their physical constitution. But what does this really mean? It means, I take it, that the criminal class is recruited in undue proportion from the group of men who manifest the orang-type of ear and the women who possess the chimpanzee-type. A larger proportion of individuals of these two classes is predisposed towards crime than those with opposite types. But clearly the presence of the orang-type of ear in any individual is of itself no evidence of this predisposition.

I have already shown that the ratio in which these two types of ear occur is correlated with the colour of the hair. On comparing the colour of the hair of the criminal class with that of groups of people in various parts of the country, for the criminals I dealt with were drawn from almost every county, I found that the criminal class was drawn in an undue proportion from the black-haired men, in a lesser degree, also, from the black-haired women, and that therefore the orang-type should occur in them with a decreased, and not as it does with an increased, frequency.

Darwin's Point.—Since Darwin drew attention to the remnant of the tip of the human ear, an enormous literature has grown up around it. Vali found that it occurred with thrice the normal frequency in the insane; but before considering the relationship which its presence bears to an unstable mental equilibrium it is necessary to clear away some popular misconceptions that still prevail as to its nature.

It is not the case, as the following table (Table IV.) will show, that it is only in the human ear that the tip has become lost; it will be seen that this is also the case in all the anthropoids, a group that is genetically closely related to man. In all

TABLE IV.—The Occurrence of Darwin's Point.

	(1) In Apes and Anthropoids.			
	No. observed.	Present.	No. observed.	Present.
Baboons ...	15	100 per cent.	(2) Races of Men.	No. of observations. Present. Male. Female. Male. Female. Per cent.
Macaques ...	21	95		
Cercopithecus ...	19	80		
Semnopithecus ...	29	45		
Gibbons ...	12	0		
Orangs ...	15	40		
Chimpanzees ...	23	9		
Gorillas ...	19	26		
African Negroes ...	29	7		
Hottentots ...	18	6		
Andamanese ...	52	38		
Turin (Gradenigo) ...	—	3.5		
English (Peterborough) ...	306	12		
Lower Alsace (Schwalbe) ...	—	36		
Upper Alsace (Schwalbe) ...	—	11		
Kerry ...	282	13		
Dublin ...	267	12		
Cork ...	254	14		

the anthropoids the tip occasionally recurs, showing that they come of a stock in which the ear was tipped. Only two groups of the old-world monkeys constantly retain the tipped form of ear—these are the macaques and baboons; in the other three groups of old-world monkeys (see Table IV.) the tip has already begun to disappear. It is probable, then, that the tipped form of ear began to disappear during an early stage in the evolution of the anthropoid and human stocks.

There can be little doubt that in the ear of the baboon or macaque (see Fig. 6) we have preserved for us approximately the form out of which the different types of ear seen in the higher Primates, including man, have been evolved. The tip occurs at the junction of the horizontal and descending helix; in this position it has to be looked for in man.

The complete or partial disappearance of the tip of the ear is part and parcel of the retrogression of the descending helix. When the descending helix (posterior border) becomes inrolled, then the tip is also inrolled. In the third month of foetal life, the descending helix is not yet inrolled and the tip is constantly present on the human ear (Schæffer). Some trace or indication of the tip can be made out in 75 per cent. of adult men (Schwalbe). But in the statistics I give here relating to this structure, only those cases are included which showed Darwin's point in an unmistakable and pronounced form.

It is clearly evident from Table IV. that, before any deduction as to the presence of this structure on the ears of the criminal and insane classes can be made, the influence of race and sex must be taken into account. It is more frequently present in the male than the female; Schwalbe found it three times more so in the males of Upper Alsace, and this agrees with what I found in a typical English place, such as Peterborough.

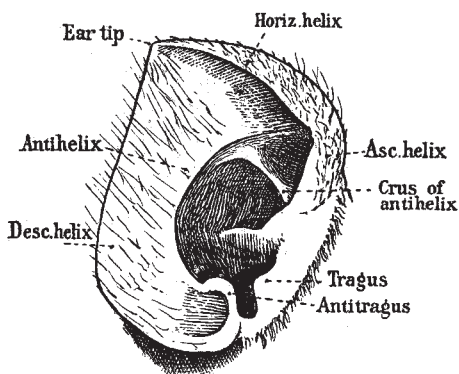


FIG. 6.—Ear of Macaque.

In the African negro it is rarely present; the helix of his ear has undergone so marked retrogressive changes; but in the Andamanese it is frequently present—more so in the women than men. The ratio of its presence varies widely with the race and locality.

In Table V. are given the results of observations made on (1) the insane, (2) criminals, (3) congenital idiots.

TABLE V.—*The Occurrence of Darwin's Tip in the Insane, in Criminals and in Congenital Idiots.*

Place.	No. of Observations.		Present.	
	Male.	Female.	Male. Per cent.	Female. Per cent.
Aberdeen Asylum ¹	198	209	13	15
Durham Asylum	211	206	22	19
Cork Asylum	203	205	23	20
Dublin Asylum	189	203	26	18
Scotland Yard	328	201	27	17
Congenital Idiots	27	—	37	—

Unfortunately I have no "control" observations on the population from which the insane of Aberdeen and Durham are drawn, but in the case of Cork and Dublin I have, and it is seen that Darwin's point comes out in the insane with double the frequency, or rather more, than that with which it occurs in the sane. The criminals also show it with a much greater frequency than I have found in any locality throughout the

¹ I am greatly indebted to the superintendents of these four asylums for the opportunities and help they afforded me.

country. Its frequency is especially marked in congenital idiots and those vagabonds that congregate at the doors of the police courts and night shelters in London and Liverpool.

Darwin's point, the structure which we now deal with, differs very materially in nature from the subject last considered, viz., the type of ear. The two types of ear were symptoms merely of progressive or retrogressive development, but Darwin's point is the persistence of an ancestral or, what amounts to nearly the same thing, a foetal form, and with this persistence might be expected a correlated persistence, to some extent at least, of the ancestral faculties of the brain. This certainly does not hold true of the individual; it does to some extent of the mass. Clearly the insane and criminal classes are drawn with an undue proportion from those in which Darwin's point is pronouncedly present.

The Lobule.—Before concluding, I wish briefly to refer to this structure, because it differs in nature from the two features of the ear already considered. It is a structure of comparatively recent addition to the ear. It is not the case that it is a feature peculiar to man; it may be detected, as Table VI. shows, in the ears of the three great anthropoids, but it is only in man that it finds a full and almost constant development, and therefore may be regarded as a recently added and progressive structure.

TABLE VI.—*The Development of the Lobule in Anthropoids and Races of Men.*

	Number of observations.		Index of development.	
	Male.	Female.	Male.	Female.
Orangs	13	both sexes	...	25
Chimpanzees	23	"	...	3
Gorillas	19	"	...	1
Negroes	29	1.1
Andamanese	52	16	1.3	1.5
Aberdeen	473	563	1.5	1.7
Peterborough	182	140	1.3	1.3
London, E.	684	383	1.4	1.5
Jews	119	83	1.7	1.9
Hamburg	252	164	1.3	1.5
Cork	254	254	1.7	1.8
Dublin	264	285	1.7	1.9
Aberdeen Asylum	211	208	1.4	1.5
Durham Asylum	211	206	1.5	1.6
Cork Asylum	202	205	1.8	1.8
Dublin Asylum	189	203	1.5	1.6
Scotland Yard	330	201	1.5	1.7
Congenital idiots	27	9	1.2	1

It is necessary to allude to the manner in which the index of the development or size of the lobule was obtained. A reference to Fig. 5 will assist in the explanation. I became accustomed to measure with the eye the various degrees to which the lobule was developed and arranged them in four groups:—(1) those in which the lobule was extremely small or absent; (2) those in which it was developed to the first degree; (3) those in which it was developed to the second degree; and (4) those of the largest or third degree. Those degrees are indicated in Fig. 5. An index of 1.6, for instance, signifies that the average lobule in that group of individuals reached, in my artificial standard, 1.6 degrees of development. The method is not accurate; nothing less than actual measurements would render it so; but before such a laborious process is undertaken one requires to be assured that some very definite result will be accomplished. My method is accurate enough for the purposes of comparison and for eliciting any decided factor which may be at work.

It will be seen that it is the case with the lobule as with the two other features of the ear, that its development varies with sex and race. It is larger in the female than in the male; it is larger in the white races than in the black.

Its development in the insane and criminal classes does not depart to any marked extent from that of the normal classes. In the insane of Aberdeen and Dublin, the lobule was smaller than that of the sane of the same localities, but in Cork the difference was rather the reverse. It appears to reach an average development in criminals, but in congenital idiots, on the other hand, it rather approaches the degree of development met with in the gorilla.

To sum up. This investigation was originally undertaken to see how far the characters of the external ear might

be utilised in unravelling the genetic connection of human races; it was only incidentally, when I became aware of the extraordinary degree of individual variation, that I was drawn into the investigation of features which have been described as "marks of degeneration." The result of my inquiries in this direction has been to show that only two out of the seven features of the external ear which I investigated are correlated with a mental bias towards crime or insanity, viz. a retrograde development of the helix and a persistence of the ear tip.

My results are the more valuable because I was at first sceptical of the very definite results obtained by continental observers on the insane and criminal classes. It appeared very probable that the definiteness of their conclusions would disappear if allowances were made for the populations from which the criminals and insane were drawn and for the influence of race, sex and colour. After making those allowances, however, there remain a certain number of characters peculiar to these classes, of which those I have cited in the ear are only examples. But, unfortunately for any practical application of Lombroso's doctrine to the detection of the socially unfit, the physical differences between the sane and the insane or criminal classes are those of degree or ratio, not of kind. The characters may assist in the detection of the class, but not of the individual.

All that can be deduced from the present investigation is that a slightly greater proportion of the people who have ear tips and retrograde helices give themselves over to crime than those in which these two features are absent. The evidence is just sufficient to justify the suspicion that a small proportion of criminals are criminals because of their physical constitution, and it is certainly the duty of every anatomist to discover how such individuals may be recognised. As yet all the criminal marks we know of can only be stated in relative terms of the class, and have, unfortunately, no application to the individual.

ARTHUR KEITH.

SCHOOL BOARD EXHIBITION OF SCIENTIFIC APPARATUS.

ONE of the reasons often given as an excuse for not introducing instruction in the elementary principles of science into the curriculum of elementary schools is the expense involved in providing the necessary apparatus for experimental demonstrations. It is common to find that school managers have very exaggerated ideas as to the amount of really necessary equipment. Though it has been the custom for some years, at institutions like the Royal College of Science, to instruct the students in training to become science teachers how effective apparatus can be made at a very small cost and with a minimum of mechanical dexterity, the great majority of science teachers, notably those of elementary schools, have had few opportunities of acquainting themselves with the use that may be made of the odds and ends of domestic life to construct instruments which can be effectively used in simple work in experimental science.

The School Board for London has recently taken steps to remedy this defect in the training of its teachers. Influenced by the heavy expenditure on apparatus to which it has been put, and convinced that the construction of simple instruments can be made a valuable assistance in teaching science, the Board has for some months encouraged its teachers to make apparatus themselves and to give their pupils opportunities of making models to illustrate the principles of the lessons they have received. The exhibition at the Examination Hall on the Embankment (see NATURE, p. 656) represents the results of these efforts up to the present time. Though satisfactory if considered as the first exhibition and as showing that an earnest attempt is being made to give science its proper place in training children for the business of life, there are some directions in which improvement is easily possible. It must be understood that in pointing these out we do not lose sight of the difficulties the organising committee has had to overcome, but desire simply to suggest what may be done to ensure a better set of exhibits next year.

In the present exhibition the work of teachers, adult students in evening classes and children in day schools are indiscriminately mixed up. The work of comparison is consequently very difficult, and it is to be feared that the boys and girls will be a little disheartened to find their work side by side with that of their instructors and their big brothers in the continuation

school. Nor is it easy to form an idea of the work of the pupils of different schools. It is only after consulting a catalogue, or reading a label affixed to the exhibit, that the visitor is able to find the school from which the maker of the apparatus comes. It would be better in the future to have together typical sets of apparatus from different schools.

It is difficult to estimate the relative importance given to different branches of science by the Board. There is a large number of exhibits in static electricity, but only two pieces of apparatus shown in connection with the study of light and three to illustrate the teaching of physiography. The subjects of heat and voltaic electricity are, judging from the number of exhibits, popular, while acoustics meets with very scant recognition. It is disappointing, too, to find so little attention given to Nature-knowledge. From the conditions of city life it is hard for children to get even a nodding acquaintance with the beauties of organic life, whether animal or vegetable, and the school should be able to help the youngsters to learn something of the joys of country life. So much has been accomplished in recent years in the direction of providing simple school museums of common botanical and zoological objects, that it is to be hoped the teachers and scholars will be encouraged to do something in this direction. Then, why is nothing done to familiarise the children with the "starry heavens"? We looked in vain for a simple home-made telescope. Yet teachers have been shown for many years past in the astrophysical laboratory at South Kensington how a really effective instrument can be made with cardboard tubes at a trifling expenditure.

But a good beginning has been made. If more attention is in the future given to some of the subjects we have indicated, and if the work of teachers is separated from that of the taught, the utility of the exhibition will be much enhanced.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—An election to the Isaac Newton Studentship in Physical Astronomy and Optics will be held next term. Candidates must be Bachelors of Arts under twenty-five on the first day of 1902. The studentship is of the value of 200*l.*, tenable for three years. Applications are to be sent to the vice-chancellor between January 16 and 26.

On November 4, Mr. R. P. Paranjpye, the Indian student who was bracketed senior wrangler in 1899, was elected to a fellowship at St. John's College.

PROF. WILLIAM RAMSAY, F.R.S., commenced a course of twelve lectures on "The Recent Developments of Chemical Theory" at University College, London, on Friday last. This course is especially designed for those who have a previous acquaintance with inorganic and organic chemistry and who may wish to know the present standpoint of chemical thought.

At the annual meeting of the governors of Dundee University College last week Mr. John Morley referred to the signs of increasing interest in universities and the increasing force which must be given to the movement in order to put ourselves in the position of other progressive nations. He hoped that the movement had not yet attained full flood, because "all those who inquired into the conditions of scientific training in Germany and the United States were really—he was not using an excessive word—dismayed when they found the comparative shabbiness and meagreness of the buildings, funds and equipments in this island. There was no form of care for the public weal more distinctly certain of being reproductive than that care which placed within the reach of the coming generation opportunities for making the best of itself and giving to the Commonwealth the best of its faculties. That was now a commonplace. The immediate question was, what was to be done in order to raise Dundee and other places in Scotland up to the level which public necessities—national necessities—imperial necessities if they liked—demanded?" The answer is—and it will serve for practically all institutions for higher education in the British Isles—Increase the teaching resources by building and equipping laboratories, encourage original work rather than the multiplication of successes in examinations, create in the public mind a spirit of sympathy with scientific work, and inspire the Government to action before it is too late.

A SCHEME for the extension and better equipment of the University of Glasgow, especially in the departments of