on the whole, has been continuous and the erosion of the canyon has been accomplished in a single cycle.

Another fact which eliminates the necessity of considering that the esplanade—Redwall bench—of the Toroweap and the Tonto bench of the Kaibab section represent a common base-level of erosion and a halt in the uplift of the region is that these two benches occur in the same locality one above the other in undisturbed condition and separated vertically by over 1,000 feet. Evidently they can not indicate one base-level of erosion and it is necessary to suppose, as in the previous case, that they represent two base-levels, each coinciding with the summit of a resistant formation, or that the benches are structural surfaces exposed by the removal of soft overlying beds. The latter explanation, taken in connection with other lines of evidence, is to be considered the correct one.

In the foregoing paragraphs it has been assumed that Dutton considered the Tonto bench as equivalent to the esplanade farther west and as indicating a base-level of erosion. It should be said that Dutton does not specifically make this correlation. He states that the esplanade represents a base-level of erosion (p. 121) and in speaking of the first stage of the canyon cutting says that "during this paroxysm of upheaval the outer chasm of the Grand Canyon was cut; the river corrading down to the level of the esplanade in the Kanab and Uinkaret divisions but *below that horizon in the Kaibab*" (p. 226). In speaking of the second stage he says that "the narrow inner gorge of the Toroweap was swiftly cut, and is in this respect *a type of the lower deeps of the entire canyon*" (p. 227). The only lower horizon in the Kaibab which has a development corresponding to the esplanade of the Kanab and Uinkaret sections is the Tonto bench. And the only part of the lower depths of the Kaibab which is comparable with the inner gorge of the Toroweap is the granite gorge. The Tonto bench lies immediately above the granite gorge in the Kaibab, as does the esplanade above the inner gorge of the Toroweap. It has seemed to the writer that the logical interpretation of these statements permitted the correlation of the Tonto bench with the esplanade; but this may be taking too great a liberty with the written word.

A minor topographic detail, of definite import, however, which argues against the Tonto bench being a base-level of erosion and indicating a halt in the uplift of the region, is seen just west of the mouth of Bright Angel Creek. At this locality the Tonto formation has been faulted to the extent of about 400 feet, and the faulting is apparently of pre-Carboniferous date and in any case older than the cutting of the canyon. (The displacement here referred to is not the Bright Angel fault.) The point is that a bench has been perfectly developed at the same horizon in the sandstone, judging from the eroded remnants, on both sides of the fault, notwithstanding the difference in the elevation of the strata in the two blocks. It is evidently unduly complicating matters to suppose that the lower bench, for instance, represents a base-level of erosion and that the upper one originated in some other way, for this is calling in two processes to explain exactly similar things. The true explanation is clearly to be found in the single process of stripping and consequently the Tonto bench in general, like the older benches in the Carboniferous formations, does not indicate a pause in the uplift of the region, but is simply a stripped structural surface exposed by the removal of the softer overlying beds.

The writer has little doubt that when this problem is studied in more detail many other facts will come to light supporting the general conclusion of Davis "that while many partial cycles of erosion may have preceded the long pause during which the broad denudation of the plateaus was completed, only a single uplift and a single down-cutting are recorded in the canyon."

H. H. ROBINSON

THE HUMAN FACE

IT seems surprising how little we are influenced by the scientific method in the ex-

amination of faces. Yet when we inquire into causes and results and learn something of the influences which have modified the facial type, and especially when we consider our individual bias with respect to all the people we see and know, then the difficulties of accurate and general conclusions become evident indeed.

The face of man is distinguished from that of lower animals by the greater development of the frontal region or forehead and the development of folds which delimit the chin. In lower races of mankind the lack of development of the frontal region and bridge of the nose, slight projection and great breadth of the nasal region and the large heavy jaws, are evident.

Early ontogenetic conditions of the human face simulate the lower animals, while later stages suggest the lower races. The arching of the frontal region soon destroys close resemblances to lower types but the broad, bridgeless condition of the nose in the embryo does not so quickly disappear and may indeed persist in the adult. The chin may be receding or almost lacking, a condition also well recognized after birth and throughout life in a considerable proportion of individuals.

In the development of the intellectual value of a face, we can trace a connection between the size of the frontal region of the brain and the height and breadth of the forehead, although judgment of intellectual worth by this criterion can be of only the most general character because of the variation in skeletal structures.

When we try to trace the evolution of the face from an esthetic viewpoint we encounter still greater obstacles. In the first place a definition of beauty is difficult and yet if we examine the faces of ancient Assyria, Egypt and Greece, we find in general the same outlines or much the same features which we now usually regard as beautiful. Aside from this *general* type, we, each one of us, hold certain features or combinations of features to be especially beautiful because of people we have known, or for some other reason. But so far as the general idea of what constitutes a beautiful face is concerned we might, perhaps, find that it must have its parts in good proportions, no single feature should represent the extreme. Each element should bear a certain definite relation to the rest, with the profile lines regular and the curves of a delicate sweep. It should express unity as well as variety.

Why the human face has developed as it has may be due to our ideas of what constitutes beauty, and if we inquire into this a little more closely, the following suggests itself: The earlier ideas of beauty were determined by a comparison with the lower animals, possibly with the ape in the beginning; in part, the antithesis of such a face was first recognized among primitive men as beautiful. That such comparisons are constantly being made by ourselves to the disadvantage of one who seems to resemble a lower animal in appearance, and that such comparisons are also being made by lower races in the savage state, no one who inquires into the subject can doubt. In the case of lower and higher races, those resemblances to the lower are regarded even by primitive people to be less admirable. Of course many primitive tribes often develop one or another idea of beauty which is not coordinate with that found in the higher races.

This principle of antithesis I believe can not account for *all* the perfection of a beautiful ideal, for with the evolution of the race, education along many lines contributes a component, the artistic sense becomes developed and fine lines with delicacy of contour come to be appreciated. These ideals work over the rather rude materials furnished by selection.

There is another most interesting and difficult problem which confronts us in this connection. How may we judge character from the face? What information may we gain of the intelligence, moral worth and disposition of an individual in this way? We are familiar with the often extremely absurd claims of phrenologists and physiognomists, but none of us doubt that an individual's character shows more or less in his face. Yet

when we analyze our methods of determination we find them for the most part based on nothing but vague impressions. Many, if not most of our personal judgments are of this sort; when inquired into they are as absurd and with as little foundation as are the ideas contained in the older works on physiognomy.

There usually has been, as Mantegazza recognizes, a confusion of two separate factors in the determination of character from a face; the mold or cast of the features and their expression. These two are distinct and should be so regarded. Although the latter may in time mold or modify the former to a large degree, many of the parts of the face come very little under its influence, and except for the changes which expression and physiological conditions bring about in the course of time, I am inclined to totally ignore all judgments of character from facial mold alone. As yet it seems to me we have not the least safe evidence for regarding this or that type of eye, nose, mouth or chin as indicating one or another sort of character, only in so far as the life and disposition of the individual has modified them through expression. The one feature which may show something of the character independent of expression has already been mentioned in the forehead, but the bones of the skull and the sinuses within them are so variable that nothing but the most general conclusions can be drawn even here. We often find faces of a low type associated with a defective individual and there may be some relation between defective physical and psychical conditions, but just what the connection is, remains to be learned.

Several of the causes which have led us to consider this or that mold of feature as indicative of special characteristics of the individual are the following:

1. The resemblance to lower animals and the inference that man has the character of the animal in whose face we see a likeness. Much was made of this in the older works upon physiognomy and it becomes absurd when we consider for instance, that one with a face like a lion has the character we ascribe to that beast, or a face like a crow indicates the prying nature so commonly known in pets of this species. Yet are we to-day, generally speaking, much better than this when we ascribe to a man whose face reminds us of a fox, a fox-like nature? Or when a man with a bulldog-like mouth and chin is accredited with a character which savors of this animal's qualities?

2. The resemblance in another of features from one or several individuals whose character we know. Such comparisons are very common. It is difficult to determine how far every one is thus influenced.

3. The fixed resemblance in contour of face or feature to certain transitory expressional states which we have come to associate with emotional conditions.

To many, a long nose gently depressed at the tip indicates a benignant character. This, I think, is because in certain types of noses we have seen the tip slightly depressed in smiling and the long nose with the slight depression gives the appearance of a continued gentle smile, while it may or may not indicate a benignant character, depending upon how much expression has modified the feature.

In case the end of the nose is more flattened, we very often get the idea of a cruel or cynical individual, because in a sneer or grin, the tip is sometimes greatly depressed.

Those in whom the corners of the mouth turn up a little, or in whom the lips are moulded so as to convey that appearance, give us the resemblance to a smile which we associate with cheerfulness. And one in whom the corners of the mouth are formed in such a way as to make them appear to turn down, so much resemble the expression of grief or sorrow that we think of the individual as possessing a melancholy disposition.

Another illustration. Those in whom the eyes are deep under heavy eye brows are said to be thoughtful because during mental concentration we are apt to draw the eye brows down and together. Many other examples might be given.

4. Physiological conditions.

Of course expression is physiological primarily, but more or less separate from its emotional side, there are a number of purely physical conditions either permanent or transitory which influence to a large degree our judgment of character. The appearance of good or ill health and the changes which may take place in a face due to the adaptations of the body to environment. Under the last come such changes as might take place in the nostrils with variation in altitude, in the development of the jaw muscles due to change of food, and many others.

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Occurrence of Euthrips pyri Daniel in New York State

For several years pear growers in various localities in this state have observed a peculiar blighting of blossoms, which is usually attended by a considerable loss in the fruit yields. In some orchards where this condition has prevailed the crops for the past three years have been almost complete failures. This spring we received specimens of injured blossom clusters from Germantown and other localities along the Hudson River, and we have found that an insect is responsible for this damage. It is known as the pear thrips (*Euthrips pyri* Daniel), and for the determination of the species we are indebted to Dr. W. E. Hinds, of the Alabama Polytechnic Institute. The insect has attracted considerable attention in recent years in California because of its destructiveness to various deciduous fruits, but its occurrence in eastern states was not suspected. The adult is a small, brown, winged insect, about one twentieth of an inch long, which makes its appearance when the buds are opening, attacking the tenderest of the flower parts. Pears, especially, seem to be very susceptible to the attacks of the thrips, and many blossoms are killed before the clusters open. This pest has proved a difficult one to control by spraying, but tests which we have conducted indicate that the thrips may be efficiently combated by slight changes in the scheme of spraying which we are encouraging growers to adopt for the control of the pear psylla.

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Blue Stain on Lumber

Each year a great deal of money is lost by lumber companies through the staining of the freshly cut sap yellow pine and red gum stacked in the mill yards. One of the commonest of these stains is the so-called "blue-stain," which is caused by a number of fungi, many of them belonging to the Pyrenomycetes, especially *Ceratostomella* and *Graphium*. This stain is usually blue or black, due, very likely, to the presence of the brown-colored mycelium which grows in the cells of the sap wood only, and does not injure the strength of the wood. The hyphæ of the fungi live on the food stuff within the wood cells and do not destroy the walls of the cells. It is the stained appearance of the lumber which seriously decreases its money value.

The lumber companies try to prevent this stain by various methods, a common one being to dip the freshly sawed lumber into a solution of either sodium bicarbonate or sodium carbonate. This soda dipping process is still uncertain in results; at one time preventing the blue-stain from appearing on the wood, at another having no beneficial effect.

The varying and often unsatisfactory results obtained in the mill yards where soda dipping has been tried, led to certain investigations being taken up in the laboratory. The problem was to find why the soda solution sometimes prevented the growth of the wood-infecting fungus and its spores and sometimes did not. Since the factors determining the growth of *Ceratostomella* and of *Graphium* are as yet imperfectly understood, it was thought that a better knowledge of the relation of the fungus to its substratum might lead to a more satisfactory method of destroying it.

As it is well known that many fungi grow best on a slightly acid substratum, it was thought that the growth of the blue-stain