either (*a*) a characteristic absorption, consisting of one or more narrow bands and depending on the chemical structure of the dye molecule, or (*b*) a "resonance" spectrum due to colloidal particles, and much more remotely connected with chemical constitution. This spectrum is ill-defined.

The detailed experiments which have led to these conclusions will be communicated in a paper shortly to be published. A word or two is desirable in explanation of the term "resonance" spectrum. By this is denoted the type of absorption exhibited by colloidal metal solutions, glasses, and certain photographically prepared films (F. Kirschner, *Drude's Annalen*, 1904, xiii., 239; Kirschner and R. Zsigmondy, *ibid.*, 1904, xv., 573; K. Schaum and E. Schloemann, *Zeit. wiss. Phot.*, 1907, v., 109). It is probable that all absorption is due to resonance, no doubt, and hence the narrow-band type (*a*), but in this case the resonators would be the molecules or the contained electrons, whereas in case (*b*) the resonance of larger aggregates is the cause of the absorption.

The investigation is to be continued, but a striking case was found in one of the pinacyanols, a class of dyes recently introduced as photographic sensitisers. This dye gives in aqueous solution a flattish, ill-defined absorption, the solution showing all the characteristics of a colloidal solution. In alcohol and organic solvents the absorption was of a narrow-band type, entirely different, and *this spectrum was also obtained by heating the aqueous solution to boiling point.* The behaviour was quite analogous to that of starch, which gives crystalloid solutions at the boiling point. S. E. SHEPPARD.

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The Convection Explanation of Electrolysis.

AT p. 12 of a recent text-book entitled "Electro-chemistry," by Prof. R. A. Lehfeldt, the author mentions the convection explanation of electrolysis, and states that "Faraday was sufficiently impressed with it to form the hypothesis of *ions*, *i.e.* of charged particles in the liquid travelling under the action of the electric force."

So far from being impressed favourably by this "explanation," Faraday considered it might have a "dangerous influence" and "do great injury to science by contracting and limiting the views of those engaged in pursuing it." He therefore constructed his terminology of electrolysis specially to get clear away from this "explanation."

Again, Faraday did not form a "hypothesis of ions as particles." The word ion refers to the nature of the substance evolved at the electrode, not its dimensions. The ion of Faraday might weigh an ounce or a ton.

The opinions which the modesty of the great observer permitted him to express may be found in the seventh series of his "Experimental Researches." To attribute to him, for any purpose, other opinions absolutely alien to these is, I submit, either scientifically reprehensible or grossly careless. J. BROWN.

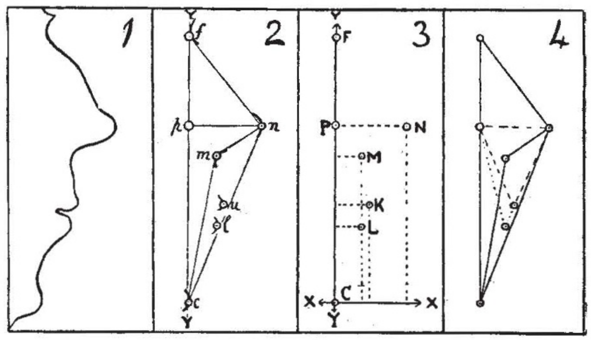
Belfast, August 18.

CLASSIFICATION OF PORTRAITS.

EXPERIMENTS of various kinds that I have made to define the facial peculiarities of persons, families, and races by means of measurement led to the following results that seem worthy of publication. The most elementary form of portrait will alone be considered here, namely, the outline of the face from brow to chin, as in a shadow or in a silhouette. It contains no sharply defined points whence measurements may be taken, but artificial ones can be determined with fair precision at the intersections of tangents to specified curves. It will be shown that it is easy to "lexiconise" portraits by arranging the measurements between a few pairs of these points in numerical order, on the same principle that words are lexiconised in dictionaries in alphabetical order, and to define facial peculiarities with greater exactness than might have been expected.

The individuality of a portrait lies more in the relative positions of six cardinal features (see the figures below) than in the shapes of the lines that connect them, so long as the general character of the connecting lines is roughly indicated. A few standard types, perhaps ten in all (though I prefer to use more), represent as many concave, convex, and sinuous varieties of outline, between each specified pair of the six cardinal points, as need to be noted. I may recur to this in a future letter.

This will be apparent to the reader's satisfaction if he compares portraits under unfavourable conditions, as through a blurring medium, or out of focus; or, again, if he substitutes connecting links that differ somewhat from the true ones. Consequently my first endeavour was to define accurately six points that should severally be good representatives of the six cardinal features in the outline. Those features the limits of which are vague are expressed by *italic* letters in Fig. 2, and their representative points by the same letters in *capitals* in Fig. 3. The features are these:—*c*, the tip of the chin; *l*, the lower, and *u*, the upper lip; *m*, the hollow between the upper lip and the nose; *n*, the tip of the nose; *f*, the hollow between the nose and the brow. In order to find their respective representative points, proceed as shown in Fig. 2, by drawing (upon tracing paper) a tangent, YY, to both *c* and *f*. Then draw a short tangent to *n* parallel to YY (accidentally omitted in the Fig.). A tangent to



both *c* and *n* intersects the first of these lines at C and the second at N, and determines them. A line drawn from N tangential to *f* determines F. Thus the fundamental triangle CNF is obtained, in which YCFY is used as the axis of Y, and the length of CF (divided into 100 equal parts, here called "cents") determines the scale of measurement. In the life-sized portrait of an adult, 1 cent may be regarded as roughly equivalent to $1\frac{1}{4}$ mm. or to 1/20th of an inch. M, and consequently the triangle CMN, is determined by the intersection of one line drawn from C with another from N, both tangent to *m*. U and L lie at the intersections of tangents drawn in either case, parallel to X and CN respectively. They require less attention than the preceding letters, because *u* and *l* are usually small.

The positions of the six cardinal points may be expressed in either of two ways—(1) as in Fig. 3, by rectangular coordinates, YCY being the axis in Y, and XCX perpendicular to it, the axis in X. Or (2) as in Fig. 4, by triangulation. Here an additional line, NP, drawn perpendicularly from N to YCY, is convenient. I have compared both of these methods, and found each to have its advantages and disadvantages, depending on many variable causes, of which the scale of the portrait is one and the available in