

on Roberts' photograph (1889); the circular spots are stars, recognisable in the drawing. Unless this part of the Trouvelot drawing—the excellence of which is stated by Dr. Roberts himself—be very incorrect, the nebula would seem to have turned about 15° from left to right. The globular nebula (M. 32) to the other side of M. 31, seems also to have slightly shifted its position.

Evidence of the reality of such changes is of course only obtainable by comparing three or more photographs taken at comparatively wide intervals. In the meantime, this short notice in NATURE may call the attention of photo-astronomers to this interesting point.

Dordrecht, September 14.

C. EASTON.

On the Identification of Habitual Criminals by Finger-Prints.

A PARLIAMENTARY Blue Book on "The Identification of Habitual Criminals," which has recently been issued, reports on *The Finger-Print System*, stated to have been "first suggested, and to some extent applied practically, by Sir William Herschel."

The chairman of the committee appointed by Mr. Asquith, whose report contains the above statement, refers me for his evidence on this point to Mr. Galton's work on "Finger-Prints" (Macmillan and Co., 1892).

My "careful study" of the subject is mentioned there, and an article of mine in NATURE, October 28, 1880 (vol. xxii. p. 605), is referred to. It is correctly indexed in the "Index Medicus" for the year, published in 1881, although Mr. Galton spells and indexes my name incorrectly. That article, I believe, is absolutely the first notice of the subject contained in English literature, and the conclusion I reached therein was that the patterns of the skin-furrows, with their distinctive loops, whorls, and lines, breaking and blending like the junctions in a railway map, were capable of being readily used as a reliable and permanent basis for the "scientific identification of criminals." I conclude my paper with the statement that "There can be no doubt as to the advantage of having, besides their photographs, a nature-copy of the for-ever unchangeable finger-furrows of important criminals."

Sir William Herschel wrote in NATURE, November 25 of the same year, alleging that he had "been taking sign-manuals by means of finger-marks for now more than twenty years." It does not yet appear that anything had been published on the subject by that gentleman till my contribution called forth his letter a month afterwards. The collections made by Sir W. Herschel were recently placed in Mr. Galton's hands, and that writer states that "they refer to one or more fingers, and in a few instances to the whole hand, of fifteen different persons." ("Finger-Prints," p. 9.)

It is not stated how many of these had been imprinted prior to my first calling attention to the subject. At present it would seem that Sir W. Herschel had not accumulated the impressions at a more rapid rate than that of one person in two years! As we are informed in the letter to NATURE, referred to above, that the identification of pensioners had been secured in this way, that the method was in use in all the registration offices of the district, and that "on commitment to gaol, each prisoner had to sign with his finger," I should have expected that a somewhat more extensive collection might have been secured. As priority of publication is generally held to count for something, and as I knew absolutely nothing of Sir W. Herschel's studies, nor ever heard of anyone in India who did, some little evidence on the point of priority would be of interest even now.

Mr. Galton says, of Sir W. Herschel, "He informs me that he submitted, in 1877, a report in semi-official form to the Inspector-General of Gaols, asking to be allowed to extend the process: but no result followed." (p. 28.) A copy of that semi-official report would go far to settle the question of priority, as its date is nearly two years previous to my having noticed the finger-furrows. No reference to them was then to be found in any anatomical work that I could find access to, and no writer on identification had ever thought of them as a means to that end. My interest, like that of Purkenje, arose from a special study of the sense of touch, and I was then lecturing to medical students on the "Physiology of the Senses." Having myopic eyes which enable me to write with ease the Lord's Prayer three times in the space of a sixpence, I soon noticed

the unique patterns which the papillary ridges formed. I happened to be studying the prehistoric pottery of Japan at the same time, and became interested in observing that these patterns were similar, but, I thought, finer and more slender than those of the present day, which pointed, I conjectured, to the employment of children in early fictile art. However that may be, my knowledge of the subject had a natural and independent genesis.

The subject of identification by this means has been brought under the notice of the authorities on criminal matters of different countries by me from time to time, and some years before Mr. Galton's work was published, Scotland Yard placed one of its most enlightened officers in communication with me on the subject. Inspector Tunbridge studied the subject with me during a forenoon. Even in 1880, I prepared copper-plate outlines of the two hands, accompanied with instructions as to obtaining finger-prints, and some two chief points on the palm, where the rugæ are characteristic. Sir W. Herschel's letter mentions prints of one finger only as being obtained from prisoners on commitment. On page 79 of the Blue Book mentioned above, "Instructions for taking Finger-Prints" are given for the benefit of prison warders, and the ten fingers are to be printed from, as I have advocated. I may add that I have not the slightest wish to diminish the credit that may be due to Sir W. Herschel. What I wish to point out is that his claim ought to be brought out a little more clearly than has yet been done, either by himself or by Mr. Galton. What precisely did he do, and when?

HENRY FAULDS.

The Tetrahedral Carbon Atom.

YOUR reviewer, in his notice of my "Elementary Lessons in Organic Chemistry," takes exception to the statement that the carbon atom has been hypothetically regarded as tetrahedral in shape; he is presumably unacquainted with the criticisms of Lossen (*Berichte* 20, p. 3306) on Wislicenus's memoir, with Wislicenus's reply¹ (*Berichte* 21, p. 581), as well as with the pamphlet of Wunderlich (*Configuration organischer Moleküle*, Würzburg, 1886); he need not, however, search "the whole range of stereo-chemical literature" for references of this kind, as there is in the "Handbuch" of V. Meyer and Jacobson, pp. 433-436, a tolerably full discussion as to the ultimate cause of stereo-isomerism in carbon compounds, where it is stated (p. 434) that "the carbon atom may be regarded as a mass of finite extension in space, of any shape, with four points on its surface corresponding to the corners of a regular tetrahedron as the units of affinity."

Most writers on stereo-chemical subjects prefer to speak of the tetrahedral arrangement in space of the four valencies of the carbon atom, rather than of the tetrahedral shape of the carbon atom itself; but if the "valencies" are sufficiently material to have a definite position in space, they may fairly be regarded as parts of the carbon atom, which then becomes of finite size, and for the purposes of stereo-chemistry essentially tetrahedral in shape. This form of statement has the merit of simplicity, and is in itself less objectionable than the idea of "valencies" directed towards the corners of a tetrahedron; at the same time, I freely admit that the statement errs on the side of excessive simplicity, and is not what would be adopted before a class of honours students.

It is possible to connect the facts of stereo-isomerism to some extent by a series of separate propositions, and at the same time to avoid any reference to the distribution of the "valencies" in space, or to the finite size of the carbon atom; one of these propositions would be that "two carbon atoms connected by an ethylene linkage are no longer free to rotate round the axis which joins them"; but so soon as an attempt is made to unite these separate statements into one hypothesis, or to assign any reason for the proposition just quoted, it is impossible (as it appears to me) to escape from the dilemma; of the two alternatives, I think most chemists, who have not become blinded by long usage to the gross misuse which the word "valency" has suffered, will prefer to regard the carbon atom as finite in size with four points in it, occupying the corners of a tetrahedron, distinguished in some way beyond the rest as regards the action of chemical affinity.

This idea must be made more definite before the average student can derive much help from it in correlating the facts of

¹ Wislicenus says "the atom of carbon may possibly resemble very closely regular tetrahedron in shape."