MEN OF SCIENCE, THEIR NATURE AND THEIR NURTURE*

THE lecturer spoke of the qualities by which the English men of science of the present day were characterised; he showed the possibility of defining and measuring the amount of any of those qualities, and concluded by summarising the opinions of the scientific men on the merits and demerits of their own education, and gave his interpretation of what, according to their own showing, they would have preferred. His data were obtained from a large collection of autobiographical notes, most obligingly communicated to him, in response to his requests, from the larger part of the leading members of the scientific world. He had addressed 180, who, being Fellows of the Royal Society, had, in addition, gained medals or filled posts of recognised scientific position; 115 answers had already been received, of which 80 or 90 were full and minute replies to his long and varied series of questions. He dealt with only a small part of his deductions from this valuable material, referring to a forthcoming work for the rest.

Regarding the chief qualities in the order of their prevalence among the scientific men, they were—(1) Energy both of body and mind; (2) Good health; (3) Great independence of character; (4) Tenacity of purpose; (5) Practical business habits; and (6) What was usually the salt of the whole, strong innate tastes for science generally or some branch of it. He illustrated his remarks by reading many anonymous extracts from the returns, and explained in what way a notable deficiency in any of the above-mentioned qualities would tend to disqualify a man from succeeding in science.

As to the measurement of qualities, it was argued that the law of constancy in vital statistics might be taken for granted, being evidenced by the experience of insurance offices against fire, death, shipwreck, and other contingencies, always with the proviso that the facts are gathered with discretion, on well-known general principles. Hence we may say with assurance, that although two common nuts may differ, yet the contents of different packets, each containing 1,000 nuts, will be scarcely distinguishable, for the same number of nuts of different sizes will be found in each. Let the contents of the several packets be each arranged in a long row, in order of size, beginning with the biggest nut and ending with the smallest, and place the rows rank behind rank; then by the law of statistical constancy the nuts in the same *files* will in all cases be closely alike (except the outside ones, where more irregularity prevails). Again, if we incorporate two rows into one of double length, still preserving the arrangement as to regular gradation in size, the centre nuts of the two original series will still be found at or near the centre of the compound series, the nuts in quarter positions will still be in quarter positions, and so on. Hence, whatever be the length of the series the *relative* position in it of the nut will be a *strict criterion* of its size. This is of course equally true of all groups of qualities or characters

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whatever, in which the law of statistical constancy prevails, the series, in each case, being arranged according to gradations of the quality in question. Each individual is measured against his neighbour, and it is quite unnecessary to have recourse to any external standard. As regards a scale of equal parts, the lecturer made use of a converse application of the law of "frequency of error," which he illustrated by many experiments, and which showed that in a row (say as before) of nuts, if we took those which occupied the three quarterly divisions (1st quarter, centre, 3rd quarter) as the three elementary graduations of size, a range of successive graduations would be obtained by the following series, in which the places of the nuts are supposed to be reckoned from the end of the row where the large nuts are situated, and to be given in per-thousandths of the entire length of the row. It might be called the "Common Statistical Scale" (S. S.). The place of $+ 4^\circ$ would be at 4 thousandths from large end; $+ 3^\circ$, at 21 thousandths; $+ 2^\circ$ at 89; $+ 1$, at 250; 0° at 500; $- 1^\circ$ at 750; $- 2^\circ$ at 911; $- 3^\circ$ at 979; and $- 4^\circ$ at 996, or 4 thousandths from the small end of the row. Thus if we say that the size of a nut is $+ 2^\circ$ S. S., we absolutely define it. Anybody can procure such a nut independently by getting a quart of nuts and arranging them. Also we know that the difference between a nut of $+ 4^\circ$ S. S. and $+ 1^\circ$ S.S. is 3°, and therefore three times as great as between one of $+ 2^\circ$ S. S. and the latter. It cannot be affirmed that this is a precise scale of equal parts for all qualities, but it is found to hold surprisingly well in a great variety of vital statistics; perhaps, too, the mere thickness of tissues may be a chief element in the physical basis of life. This scale appears, at all events, more likely to be nearly approximative to one of equal parts, for qualities generally, than any other that can be specified, and it certainly affords definite standards subject to the law of statistical constancy. The habit should therefore be encouraged in biographies, of giving copious illustrations which tend to rank a man among his contemporaries, in respect to every quality that is discussed, in order to give data for appraising those qualities in terms of the Statistical Scale. By the general use of a system of measurement like the above, social and political science would be greatly raised in precision.

Regarding education, the lecturer disavowed speaking of what might be suitable for boys generally, but he summarised the replies of the scientific men with reference to their own special experience, and notwithstanding the diversity of branches of science, he found unanimity in their replies. They commonly expressed a hatred of grammar and classics, the old-fashioned system of education being utterly distasteful to them. The following seems the programme they themselves would have most liked :—1. Mathematics, rigorously taught up to their capacity, and copiously illustrated and applied, so as to throw as much interest into its pursuit as possible. 2. Logic. 3. Some branch of science (observation, theory, and experiment), some boys taking one branch and some another, to insure variety of interests under the same roof. 4. Accurate drawing of objects connected with that branch of science. 5. Mechanical handiwork. All these to be rigorously taught. The following not to be taught rigorously: reading good books (not trashy ones) in literature, history, and art. A moderate knowledge of the more useful languages taught in the easiest way, probably by going abroad in vacations. It is abundantly evident that the leading men of science have not been made by much or regular teaching. They craved for variety. Those who had it, praised it; and those who had it not, concurred in regretting it. There were none who had the old-fashioned high-and-dry education who were satisfied with it. Those who came from the greater schools usually did nothing there, and have abused the system heartily.