

## WHY DO WE MEASURE MANKIND?

WHY should you, the reader, put yourself to the trouble of being measured, weighed, and otherwise tested? Why should I, the writer, and why should others, take the trouble of persuading you to go through the process? Are the objects to be gained sufficient to deserve this fuss? The reader may be supposed to say, "I do not care for science, and do not intend to go out of my way to advance it. The so-called scientific men may, and probably have, reasons satisfactory to themselves for asking me to go and be tested, but their motives do not influence me a jot. If anybody can show me that all this measuring will be useful to myself, I will undergo it with pleasure; otherwise not."

It is to this very cynical and not quite imaginary speaker that the first answer must be given. It will make it easier to do so satisfactorily if we confine ourselves to showing that there will be at least a fair proportion between his expenditure and what he will gain by it. So we must begin by showing what the cost of measurement is likely to be.

At the laboratory at Cambridge the charge of threepence per head suffices to defray the working expenses of a short but important series of tests, and of registering the results for future reference. But the use of the part of the room where the testing is carried on is given free of cost, the operator has other sources of remuneration, and the instruments were presented. At the International Health Exhibition the charge was the same, and fully defrayed the working expenses. Here also the necessary space and protection were gratuitously given, and the instruments were lent. The little laboratory I have started and carry on, that is attached to the Western Gallery of the South Kensington Scientific Collection, hardly serves as a guide towards expense. There the measurements are at present gratuitous. I think we may say, roundly, that a laboratory that was much and regularly frequented could be wholly and well maintained by a charge of a shilling per head. Accepting this as a basis to reason from, the question that the cynical reader is supposed to have asked may be changed into this:

"Is it worth while for myself, or for my boys and girls, to pay a shilling, a sixpence, or other small sum, in order to be measured and tested in many ways, to have the results registered for future reference, and their meaning explained?" I do not say anything about the trouble of going to the laboratory, because there may be an equivalent for it in the instruction to be found in the books and diagrams that are kept there, and in the amusement of seeing the process. I have always noticed that people seem much interested in looking on.

First, as regards boys and girls, in what way would the measurements be worth the expenditure on them? The answer is briefly this. They will show how the boy or girl ranks among other children of the same sex, age, and of similar social position, in respect to physical efficiency in various specified respects, which give a fair indication of

physical efficiency generally. A comparison of the measures made from time to time will show whether the child maintains his former rank, or whether he is gaining on it or losing it. It must be confessed that at the present moment the necessary tables for giving this information are very imperfect. They exist as yet only for some faculties, ages, and broad subdivisions of social position. But there is nothing to hinder the indefinite extension of tables of this kind. Their construction is steadily going on. Before long, the required information may be given with perfect distinctness for many measurable qualities.

As an example of what can easily be done, let us consider the measurement of eyesight. Its degree of keenness, in persons whose power of accommodating the focal length is normal, is most easily ascertained by noting the greatest distance at which printed numerals of a specified size can be freely read. Measurement would give an indication of the eyesight becoming less good, long before the child would find it out for himself or before its impairment could attract the observation of others. It is frightful to think of the frequent mischief to eyesight that has been caused by the neglect at schools of the most elementary requisites to protect it from unnecessary strain, such as an abundance of light coming from the proper direction, and desks and chairs so shaped as to discourage a lolling or sidelong attitude, by supporting the book or paper squarely before the reader. The stupid want of care in providing these essentials to eye-comfort has gone far towards converting the educated classes of Germany and the cultured girls of England into short-sighted sections of society. When measurement shows that the sight is beginning to be slightly impaired, there is probably time to hunt out and abolish the cause of mischief before serious harm is done, and an occasional small fee would be little grudged by most persons to insure so timely a warning of danger.

The unobserved existence of color-blindness is another possibility well worth being inquired into at an early age, as it materially limits the choice of occupation. It is curious to hear how late it may be in life before this remarkable defect is found out either by the person or his friends; and, as it affects about one male in twenty-five, the risk of being subject to it is considerable. I have myself witnessed painful scenes at my own laboratory when the discovery was first made by grown-up persons who came there for general measurement. One case occurs vividly to me as I write, which will serve as an example of what might often happen. A young widow brought her only son, a youth of about eighteen, to the laboratory. When he was put to the color test he blundered hopelessly among the reds and greens. I privately drew his mother's attention to his indecision and blunders, while he was in the midst of them, but she could not or would not believe that he really had not the power of distinguishing colors. At first she thought he was joking, then she expressed her vexation at his silliness, and at last grew quite angry with the lad. Poor boy! It was easy to realize from that brief experience all the accusations of stupidity and of negligence and all the humiliations that must be endured by every color-blind person, until the true cause of his failures is ascertained to be due neither to stupidity nor to negligence, but to a natural incapacity in a

single particular. Not a few persons have entered upon their occupations without the least conception that this irremediable defect must cause them to fail. In some pursuits color-blindness is no hinderance to success: in others it is an absolute bar. Therefore before preparing plans for a start in life the efficiency of the color sense ought to be tested.

The rest of my remarks will refer to adults as well as to youths, though after adult life has been reached the value of yearly measurement decreases. Perhaps the best general test of bodily efficiency is the breathing capacity, taken not by itself, but with reference either to the stature or the weight. Lungs that are amply large enough for a small man would be wholly inefficient for a large one, as the tables of averages and of "rank" show very distinctly. The next test in importance is that of strength, and preferably the strength of grip. It serves as a fair sample of the general strength, and it can be measured very easily and accurately, without any risk of bodily strain. Like the breathing capacity, the strength also has to be considered in reference to the stature. The possession of a considerable amount of breathing capacity and of muscular strength is an important element of success in an active life, and the rank that a youth holds among his fellows in these respects is a valuable guide to the selection of the occupation for which he is naturally fitted, whether it should be an active or a sedentary one. As life proceeds, the strength declines somewhat, and the breathing capacity is materially reduced. It is well that a man should have the advantage which occasional measurement affords, to be warned of any premature decay in his powers. If it should take place, and if it is due to mere indolence and disuse, he may exert himself with advantage before it is too late. A register of measures resembles a well-kept account-book. It shows from time to time the exact state of a man's powers, as the account-book shows that of his fortune.

Whatever may be whispered by the inner voices of vanity or of envy, no sane and experienced person can doubt the enormous difference between the natural gifts of different men, whether in moral power, in taste, in intellect, or in physical endowments. Those who have frequently pitted themselves fairly against others, doing their very best to succeed, must have often known what it is to be utterly beaten by their natural superiors. It is only those who have kept aloof from contest who can possibly flatter themselves with the belief that their failures are wholly due to circumstance and in no degree to natural incapacity. Such persons will quickly be awakened from their self-conceit by submitting themselves to physical measurement and thereby ascertaining their exact rank among others in each several respect. They will be pretty sure to receive a good moral lesson from the results.

Employers of labor might often find it helpful to require a list of laboratory measurements when selecting between many candidates who otherwise seem to be equal in merit. Certainly a man who was thereby shown to be measurably much more highly endowed than the generality of his class with physical efficiency would have a corresponding chance of being selected for any post in which physical efficiency of the kind tested was of advantage. I have great hope of seeing a system of

moderate marks for physical efficiency introduced into the competitive examinations of candidates for the Army, Navy, and Indian Civil Services.

In this brief notice I will allude to only one other advantage in going to a laboratory,—namely, the help that the registration of the measures might hereafter give to identification. Rogues had better avoid such places, but respectable people who may possibly at some future time desire to have their identity proved, or at least their presumed identity with some other undesirable personage disproved, might reasonably go to a laboratory to secure the necessary evidence. Differences that hardly strike the eye or are retained in the memory, whether of the breadth or of the length of the head, or of the cubit, or of the length of foot, and so forth, exceed the greatest errors of measurement that need be feared, added to the utmost change of which the human body is capable between the ages of twenty-one and sixty. They are relied upon as guides to identification in the criminal administration of France, according to the method of M. Alphonse Bertillon. The prints of the thumbs or fingers also afford a singularly exact means of identification. I now always cause the thumb-prints to be taken at my laboratory, partly for that reason, and partly because they bear, to myself, a present interest of their own, that lies wholly outside the subject we are talking about, and of which I hope before long to give some account.

The stage at which we have thus far arrived is that a man who occasionally takes a child, or who goes for his own sake, to a well-equipped laboratory where numerous measurements are made, where their meaning is explained and the results are preserved, will obtain what is worth much more to himself than the small fee which is sufficient to defray the cost of the process.

Now let us endeavor to justify those who, like the writer of these remarks, are taking much trouble to persuade persons to be measured and afterwards to discuss the results. Is it more than a harmless hobby on their part, or have they substantial reasons for what they do? My reply is that these measurements afford apparently the only way of obtaining information upon a variety of important topics on which we are at present in deplorable ignorance.

For example, we have no knowledge of the degree in which the promises of youth are fulfilled in after-life. How far may the vigor, strength, keenness of senses, and efficiency in other respects at the various ages of childhood and boyhood be accepted as true indications of the future efficiency of the man? The answer to this question has a direct bearing on the value of examinations at different ages, as a means of selecting capable candidates for employment. To the best of my knowledge, this problem has never been adequately discussed,—mainly, I presume, owing to the want of a sufficient collection of trustworthy data. It is a question that admits of a perfectly precise and complete answer, as those who are familiar with the modern developments of statistical analysis are well able to appreciate.

Another problem is to ascertain with precision the influences of special education as distinguished from natural capacity. Suppose there

are two youths who have been reared in a similar and ordinary way, and who are alike in their physical performances, but that one of them afterwards becomes an artisan in a trade that greatly exercises some particular set of muscles, while there is nothing peculiar in the occupation followed by the other. The years go by, and the performances of the same persons are again compared. What is the difference between them now, in respect to the set of muscles in question? By taking many such pairs, the entire history of the effects of that sort of education ought to be clearly made out. We should learn, and be able to express in a very compendious way, the frequency with which education produces each of the various gradations of effect. We should, for example, know in what proportion of cases the strength of those muscles was increased by a quarter, by a half, or in any other ratio. No measurements of persons engaged in different occupations, without a knowledge of their previous history, can tell us this. It would be absurd to compare the strength of the arms of blacksmiths with that of the arms of tailors, for the very obvious reason that strong men rarely become tailors, or weak men blacksmiths. The results of such comparisons as these would confuse natural gifts with acquired ones, and would probably be more influenced by the former than by the latter.

It would be most instructive to analyze the measures after a sufficient number had accumulated, in order to find out the rate at which the education of a muscle or a faculty proceeds. At a gymnasium the hitherto imperfectly exercised muscles of new-comers become rapidly strengthened, but the rate of their daily improvement steadily lessens, and at last it stands still. Then the limit of perfectibility has been reached. Experiences of this kind on a large enough scale to give trustworthy results would have a direct bearing on the science of education.

The effect of environment is another obvious line of investigation. As we should have *precise measures* to deal with, we might fairly hope to obtain *precise* results. This, in the most general sense and in the briefest form, is the true justification of those who spend their time in measuring mankind.

The educational effect of a habit of human measurement may be of much value in promoting accuracy of ideas and language. The present vague way in which men mostly estimate and describe the performances of themselves or others testifies to much muddleheadedness and to a sad lack of power of expression. There is no measure in their epithets; their phraseology readily flies off into hyperbole; superlatives abound, but precision is wanting. The generality of mankind would be astonished to learn that a precise measure may be applied to the general performance of a man, although his performances vary in value from time to time, and that a measure of the most successful performance is of very little importance. They never dream of using the simple scientific expression, say in reference to a marksman, that such a proportion of his shots, at such and such a range, lie within such and such a distance either to the right or to the left of the bull's-eye. They have no conception of *the completeness* with which a brief statement like that defines the varying accuracy of his aim; how it enables us to foretell the distance within which one-quarter of his shots, one-half, or any

other specified proportion of them, will fall. There is a world of interest hidden from the minds of the great majority of educated men, to whom the conceptions and laws of the higher statistics are unknown. A familiarity with these conceptions would soon be gained by the habit of dealing with human measurements, as by the assignment of rank in a class, or by making other deductions that I have not space to refer to here, such as the numerical values by which the nearness of different degrees of kinship may be expressed, or the closeness of correlation between different parts of the body. There is no intrinsic difficulty in grasping the conceptions of which I speak, but they are foreign to present usage, and look strange at first sight. They are, consequently, very difficult to express briefly and intelligibly to those to whom they are wholly new.

It is reasonable to expect that if intelligent interest should be taken by many persons in the methods of human measurement, the number of the faculties that we shall be able to deal with will steadily increase. It is only a few months since the ingenuity of one of the masters at Eton College devised a test of muscular endurance. It is made with an ordinary grip dynamometer, that measures the strength of squeeze or grasp. The utmost strength of squeeze is first noted; then a second trial is made to test the length of time during which the experimentee can maintain his previous grip, so far as not to permit the index hand of the instrument to fall back more than ten pounds below its previous maximum. This precise limit of ten pounds is of small importance, as when the muscles fail they give way rapidly. Experience has not yet adequately confirmed the value of this simple and novel measure of an important quality. It is alluded to merely as an example of one of the steps by which the art of human measurement may become indefinitely extended.

Francis Galton, F.R.S.

#### BOMBIN.

THEY are burying Bombin over the way,  
The village street will miss him some,—  
His vacant smile and look astray,  
And the unused tongue grown strangely dumb.  
Six feet to rest in many a day,  
Prince or princess, what more have they?  
Six feet by three of narrow clay.

The school-boys straying along the street  
Will miss the quaint, uncanny form,  
The sad tired look they would surely meet  
In summer's sun or winter's storm,  
And the head that little more did shield  
Than it finds to-day in potter's field,  
Unless there is shelter unrevealed.