

THURSDAY, NOVEMBER 24, 1870

## THE CLAIMS OF SCIENCE

THE Statistical Society, which held its first meeting for the session 1870-71 on Tuesday, the 15th inst., had the claims of Science brought before it in a paper read to it by Dr. Guy, one of its vice-presidents. The paper was written with the practical aim of commending and furthering a scheme which the Statistical Society has set on foot, and in which it has invited the Institute of Actuaries, the Social Science Association, and several other scientific bodies, to participate. The object these societies have in view is to provide a common home in which they shall enjoy the advantage of fixity of tenure and the sense of permanence, with suitable and economical arrangements for carrying on their scientific work. They wish to provide for themselves a common theatre, convenient offices, spacious libraries, and—in the case of societies requiring moderate museum accommodation—museums. All this the societies aim at accomplishing within moderate limits and at a reasonable cost; for they feel very naturally that when the Government has made provision at Burlington House for six leading societies, and other institutions have provided their own isolated accommodation, there no longer remains any place or pretence for a large and comprehensive scientific centre. The building contemplated by the associated societies would have all the unity of character now practicable, if its principal tenants were to consist of societies having a common aim. Such an aim is to be found in the culture of the sciences now known as “social,” or societies which make man himself, as the unit of society, the object of their study.

If we define Science as “knowledge in its most definite, condensed, and exquisite form, dealing with worthy objects, and applied to worthy uses,” it may be stated, as a truth worthy of general acceptance, that every branch of knowledge that is, by common consent, stamped with the word *science*, aims at some useful and worthy object, studies a certain defined order of things, which it identifies by accurate descriptions and exact definitions, by expressive words and phrases; which it arranges in lucid order, under classes and sub-classes; on which it brings to bear the most delicate instruments and most refined methods of analysis; to which it applies, as far as practicable, the rules of logic and the figures of arithmetic; crowning the entire edifice, if it proves equal to the burthen, with some comprehensive numerical theory.

Passing from this general view of science, and coming to that branch of it now known as *social*, we may trace the seeds of it back to the parish registers of 1538 and the enactment of Henry VIII., respecting leases for three lives, or twenty-one years, through the London Bills of Mortality and the commentaries of Grout and Petty, through the early attempts of Halley to construct a table of mortality from the death registers of Breslau, through the prison inspections of John Howard, up to the establishment of the Statistical Society in 1834, and the foundation of the Social Science Association in 1857; the Statistical Society having, as is well known, been set on foot with the object of collecting “facts

calculated to illustrate the condition and prospects of society,” which was what Gottfried Ochenwall, of Göttingen, who coined the word *Statistik*, really meant by that word. The Social Science Association, therefore, was a second development and a modified culture of that branch or division of human knowledge—that science of States—to which had been previously given the name of Statistics. The two societies have a common aim—the improvement of man’s condition physical, intellectual, and moral, through the patient heaping up, intelligent sorting, and critical examination of the elements of a knowledge which, properly applied, is power indeed.

This social science, of which the *Institute of Actuaries* cultivates a very important section, differs from most other sciences chiefly in this, that its units are of variable magnitude, and that its truths and principles, gathered from large assemblages of such units, admit of application only to like collections of facts, not to the individual units themselves. The actuary has the function of first establishing truths of this order, and then applying them; the statistician must look to the statesman to carry into effect the practical works of justice and benevolence. The association of the Statistical Society and Institute of Actuaries with the Social Science Association and Law Amendment Society is, therefore, one pointed out by the nature of things; and we may hope to see them some day working side by side under one roof with one common aim—“the improvement of man’s estate.” But this principle of association admits of being carried much farther, so as at length to embrace in one group, under one roof, all the societies or associations that make man himself, as a physical and moral unit, the object of their study.

The section of Dr. Guy’s paper that treated of *scientific societies and associations*, consisted of an historical retrospect of the rise and origin of most of the societies now existing, finishing with some details of the number and composition of the Statistical Society’s members, and of the number of members of the allied societies. Into these details we shall not enter, but we shall restrict ourselves, in what we have yet to say, to the views expressed by Dr. Guy on the subject of the claims of science to public recognition and support. After pointing out that science has found favour, encouragement, and support under every form of Government, that kings have acknowledged that it adds lustre even to thrones, and republics have deemed it quite consistent with their sterner virtue to hold out to it the hand of fellowship—a recent notable example of which has been afforded in the pecuniary assistance and means of transport afforded by the United States to two parties of its citizens bent upon voyages to Spain and Sicily to view the total eclipse on the 22nd of December, an example which our Government has at last, however, willingly consented to follow,—the paper proceeded to do justice to our own Government. The refusal, followed by a slow repentance, was quite an exception to the rule in England. It could only have occurred during one of those cold fits of economy to which the nation is subject at the close of some feverish paroxysm of prodigal expenditure; or it may have been an outbreak of the hypochondriac fancy that they are on the brink of ruin, which is apt to seize the richest nations no less than the wealthiest individuals. It is not difficult to show that Science, in the

sense of knowledge of the more precise, exact, and exquisite order, has claims to public recognition and support on the ground of benefits conferred on the nation in the shape both of honour and profit; that it shares with righteousness the prerogative of exalting a nation (for the love of truth, which causes men to seek after knowledge and the patient industry and self-denial which are the first conditions of the search, are among the manly virtues that give strength and solidity to a people); that it must be preferred before learning, as being more practical, and coming into more direct contact with the realities of life; before art, as less apt to be turned to unworthy uses, more sure not to become an agent of effeminacy and luxury.

Of the good gifts which Science showers upon mankind, we may find grand and convincing examples in the works of the hygienic heroes of the last century—Sir George Baker and his masterly demonstration of the cause of the Devonshire colic, Captain Cook and his successful prevention of scurvy, John Howard and his prison work, ending in the destruction of the Jail Fever, and Jenner, with his discovery of vaccination. We fully sympathise with the concluding words of this part of our author's paper:—"By what figures of arithmetic shall I attempt to measure the greatness of these four gifts of science, freely bestowed upon us, and upon all men everywhere, in the short space of a single generation? I believe it to be no exaggeration to affirm that the great war of the French Revolution was brought to a successful issue as much through the lives thus saved as by the valour of our soldiers and sailors. Such have been the triumphs, such the precious gifts, of this one science of *hygiène*." Other illustrations of the same class, that is to say, showing direct profit to the nation, may be drawn from the Science of Chemistry, of which the whole history, from first to last, is one unbroken series of purely scientific discoveries made for love of truth, without thought or hope of reward, but, sooner or later, turning to profit in the hands of our manufacturers.

We might cite examples from the discoveries of Davy and Daniell, and the arts of electrotyping and photography, discoveries appealing to universal experience of the manifold obligations under which science and scientific men have laid mankind for all the arts which make our civilised existence to differ from the rude life of the savage. The Penny Post, with its world-wide benefits, is the result of a scientific demonstration belonging to the methods and domain of Social Science.

We conclude with the following statement of the special claims of the Statistical Society and its associates in the culture of Social Science:—"The scientific labours of our members, inspired by a mere love of truth, looking to no pecuniary reward, and bearing directly on the very questions which come under discussion in the Legislature, are in many cases a direct saving of expense to the nation. An important (perhaps a very costly) return is made to Parliament. It abounds in tables and columns of figures. The work of analysis, which must be undertaken if the return is not to become so much waste paper, if Parliament and the public are to profit by the expense incurred—this work of analysis is done by some member of the society seized with a wholesome curiosity to know the truth. He

bestows upon it time, and thought, and the skill acquired by practice; he submits his work to the criticism of the Society, his paper is published in its *Journal*, at its proper cost; and thus the public and the Government save money and become possessed of wholesome and fruitful truths." These are claims which, we think, the Government will feel bound to recognise, and we wish the cultivators of the Social Societies every success when they come to represent them in the proper quarter.

#### THE SOURCES OF PHOSPHATIC MANURES

"PRACTICE with Science" is the title of a volume of essays (the second of a series), issuing from the Royal Agricultural College, Cirencester, and containing contributions from the members of the staff of that institution. Amongst other papers is an interesting account by Prof. Thiselton Dyer of the geological distribution of Tricalcic Phosphate; that is to say, a sketch of the chief sources of mineral phosphate of lime, whether as apatite, osteolite, phosphatite, coprolite, or guano. Mr. Dyer points out the abundance of phosphate of lime in igneous rocks, but hesitates about tracing its origin in such beds either to direct chemical combination, or to the inclusion of organically-formed phosphate in the rocks in question. He does not, in short, discuss the possibility of the combination of phosphoric acid and lime in the primæval state of the globe without the intervention of life, which one distinguished geologist at least denies. Mr. Dyer traces the occurrence of tricalcic phosphate in the various sedimentary deposits with great care, having obviously taken much trouble to render his statement an exhaustive one. He considers the many structureless masses of phosphatic deposits which occur "as residuary evidence of formerly existing life, of which they are to some extent the measure," as graphite is in other cases. A greater influence in the production of these masses is attributed to animal than to vegetal life, though marine plants are stated to be especially rich in phosphate of lime, and have undoubtedly played their part in its introduction into sedimentary strata. Mr. Dyer mentions that the recent Brachiopod *Lingula* has 86 per cent. of phosphate of lime in the mineral ingredients of its shell; and the occurrence of large quantities of phosphate of lime in the great Laurentian and Silurian formations is noticed by him in detail, as well as its occurrence in Devonian and Carboniferous limestones. In emerging to the group of mesozoic strata, we leave behind almost entirely those veins and beds of "phosphate" which occur in the older and more changed rocks, where the segregation of the phosphate of lime has been more completely effected, owing to the greater age of the beds. In mesozoic and tertiary strata we find those nodules which have so erroneously been confused with "coprolites"—the droppings of fish, which are not unfrequently preserved in the fine sediment of the Liassic and the Rhætic beds of the chalk—though beds of flaggy phosphate also occur in some deposits of this age.

Mr. Dyer accepts the history of the origin of these nodules which I have advocated (*Geol. Magazine*, vol. v.), in describing those which occur below the Suffolk Crags. Clay has a remarkable power of detaching phosphate of lime from its solution in carbonated water; and the phosphatic