The Renaissance of British Mineralogy.

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[Read by the retiring President at the Annual Meeting, Oct. 30th, 1888.]

IT is my unpleasant duty this evening to retire from the honourable position in which I was placed by the members of the Mineralogical Society three years ago. Before doing so I would say a few words on a subject which has demanded grave consideration from myself, and doubtless also from my predecessors in the Chair: namely, as to whether any formal address should be delivered by your President during his term of office.

Our Society, instituted only twelve years ago, is still in its early youth, and is as yet unrestrained by the unyielding bonds of traditional custom. Its precedents are now in process of being made, and we must have a care that they be such as may safely be followed in the distant future without detriment to the true interests of the Society.

This question is one which must, sooner or later, become of vital importance, and deserves our serious attention.

Let us first recall, by reference to the printed Proceedings of the Society, the course which has been followed by my four predecessors in the Chair. We find that our first President, Mr. Sorby, during his three years of office, gave a single address, a very valuable one, on the determination of the chief optical constants of minerals. Of Professor Heddle no formal presidential address is recorded. Mr. Hudleston went so far as to express his happiness that it was not the custom to deliver an address. My immediate predecessor, Professor Bonney, pointing out that an address was not a matter of fixed precedent, said that he had hoped to have escaped, but that at the urgent request of our energetic Secretary he had prepared what he preferred to call "some remarks."

So much for the practice of our own Society. Let us now consider what is the custom in such of the other learned societies as are most nearly related to our own. At the Geological Society the President delivers a set annual address, which precedent requires to be of so lofty a character that during his whole term of office, instead of rejoicing over his dignities, he feels life to be a heavy burden, and is ever wistfully looking forward to a happy day in February when he will once more be freed from the oppressive responsibilities of his office. At the Chemical and Physical Societies

the set address on a specific subject is replaced by a report on the progress of the society or of the science during the preceding year.

Now it seems to me that a presidential address on a specific subject is out of place. However valuable the address in itself, expressing, as it often does, the results of years of patient study, it might with greater propriety and with equal effect be brought forward by the author in his unofficial capacity. The convenience of the latter method to the author himself is obvious; for an important scientific paper, founded on observation and perhaps also on direct experiment, should be published when complete, and not be required or reserved for a definite date.

An ideal presidential address should treat, not of a special point in the science of interest to a section only of the Society, but of the science in its broader aspects; and the simplest permanent arrangement of this kind is that which makes it deal with the progress of the society or of the science during the interval which has elapsed since the delivery of the next preceding address.

But in the case of our own Society we labour under special disadvantages, whether the address is to be on a specific subject or on the progress of the science. Not only is the Society small, but the number of its members able to devote any large part of their time to pure Mineralogy is far smaller still. Hence, if a set address were expected from the President we should be unnecessarily limited in our selection for that office. Many of our ablest members, men who would make the best of presidents, men of wide culture and extensive general knowledge, men endowed with ideas and the power of expressing them, men who would bring to us a large experience obtained on the executive of other and larger societies, though willing, nay anxious, to help us in the management of the affairs of the Society, would be prevented from giving us their services in the Chair owing to the sheer impossibility of devoting the requisite time and thought to the preparation of a purely mineralogical address such as they would consider worthy at once of the Society and of their own reputation.

Again, the number of our London meetings has been up to the present only three a year, and, as far as we can see, it is not yet desirable to increase their frequency. To set aside annually one-third or even one-fourth of the time of the Society for consideration of the views of the President or of the progress and past work of the Society would seem to be wanting in regard for proportion. A few minutes spent by the members in turning over the pages of the Magazine will give a better idea of the work of the Society, and be at the same time more exhilarating, than any summary a President can make.

A report by the Council on the finance and general business, as brief as it can be made, seems to me sufficient for all reasonable purposes, and least wasteful of the time of the members and officers.

I have referred to the Magazine, and have said that a good idea of the work of the Society may be obtained in a few minutes by turning over the pages of one of its volumes. It may be cast in our teeth that the volume is small, but we can proudly and truly retort that few volumes of the same size furnish so vast an amount of heavy reading. The density, indeed, is prodigious—not that of lead, but of gold, refined gold. The volume is intended for transmission to all posterity, and not as a mere addition to the ephemeral literature and scientific gossip of a too prolific century. The present generation, by its careful use of the volume, will doubtless help it to reach its destination.

Bulky publications are indeed matters for shame rather than pride: they are the immediate ruin of a small society, a perennial burden to librarians, and, as their contents are never completely indexed, a terror to subsequent investigators. The Ancients, not unwisely, refrained from the invention of printing: they recognised that their duty to themselves was to read only what was worth the vast labour of transcription, and that their duty to posterity was to transmit to it only their masterpieces: when even these became burdensome, an incendiary, doubtless a librarian, quickly reduced their volume. But for us Moderns the cost of multiplication of copies has become so small that everything, good or bad, is printed and preserved, and it becomes necessary to spend the greater part of one's life in the preparation and study of indexes rather than of the literature itself.

It would be an immense boon to mankind if some impartial and perfect tribunal could be empowered to do on the large scale, what the curate and barber did so satisfactorily with Don Quixote's books on the small scale; distinguish the worthy from the worthless, and relentlessly annihilate that which ought not to cumber our shelves or demand even a passing glance.

I have said that the number of our members is small: I am not sure that it would be politic as yet to increase it. Members who have a living interest in Mineralogy are most valuable, and of such we cannot have too many; but mere subscribers of paltry gold would be eventually a source of weakness. After encouraging the Society to extravagant expenditure, they would fall away and leave it in the lurch.

But is it necessary that the number of people in this country with a lively interest in Mineralogy should remain so small? We have only to

look abroad to see at once that the cause of this smallness of number is not inherent in the subject itself. In Germany, for instance, every one, of course with here and there a conspicuous exception, seems to be either a professor of mineralogy or a student of it. Periodical publications, at once voluminous and teeming with valuable results of scientific work, are there maintained. Somewhat more than a century ago the study of minerals was everywhere popular, and received its share of attention from the cultured classes. Students thronged to Freiberg from all parts of the world to hang on Werner's lips.

There is one reason for this decline of general interest in Mineralogy which I may mention in passing. In the good old days minerals were named and classified by help of simple external characters, and the facts of the science could be easily grasped without much preliminary training. Since then, the invention of crystallography and of the atomic theory, and the discoveries made in physical optics, have brought about a vast change in the treatment of the subject, and the Mineralogy of to-day is even in its elements beyond the range of ordinary mortals, The pages of its text-books are sprinkled with wonderful formulæ designed by perverse chemists, and with unpronounceable hieroglyphics maliciously invented by cruel crystallographers.

But the chief reason for the decline of mineralogical study in our own country is that mineralogy has been almost completely excluded from our educational system. In the older universities, it is true, mineralogy has been long represented by professors, but until lately at least it has been allowed scarcely any weight in the examinations for a degree. The study of other branches of science has been encouraged, while that of mineralogy has been neglected and forgotten. One of the evils of the examinational system is that all the available energy of our youth is concentrated wholly on subjects upon which stress is laid by a not omniscient examining board. Most students too must almost necessarily take up subjects in which there is an opportunity of showing their comparative ability, and by a knowledge of which there is a reasonable prospect of being able to gain a future livelihood.

Taught only as a subordinate and unimportant subject at the universities, and not taught at all outside, pure mineralogy has been in danger of becoming extinct in this country: a few years ago the capsizing of a coach or the bursting of a balloon might have been the end, and the British professor or student of pure mineralogy have become a mere tradition.

The discovery of the transparency of thin rock-sections, and the

important conclusions which may be arrived at from their microscopical examination, have now turned attention to mineralogy once more, and it seems likely that the knowledge of mineral characters requisite for petrographical work may at last lead to our mineralogical *Renaissance*. Owing chiefly to the patience and perseverance of Professor Lewis, there is now a certain amount of encouragement to mineralogical study at Cambridge: and if the *Renaissance* is to be brought about, the example of Cambridge must be followed by the other universities, and mineralogy be assigned a higher place in the examinational system.

Minerals are omnipresent. Is it unreasonable to ask that every one should be taught their simpler characters, and be shown how to recognise the minerals which are met with at every turn? Such teaching would improve the capacity for observation, and give fresh interest to many a pleasant ramble—through the workings of a mine. And is not Professor Ruskin in the right when he claims that a knowledge of the minerals, conveniently grouped as precious and ornamental, should form a part of every gentle education? Ought we not more especially to insist upon such elementary teaching for the numerous officials sent out by the nation to the less explored regions of the world?

In the higher teaching of mineralogy difficulties present themselves, but they might easily be lessened by division of labour; a preliminary training in the elements of mathematics, physics, chemistry and crystallography being absolutely necessary to the manufacture of a mineralogist. The teaching of crystallography is generally relegated to the professor of mineralogy, and the subject is regarded as a mineralogical difficulty; but this ought not to be the case. It is true that a mineralogist was the first to discover a relationship between the various crystallised forms of the same substance, and thus to institute a crystallographic science which has since been found indispensable in mineralogical study. It is true that a mineralogist has been the originator of every advance in crystallographic knowledge. It is true that a mineralogist has in minerals ready-made crystallisations, which in their excellence and variety of form can rarely be imitated in the laboratory. But it is no more the province of a mineralogist to teach crystallography than it is to teach chemistry, or the use of a delicate balance. He does teach it indeed, but that is merely because his pupils reach him imperfectly trained for the pursuance of his own subject.

Crystallography should be taught as a special subject; and a knowledge of it should be required, not only of the mineralogist, but of the chemist, and even of the physicist. Hitherto, at least, the chemists of this country

have been too content, either to leave the crystalline forms of their artificial products undetermined, or to impose the task of their determination on the already sufficiently occupied mineralogist. It seems obvious that in a satisfactory system of education every chemist should be taught how to measure and describe the crystalline characters of the products which it is his fate to call into existence. On various occasions expression has been given to this view, but the only chemist who has yet seen his way to act upon it is Professor Henry Armstrong, who, I am happy to say, has introduced the subject into the educational course at the City and Guilds Technical Institute. I trust that before another generation passes away his excellent example will be followed throughout the country. A knowledge of the elements of crystallography, including the mechanics of crystal-measurement, ought to be made a *sine quâ non* for a degree in chemistry at every university.

The measurement of the angles of a crystal, the determination of its symmetry, and the calculation of its form, are infinitely less difficult than is generally imagined: given a knowledge of elementary mathematics and of the careful use of measuring instruments the processes are in general extremely simple. The complexity of crystallographic calculation is only apparent, and is due to the existence of text-books. These are generally worse than useless. A voluminous work on crystal-calculation is usually an attempt to provide formulæ which shall enable a student to solve every possible problem by rule of thumb, without his needing to have the faintest idea of what he is really doing. Practically any one familiar with the processes of trigonometry can deduce from first principles the formulæ required for each special case, as it occurs, in less time than he can discover the rule in the ponderous tome invented for his mystification. I am of course far from asserting that the teaching of crystallography presents no difficulties at all. What I do wish to insist upon is that the kind of crystallographic knowledge required for the chemist in his own work is such that it may fairly be demanded of every one of them. The higher flights may be abandoned to the specialist.

At the present time, when professors of crystallography are not yet called into existence, there is one step which ought to be at once taken, and which would make mineralogy more possible eventually to a large number of our students. Every student of practical physics is taught how to measure with a reflecting goniometer the angles of an artificial prism. He should further be taught the measurement of the angles of a simple crystal, and the deduction of its symmetry. In his optical studies especially such a practical knowledge of crystalline symmetry would be of great

help to him. The reflecting goniometer in one of the forms used for crystallographic work might well be an instrument in use in every physical laboratory, and would subserve many a useful purpose.

As soon as every physicist is taught how to determine the angles and symmetry of a simple crystal, and every chemist is further enabled to define the crystalline forms of his artificial products, we shall have a large army of students for whom the transition to mineralogical work will be easy; then, and not till then, can we hope for any useful increase in the number of the members of this Society; then, and not till then, can we hope that our country will in its study of mineralogy take its proper place among the nations of the earth.

One more point I may mention. Until a few years ago there were two distinct societies—a Mineralogical and a Crystallological. They had objects far from identical, and in a more perfect world might have flourished side by side. The fusion of the two societies without any extension of the title of the Mineralogical has had for its effect that we cannot satisfactorily demand what the Crystallological could—namely, the support of the organic chemist; and although it was understood at the time of the fusion that papers on the crystallisation of artificial products, organic or inorganic, should be within the scope of the joint society, their inclusion in a *Mineralogical Magazine* would suggest a misnomer. The change or extension of our already lengthy title has its evident inconveniences, but it may be worthy of careful deliberation by the Society at some early date as to whether such an extension is not really necessary for the clearer definition of our objects if we are to enlist the sympathy of many who, though they may feel to be beyond the pale of a mineralogical society, yet by their investigation of the crystalline forms of the products of the laboratory may in the future, as in the past, throw light on the crystallography of the mineral kingdom.

With these few words I now give place to my successor in the Chair. His past services as Honorary Secretary *pro tem.* are familiar to us all. For seven long years he has undertaken the heavy responsibilities of his office, and by his zeal and devotion and by his knowledge of business has rescued the Society from those pecuniary dangers which at one time threatened it. Thirty years have now flown by since Mr. Scott began to publish the results of his mineralogical study. At one time in the quiet laboratory at Dublin analysing a felspar from the Urals, at another wandering o'er the wild districts of Donegal for the observation of its granites, or in stern Caledonia investigating the minerals of Strontian, or once more in Dublin preparing with Professor Haughton the Blowpiper's

Vade Mecum, his researches and publications were at one time frequent and varied. But in an evil hour for himself and his old love he was allured from the narrow path by the charms of a fickle goddess, and mineralogy has, since then, obtained his regard during only an occasional passing hour. But even this was at last to be denied. The Meteorological Muse, grown still more arrogant, would no longer brook a rival, and demanded his whole attention. It is divulging no great secret when I tell you that it required much pressure to obtain Mr. Scott's consent to his being nominated as President on his vacation of the secretarial office. Conscience-stricken, he seemed to feel that the intimacy of his relationship to Meteorology was a bar to his acceptance of the highest dignity the Mineralogical Society can bestow. The Council considered, however, that his meteorological relationship should be ignored in consideration of his many years of faithful service here, and ventures still to entertain the hope that his leisure hours at least may be reserved for this Society during many years to come.