

emulated, under a still higher stimulus, in the more successful career of others; and at last, in the discovery of the North-West Passage (still so-called in spite of its having been found impassable), the courage and endurance of Capt. M'Clure and his associates have ascertained with certainty a most remarkable fact in the physical conformation of the globe. Results of still larger, and certainly of more immediate interest, are being arrived at by the rapid march of African exploration,—not, surely, before the time. Every part of the *circumference* of that vast continent has been either known or accessible to us for centuries. On its soil has flourished some of the most ancient and famous monarchies; and one of its great valleys is the fatherland of science. Yet up to comparatively recent times our horizon there has been bounded by the same sands or mountains which bounded the knowledge of antiquity, and we had almost as little acquaintance with its interior as had the Tyrian merchant when his eye rested of old on the peaks of Atlas. Nothing but familiarity with the fact could have reconciled us to the ignorance in which we have so long remained of one of the largest and most interesting regions of the world. That ignorance is at last being cleared away; and the exertions of many individuals, amongst whom the names of Mr. Galton, of Mr. Anderson, Dr. Livingston, Dr. Baillie, and Dr. Barth stand conspicuous, have contributed results of the deepest interest and importance. No man who values science can fail to appreciate the extension of our knowledge respecting geography even where, as in the Arctic regions, that knowledge is pursued simply for its own sake. But it becomes invested with tenfold interest when it brings with it the largest influence on the destinies of millions of the human race; and adds, as we may confidently hope it will ultimately do in the case of Africa, an inexhaustible field for manufacturing and commercial enterprise.

In connexion with the diffusion of geographical knowledge I cannot omit to mention the magnificent publications of Mr. Alexander Keith Johnston of Edinburgh, in his "Atlas of Physical Geography." It is seldom that such a mass of information has been presented in a form so beautiful and attractive; or one which tends so much to place the study of geography on a truly scientific basis—that is to say, on the basis of its relation to the other natural sciences, and those grand cosmical views of terrestrial phenomena which have found their most distinguished interpreter in Baron Humboldt.

The kindred science of Ethnology has received of late years great development; not only by its increasing store of facts, but by the more scientific use which is being made of facts which have been long familiar. The investigation of the laws which regulate the growth of language, promise to cast the most important lights on the history of our race; but the conclusions to which that investigation may lead are still matters of keen and anxious controversy, and are exposed to all that suspicion which has been directed against almost every science at some stage or other of its growth; and which, we must allow, every science has, at some stage or other, justified by hasty generalisation and premature deduction.

Of all the sciences Chemistry is that which least requires to have its triumphs recorded here. The immediate applicability of so many of its results to the useful arts has secured for it the watchful interest of the world; and every day is adding some new proof of its inexhaustible fertility. There is one department of inquiry, and that perhaps the most interesting of all, I mean Organic Chemistry, which has received an especial impulse during the last few years, an impulse mainly due to the genius of one distinguished man whom we have the ho-

nour of numbering among our guests upon this occasion. I think Baron Liebig will find in Scotland that kind of welcome which a man of science values most,—a readiness to profit by his instructions, and an enlightened appreciation among the farmers of the country of the practical value of studying in their husbandry the laws which have been revealed by his research. I am reminded, through the kindness of Dr. Lyon Playfair, of some facts which give yet a more special interest to this subject in connexion with our meeting here. It was to the British Association at Glasgow in 1840 that Baron Liebig first communicated his work on the Application of Chemistry to Vegetable Physiology. The philosophical explanation there given of the principles of manuring and cropping gave an immediate impulse to agriculture, and direct attention to the manures which are valuable for their ammonia and mineral ingredients; and especially to guano, of which in 1840 only a few specimens had appeared in this country. The consequence was that in the next year, 1841, no less than 2,881 tons were imported; and during the succeeding years the total quantity imported into this country has exceeded the enormous amount of 1,500,000 tons. Nor has this been all: Chemistry has come in with her aid to do the work of Nature, and as the supply of guano becomes exhausted, limited as its production must be to a few rainless regions of the world, the importance of artificial mineral manures will increase. Already considerable capital is invested in the manufacture of superphosphates of lime, formed by the solution of bones in sulphuric acid, the use of which was first recommended at the last Glasgow Meeting. Of these artificial manures not less than 60,000 tons are annually sold in England alone; and it is a curious example of the endless interchange of service between the various sciences that Geology has contributed her quota to the same important end; and the exuvie and bones of extinct animals, found in a fossil state, to the extent of from 12,000 to 15,000 tons, used to supply annually the same fertilizing materials to the soil. The exertions of Prof. Daubeny of Oxford on the same important subject, and the continued attention which he has devoted to it, have done much for the cause of agricultural chemistry in England; whilst the thanks both of practical and of scientific men are due to Dr. Lyon Playfair and Prof. Gregory of Edinburgh, for those admirable translations of Baron Liebig's works, which have rendered them accessible to every English reader; and have thereby had no unimportant influence in extending the knowledge of the laws affecting both vegetable and animal physiology.

I am indebted to the same quarter for the mention of one remarkable instance of the manner in which—to use Dr. Playfair's words—"the overflowings of Abstract Science pass into and fertilize the field of Industry." One of the newest and most obscure subjects of chemical research has been the discovery of certain conditions under which bodies, like in their composition, are nevertheless endowed with unlike properties, and thereby become convertible to new purposes. It is in the application of this principle that a gentleman of this city, Mr. James Young, has succeeded in obtaining the illuminating principle of coal gas either in a solid or liquid state; and it has proved to be a substance of immense value for the lubrication of machinery, vast quantities of it being now manufactured and sold for that purpose.

I hardly know whether it is strictly in connexion with the advance of chemical knowledge that I ought to remind you of one great discovery made long after we last assembled here;—I refer to the discovery of the effects of chloroform on the animal system; one which claims for my friend Dr. Simpson of