

board go to each subboard, and twelve subsidiary circuits leave it. In the main electrical laboratories there are five of these subcircuits, and to avoid magnetic action concentric wiring has been used in the section. Each board is fitted with a voltmeter, so that the voltage can be tested before connection is made with any instruments. Thus the electrical equipment, so far as it goes, is unusually complete. It should be noted, however, that provision is still required for alternating current supply and for voltages above 110 volts. Arrangements have been made by which the experimental battery can be put on to the lighting circuit, or run in series with the lighting battery to get 220 volts, but it is not anticipated that this will often be done. As soon as funds permit, the outfit will need supplementing in this respect.

It will appear from the above that there is much to be done before the Laboratory can be called complete; still, for many branches of its work it has the means to start, and its success in these will lead to increased opportunities for development.

#### THE SCENERY OF ENGLAND.<sup>1</sup>

IT is curious to reflect on the history of man's inquiry into the origin of the landscapes among which he has lived for so many thousand years, and to find how recent is his intelligent interest in the subject. Within

secrets of the rocks below the surface and thus reconstructing the geography and scenery of the successive eras of the geological past, only meagre attention was given to the causes which had brought about the existing features of that surface. The popular notion that everything remained as it had been from the beginning was known to be untenable and absurd; nevertheless, the subject failed to excite the interest of geologists as a body. Some of them were Wernerian Tories, others Plutonist conservatives or Uniformitarian liberals; but whatever might be their geological creed, they were for the most part Gallios in this matter, never caring to set themselves seriously to consider how their familiar hills and valleys were in detail to be accounted for.

Yet the way had been shown to them generations before. It had been opened up by Lazzaro Moro and Generelli in Italy; by Ray and afterwards by Hutton and Playfair in this country; and by Guettard and Desmarest in France. Living on an island and accustomed to continual tales of the destruction wrought by the sea on the margin of the land, British geologists, largely influenced in later years by Lyell, had come to look upon the sea as the prime agent in the degradation of the terrestrial surface. They had no theoretical objection to depressing or uplifting the land to any extent that might be desired, in order to account by marine erosion for any particular topographical feature. While admitting the existence of

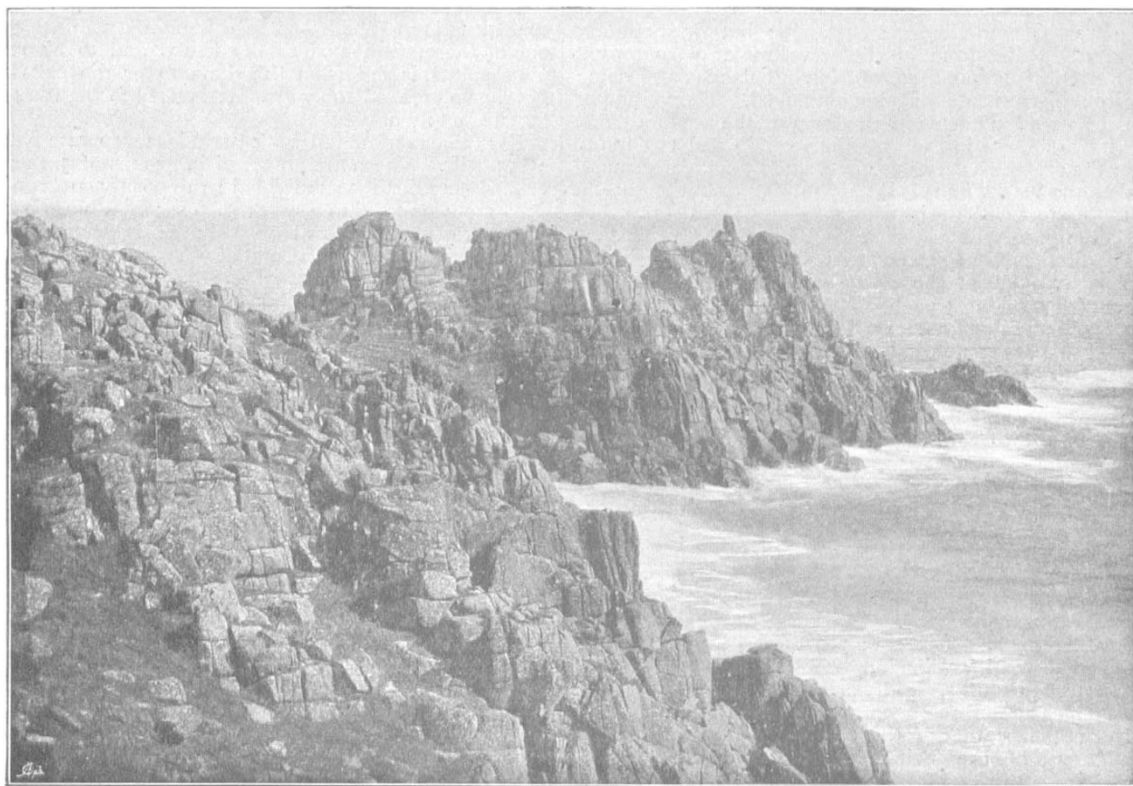


FIG. 1.—Granite Coast, Cornwall.

the memory of many who are still alive and active, the present topography of the land hardly came within the scope of scientific investigation, and while the utmost energy and enthusiasm were displayed in unravelling the

<sup>1</sup> "The Scenery of England and the Causes to which it is Due." By the Right Hon. Lord Avebury. Pp. xxvi + 534. (London: Macmillan and Co., Ltd.) Price 15s. net.

what were called "valleys of denudation," they thought it much more probable that these hollows had been scooped out by violent inundations of the sea, or by ocean currents moving with great velocity over the submerged country, than that they could have been carved out by such seemingly feeble agents as the rivers that flow in them. The admirable demonstration given by Desmarest, as far

back as 1774, that a system of valleys, like that of Auvergne, had been carved out by running water in a series of rocks of varying powers of resistance, including even thick and wide sheets of solid lava, failed to impress the geological mind. The subsequent enforcement of the same lesson from the same region by Poulett Scrope in 1826, and three years afterwards by Lyell and Murchison, likewise roused no general interest. English geologists, while they admitted that such a process of land-sculpture might very well be allowed to have been effective in the heart of a foreign country, far from the sea and high above its level, remained true to their impression that, by invoking convulsions of the solid ground below and sufficiently destructive operations of the sea above, they could satisfactorily explain all that seemed to need explanation in the topography of the land. How deeply rooted this prejudice was is well shown in the memorable paper by Ramsay on the denudation of South Wales and the adjacent English counties, published in 1846. This great classic holds, and deserves to hold, an honoured place in geological literature, as the first concrete attempt to work out in some detail the denudation of a region with reference to its geological structure. Yet at that time, being as marine as the staunchest adherent of the old faith could desire, its author scouted the idea that rivers and streamlets had played any notable part in carving out the valleys of the country. With the naïve remark that "it is not to

for twenty years longer. Their last champion was probably the late Dr. D. Mackintosh, whose "Scenery of England and Wales" appeared in 1869.

But some years before that date the first step in the application of Hutton's teaching to the history of the valleys of this country had been taken by Beete Jukes, who broke new ground and opened the eyes of his brother geologists to the true nature of the problems of topography by the publication of his ever-memorable essay, "On the Mode of Formation of River Valleys in the South of Ireland," which was issued in 1862. The examples cited this time were not from a foreign country, but from our own islands, where they could be judged of and criticised in the light of all that was known of a similar nature in other parts of Britain. The process of time had fitted the soil of the geological mind for the seed, and it soon sprang up and bore fruit. Next year (1863) Ramsay showed in the first edition of his "Physical Geography and Geology of Great Britain" that his old faith was weakened, and that he was prepared to follow his friend and colleague in what was really a return to the Huttonian fold. At that time the Geological Survey was at work on the Weald under Ramsay's supervision, and had to face the problem of its denudation, which had been so often described and discussed and had so complacently been assumed to be a proof of the levelling action of the sea. For the first time in England a tract of country which was geologically mapped in detail was



FIG. 2.—Lower Fall, Aysgarth, Wensleydale, Yorkshire.

be expected that an unaccustomed eye should at first detect all the evidences of the former action of the sea on these lands," he affirmed that "we must either adopt the theory that the great features of the land have resulted from the ordinary action of the sea, or else revert to the hypothesis of great bodies of water violently rushing over the surface." These views continued to prevail

simultaneously subjected to a searching inquiry as to the history of its topographical features. The officers of the staff, after an exhaustive examination of the ground, were led to discard the doctrine of marine erosion and to adopt in its stead that of long-continued subaërial waste. They showed convincingly how this explanation reconciled all parts of the evidence, and how each new



observation advanced and confirmed the deduction that the valleys which diverge from the Weald began to be eroded by the streams that flow in them when the drainage descended from the still existing dome of chalk, and that during the enormous time in which atmospheric degradation has been at work that dome has been completely removed, the rivers gradually sinking to lower levels, but still continuing to flow outward as at first. Ramsay proclaimed his conversion to these views in the second edition of his book, which was issued in 1864. Next year there appeared the detailed essay on the subject by Dr. C. Le Neve Foster and the late Mr. Topley, which established beyond all further doubt the potency of atmospheric decay and river-erosion in the sculpture of the surface of this country.

The Huttonian doctrine, though thus long in gaining acceptance, made rapid progress when once a few enthusiastic workers, drawn under the spell of its attractiveness, began to apply it to the interpretation of all parts of the British Isles. In England and Wales, in Scotland and in Ireland, it gained every year an increasing number of followers, many of whom, with the usual geological alacrity, have contrived to pile up quite a respectable mass of scientific literature devoted to its discussion and promulgation. This great phalanx of observers and writers on the subject has now to hail as its latest recruit Lord Avebury, who has given another proof of his versatility by a contribution of more than 500 pages to a discussion of the origin of the scenery of England and Wales. Encouraged by the favourable reception accorded to his volume on the "Scenery of Switzerland," he has been led to produce another on that of his own country. Paradoxical as it may seem, it is nevertheless true that the task he set before himself in the preparation of this work was in many respects more difficult than that of the earlier publication. Notwithstanding the complicated structure of the Alps, the story of the origin of their valleys and the sculpture of their great blocks of mountain is on the whole less complicated and obscure than that of the tamer English landscapes. In this country the problems of topography involve questions of higher antiquity and lead the inquiry into a domain where the evidence is less distinct and abundant, and where a larger demand is made for detailed knowledge of the geological structure and history of the ground.

Lord Avebury devotes his earlier chapters to an outline of the geology of the country, and gives a brief account of the various rocks from the oldest to the youngest. In dealing with the scenery, he begins at the coast-line and notes the distinctive characters of our shores with the causes to which their variations are due. With regard to the interior, after some general statements respecting the movements of the terrestrial crust and their effects, he discusses the distribution, structure and origin of the mountains and hills, citing numerous examples from different parts of the country. He then passes on to the consideration of the rivers, dealing first with the general history of a typical river and illustrating his subject by references to the various English and Welsh streams by which the successive features of that history are best displayed. From moving water he naturally turns to the lakes, and picks his way with great skill among the rocks and shoals of that much-debated subject. The influence of the rocks in determining variations in the character of the landscapes is rapidly treated in a single short chapter, which is followed by one that probably gave him as much pleasure to write as any part of the book, for it deals with the downs, wolds, moors and commons which have been so familiar and delightful to him all his life. The next two chapters are not unlikely to have more interest for the unscientific reader than the rest of the volume, seeing that they treat of the connection of certain topographical features with

old systems of land-tenure and methods of agriculture. They show why parish-boundaries run as they do and what causes have often determined the sites of towns. We are led across the country from one interesting historical spot to another, and are finally brought back to London and set to think of the geological reasons that have fixed the position of the chief city of the empire. It might, perhaps, have been better had the book appropriately ended there, but a final chapter is added in which, quitting the scenery and history of the Thames valley, the reader is suddenly plunged into the "nebular theory" and the tetrahedral collapse of the globe.

In his preface the author expresses a hope that the book may prove half as interesting to read as he has found it to write. Every reader must recognise the enthusiasm with which Lord Avebury has followed out his self-imposed task in a field which he had not made specially his own. He has brought together in readable compass a summary of what has been done in the investigation of the history of the scenery of England. Every here and there his narrative glows with the fervour of a true naturalist, as where he describes the shore-life of our coast-line with a minuteness which shows how closely he has observed, and with a breadth that brings the whole scene before us, or where he depicts the charms of the downs, noting their wild flowers one by one, and carrying us with him over their breezy crests, past green barrow and grey standing-stones. His book will doubtless do good service in attracting more general interest to one of the most fascinating branches of geology.

One feature of the volume gives it a special attraction. It is profusely provided with illustrations from photographs of English scenery, chiefly selected from the great collection which is gradually being gathered together by a committee of the British Association. We give two of them in this article, by way of examples (Figs. 1 and 2). Most of them have never before been published. But, beside the charm of novelty, they possess the still greater merit of having been taken, either by geologists or others, for the express purpose of preserving a record of interesting geological features. Those chosen for this volume have been excellently reproduced, and the printing of them is perhaps as near perfection as can be secured for illustrations that are printed with the general body of the type. The name of Messrs. Clark is a sufficient voucher for the beauty of the typography. But how did their reader or pressman allow the map (Fig. 183) to appear upside down?

Lord Avebury has not adopted the topographical nomenclature which our cousins on the other side of the Atlantic have devised and seem to be so proud of. Like other writers in this country, he has been able to treat his subject in plain English words, without recourse to a set of uncouth terms which are as unnecessary as they are undesirable.

The history of the landscapes of England, notwithstanding all that has been published on the subject, still presents many difficult problems for solution. Though Ramsay in his later papers so ably led the way, one great cause of stumbling to many of the workers in this field of inquiry still arises from their inability to realise the vastness of the denudation of the country within Tertiary and recent times. They shrink from the boldness of covering hundreds and thousands of square miles of ground with formations of considerable thickness, every vestige of which has disappeared. Yet it is only by conceding the former existence of such formations that they can possibly explain the present topography of the country and lines of drainage. The mere existence of an area of Palæozoic formations at the surface, especially, too, where it forms high land, ought to be regarded as in itself a proof that, for a vast period of time and until a comparatively late date, that area must have lain under a covering of later rocks. It was over this vanished

covering that the present drainage system began to be traced, and the channels originally chosen by the streams that first flowed over it still, on the whole, keep to the same courses, though they have now cut their way down into the older rocks. The most helpful line of investigation that can at present be pursued in this subject is to be found in the search for actual or probable evidence of the extent of the denuded formations. The recent discovery by the Geological Survey of masses of Rhætic, Liassic and Chalk strata in a Tertiary volcanic vent in the Isle of Arran, which proves the former extension of these formations into the west of Scotland, is an example of the unexpected way in which the most important evidence may at any moment be discovered. But even if no such evidence should be forthcoming, it is impossible to contemplate the prodigious denudation of the country even among solid massive rocks like the lavas of the west of Scotland without the profound conviction that since Tertiary time hundreds of feet of rock have been removed from the surface, and that it is impossible to comprehend the history of our landscapes without taking this momentous fact into account.

*THE ROYAL SOCIETY AND THE PROPOSED  
BRITISH ACADEMY.*

THE following letter on this subject appeared in the *Times* of March 20 :—

*To the Editor of the TIMES.*

SIR,—In the references which have been recently made to the early history of the Royal Society, the charters of King Charles II. have frequently been remarked upon, and also the subject-matter of the communications published by the *Philosophical Transactions* from time to time. It has been conceded by many who have given attention to the matter that the charters of King Charles II. intended that the then newly-founded Society should take cognisance, not only of observational and experimental science, but also of those philosophical, historical and philological subjects for which, on the ground that they lack representation to-day, King Edward VII. has been petitioned to grant a charter enabling some new body to look after their interests. It has also been conceded that the early practice of the Royal Society was in accordance with the suggested intention referred to above, so far as the communications made to it enable us to form a judgment.

In a previous letter on this subject, which you were good enough to insert in the *Times* of January 29, I pointed out that a committee specially appointed by the Council of the Royal Society to consider the matter had reported, after consultation with high legal authorities, that the inclusion of the subjects within the scope of the Royal Society, for the general organisation of which it is now proposed to found a new Academy, is within the powers conferred on it by the charters of that Society. I venture to give two extracts from the first charter granted by King Charles II. which alone seem to establish this conclusion. If you will permit me, I will reproduce them here :—

Charles II., by the grace of God King of England, Scotland, France and Ireland, Defender of the Faith, &c., to all to whom these present Letters shall come, greeting.

We have long and fully resolved with Ourselves to extend not only the boundaries of the Empire, but also the very arts and sciences. Therefore we look with favour upon all forms of learning, but with particular grace we encourage philosophical studies, especially those which by actual experiment attempt either to shape out a new philosophy or to perfect the old. In order, therefore, that such studies, which have not hitherto been sufficiently brilliant in any part of the world, may shine conspicuously amongst our people, and that at length the whole world of letters may always recognise us not only as the Defender of the Faith, but also as the universal lover and patron of every kind of truth : Know ye, &c.

Of the "Fellows" it is written :—

The more eminently they are distinguished for the study of every kind of learning and good letters, the more ardently they desire to promote the honour, studies and advantage of this Society . . . the more we wish them to be especially deemed fitting and worthy of being admitted into the number of the Fellows of the same Society.

Of course it would have been very much more satisfactory if the committee, instead of enunciating pious and legal opinions as to what the charters enabled the Society to do, as abstractedly as if the Society had never existed, had, seeing that action under the charters had been going on for nearly two centuries and a half, told us what the Society had really done year after year in the matter of choosing men for election into the Society. In this way sure proof could be obtained of the general opinion of what the charters empowered and enjoined the Society to do, not only at the time they were conferred, but at subsequent dates. This course, which obviously is the only satisfactory way of arriving at a conclusion on the questions at issue, was, however, not open to the committee ; for a complete list of the officers, Fellows and foreign members elected in each year from the foundation of the Society was not generally available.

This gap in our knowledge of the actual life of the Society has recently been filled, and we can now learn the kind of work for which the Society considered itself responsible by the men it elected to do it in its early days, and especially by those who were elected to fill the various offices. It will be obvious that a complete inquiry of this nature is a matter involving considerable time and labour ; but in the present state of the question raised by the proposition for a new British Academy it is of such high importance to know the facts that I have not hesitated to try to get at them, however imperfectly ; my inquiry being limited as much as possible, this has been done by passing over all doubtful cases and considering chiefly the first century of the life of the Society, that is from 1663.

The general result of this limited inquiry may be stated as follows :—

I begin with the presidents. Some were appointed on account of their rank, others on account of their contributions to observational or experimental science, among them Wren, Newton, the Earl of Macclesfield, and others. But besides these we have Sir John Hoskins, "a most learned virtuoso as well as a lawyer," according to Evelyn ; Samuel Pepys, of diary fame ; Martin Folkes, an antiquarian "under whom the meetings were more literary than scientific" ; Sir James Burrow, an antiquarian, also a lawyer ; and James West, another antiquarian and collector of coins, and given to "black letter lore." If we pass the first century, we find Sir John Pringle, a learned physician and professor of metaphysics and moral philosophy, elected in 1772, and Davies Gilbert in 1827, who, although addicted to science, was chiefly an antiquarian and historian.

Among the treasurers we find one of the first appointed Abraham Hill, given as much to moral as to natural philosophy ; Roger Gale, an archæologist and numismatist ; and, again passing the first century, Wm. Marsden (1802), an Oriental scholar, and Samuel Lysons (1810), an antiquarian and an artist.

We next come to the secretaries. The most remarkable thing about these officers is that between 1663 and 1765, of the twenty-nine elected no less than sixteen were doctors of divinity, medicine or law ; and, so far as the inquiry has gone, the "Dictionary of National Biography" shows that they were not merely professional men, but scholars first and writers afterwards. The secretary elected in 1776 was Joseph Planta, the librarian of the British Museum ; while in 1812 Humphry Davy was followed by Taylor Combe, an archæologist and numismatist.