With Dr Shaw's
Compliments

ADDRESS

TO THE

ROYAL GEOGRAPHICAL SOCIETY OF LONDON;

DELIVERED

AT THE ANNIVERSARY MEETING

ON THE

23RD MAY, 1853.

PRECEDED BY OBSERVATIONS ON PRESENTING THE ROYAL MEDALS OF THE YEAR.

BY

SIR R. I. MURCHISON, G.C.St.S., D.C.L., M.A., F.R.S.,

MEMBER OF THE ACADEMIES OF ST. PETERSBURG, BERLIN, COPENHAGEN; AND CORR. INST. OF FRANCE, &c.,

PRESIDENT.

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1853.

PRESENTATION

OF THE

GOLD MEDALS

AWARDED TO Mr. FRANCIS GALTON AND COMMANDER E. A. INGLEFIELD, R.N.

The Founders' Medal has been awarded to Mr. Francis Galton, "for having, at his own cost and in furtherance of the expressed desire of this Society, fitted out an expedition to explore the interior of Southern Africa, and for having so successfully conducted it through the country of the Namaqua, the Damara, and the Ovampo (a journey of upwards of 2000 miles), as to enable the Royal Geographical Society to publish a valuable memoir and map in the last volume of the Journal, relating to a country hitherto unknown; the astronomical observations determining the latitude and longitude of places having been accurately made by himself."

Whilst the above paragraph conveys the reasons which induced the Council to make this award, it is gratifying to me to add to it a few words of commendation.* I will not now repeat what I expressed last year, in giving a sketch of Mr. Galton's adventurous journey across that portion of Africa into which he was the first to penetrate. Those comments, which are now published in your Journal, concluded with a reference to certain astronomical observations, whereby the latitude and longitude of many places were determined, and which would, when published, be found, I hoped, worthy of your approbation. These observations having been examined by a committee of our associates, and having been entirely approved, the Council saw in this fact, a special reason why the journey of Mr. Galton should be preferred to all other enterprises now on foot in the interior of Africa; none of which had, as far as we were aware, determined such positions in other tracts of that continent.

Standing alone, therefore, in this respect Mr. Galton had a distinct claim on us above all his African fellow-travellers; and when we add to this consideration, that he had fitted out the expedition at his own expense, in furtherance of our wishes, and had successfully accomplished a most adventurous mission, we willingly offered to him one of our medals to mark our sense of the positive value of researches thus made by an independent English gentleman.

The President then rising, addressed Mr. Galton.—"It is now my pleasing duty to present this tribute of the Royal Geographical Society

* Mr. Galton's animated description of the Damara and Ovampo people, among whom he travelled, and the graphic sketches of his adventures, which have justly procured him the approbation of many readers, have been published since this Address was delivered.

to you, who quitted a happy home, and in the ardour of research, explored at your own cost and under great privations, a region probably never before trod by civilized beings. So long as Britain produces travellers of such spirit, resolution, conduct and accomplishments as you possess, we may be assured that she will lead the way in advancing the bounds of geographical knowledge. Pray receive this Medal as the testimony of the sincere approbation of the Council and Members of the Royal Geographical Society."

Mr. Galton replied :—

"Sir,—In acknowledging your very flattering expressions, and the kind sympathy which this Society has more than once shown towards me, I accept its Medal with the deepest gratitude. I am by it assured that the peculiar difficulties I experienced in travelling through a most inhospitable country are recognised, since you thus highly reward the efforts I made. Mr. Andersson, who was my companion, still remains in Africa, and he will, I trust, extend the limit of our joint explorations."

The President then proceeded to explain the grounds on which the other Medal had been adjudicated. . "The Victoria, or Patrons' Medal, has been (said he) awarded to Commander E. A. Inglefield, R.N., for his very remarkable and successful survey of the coasts of Baffin Bay, Smith Sound, and Jones Sound, in the last summer, during which he threw much new light on the geography of the Arctic regions, and with very limited private means accomplished most important results."

At our last anniversary, it was my painful duty to announce to you that the private expedition of the Isabel screw steamer, which had been prepared mainly through the liberal expenditure of Lady Franklin, and partly by the subscriptions of individuals, could not proceed, as was intended, to Behring Strait. But, even whilst the discourse delivered on that occasion was passing through the press, I had the gratification to announce, that the same stout little vessel having been given by her owners to Commander Inglefield, that gallant officer had undertaken, at his own risk, the enterprise of exploring Baffin Bay, including Jones and Smith Sounds.

This effort, undertaken so late in the season (for it was the 10th of July before the Isabel sailed), was indeed looked upon in scarcely any other light than that of an independent reconnaissance, in which everything was left to the energy and skill of the Commander, who might, it was hoped, turn so appropriate a vessel to some good service, by filling up lacunæ in Arctic discovery, even if he failed in the great object of obtaining any tidings of Franklin and his associates. When inspecting the preparations for the departure of the Isabel, I had strong reason to admire the energy with which Commander Inglefield equipped his vessel, and the ability and skill with which he overcame many difficulties. The survey which he made of the eastern and northern shores of Baffin Bay, in the few weeks at his disposal, is, I believe, the greatest amount of Arctic research ever accomplished in so short a time. It is true that good old Baffin, whose name is imperishably affixed to that great sea, around which he was the first to navi-

gate, defined the outlines of its chief bays and headlands. But much more was required to exhaust the survey, and to bring certain suggestions concerning the fate of Franklin to the test of critical examination, than had been realized by any of the followers of Baffin. First clearing away all doubts respecting the destruction of our missing navigators by the Esquimaux on the east side of the bay, and favoured by a singularly open season, Commander Inglefield surveyed all the headlands and inlets from the Danish settlements to the northward, and judging from the set of the current, as well as from the great length of an opening unnoticed by former explorers, he suggested that in the $77\frac{1}{2}^{\circ}$ of north latitude, Greenland is probably separated from the more southern lands by a continuous strait, and is thus insulated.

Besides delineating the outlines of many masses of land which never before were named, he boldly sailed into the northernmost opening or Smith Sound, into which Baffin only peeped, but which he, Inglefield, so far penetrated, as to determine that a current there prevailed from south to north, thus indicating a communication between Baffin Bay and a great unknown Arctic sea. The determination of this point, which is of the highest importance in respect to all Arctic endeavours, was accompanied by the discovery of lands covered with a green vegetation, a conspicuous island in the distance, and an abundant distribution of animal life in a higher degree of latitude than was ever reached by any navigator in that meridian. Unluckily, a furious storm drove back the little Isabel, and carried her out of the strait far to the south, or assuredly the explorer would have forced on his way, and have endeavoured to reach that "Polynia" or open northern sea, which it is presumed that Belcher may have entered by another channel.

When defeated in that project, see with what skill and energy he employed his remaining days of fair weather. Entering Jones Sound on the west coast of Baffin Bay, he so far trended its banks, and ascertained its current, now an outward one, as to lead him to believe that this so-called 'sound' might be also a *strait*, communicating with a northern sea; thus confirming the views arrived at by similar tests applied to the east and north sides of the great bay. And as the navigable season came rapidly to a close, mark with what good seamanship he got rapidly round through the fast accumulating ice and shoals, with his little-screw, to Beechey Island, and how he put himself in communication with the station of our Arctic squadron.

Let me here advert to one of the deeds of our medallist, for which, in my opinion, the friends of Franklin ought to be sincerely indebted to him. That three of the missing expedition had been buried in Beechey Island was well known, as recorded on their gravestones; but their graves had never been examined. Now, whatever prejudices sailors might have on such a subject, Commander Inglefield, being in a private expedition, resolved to dig down into the frozen ground, for the purpose of ascertaining the condition in which the men had been interred. The opening out of one coffin quite realized the object he had in view, for at six feet beneath the surface, a depth reached only with great difficulty, by penetrating frozen ground as hard as a

rock, a coffin, with the name of Wm. Heartwell, was found in as perfect order as if recently deposited in the churchyard of an English village. Every button and ornament had been neatly arranged, and what was most important, the body, perfectly preserved by the intense cold, exhibited no trace of scurvy, or other malignant disease, but was manifestly that of a person who had died of consumption, a malady to which it was further known that the deceased was prone. The knowledge of this simple fact assures us therefore, that when last at Beechey Island, the Franklin expedition was in perfect order, and ready to traverse the icy barriers the moment weather permitted.

Even in returning home, and in very tempestuous weather, we see how much Commander Inglefield added to our acquaintance with the west coast of Baffin Bay, and I must say, that when he re-appeared among us last autumn, his clear and manly description of what he had done in the brief space of three months, accompanied as it was by charts and very numerous characteristic drawings, produced such an effect upon all geographers, that I felt certain the Council of our Society would crown so brilliant and successful a survey with its highest reward.

Sir Francis Beaufort having offered to receive the medal, the President thus addressed the gallant Admiral :—

"To you, Sir Francis, who are the best possible judge of the merits of an Arctic explorer who has delineated headlands, gulfs and straits, in a manner formerly unknown to us, I have singular satisfaction in handing this Victoria Medal; since your offer to receive it for your friend is the best guarantee we can have that our award is a just one. I feel, indeed, assured that when Commander Inglefield returns from the renewed Arctic Expedition on which he has just sailed, and learns that the veteran and distinguished hydrographer of Her Majesty's Navy has stood sponsor for him on this occasion, he will acknowledge that he has received an honour second only to that of the entire approbation of the Royal Geographical Society."

Admiral Sir Francis Beaufort replied :—

"Sir Roderick,—First thanking you for the gracious and flattering terms in which you have addressed yourself to me, I am desirous of expressing the double pleasure I have had in listening to the masterly panegyric you have bestowed on my gallant friend, and in being made the medium of transmitting to him this high and well-merited honour which has been unanimously awarded to him by our Council—which has been so heartily confirmed by the acclamations of the present numerous meeting of the Society—and which will be warmly ratified by the voice of the nation.

"Sir, the object of these honourable testimonials is not only to reward, but to stimulate; and therefore, in accepting the duty you have conferred on me, I beg permission to add, that strongly as you have sketched out Commander Inglefield's brilliant antecedents, I venture to pledge myself that they will be surpassed by his future conduct."*

* Whilst these pages were passing through the press, Commander Inglefield was elected a Fellow of the Royal Society.

ADDRESS

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ROYAL GEOGRAPHICAL SOCIETY OF LONDON;

Delivered at the Anniversary Meeting on the 23rd May, 1853,

By Sir Roderick Impey Murchison, G.C.St.S.,
D.C.L., M.A., F.R.S.,

MEMBER OF THE ACADEMIES OF ST. PETERSBURG, BERLIN, COPENHAGEN;
AND CORR. INST. OF FRANCE, &c.,

PRESIDENT.

Obituary.

In opening this anniversary discourse, as is usual, with a record of the members we have lost, I first call your attention to the character and labours of that eminent geographer and geologist, my valued friend Leopold von Buch, so unexpectedly taken from us by a typhus fever. For although he had attained the age of 79, M. von Buch was still vigorous in body, and even during the last summer had climbed Alpine heights.

Many of you may recollect with what devotion I spoke of the attainments and qualities of our deceased foreign member, when, in the year 1845, I requested him to receive for his friend and countryman Carl Ritter, the medal which we had adjudicated to that distinguished Prussian geographer. I then expressed the joy I felt, when, as your President, I was enabled to consign to the great geologist of the continent, the medal which the geographers of Britain had adjudicated to their learned foreign contemporary. I dwelt with fervour on researches, geographical as well as geological, by which Von Buch had shed light on many lands, from the remotest parts of Scandinavia to the southernmost corners of Europe—from the Alps to the Canary islands. Alas! this bright spirit has fled, and I am now called upon to place before you some of the leading features of the man.

Born of a noble family, he was educated at Freiberg under Werner, and was the college companion of the illustrious Alexander von Humboldt, his warm friend throughout a long life. Well prepared by a sound education, he began his career early as a geographical traveller; a term as truly applicable to him as to Pallas, de Saussure, and Humboldt. In perusing the works of these great men, the reader at once finds himself in company with master minds, rich in every sort of knowledge of the earth, its subsoil, its products, or its atmosphere. In short, they each of them combine the acquirements of the geographer with those of the geologist, mineralogist, botanist, and naturalist. By organizing in recent times a division of labour among men of science, so as effectually to advance its separate branches, we have, it is true, gained some important steps; but we are painfully reminded, by the loss of Leopold von Buch, that we are now left almost alone with Humboldt, as the last representative of that race of philosophical generalizers, capable of placing before us in one work all the natural features and contents of a region.

Looking to one of the earliest of Von Buch's works, published fifty-one years ago, and reading his racy descriptions of the forms and heights of the mountains, the quality of the soil and subsoil of various parts of Germany and the Alps; his graphic sketches of the extinct volcanoes of Central France, and of the active operations of Vesuvius, accompanied as they are by the first clear general view of the subsoil of ancient Rome, field-geologists like myself cannot but offer him a sort of hero-worship.

If we pass to another of his early productions—Travels in Norway*—see how pregnant it is with original thoughts on terrestrial physics. It was in this work, for example, that the oscillation of the land of Scandinavia was first pointed out as an actual geographical phenomenon, which explained former geological changes of sea and land. Celsius had, indeed, in the seventeenth century, noticed what he considered to be the retirement or depression of the sea. Linnæus subsequently caused observations to be made respecting it, and Playfair, whilst illustrating the theory of Hutton, had sagaciously suggested, what in the hands of Lyell and modern geologists has become admitted, that the land had risen whilst the sea was stationary. But Leopold von Buch first applied this view after personal observation

* The French edition has a preface by his fellow student at Freiberg, and his valued friend through life, Baron A. von Humboldt, who honoured me with a most touching letter on the death of his associate.—See 'Athenæum' and 'Literary Gazette,' March 12, 1853.

The English edition of 'Travels in Norway' is very scarce.

to a wide northern area, and all that we have since added to that which he then wrote, has been to estimate the amount of rise, and to show that whilst to the north of a certain line the land is undergoing elevation, to the south it is subsiding.

In exploring various parts of the Alps with M. von Buch, I never failed to obtain from him a clear insight into certain great phenomena respecting that chain, which to other men were obscure. Such was the manner in which he explained how the secondary and younger strata had been arranged around large ellipsoidal masses of granite and other eruptive rocks, and the consequent metamorphism of the surrounding strata. Such his definition of certain horizons or zones, which he determined through the aid of their typical fossils. Such his grand generalization respecting the spread of the nummulitic, cretaceous, oolitic, and other formations over various parts of the world.

And here let me say, in reference to the field labours of the geographer, that no explorer of the internal structure of mountains was ever a more perspicuous expounder of their physical forms.

Von Buch's large work on the Canaries, and the magnificent map which accompanies it, as well as his unique map of Teneriffe, both drawn with his own hand, offer results which no geographer could have accomplished who was not at the same time a good geologist and thoroughly master of the whole subject of volcanic action. On this point my lamented friend entertained a conviction in which I fully participate, that to give a proper feeling to his subject, the field topographer only knows half his business if he be not acquainted with the nature of the rocks he surveys. If ignorant of their structure, he may truly be compared to the artist who ventures to paint a great historic picture without an acquaintance with the anatomy and skeleton of the human form.

As therefore it is impossible to separate the sciences of geography and geology, I must say a few words on the methods by which M. von Buch attained his knowledge of rocky regions. Many of you know, that it is only by interrogating nature amidst her most broken outlines, that the real secrets of the internal workings of the earth are to be ascertained. It is by extrusion from within that some of the innermost masses of the crust have been forced to the tops of the hills, and hence it was, that despising the muleteer and horseman, and placing his whole reliance on his own strongly knit frame, Leopold von Buch explored on foot, from its base to its summit, every mountain with which he desired to be acquainted. I have, indeed, accompanied him through Alpine passes, even when he had passed his 75th year, and when exposed to every inclemency of

weather, his only baggage has been a pair of stockings and a shirt, though in his side pocket he invariably carried the best detailed map of the country we were examining, a hammer and compass, and a memorandum book, in which he registered, at rare intervals, a few pithy words in the minutest hand, to which he added graphic sections of the subsoil we had traversed. Carrying thus his baggage on his back (often including fossils which far outweighed all the rest of his equipage) he would march day after day, never tiring, never complaining, always cheerful, though often fasting from the earliest dawn to night fall, when he reached some humble habitation, there to take the chance of his only meal.

Again let me advert to one of the marked characteristics of the man, and say that he possessed a most unrivalled facility in turning his mind to any branch of natural history, by which he saw that his favourite science could be best advanced. Thus, he had almost reached 60 years of age, as a geographer, geologist, and mineralogist, when, perceiving that the real history of the successive ages of its crust could never be ascertained without a searching analysis of its imbedded organic remains, he went, as it were, to school in zoology; only, however, to become in a very few years a master in palæontology or the history of fossil animals. As soon as he had in his possession this master-key of modern geology he succeeded in some of the happiest generalizations. Seated in his well-ordered room at Berlin, and surrounded by choice fossils, sent to him from distant regions, M. von Buch passed the winter months of many of the last years of his life in determining the range of European sedimentary formations through those quarters of the globe, which he had not been able to explore in person.

Hence it was that, without crossing the Niemen, he convinced himself, before I visited Russia with my associate De Verneuil, that the Silurian and older formations, as described in Britain, would be found in that empire and the Ural Mountains. Thus, was it when he aided me in generalizing certain views respecting the wide diffusion of the Nummulitic formation of the Alps and Western Europe into the heart of Asia and Hindostan; and thus his very last work on the spread of the Jurassic rocks over different parts of the world, which he had just printed before he was taken from us, is a masterpiece of broad, general views, as essentially geographical as they are geological.

M. von Buch had one peculiarity to which I must here advert; for whilst this feature was part of his noble nature, and highly creditable to him as a man, it prevented his merits being half as widely known as they

deserve. He constantly published maps and memoirs at considerable cost, without his name; very often indeed not allowing them to be advertised. Hence one of the first duties of his admiring countrymen must be the concentration of all those scattered rays of light.

I must, however, restrain myself in my endeavours to illustrate even the salient points of the scientific character of such a personage, or I might fill a volume. I will, therefore, only now further allude to his benevolence, and that true charity which allows not the left hand to know what the right hand doeth; and on this point, I have no doubt that his biographer will relate abundant anecdotes of his generosity, and particularly of his kind encouragement of young and deserving cultivators of natural knowledge. Suffice it to say that, as during my own life I have never known a more true-hearted man, nor one more distinguished in those pursuits to which I am attached, so do I now sincerely mourn the loss of this illustrious geologist and geographer.

Leopold von Buch was a Member of the Institute of France, and an Honorary Member of the Royal Society of London, and indeed of nearly all the Academies of various countries. His value was duly estimated by his enlightened Sovereign, who not only named him one of his Chamberlains, but also conferred on him the Orders of the Red Eagle and of Merit.*

His Excellency Vice-Admiral Christian Christopher Zahrtmann, another of our Honorary Members, died suddenly on the evening of the 15th of last April, in the 60th year of his age, though apparently hale and vigorous. He was one of the ablest and most accomplished officers in the Danish navy, and being of a sincere and stedfast character, was deservedly held in the highest esteem. He was a Knight Grand Cross of the Royal Danish order of Dannebrog and Dannebrogsman, and of the Russian order of St. Anne; Knight of the French order '*Pour le Mérite Militaire;*' of the Prussian order of the Red Eagle, and of the Greek order of Our Saviour. He was also Master-General of the naval Ordnance, Director of the Chart Depôt, Inspector of the Chronometer Bureau at Copenhagen, and a Chamberlain of his Sovereign.

Entering the Naval service as a cadet in 1805, Zahrtmann served as a lieutenant in many arduous and perilous services during the remaining years of the old war. At the general peace he betook himself entirely to geodesical and hydrographic labours, and was employed in the construction of an arc of the meridian, which was then being measured by

* The posthumous honours paid to Leopold von Buch on his interment at Berlin, together with an eulogium by Professor Cotta, have been recorded in a Memoir published at Berlin since this Address was read.

Professor Schumacher. After a cruise to the West Indies, during which he made a chart of a portion of those seas, and set up an observatory at St. Thomas, he was appointed successor to Admiral Lövernörn as director of the Hydrographic Office. In this capacity, notwithstanding much prejudice respecting the publication of documents, he brought the labours of his department to the highest degree of finish and exactness. The works, so very important to the navigators of all nations, on which his fame rests, are the charts of the coasts of Denmark, with accurate soundings between the numerous islands, accompanied by determinations of the currents and trigonometrical surveys of the coast. His chart of the North Sea (1843) was indeed the greatest boon to all seamen, and to those of Britain in particular; whilst the Danske Lods, 'Danish Pilot,' which is a complete description of all the seas surrounding Denmark, has been found so useful as to have been translated, under the direction of Admiral Sir F. Beaufort, both into English and French.*

The funeral of Zahrtmann, which took place on the 24th ult., was attended by His Royal Highness the Hereditary Prince of Denmark and the other Royal Princes; also by all the ministers and the corps diplomatique, and a large number of naval and military officers and civilians. Some eulogistic stanzas upon the deceased admiral have been circulated, evidently written by one who knew him well; and as they are signed "S. B.," the author, we may conclude, is the worthy and scientific Rear-Admiral Steen Bille, minister of marine, who so ably commanded the 'Galathea' corvette on her late voyage round the world.

Among the deaths of foreign geographers I also regret to record that of General Don Joaquim Acosta, one of our corresponding members, who has done good service to his country and to our science. He is known particularly from his map of New Granada, in which the positions of more than 1000 places are fixed which were not given in any former map. He is also the author of an historical account of the Discovery and Colonization of New Granada in the 16th century, and of various valuable papers in the 'Seminario de Bogotá,' reprinted at Paris, containing some interesting information on the geography of the *ci-devant* vice-royalty of New Granada. After passing some time in Europe, including a visit to this country, he had returned to his own country, to undertake a survey of the snowy and almost unknown mountain group of St. Martha, and has bequeathed to the state of New

* A portion of the 2nd edition, lately published by the Hydrographic Office, was translated by Dr. Shaw.

Granada a vast mass of valuable documents, which there seems every desire to make available for the instruction of his countrymen. In this way the name of General Acosta may be rendered as memorable in our day as that of his famous namesake in the 16th century, the Father Joseph Acosta who gave to the world the first graphic sketch of South America in his 'Natural and Moral History of the Indies.'*

At the head of the deceased British Geographers of the past year, unquestionably stands Major-General Colby. Born in 1784, and son of Major Colby, of the Royal Marines, he passed through the Academy at Woolwich, was appointed to the Royal Engineers in 1801, and in the following year was attached to the trigonometrical survey at the special request of Capt. Mudge its director, who selected him on account of his superior mathematical qualifications. In 1803, when on a tour of inspection in Cornwall, the accidental bursting of a pistol so shattered one hand, that amputation of it was necessary, whilst a portion of the barrel fractured his forehead. But this misfortune had no permanent influence on his future career; for with the remaining hand he became a remarkably accurate observer and manipulator. He successfully served as Lieutenant, Captain, Major, Lieut-colonel, and Colonel to 1847, during a period of forty-five years, only then quitting the survey—unfortunately for the public interests—on having attained the rank of Major-general. He died at Liverpool, on the 9th of October last, leaving a widow and seven children to deplore their loss; lamented also by a large circle of friends to whom he was endeared by his ability, zeal, and singleness of heart.

The earlier years of Colby were, of course, passed in carrying out the views of Generals Roy and Mudge, in doing which, he singularly distinguished himself in his surveys of the Highlands. Being appointed Superintendent, on the death of Mudge in 1820, he continued the construction and engraving of the ordnance maps of England and Wales, on the scale of one inch to a mile, or $\frac{1}{63360}$. But in 1824, the House of Commons recommended a survey of Ireland in more copious detail, so as to form the basis of a valuation of the country, and of a revised system of local taxation and townland registration. The Duke of Wellington, then Master-General of the Ordnance, at once confided the execution of this great mensuration to Colby; thereby affording him a crucial opportunity for displaying that union of energy, resource and judgment, which characterised him. Indeed, the

* This admirable work of old Father Acosta, of which there is a very rare English edition, 1604, will I hope soon be printed by the Hakluyt Society, under the editorship of Lord Ellesmere.

Irish Survey was completely successful in its object, and may be justly deemed the great work of his life. A large portion of the force of the ordnance surveyors had been then transferred to Ireland; but still the great difficulty at the outset consisted in the want of an adequate number of trained assistants. This Colby remedied by the employment of non-commissioned officers, privates, and even of native peasants, at one period amounting to 2,000 in number. In all this his self-reliance was conspicuous, though ably supported by those energetic and skilful officers, the younger Mudge, Robe, Drummond, Portlock, Larcom, Yolland, Murphy, James, and others. By these means the survey advanced with unprecedented celerity, and the details were not only such as were required, but were also found to answer the wants of the geologist, statist and archæologist. The field-work was rapidly followed by the publication of sheets, on the scale of six inches to a mile, $=\frac{1}{10560}$; and the diligence of execution may be estimated by the fact, that between 1833 and 1847, the number of such sheets issued to the public amounted to 1939. For the advances and improvements which were successfully introduced into geodesical operations during this great undertaking, I must refer my hearers to the account of the Ordnance Survey of the County of Londonderry, 1837; Colonel Portlock's Report of the Geology of Londonderry and parts of Tyrone and Fermanagh, 1843; the account of the Measurement of the Loch Foyle Base, published by order of the Board of Ordnance, in 1847; and Captain Yolland's recent volume of observations made with the Zenith Sector. I have before expressed my own opinion that although the publication of this six-inch survey was statistically useful in Ireland, it is a scale to which geographers cannot refer for general purposes, and is not in reality what we call a map; but to any objections of this sort Colby and his associates are in no degree amenable, for they admirably performed their duty in giving to the Government the means of administration which were required of them, and thus laid the foundation for a future compendious map, which has been commenced.

Quite irrespective, however, of a future general map (for none has yet appeared), the Irish survey had prominent merits. Among these may be mentioned its remarkable accuracy of operation, the linear results it afforded of terrestrial measurements on a rigorous comparison with those obtained from astronomical determinations, thus furnishing interesting conclusions respecting the important and delicate co-efficient for the compression of the earth; and even giving rise to the supposition of a change in the direction of gravity from differences in the density of

terrene components. Nor can we overlook Colby's novel and comprehensive method of arriving at a datum of altitude for the heights inserted in his survey sheets, by causing a complete series of tidal observations to be simultaneously made at twenty-two different stations round Ireland ; from these, he not only derived the desired zero, but also made the operation contribute to improvements in the theory of the tides, by the extent and conformity of the plan.

Besides the system of contouring, which was introduced under his direction by Captain, now Major Larcom, General Colby was the originator of many new and useful instruments and contrivances in his department, which cannot be here mentioned, but for an account of which I refer to a memoir of his life, just printed by a friend and coadjutor. In that memoir, which also clearly traces the progress of the Ordnance Survey, Colonel Portlock merits our best thanks for describing the peculiar merits of a chief, whose modesty and dislike of anything approaching to ostentation, prevented his doing literary justice to himself and his associates, in having triumphed in our hazy climate, and on the summits of our highest mountains, over many difficulties of observation. From that record, those not so well acquainted with him as myself, will gain a just appreciation, not only of his solid acquirements, but also of the indomitable zeal of the man who did so much and said so little of his deeds. As geographers, we must admire the example he set (himself a worthy successor of General Roy) to all under his command, and the manner in which he inspired that school of eminent men whom he has bequeathed to us, with the true love of physical features, which made them forget all labour and distance, in following him for hundreds of miles on foot and over rugged precipices, to catch a fair glance with the telescope from some lofty summit. The graphic short diary of one of his subaltern officers, now Lieut.-Colonel Dawson, as given in this memoir, and describing a scientific march in the Highlands of 586 miles, brings out to the life the characteristic features of this pattern of a British Engineer.

At the time of his death, General Colby was a Fellow of the Royal Societies of London and Edinburgh, and of the Astronomical and Geological Societies ; he was also a Member of the Institution of Civil Engineers of the Royal Irish Academy ; and was one of our original Members. He also received the degree of LL.D. from the University of Aberdeen, and was a Knight of the Danish Order of Dannebrog.*

* From 1841 to 1846, both years inclusive.

Colonel Jaekson, who died on the 16th of Mareh, in the sixty-third year of his age, devoted many of the best years of his life to advanee our seienee, and was for six years the methodical and diligent Seeretary of this Soeiety. In early life, he entered the military serviee of the East India Company, whieh he quitted at a period when our eastern possessions afforded mueh fewer ineitements to young soldiers than the eontinent of Europe. At that time, when the world was resounding with the fame of Wellington, and the exploits of his Peninsular soldiers, our deeeased member returning home, made an effort to obtain serviee in the British army, but the obstaeles were insurmountable. Soon after, however, when England was visited by the allied Sovereigns (1814), he, in eommon with many young Englishmen who had no other military eareer open to them, offered his serviees to our ally, the Emperor Alexander of Russia, and they were aeeepted. In that serviee he rose to the rank of Colonel of the Staff Corps, and on his retirement from it, obtained, from the then Imperial Minister of Finanee, Count de Canerine, the seientific appointment of Correspondent and Commissioner in London for the Department of Manufaetures, through the emoluments of whieh, and his income as our Seeretary, he was enabled, for many years, ereditably to support his wife and family. But shortly after he retired from his duties as our Seeretary, another gentleman was most unexpeetedly appointed to the post whieh he had long held, and thus he was suddenly redueed to distress, and eompelled to retire from the Geographical Soeiety.

Painfully aware of this fact, I no sooner mentioned it to the Marquis of Lansdowne, than seeing how well qualified Colonel Jackson was to fill an offiee in the Board of Edueation, that benevolent and gifted nobleman, then at the head of the department, named him to a elerkship, whieh he held to the day of his death.

Let me here, also, do justiee to the Sovereign whom Colonel Jaekson had formerly served. For when deprived of all means of subsistenee save the employment of his pen, he wrote direetly to the Emperor Nieholas, and His Imperial Majesty direeted that a small pension should be settled on him. I have farther the satisfaetion to state, that by the same Imperial kindness, the half of this annuity has, on a representation, been eontinued for the use of his widow. I indite these sentiments with the feeling of a soldier, old enough to reeolleet the good fellowship with whieh Russians and English served together, at the time when our late Seeretary entered the Imperial army, and with the reeollection that from the days of Peter the

Great, my countrymen have often proved some of the brightest ornaments in that service by land and by sea.

Colonel Jackson published many works which will be creditably remembered, and all indicating great industry, research, and precision of thought. His 'What to Observe,' which was first brought out in French in the year 1834, under the title of 'Aide Mémoire du Voyageur,'* is most useful in giving to the young traveller a true geographical foundation, both by pointing out his duties and by teaching him how to make observations, even when ill-provided with instruments, or when checked by physical difficulties; whilst it further incites him to acquire knowledge in every department of natural history, laws, customs, arts and sciences, including those military statistics which bear upon the country under survey. In this publication, as in every action of his life, Colonel Jackson worked out his data with that accuracy which was worthy of his military education, and of which he has left many proofs. Including contributions to periodicals, he was also the author of a vast number of memoirs and notices, chiefly relating to physical science and geography. Such, for example, were several contributions to the 'Bibliothèque Universelle de Genève,' in the years 1830 and 1831, on the Colours of Water, the Atmosphere, and Transparent Bodies, and on the Nature of Salt Lakes. Such also were his Observations on Lakes, and the Causes of their Formation and Diminution, published in London, 1833, and followed by an article in our Journal † on the 'Siches' of Lakes. His other memoirs in our volumes are on Geographical Arrangement and Nomenclature; on the Congelation of the Neva; on Picturesque Descriptions; a translation of Weitz on Ground Ice; a review of Kupffer's Meteorological Observations; a review of Darwin's Coral Reefs: these were followed by an index to the ten first volumes of our Transactions,—all written with his own hand, and of which I find the record that it cost him the labour of 255 days, at five hours per diem!

He afterwards published a pamphlet on National Education, another in illustration of this Society and its labours; a glossary of geographical terms;‡ a work on Minerals and their uses; a memoir on Cartography; § an essay on the importance of Military Geography; ‖ and, lastly, the Military Topography of Europe, edited from the French of Lavallée, but which, in the hands of the deceased, became almost a new work.

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* This work, begun in 1822, was published at Paris. The 'What to Observe,' or the enlarged English edition of the same, was printed in London. Madden, 1841.

† Vol. iii. p. 171. ‡ Johnston, Edinb. 1848. § Parker, Strand.

‖ Parker and Co., Military Library, Whitehall.

In addition to these publications, and many contributions to societies in Paris and St. Petersburg, Colonel Jackson had, long before the retirement of our former excellent secretary, Captain Washington, shown himself to be thoroughly qualified to classify geographical labours, by suggestions concerning the arrangement of our maps and charts; and if ever the Government should be pleased to make the Royal Geographical Society what I have long urged, the real "Map-office of the nation," the system proposed by Colonel Jackson will, I think, materially contribute to the establishment of order and perspicuity in that which will, I trust, become a national establishment. In 1845 he was elected a Fellow of the Royal Society, and so continued to the year of his death. He was also a Member or Corresponding Member of various Foreign Scientific bodies, and a Knight of the second class of the Russian Order of St. Stanislaus.

The late George Dollond,—a Fellow of the Royal and Astronomical Societies, and one of our original Members,—was well known to many of those whom I am now addressing, both for his character as an honourable man, and for his reputation as an efficient mechanician. He was born in London, on the 25th of January, 1774, and was brought up by his maternal uncle, the eminent optician, Peter Dollond, whose name he afterwards assumed; his own name having been Huggins. From the year 1805 until his death, on the 13th of May, 1852, Mr. Dollond maintained his position with ability and punctuality, inasmuch, that in the course of his career, he was honoured with the personal friendship of many of the most illustrious philosophers of the age.

The various instruments constructed by Dollond for practice in geodesy, navigation, astronomy, and every branch of philosophical inquiry, were remarkable for accuracy of principle, skilful graduation, and excellent workmanship. Those made for the fixed observatories of Cambridge, Madras, and Travancore, as well as those for the private establishments of the Rev. Mr. Dawes, Captain W. H. Smyth,* Lord Wrottesley, and Mr. Bishop, all and severally did good work, and met with deserved approbation. But as it is unnecessary here to enumerate the many works by which he maintained the celebrity of his name, I will conclude by mentioning his last, the Atmospheric Recorder, which, I have no doubt, most of you examined at the Great Exhibition of 1851. This was the epithet which he applied to a self-registering apparatus

* My distinguished predecessor has become Rear-Admiral Smyth whilst these pages are going through the press. His great work on the Mediterranean will soon be issued to the public.

for simultaneously recording the varying pressure of the atmosphere, the changes of temperature and evaporation, electrical phenomena, fall of rain, and force and direction of the wind. For this very ingenious, and all but portable instrument, which registers all these changes during any period of time, according to the length of the paper used on the roller, Mr. Dollond obtained the reward of the Council Medal of that Exhibition; and this clever arrangement was the closing effort of his long and well-spent life.

Captain Granville Loch, who was killed in the endeavour to storm the fastness of a Burmese robber-chieftain, in the last campaign of the Irawaddy, in the 40th year of his age, was the second son of my old friend Mr. James Loch, during many former years and still the highly useful representative of the Northern Burghs in Parliament. Serving in early life in the Mediterranean, Atlantic, Pacific, Indian, and Baltic Seas, and in various ships, young Loch obtained his lieutenancy in 1833 and the rank of commander in 1837, or at the early age of 24. On coming home from the Mediterranean to receive that step, his youthful appearance so surprised the clerk in office, that he hesitated in issuing the warrant, saying "it was usual for the officer himself to come for the commission." Carrying out despatches for the Admiral in the Pacific, in the 'Fly' gun-brig, he rode across the Pampas from Buenos Ayres to Valparaiso; not, however, before he had failed in a first effort to do so, from being attacked and pursued back to Buenos Ayres by wild Indians. After other services, including the command of the 'Vesuvius' steam-frigate, he was made post-captain in 1840, and during the following year served as a volunteer in the Chinese War, an account of which he published, in an instructive and lively narrative, entitled 'Events in China.' Subsequently, after commanding the 'Alarm,' in the West Indies, he conducted, in 1846, an expedition up the river San Juan de Nicaragua, to repress the aggressions of the Nicaraguans on our ally the young King of the Mosquito Indians; and though the sailors and soldiers under his orders suffered excessive privation, from want of food and incessant rains whilst in open boats, he accomplished his mission successfully. Here it was that Captain Loch showed his geographical spirit; for, when lying in the Lake of Nicaragua, he made soundings of that sheet of water and its affluents, and prepared a chart exhibiting the general features of their navigation, which was sent by him to our Society.

For these last services Captain Loch was made a Companion of the Bath. In 1852 he was appointed to the 'Winchester,' 50, and proceeded to the East India station, and, as we all know, was one of the

most successful of our naval heroes in clearing the river Irawaddy, and in capturing the forts on its banks.

The same daring spirit, which was his characteristic, and had hitherto ensured success, led him unfortunately into the ambush, in which he received a mortal wound, after cheering on his men to force an impervious thicket ; and thus, alas ! were we deprived of a noble fellow in the flower of his age, and endowed with all the vigour, as well as the ability, to vindicate our country's honour in the day of need. Let me add that Captain Granville Loch was as much beloved for his agreeable manners and fine temper, as he was admired for his professional skill and gallantry.

The other Members of our body who have departed this life are:— Captain Wentworth Buller, R.N.; Mr. James Ewing ; Captain Leslie Lewis, R.E., F.R.S. ; Mr. Alexander Mackenzie ; Sir I. H. Pelly, Bart., Governor of the Hudson's Bay Company ; Lord Skelmersdale ; Sir F. B. Watson, F.R.S., and Mr. George Wilbraham, F.R.S.

Arctic Discovery and continued Search after Franklin.

At our last anniversary it was my duty to give you a sketch, however imperfect, of some of the chief features in Arctic discovery since the time when my honoured friend Franklin left our shores. Advocating in no stinted measure the employment of national resources for this humane end, I rejoiced in announcing the departure of the expedition under Belcher and Kellet ; and before the discourse was printed, I had the gratification of also adverting to the sailing of the little 'Isabel' under Inglefield. The brilliant success which attended the latter enterprise has been already adverted to in awarding to its commander the Victoria medal ; but of the progress of the great expedition we as yet know little more than the news brought home to us last year.

The speculations of geographers and seamen have indeed been again roused to consider the route which the absent mariners may have taken. In a recent article of the Quarterly Review an opinion which had been to a great extent set aside is renewed. It is there suggested that, in obeying his orders, Franklin must have sailed from Beechey Island to the west and by south, and not to the north and west through Wellington Channel. Fortunately, there are now so many expeditions afloat and acting in such different directions, that if the ultimate rescue of some at least of our countrymen should not be effected, we still may presume, that we shall at length positively ascertain the direction which was followed by Franklin after he left Beechey Island.

Unshaken by opposing arguments, I still believe that Franklin, finding himself unable to force his way to the west, seized just such an opportunity of thaw and dislocation of the ice as that by which Belcher profited last year, and steered either through the Wellington Strait or some other opening (possibly one of those straits indicated by Inglefield), in the hope of finding a northern and comparatively open polar sea. Every experiment which has been made has indicated, what few geographers indeed could doubt, that vast accumulations of ice exist along the northern shores of the great American continent and its adjacent numerous islands. The range of the lines of greatest cold dependent on much prevalence of land in those latitudes necessarily leads us to this inference; and observation, as far as it goes, has confirmed it.

The exploration of Rae, which last year you honoured with your highest reward, went far to satisfy my mind, that no ship expedition ever could have approached to, or still less have trended, the real shores of North America and its islands. Again, the very remarkable land journey of the bold and enterprising navigator Kennedy and his spirited companion Lieutenant Bellot* of the French navy, of which we had a very interesting account at our first meeting of this session, established in a conclusive manner that, as the narrow strait, so worthily named after the French officer, was the only opening into the sea, between North Somerset and the Prince of Wales Land of Ommaney, so was it hopeless to search for the missing expedition in such latitudes. The work by Mr. Kennedy, since published, and which every one will peruse with profit, leaves, indeed, no doubt on this part of the subject. The renewed exertions of Rae, who is now again employed by the Hudson's Bay Company, to travel perchance a few more thousand miles in snow shoes, will still more effectively set this question at rest, and complete our acquaintance with the few remaining parts of the North American geography, of which we have not yet a correct knowledge.

Now, if the ice in these parallels be so agglomerated and packed along the edges of such great masses of land, by what agency is it to be removed? The Mackenzie and the Copper-Mine Rivers are but feeble streams when compared with the Ob, the Lena, the Jenessei—

* Lieut. Bellot, who with the permission of his Government rejoined our Arctic Survey, has just sailed with Capt. Inglefield, in the 'Phœnix,' for Beechey Island. It is to be hoped that this officer, who has won golden opinions among our seamen, for his courage, ability, and good conduct, may, on his return, be employed as a surveyor of the French Imperial Marine; for, as it is well known, that the present Emperor of the French takes a lively interest in Arctic researches, we may hope that Lieut. Bellot will be promoted to the command of a French vessel in the same great cause of humanity, in which he has already so distinguished himself.

those grand Siberian rivers, which, with their enormous volumes of water rend asunder the vast quantities of ice which are packed along the north shores of Asia, and by their débâcle and currents transfer large portions of them to the coast of Greenland.

In the absence therefore of adequate causes of dislocation and transport (and the small effect of the North American rivers is already known), what reason have we to lead us to infer, that along the widely spread north-western shore of America, there are any practicable passages amidst its archipelago of large islands? Looking to Wellington Channel, as explored by Penny * and the American De Haven, as well as to the supposed straits in Baffin Bay which are noted by Inglefield as having currents that proceed from a Polar Sea, are we not also informed that the distribution and great quantity of life indicates a vast and comparatively open sea to the north? Is this not indicated indeed by the positive observation of Parry's explorations to latitude 82°? Have we not, in the quantities of whales which come southwards under the ice through Wellington Channel, undeniable proof that there must be a vast proportion of smaller animals on which the huge mammalia feed? and if so, must there not be open seas towards the north pole? This natural-history testimony on the one hand, and the fact of an ice-bound American continent void of all self-extricating agency (like Siberia) on the other, seem to me almost decisive of this part of the question.

I have therefore little doubt, that were the father of all these expeditions, Sir John Barrow, now alive, and cognizant of what we know of the geography and products of these regions, he would himself counsel the experiment of steering through Wellington Channel, or some such strait, whereby the navigators could free themselves from the impenetrable ice which accompanies all extensive masses of Arctic lands. And if Franklin did so, why, I repeat,† may not the two ships which were seen floating southwards on an iceberg, have been the Erebus and Terror, which, when abandoned, had made a voyage around the eastern shores of Greenland without crews, rudder, or compass?

But passing from this hypothesis, the opinion, which is entertained

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* The work of Dr. Sutherland, or the 'Journal of Capt. Penny's Voyage to Wellington Channel,' which has appeared since the last anniversary, is an admirable addition to the publications on Arctic researches, from its simple and clear style, and very graphic descriptions of many important subjects in natural history. As Dr. Sutherland is about to visit Port Natal, and this Society has furnished him with several costly instruments, we may anticipate much instruction from the observations of so good a naturalist in that very interesting tract of South Africa.

† See Address of last year.

by most persons entitled to respect, is, that after all due attempts to execute his orders by steering westwards, (a point, I admit, to which he would first sedulously attend,) Franklin, not finding an exit in that direction, seized the first opportunity presented to him, and forced his way through some one of the channels leading to the north. God grant that, by pursuing a similar course, Belcher may obtain tidings of the expedition, and that some of our absent mariners may still be in existence on an island surrounded by a polar sea, where their vessels being lost and the means of constructing boats denied them, they have ever since been prisoners! This is the brightest side of the picture which we can present to our mind's eye. For, if the expedition passed westwards into a region where it must soon have been bound up in ice at no great distance from the continent, why should we not have before now found some remnants of the crews, who in such case might have escaped to the northern shores of America, or have been heard of through the efforts of Richardson, Rae, and Kennedy, who have explored in that direction?

Whatever may be the fate of the courageous McClure, who pushed in boldly, as we know, to the north-east from Behring Strait, and however we must pray that this adventurous seaman may be met with by his excellent brother officer Kellett, to the west of Melville island, let us rejoice that the little 'Isabel' is at last, through the continued exertions of Lady Franklin (aided chiefly, as I shall presently explain, by the excellent inhabitants of Van Diemen's land), about to be sent in that direction which several members of this Society think is the right one, and to accomplish the very object, indeed, for which many of us subscribed.

Commanded by the fearless Kennedy, may this good vessel yet accomplish all that we desire! For, although our Admiralty has not thought fit to employ any vessel provided with a screw in the direction of Behring Strait, we ourselves feel assured, from all that Captain Kellett and the Russian navigators have told us, that by such appliances it is most likely that a vessel can twist and wend its way through tortuous, narrow lanes of water, and force itself through the countless packs and masses of ice, which encumber the Asiatic and American continents.

That a compact screw steam-vessel can best accomplish such navigation is indeed too manifest to be dwelt upon. The sailing-ship once ice-bound becomes an inert mass, which can alone be extricated by some great change of weather, or by labours almost superhuman; and once liberated from entanglement, her commander must often be but too anxious to avoid a similar catastrophe. The

screw-ship, on the other hand, if only short and strong, can be turned and conveyed through straits however narrow, and can penetrate through obstacles quite insurmountable by a sailing-vessel, and which, indeed, cannot be satisfactorily overcome by a steamer with side paddles.

The success attending the voyage of a small vessel under old Baffin, and the renewal of a like enterprize under Inglefield, lead me to direct your notice to a highly interesting, reprinted translation of the early Dutch navigators, Barentz and De Veer, to Spitzbergen and Nova Zemla, which has lately been issued by the Hakluyt Society, and which does great credit to its editor Dr. Beke. We see in this work, how steadily the bold Dutch navigators adhered to the idea, that a real passage might be effected to the N. East, by holding a middle course between Spitzbergen and Nova Zemla, as recently revived by M. Petermann.* As an admirer of the prowess and indomitable courage of Barentz, I commend Dr. Beke for reinserting in the map attached to this work, the N. eastern portion of Nova Zemla, which has recently been omitted, and in giving to it the name of the old navigator; whilst with equal justice to the only other explorer of another portion of these frozen lands in our day, he has most appropriately assigned the name of our associate Admiral Lütke.

When we reflect upon the extraordinary discoveries made by the old Dutchmen in such small craft, the difficulties they overcame, and finally, how, after the loss of their ships, they constructed boats in which they worked their way home round headlands for 1700 miles, we may well think of what the small private expedition of the 'Isabel' may still accomplish! But whether it be by greater or smaller ships, and whatever be their equipment and armament, let us rejoice that our Government, seizing the spirit of our most enlightened countrymen, and despising the croakings of those who despond, should have favoured every effort, which to them seems most likely to obtain intelligence of our missing countrymen, by opening out our acquaintance with the inhospitable north. After the example of the rescue of the sailors of Archangel from their six years captivity in Spitzbergen, to which I made ample allusion last year, geographers must never despair, until every legitimate effort shall have been made, of ascertaining the fate of our missing navigators.

In renewing my exhortation to exhaust the Survey, let me conclude

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* M. Petermann prepared for the work a map of the Spitsbergen, or Barentz Sea, in which the outward course of the old navigator in 1594, and his return in two open boats round the north end of Nova Zemla, and by the coasts of Russia and Lapland, is detailed.

these allusions to Arctic discovery, by recording one of the episodes in its history, which redounds highly to the honour of the inhabitants of one of the most distant of our colonies. As a reward for his distinguished Polar services, Franklin was appointed to the government of Van Diemen's Land, where by his conduct he secured the affections and respect of all classes of its inhabitants. That this impression was indelible is now brought out by the fact that, after a lapse of many years, the Senate and other public bodies, as well as popular meetings, have united not only to send addresses to Lady Franklin expressive of their regard for her husband, and admiration of her devotion, but also to accompany them with a substantial sum of money to aid that noble-minded lady in the unparalleled efforts she has made and is still making. Of these addresses I specially cite that which proceeded from the Senate, and is printed at the foot of this page;* for the persons who could thus write and act are entitled to the warmest thanks of every philanthropist.

We cannot but indeed rejoice in such disinterested efforts of humanity, among which the spontaneous and costly endeavours of that truly noble citizen of the United States, our associate Mr. Grinnell, to which I alluded last year, stand conspicuous. It is with sincere

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* *To Lady Franklin.*

Madam,—As the representatives of a country over which Sir John Franklin so long and so worthily presided, we cannot allow our present session to close without conveying to you a public expression of our sympathy for the peculiarly painful situation in which you have been placed with reference to the fate of your husband and his brave companions. Sir John Franklin will long live in the memory of this community, endeared by the many public and private virtues which pre-eminently distinguished him: and we who have had such opportunities of knowing his worth, must deplore, in no ordinary manner, the doubt which hangs over the fate of his enterprize.

We have witnessed with the deepest interest the exertions which have been made, and are still in progress, for the solution of this anxious problem. The noble part which you yourself have taken in maintaining and urging on those exertions is worthy of the character you earned while living amongst us.

While we thus offer you our most sincere condolence under the very distressing anxiety and suspense which you have had to endure, it is our earnest prayer to Almighty God, that through His good providence, the darkness which has so long covered your prospects may yet be dissipated by the restoration of your husband to his family and his country.

Signed in the name and by authority of the Legislative Council of Van Diemen's Land.

(Signed) Richard Day,
Speaker.

Passed the Legislative Council this twenty-third day of September, one thousand eight hundred and fifty-two.

(Signed) F. Hartwell Henslowe,
Clerk of the Council.

gratification that I hear of this benevolent gentleman having again renewed an expedition of search after the missing expedition.

Arctic Whale Fisheries.—Intimately connected as this great and important branch of British commeree is with the Arctic researches which we have been contemplating, it is gratifying to learn that so daring and experienced a navigator amongst the polar seas as Capt. Penny, whose name is so honourably distinguished in Arctic annals, should have been selected as the chief of an expedition which is destined, it is hoped, to realize wealth around the shores of Baffin Bay.

Our attention was, indeed, called to this important subject at the first of our meetings of the last session, and elicited much interesting discussion. In one of the memoirs which were read, Mr. Petermann reinforced the views he had previously expressed of the feasibility of a passage direct from Britain, through the only great opening towards the North Pole, or the Spitzbergen sea, by many well-registered facts. The extraordinary success which has attended the exertions of the whale fishers of the United States, to which Capt. W. Baillie Hamilton called my attention last summer, has naturally roused the energies of many persons in this country, in the hope that the whales which have repaired to the farthest Arctic seas to live there undisturbed may yet be reached by the harpoons of our sailors.

A document communicated to the United States Senate by the Secretary of the Navy, on the 5th of April, 1852, explains clearly the very extraordinary and successful efforts which were only commenced in the year 1848, by the whale-ship 'Superior,' commanded by Capt. Roys, penetrating through Behring Strait into the Arctic Ocean. The success of this intrepid sailor who filled his vessel with oil in a few weeks, gave rise to many imitators, and, in 1849, he was followed by no less than 154 sail of American whale-ships; nearly the same number going out in each of the two succeeding years. When it is estimated that the value of the ships and cargoes during two of these years amounted to no less a sum than 17,412,453 dollars, we cannot be surprised that so lucrative a trade should excite much emulation among British speculators. As geographers, indeed, we must now be anxious to have this important question finally set at rest; *i. e.* whether (as I think, in common with old Barentz, Capt. B. Hamilton, and others) there may not exist a practicable passage to the Arctic Ocean to the east of Spitzbergen; in which case our ships might reach profitable whaling-grounds without the risk of a long voyage to Behring Strait, and the difficult navigation of those seas.

Let us still hope that our own Government will endeavour

to determine this point, so ably urged by Mr. Petermann, who has shown at how little cost, and in how short a time, the query could be answered, and who has also given many valid reasons to induce us to confide in the prospect of success. In the meantime we must offer our best thanks to the naval authorities of the United States, who, in consequence of the loss of many of their merchant-ships from the want of accurate charts, have directed a Survey to establish the position of the chief headlands and shoals around the Fox or Aleutian islands, and the regions contiguous to Behring Strait. And we cannot too cordially approve the following passage in the report of Mr. Graham, the Secretary of the United States Navy:—"No protection that our squadrons, or those of any of the States in Christendom, can at this moment give to our commerce, can compare with that which a good chart of that part of the ocean would afford to this nursery of American seamen, and to this branch of national industry."

Minerals, Glaciers, and Icebergs of Greenland.—Before we take leave of Arctic subjects, let me remind you that, judging from a memoir communicated by M. Lundt, of Denmark, and lately read to our Society by Sir Walter Trevelyan, on the mineral produce of the southern parts of Greenland, we have every reason to think, that valuable ores of copper may be found to extend far to the north of the tracts around Disco, where the minerals in question were observed. Judging from the few rocks submitted to my inspection by Capt. Inglefield, and which were collected in the more northern parallel of 77°, I should infer, from their crystalline character, that a very large portion of this region may prove to be metalliferous, and that industry may there be rewarded with spoils of the land, as well as by catching the whales and seals of the sea.

A memoir of very great merit, on the large continental ice of Greenland, and the origin of the icebergs of the Arctic sea, was sent to us last August (1852) by Dr. H. Rink, of Copenhagen, which is of deep interest to all physical geographers and geologists. Residing for several years in the Danish settlements on the west coast of Greenland, between the parallels of 68° and 74°, this author was the first to give to the public a good account of the mineral structure of the region north and south of Disco in a communication to the Royal Academy of Copenhagen. His memoir upon the ice of the same country, sent to this Society, is of great value in explaining several difficulties respecting superficial appearances, with which the geologist has had to contend. The polished, scratched, and grooved rocks which have been observed in various European countries, and in North America, have been by all

observers referred to some one of the following operations:—to the passage over them of solid or terrestrial glaciers,—to floating icebergs detached from such glaciers, and carrying with them many blocks and pebbles of stone,—to débâcles and currents, often set in motion by the melting* of great glacial masses on the edges of continents, and their translation in a liquid state through estuaries to other shores.

Although some persons may in their ardour have too exclusively advocated one of these methods in preference to the others, the majority of geologists have been willing to take advantage of all these agencies, and even to add another method to them, by supposing that blocks or gravel may have been transported by the breaking up and floating away of raft-ice, formed in fiords or along shores, or in shallow glacial seas.†

As doubtless large portions of our continents were under water when vast erratic blocks transported to great distances by icebergs and deposited on what are now plains of terra firma, so these must have proceeded from ice-clad continents. Among others, I have laboured with my associates to show how all the higher portions of Scandinavia and Lapland constituted a glacial centre in a former icy period, which sent off its stone-bearing ice vessels to what is now the dry land of Germany, then a sea-bottom. Dr. Rink now comes out with a demonstration, that in the present period, all the vast continent of Greenland, as far as is known, is one vast interior of ice, through which the rocks scarcely protrude, and though of no great altitude, is yet sufficiently high in its central parts to afford a slight

* Since this address was read, Commander Inglefield's volume on the voyage of the Isabel in Baffin's Bay has been issued to the public; and in it Dr. Sutherland, the surgeon of the expedition, so creditably known by his description of Penny's explorations, has given us a sketch of the action of ice under various conditions, whether as proceeding from the great central plateau of ice in Greenland, or as acting when detached from the fiords and coasts. It is gratifying to see that this inquiring naturalist should, of his own accord, have come to the same conclusions as Dr. Rink. He has, indeed, added many remarkable data by observations made in much higher latitudes (up to 79½°) than those visited by the Danish author. Among these, the manner in which coast cliffs are striated by avalanches sliding over them, the irregular accumulation of drift-ice, and its change of place, seem to explain, by existing causes, some features of the most recent of our geological phenomena of drift, which it has been most difficult to understand. How much is it to be regretted that such a good observer has not been again sent out with Commander Inglefield! If left in Greenland to the north of the Danish settlements for two or three months, whilst the Phœnix was exploring northwards, he had been enabled to follow out a plan of which he has prepared a sketch, and which I shall soon make public, we might have had results in the ensuing autumn, which alone would have justified an expedition.

† See Russia in Europe and the Ural Mountains, pp. 507 *et seq.*; and a subsequent Memoir, Quart. Jour. Geol. Soc. Lon., 1846, pp. 249 *et seq.*

incline for the general and onward march of the enormous ice-field, until protruding its arms into deep and long lateral fiords, huge bergs are in certain favouring spots broken off from the parent mass, and *calve* (as the Danes term their launch), before they sail away into Davis Strait and southwards.

The glaciers which have been observed in the Alps, Norway, and Himalaya mountains, are separate ice streams, which fill valleys and radiate from certain lofty centres, carrying with them the materials out of which their moraines are formed. And in some of our insular tracts, such as Snowdon and the Cumbrian mountains, we can easily explain how such glaciers must there also have acted from similar centres, and have scratched and polished the shoulders of the valleys as they descended. But, as several authors have observed, and as Mr. Robert Chambers has well shown in a recent memoir,* replete with good new observations on the west coast of the Highlands, there are many lofty tracts in Scotland as well as in Norway and other countries, where the striation seems to be quite independent of the outline of the ground, thus indicating a grand and general movement of ice.

It is to countries which present such phenomena, that the memoir of Dr. Rink forcibly applies; and it leads us to imagine, that there was a period when Scotland, particularly all the Highlands, was analogous to what Greenland is now, and when an icy mantle extended itself from higher plateaux into the fiords or friths on its sides. In this case, doubtless, many of the rocks of the interior would be polished and striated, whilst those on the shores of the friths would also be similarly affected. In other words, the facts observed by Dr. Rink refer to a much vaster field of glacial phenomena than any previously known to naturalists. It is infinitely to be desired that geometers and geologists, like James Forbes and William Hopkins, will further exhaust this subject by explorations from the coast of Greenland into the interior, for the purpose of ascertaining the minimum inclination, on which the great mass advances and thrusts its icebergs into the sea; some of them formed in the centre of a vast continent, and hundreds of years before they are launched; and we have warmly to thank Dr. Rink for opening out an inquiry into the grandest feature of this subject, which has yet been brought under our consideration.†

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* Edin. New Phil. Journal, April, 1853, p. 229.

† When this paper is printed in our volumes, the reader will find in it the distinction drawn between the formation of white ice and blue ice, which also illustrate on a very grand scale some of the phenomena so well described by Professor James Forbes in his work upon the glaciers of the Alps.

Russia.

The vast geodesical operation of the measurement of an arc of the meridian, between Fuglenaes on the north coast of Scandinavia and Ismail on the Danube, to which I last year adverted, has been completed; and we are now in possession of the historical exposé of the labours, by which this gigantic work has been brought about, as drawn up by its chief director, the astronomer Struve.* That eminent man has clearly and succintly explained the part, which various official persons of the Imperial Russian Service have taken in this operation, particularly Lieut.-General Tenner, and he has faithfully recorded the great services rendered by the Swedish and Norwegian astronomers and mathematicians who, under the direction of the enlightened King of Sweden, extended the measurement to the northernmost headlands of Europe.

Up to this period Great Britain has had the merit of having accomplished the largest measurement of an arc—namely, that which was commenced by General Lambton. This measurement, passing through Hindostan, attained at length the colossal dimensions of 21° 21′ 17″, as explained by our distinguished associate Everest, who executing a large portion of it, completed that magnificent work. This is still by far the longest arc, which has ever been executed without the interruption of sea, and on one continuous mass of terra firma, subject to the same government. But, embracing Scandinavia, the Baltic sea, and the provinces to the south of it, the Russian measurement exceeds that of India by nearly four degrees of latitude; its total length being 25° 20′!

It is pleasing to reflect that in the execution of this vast project, the science of Britain has aided that of Russia, Sweden, and Norway; the Indian standard having been confided by the Court of East India Directors to Mr. Struve,† to be compared with the Russian standard at Pulkova.

It is also to be remarked that in this operation the Swedish academicians wisely suggested, that in extending the measurement into Lapland it was highly desirable to take that opportunity of commencing a series of observations, which should give a definite future answer to that interesting question in terrestrial physics, of the amount of progressive

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* 'Exposé Historique, par W. Struve, suivi de deux Rapports de M. Lindhagen sur l'Expedition de Finnmarken et les Opérations de Laponie.'—Acad. Imp. des Sciences. St. Petersburg. 1852.

† Colonel Everest used a 6-inch brass scale as well as an iron bar.

elevation of the northern parts of Sweden, by determining for a series of years the relative altitudes of the Glacial and Baltic seas.

As a member of the Imperial Academy of Sciences, although myself a cultivator of another branch of science, let me then say how much I rejoice, that the present ruler of Russia should have illustrated his reign by this the greatest of all the geographical works, which the combined powers of astronomers, surveyors, and mathematicians have yet accomplished—a work which never could have succeeded if, in his munificent encouragement of astronomy, His Imperial Majesty had not liberally endowed the Observatories of Pulkova and Dorpat, and placed at their head the philosopher who has in his own lifetime realized such a vast result.

The Geographical Society of St. Petersburg has been making good progress under the presidency of H. I. H. the Grand Duke Constantine; and we are duly acquainted with its proceedings* through its executive officers, General de Mouravief and M. de Milutine. One of the most important, in my estimation, of their recent labours is the publication of a map embodying the results of the survey of the sea of Aral by Commander-Captain Butakoff, of the Imperial Navy, and his assistant M. Pospéloff, as prepared by M. de Khanikof mentioned by me last year, and since illustrated by a memoir.

The gallant and intelligent chief of this survey has indeed communicated in a letter to me, which will soon appear in our Journal, an account of the labours undergone by himself and associates, first in conveying a ship built at Orenburg across the steppes to be launched on the sea of Aral. This was followed by the formation of a small arsenal, the construction of another ship, and finally by the complete survey of both shores, and the delineation for the first time of the islands in that sea, the largest of which is now named after the Emperor Nicholas. That this island had not been visited for generations (if ever) by human beings, is manifest from the relation of Captain Butakoff, who states that the antelopes were in no way scared by the sight of the Russians who came among them. Just as the ignorant Mexicans beheld with astonishment, but without fear, the first Spaniards who landed on their shores as creatures of another world, so did these antelopes, the only inhabitants of the isle, approach and gaze at their first invaders.

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* Having just received the bulletin of the Imperial Geographical Society of Russia, of April 30th, 1853, I am gratified to learn that their Constantine medal has been adjudicated to M. Kutorga, for his excellent, new geological map of the government of St. Petersburg.

The light which had previously been thrown on the nature of this region was confined to a partial acquaintance with its rocks and botanical characters; and whilst our knowledge of these is greatly enlarged by the last survey, we have now for the first time obtained an accurate delineation of the outlines of this extraordinary region. There is perhaps no feature of more commanding interest, in its bearing on the physical outlines of the earth at a period which approaches near to our own æra, than the fact which geological researches* have established, that there has existed a vast interior sea which covered all the area between Constantinople on the west, and Turkestan on the east, or a length of nearly two thousand miles; whilst it ranged irregularly from S. to N. over a space broader than the present Caspian Sea is long, or of about one thousand miles. Of this great submerged area, the seas of Azof, the Caspian, and the Aral are now clearly the chief detached remnants. For, as I formerly explained, the very same species of mollusca which are now living in these seas, are found in a fossil state in limestones, forming cliffs on their shores or on those of the Black Sea, or in masses of intermediate land, which are simply the elevated bottoms of a once continuous vast internal sea, the whole of whose inhabitants were as distinct from those of the then ocean, as are the present inhabitants of these detached Caspians from those of the present Mediterranean and ocean.

Correct surveys, therefore, of the most distant parts of such a region are of the highest importance to the naturalist as well as to the geographer; and we have only to hope that the publication of the map of the Aral sea will be followed by an effort on the part of the Imperial Government, to complete the illustration of a subject so attractive to the historian, as well as to the geographer and geologist, by ascertaining through a correct survey, like that which established the depression of the Caspian, whether there be any existing difference between the level of that sea and of the Aral. The settlement of this question will enable us to determine, by what change of outline the Oxus was deflected from its course into the Caspian, and made to discharge its waters into the Aral, as suggested by Humboldt.

In connection with this subject, let me now call your attention to the new and important lights which have been thrown upon the south-eastern portion of that vast and little-explored region, in a volume recently published by our foreign associate, my friend, Colonel

* See Humboldt, 'Fragmens Asiatiques,' p. 10, et seq.; and 'Russia in Europe and the Ural Mountains,' vol. i. p. 297.

Helmersen, in an account of the journey of the late M. Alexander Lehmann to Bokhara and Samarkand in the years 1841–2.* Devoting himself at an early age to the study of natural history, and after several excursions in the north of Russia, M. Lehmann was appointed, in 1838, by General Perovsky, Governor of Orenburg, to investigate the natural history of that vast province. "Thus," says Colonel Helmersen, "in the course of nearly ten years he had become acquainted with a considerable portion of the Ural mountain and the Caspian plains, and was, by experience and practice, well prepared to accomplish with profit the great journey reported in this work, and which he was not destined to survive." In 1841, in company with M. Khanikof and Lieutenant Bogoslovsky, he explored, at the request of the Khan, the mountain district from Bokhara to the east, where large auriferous deposits were suspected to exist. Ascending the fertile valley of the Särafschan, they entered a district never yet scientifically explored, though cursorily visited by educated Europeans several centuries ago. They then beheld the once glorious and renowned Samarkand, with "its magnificent monuments of the age of Timur the Great; and penetrating the fine mountain district never yet described by Europeans, which is watered by the Upper Särafschan, they explored it as far as the river Fon." Thence they returned to Samarkand, and again reached Bokhara. Here they were detained the whole winter and part of the following year, during which time Lehmann employed himself in arranging his collection, and preparing a report of a portion of his journey. Among other sources of enjoyment he mentions his agreeable intercourse with our two lamented countrymen, Stoddart and Conolly, which was, however, finally interrupted by their imprisonment by the Khan. In hastening home, Lehmann fell a victim to a fever at Limburt, in the south of Russia, when he had, alas! barely completed his twenty-eighth year.

In his description of the journey to Bokhara, the geology as well as the botany of the country is described; though the latter science appears particularly to have occupied his attention. The hydrography too of the wild regions, after crossing the river Syr Daryà, was not neglected, and much good matter on this subject will be found in his pages; the result both of his own observations and of information obtained from the inhabitants. Respecting Samarkand itself and the manners of the inhabitants, and the antiquities still remaining, the book contains many

* Alexander Lehmann's 'Reise nach Buchara und Samarkand. Beitrage zur Kentniss des Russischen Reiches.'—St. Petersburg. 1852.

interesting notices. Besides its fortunate position as a central point for the then commerce of the world, the importance it acquired in the 14th and 15th centuries would appear to have been in a great measure owing to the luxuriance of the climate and the fertility of the soil, greatly increased by the extensive system of irrigation then applied throughout the whole district.* The third portion of the work contains notices on various subjects obtained during his residence in Bokhara, and from which we learn, that the variety of fruits is remarkable, and the nectarine indigenous; wine, brandy, and silk are among the products of the country. In addition, M. Lehmann adds some interesting details respecting the vegetation and the periods of ripening of fruit, which he obtained from the unfortunate Stoddart, by which it appears that the wheat harvest commences about the 1st of June.

Among the projects recently undertaken by the Imperial Geographical Society, let me add that there is one which must singularly interest every geographer and naturalist—a detailed survey of all the basin of Behring Straits, including Kamschatka, the north-west coast of America, and the Aleutian and Kurile Islands. In concentrating upon this grand object its chief attention and means, the Imperial Geographical Society may not only develope many new geological, volcanic, and zoological phenomena, but also give us a clear insight into the very remarkable tides of that region, which, according to Admiral Lütke, are alone worthy of an expedition.†

British Isles.—Ordnance Survey of Scotland.

Having at our last anniversary referred you to the various endeavours I made in former years, whether as your President, or as the representative of the British Association, to accelerate the progress of a survey of Scotland which began in the last century, I regret to say that the distinct recommendation of the Committee of the House of Commons in 1851, on which I so much counted, has been, from what I can learn, to a great extent paralyzed. That Report strongly recommended that the sum of 25,000*l.* per annum, which was obtained, and

* Samarkand, the Marakanda of the Ancients, now lies about three versts to the south of the left bank of the Särafschan. In the town itself scarcely any remains of antiquity are to be seen. The river, however, has in the lapse of ages changed its course, and even the town seems to have undergone a similar change: in its immediate vicinity the travellers found numerous evidences of public buildings of great antiquity, with heaps of ruins—the clear evidence of the site of an ancient city.

† The United States government is also sending a surveying scientific squadron into those seas. (See p. 63.)

which has since been increased to 35,000*l.*, should be first exclusively devoted to the completion of a really useful map, on the scale of one inch to the mile. In consequence, however, of the petitions from various parts of Scotland, to which I alluded at the last anniversary, that view of the scheme, or the accelerated publication of a *real map*, must necessarily be very much retarded, to make way for the execution of *plans* on very large scales.

Few geographers who will take the trouble to read all the public documents connected with this subject, beginning with the appeal of the British Association to the Government in 1835,* and ending with the Report of 1851, including the Report of the same House of Parliament on the results of the six-inch survey of Ireland,† will, I apprehend, come to any other conclusion than that at which I arrived, or will not regret the indefinite postponement of the execution of an accessible and useful map. I now reiterate my conviction, which is that also of the eminent engineering authorities—Stephenson, Brunel, and Locke,—members of our body,—as well as of Mr. Keith Johnston, and all practical geographers, that a six-inch survey is much too cumbrous, and too little provided with physical features, to be useful for consultation on any matters of general or county business, and at the same time much too small for the detailed objects of the engineer, proprietor, or valuer of property. Such a six-inch survey was perhaps specially applicable to Ireland, where numerous disputes prevailed respecting the town-land boundaries in hilly districts; though many of the artificial lines and divisions of fields, laid down at much cost, have been changed, since the plates on which they are represented were engraved! No sooner, however, was this scheme completed, and in admirable style, at an expense of about 850,000*l.*, than the Irish proprietors complained through their representatives in the House of Commons, that their country was, *in reality*, *without a map*. And this statement, though made in the year 1847, is still perfectly true; for a six-inch survey is not a map which can be consulted, and Ireland, though long promised it, has yet no one-inch map.‡

Deeply respecting the opinions of our deceased member, General

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* Printed by order of the House of Commons. Trigonometrical Survey: Great Britain. 20th February, 1836. No. 106.

† See Report of Select Committee of House of Commons. Ordnance Irish Survey. 1846.

‡ I am assured by our Associate, the Marquis of Lansdowne, one of the most enlightened and improving landlords in Ireland, that finding the six-inch plans too cumbrous and unmanageable for general purposes, in reference even to his own estates, he found it necessary to have a reduced and compendious map executed from the large scale, *at his own expense!*

Colby, that accurate mathematician and most meritorious public servant, whose services I have this day eulogized, I would beg to explain the circumstances under which he undertook the execution of the six-inch survey. The British Trigonometrical Survey was in a very unsatisfactory state. The maps of large tracts of the South of England, which had been hastily sketched upon the scale of one inch to the mile by young military officers, required much revision. These sketches required, in fact, to be corrected, and are not to be compared with those most perfect and beautiful maps afterwards completed on the same scale, under his orders, which so perfectly delineate all the physical features of the country, particularly of the mountains of North Wales.

In that state of affairs a set of plans for general and local valuations of Ireland was demanded by the Government; and Colonel Colby saw, that as such documents were considered absolutely necessary, they might, if executed with precision, and under rigorous military control, form the sound basis of a future map. But, excellent as his survey was, it has not yet been followed by that general map which is demanded, though I hear that it has been commenced. I should, therefore, regret to see the same system persisted in for Scotland, where none of the political or social causes exist which rendered the large scale desirable in Ireland. In short, geographers and the Scottish public are put off with so remote a prospect of a general map, that the youngest man cannot hope to have one in his possession.

I re-assert that patriotism has, in this instance, been merged in the desire to obtain local advantages, and that the scheme of laying down on copper a six-inch survey is a waste of time, money, and labour, as respects immense tracts of moor and mountain in North Britain.

Let there, however, be no misapprehension in respect of the opinions entertained by many geographers, as well as myself, on the value of surveys on a large scale, and the application of contour lines. When formerly your President,* I spoke of the value of such contour lines as a most important auxiliary in completing detailed surveys; and I gave the fullest praise to Major Larcom, who was then so successfully working out their application in Ireland. But that which is very useful in certain undulating tracts, rich in minerals, and where it is important to ascertain the levels with precision, is of no value in flat boggy regions, and utterly useless in many wild, rocky, sterile, uninhabited tracts. On the other hand, it is in the latter regions that we specially require the skill of the good field-topographer to represent

* Journal Royal Geographical Society.

precipices, abrupt corrics, ravines, pyramids and bosses of rock, which no contour lines can give.

But where are now the men to execute this task? The truth is, that the introduction of the Irish, or six-inch system, and its application to the North of England and Scotland, have too much diminished the strength of that body of able field-topographers. The men having a true eye for a country, and who executed the beautiful maps of North Wales and the adjacent parts of England, being no longer wanted, were to a great extent paid off, to make way for the mechanical admeasurements of the Royal Miners and Sappers, a meritorious but inferior class of men, whose labours have been directed by a few distinguished officers of the Royal Engineers.

I stated to the Committee of the House of Commons, and I repeat it, that I know of no topography in any country of Europe which excels, if it equals, in execution the Welsh sheets, which were prepared under the skilful direction of Colonel Colby and Major Robe. I only wish that the maps of the mountains of Snowdon and Cader Idris, on the one-inch scale, could be transmitted to the Highland proprietors, accompanied by any one of the great six-inch surveys, without physical features, which represent the bogs and mountains of Ireland, and ask them whether they wish to have these huge surveys executed (few rooms in Scotland being large enough for laying out the plans of one extensive county), and whether, at all events, in the first instance, they would not prefer to possess in their day a real map, which they could consult and understand?

The Scottish proprietors should recollect that the most important region of Britain, including more than two-thirds of England and all Wales, has only a map on the one-inch scale, and has never had a six-inch survey of it published. Nor am I aware that the inhabitants, except those of certain rich mining tracts, have ever asked for a larger survey.

I trust, at the same time, that we, who are eager to see a map of the whole country produced on the one-inch scale, may not be stigmatized as opposed to plans and surveys on any scale, however large, for administrative or statistical purposes.

Those most important objects come under a distinct head, as has been recently developed in a long and able letter addressed to the Hon. F. Charteris by Lieut.-Colonel Dawson, R.E., and printed with other documents relating to this subject. Clearly indicating all the confusion of object, which has arisen among the clamourers for the six-inch map (many of whom erroneously think they will have in it plans of their

estates), this very competent authority has shown, that even during the execution of the six-inch surveys, the surveyors were at the same time called upon to prepare plans of parishes and townships in the North of England on the scale of $26\frac{3}{4}$ inches to the mile; and for sanitary purposes in towns on a scale of 60 inches or 5 feet, and even of 10 feet to the mile.

Whilst no one can doubt the value of documents of this large size, to which I called your attention last year, and admitting that there is every reason to wish for them as complete cadastral plans and measurements of the populous districts, particularly in those tracts in which mines abound, we must as geographers express our regret, if the execution of a real map of so interesting a portion of our country should be procrastinated by the limited sum of money granted for this purpose being so extensively applied to these affiliated subjects, however important.

No set of men can be more competent either to complete a map of Great Britain on the one-inch scale, as already executed for two-thirds of England, and as ordered to be executed for Ireland, or to make the largest plans required for towns and populous districts, than the officers of the Royal Map Office. My only wish, therefore, is that at least one great division of this corps should be so re-organized* as to be applied at once to *the field topography* of Scotland; for now that the triangulation is completed, there can be little doubt that by the employment of some able hill sketchers, the right application of the sum which was virtually granted to make a map would, in very few years, realize the main object of geographers.

Let the Parliament grant *additional* sums for the execution of large plans for sanitary purposes in the Scottish towns; let the survey on various scales, each proportioned to the wants of the places, be by all means proceeded with; and let the largest of these original field surveys be kept in an office where any persons beneficially interested might obtain, at a small cost, copies of the same; and let even 12-inch plans of certain tracts, where requisite, be engraved. But for the honour of our native land, let not Scotland continue for an indefinite period to be *the only country in Europe without a good general map.*

I have on former occasions pointed out the usefulness of the maps of various foreign countries, and I have to-day adverted with pleasure to the progress which a small state like Sardinia has made in this respect.

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* Since this was read, I learn from my friend Captain James, R.E., Director of the Survey of Scotland, that a party has recently been organized for this purpose.

Possessed of a complete map of Piedmont and Savoy, the Government of that country, being urged by its Parliament in 1850, ordered the lithographic publication of this map on the scale of $\frac{1}{5000}$, and to be sold at the rate of two francs per sheet. In the execution of this desirable work (a great many sheets of which have already appeared), the ground is scrupulously re-examined; and the whole kingdom, though about the most difficult region in Europe, will be illustrated on this useful scale in six years. The contrast between this poor but spirited state and our own rich country is, indeed, truly striking!

Having commenced the agitation of this subject in 1834, when certain promontories of the Highlands were laid down, some miles out of their true position on maritime charts, and when I further knew from personal examination that the topography of the interior was in a disgraceful state; and further, having induced the British Association, to take a decisive step in this matter, before the Highland Society or any other public body moved in it, I cannot leave the chair of the Royal Geographical Society at the expiration of my second term of office, without expressing my earnest hope that our Government will at once direct the speedy execution of a good general map of Scotland, and see that an adequate sum of money be applied exclusively to that object.*

Above all, I again urge the Highland proprietors to unite to secure their due share of this national grant, and to check its application to purposes alien to their interests, and which, if persevered in, will infallibly deprive them of a *map* in this generation.

NOTE.—The following are copies of a circular sent from the Treasury to the President of the Royal Geographical Society, and his reply:—

SIR, *Treasury Chambers, 20th April,* 1853.

THE following correspondence and memoranda describe—first, the grounds upon which it was determined, in 1840, to publish the Ordnance Map on the scale of 6 inches to the mile for the country, and 5 feet to the mile for towns; and, secondly, the opinions now given on the question, whether the purposes which a national survey ought to subserve would be more fully provided for by an increased scale; and how far such increased scale would involve increased expense.

The Lords' Commissioners of Her Majesty's Treasury request that, after having attentively read these papers, you will state, in the annexed form, what scales you would recommend for any National Surveys which may henceforward be carried

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* Whilst these pages are undergoing a revise I am happy to learn from the Right Hon. W. Gladstone, M.P., the Chancellor of the Exchequer, and the Hon. F. Charteris, M.P., that "there is no question of extending the large scale to the Highlands and uncultivated districts of Scotland which are only suited to a 1-inch general map." As regards the cultivated districts the surveyors are, it appears, occupied in obtaining the information necessary to enable the Government to determine the scale which should in future be there adopted. It also appears that the necessity of speedily completing a 1-inch map is quite admitted.—June 30, 1853.

on at the publie expense; and that you will add any speeial observations you may have to make in support of your opinions.

It is assumed that the results of the Ordnanee Survey will, under any eireumstances, be separately published on the redueed seale of 1 ineh to the mile; and the question upon whieh an opinion is solieited, is merely between the seale of 6 iuehes and any larger seale.

I have the honour to be, Sir,

Your obedient, humble servant,

The President of the Royal Geographieal Soeiety, &c. &e. C. E. Trevelyan.

Sir, *Belgrave Square, 25th April,* 1853.

In answer to your eireular of the 20th April, I beg to state that, having formerly, and espeeially in my printed evidenee before the Committee of the House of Commons (1851), fully expressed my views regarding the relative merits of maps of Seotland on the seales of 6 inehes and 1 ineh to the mile, I shall only briefly reeur to that question in the few general observations with whieh this letter eoneludes.

In regard to the question of the adoption of the 6-ineh or a still larger seale, ou whieh my opinion is asked, I reeommend that the survey be made on a seale of 24 inehes to the mile, that draft plans on that seale be preserved as public reeords, and that the engraved plans for sale (relating to sueh parts of Seotland as require them) be on a seale of 12 inehes to the mile, rather than on one of 6 inehes, and for the following reasons:—

1st. The 6-ineh map is too large for a general map, and too small for an estate map.

2nd. The 6-ineh map is too small to admit of aeeurate measurement of areas, espeeially of less than one aere, as is aeknowledged by the advoeates of that seale (Correspondenee, p. 28, 29).

3rd. The 6-ineh maps have been found wholly inadequate for the purposes of the Tithe Commutation Aet, the Paroehial Assessments Aet, and the Inelosure Aet, so that additional surveys on a large seale have been found neeessary for all these purposes (Correspondenee, p. 31).

4th. The 6-ineh maps eannot be applied with safety and eonvenienee for the registration of sales or transfer of land, assuranees or eneumbranees of property, or other similar purposes eontemplated by Lord Langdale (Corresp., p. 23), or for several of the purposes enumerated by Lieut.-Colonel Dawson (Corresp., p. 32).

5th. That whilst the 6-ineh plans are too large for the general, geologieal, or mineral survey of the whole kingdom, they are too small for the detailed plans of the rieher mineral and eoal distriets, on whieh the eourse of mineral veins, the out-erop of eoal-seams, beds of limestone and sandstone, and the distribution of other useful substanees, would require to be laid down.

6th. From the statement of Colonel Dawson, and other eompetent authorities, it appears that a survey on the seale of 24 inehes to the mile, with engraved plans on a seale of 12 inches, is fully suffieient for these purposes, and likely to meet the wants of the nation for many years to eome.

7th. That ehanges of boundaries, roads, new houses, and other alterations eonsequent on inerease of population or improvement of the land, ean be more readily entered on the plates, if the larger seale be adopted.

For these and other reasons, I reeommend that, if the Government is to ineur the great expense of surveying and engraving Seotland on a large seale, the 12-ineh plan be preferred to that of 6-ineh dimensions, the difference of expense* being more than eompensated by the superior advantages of the larger seale.

In thus reeommending a larger seale than 6 inehes for the plans, I desire that it

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* The 6-ineh plan eosts 5*d.* per aere; the 12-ineh eosts 7*d.* per aere —See Corresp., p. 44.

may be understood that I have in no respect changed my opinions regarding the relative merits of the 6-inch and 1-inch maps, as expressed in my published evidence before the Committee of the House of Commons. The correspondence now printed, with the general demand for plans on a large scale, only more fully confirms and bears out the views there explained of the comparative small value of the 6-inch maps. *I am still as firmly as ever of opinion that a 1-inch map is all that can be required for large portions of the Highlands and other wild and mountainous tracts of Scotland.*

I must also express my fears that the time requisite for the production of a minutely accurate survey on the large scale, and for drawing and engraving such vast outline plans, will occasion so much delay, that the present generation cannot expect to see the completion of the 1-inch map of Scotland, at length promised by the Government and so long desiderated by geographers and the public.

I think, therefore, that the publication of an useful and accessible map of Scotland, available for all purposes of county or national improvement, should not be made dependent on the preparation of plans on the large scale.

It was, indeed, my anxious hope that the beautiful system of mapping on the scale of 1 inch to the mile, which had been so very successfully applied by the Government surveyors to North Wales (and where no survey on the large scale was ever made) should have been extended without loss of time to the Highlands of the North.

It was this feeling, quickened by a sense of humiliation in the reflection, that Scotland stands almost alone in Europe as a kingdom without a map, which urged me to rouse public attention to the fact, first in 1834, and subsequently in 1850.

The strong impressions I entertain on a subject I have so long considered, must be my apology for requesting you to give publicity to the opinion of

Your very obedient Servant,

Roderick I. Murchison.

To Sir Charles Trevelyan, K.C.B., Treasury.

The Alps—Switzerland.

German Maps.—Austria, Prussia, &c.—If I formerly spoke in praise of the labours of Austrian topographers, among the most accomplished of whom is our Foreign Associate, H. I. Highness the Archduke John, I must now crave your attention to the very great strides, which have been made by Austrian geologists in their preparation of special maps of their vast and diversified empire. Having visited Vienna at different periods during the last 24 years, I had to regret, during much of that time, that, whilst botany, mineralogy, and topography were flourishing, the true geological structure of the empire was comparatively so neglected, that, notwithstanding the exertions of one or two individuals, passing visitors like myself were enabled occasionally to throw some light on the chief relations of the rocks of the Eastern Alps and other Austrian regions.

That state of things has, I rejoice to say, entirely passed away in the last few years, owing to the hearty union of some good native friends of science, led on by Professor Haidinger. Leaving his retirement at Gratz, and joined by M. Boué, M. Franz von Hauer, and a few other persons, that excellent mineralogist and patriotic philosopher

formed, in the first instanee, a private soeiety, the 'Montanisehtisehe Museum,' whieh soon elieited a proper desire for aeeurate geological surveys. In the spring of 1847 the establishment of an Aeademy of Seienees having given a fresh impulse to the subjeet, pupils were despatehed, to learn the method of working in the British School of Mines and Geological Survey, who have subsequently produeed in Austria some very remarkable results.

A systematie geologieal survey is now, indeed, a eoneomitant of the topographie map, and measures are taken to determine annually, 400 square miles of eountry; so that, as the empire eonsists of about 12,000 square miles, it is estimated that the whole of it will have been eompletely deseribed in about 30 years. This field-work, illustrated as it is at meetings held every week during the winter, at the Imperial Geologieal Institute of Vienna, at whieh memoirs on every affiliated braneh of seience are also read and diseussed, and the results of ehemieal and metallurgieal examinations reported, have ereated quite a new æra in the Austrian metropolis. In all this advanee I reeognize the skill and energy of my friend, M. Haidinger.

It is also gratifying to know that one of our Foreign Members, M. Hammer von Purgstal, who oeeupies a leading station in the empire, has also been instrumental in the formation of sueh a noble establishment. The volumes whieh have been issued to the publie are works worthy of every eommendation. It is, however, of the last published maps that I ean now only speak before the Royal Geographers, or those with whieh the names of Morlot, Haidinger, and others are so honourably associated. It will doubtless be the espeeial duty of the President of the Geologieal Soeiety to extraet the intrinsie value of the books of whieh these maps are the illustration.

Another Austrian establishment, the Ferdinandeum, of Inspruek, has published a large and instruetive geologieal map of the Tyrol, in sheets; a work of intense labour and detail, whieh, independently of its geologieal merits, I strongly reeommend to all geographers who may visit that highly varied and beautiful region, with the view of learning to what extent its outline is dependent on the strueture of its roeks.*

Our Austrian assoeiate, General Hauslab, has reeently eneouraged, in the most effeetive manner, hypsometrieal observations, whieh have led to the best results. Under his auspices Major Streffleur, Direetor of Publie Works, has exeeuted a rilievo, whieh is ealled by its author

* Persons wishing to acquire this map should apply to Dr. Lindner, Ferdinandeum, Inspruck.

a plastic map of Austria. Without reference to the characteristic forms of the masses, Major Streffleur has represented horizontal prismatic strata, and thus gives a general view of the elevations and depressions of the country.*

The brothers Schlagintweit, who belonging to the active and stirring school of Prussian geographers, are worthy pupils of Humboldt and Ritter, and have already distinguished themselves by their observations on the heights, climate, springs and glaciers of the Alps, have been again at work in that region. Dr. Adolph Schlagintweit has sent us a short memoir on the physical geography and geology of Monte Rosa, extracted from a work about to be published by himself and his brother, on the physical geography and geology of that region. The work justifies the expectation of much additional information respecting the complicated structure of this giant of our European chains. It describes the mineral structure of the mountains around Monte Rosa, and shows that the dominant features of the district are owing to the elevation of a central mass of gneiss, which has thrown off the overlying grey and green slate with interstratified serpentine, in all directions. It is accompanied by a notice on the elevation of Monte Rosa, derived from various barometrical observations, from which it appears that the height of Monte Rosa is 14,284 French feet, or 15,223 English feet; thus very nearly equalling Mont Blanc in altitude.

Switzerland.—Having called your attention last year to the beautiful topography of parts of the map of Switzerland, prepared by M. Ziegler, of Winterhur, it is now my pleasing duty to direct your notice specially to the continuation of that exquisite work, illustrating the Cantons of Appenzell and St. Gallen, and particularly to the remarkable feature around the great advanced sentinel of the Northern Alps—the Hohe Sentis,—whose geological structure has been so thoroughly illustrated by M. A. Escher von der Linth. In association with its chief constructor, the eminent geologist Studer, MM. Escher and Ziegler have forwarded to us the geological map of their native country, Switzerland; it is a monument of the arduous labours and skilful interpretation of many good geologists, one of whom, M. Favre, of Geneva, has recently been among us.

I cannot make the briefest allusion to the continuation of labours which will complete the topography of Switzerland, without expressing my satisfaction that you have added the name of M. Ziegler to your

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* The Austrian minister at our Court, Count Colloredo, who is an accomplished astronomer, attended our anniversary festival.

list of Foreign Correspondents. For he is truly a good correspondent; not only by sending to us the work now in progress of execution by himself and associates, but also in communicating notices of the existing surveys in various parts of his country. Thus, in a recent communication, he furnishes us with accounts of the various Cantonal publications,—the recent surveys of mountains and glaciers along the Italian frontier, in which Professors Studer and Ulrich have been engaged, including a record of the phenomena of the great débâcle of 1818 in the valley of Bagne, and sketches of the 22 glaciers which feed the river Dranse.

A most important paragraph in this communication also informs us that, whilst the Swiss triangulation disagreed in the slightest degree only with the French, Bavarian, and Lombard determinations, there was a considerable and constant difference in relation to the Austrian observations along the eastern frontier, from the Grisons to St. Gall. It is, therefore, to the credit of the Austrian Government that it should have ordered that complete revision of the primary triangulation of that region, which was long ago considered necessary by Humboldt. For the perfect completion of this work, and for the erection of new signal-stations, the adjacent Swiss Cantons have given free access to their States.

Other advances made by the Austrians have also a real bearing on Switzerland, among which the commencement of a bas-relief of all that country, by M. Paulini, of Vienna, on the scale of one mile to 1¼ inch, and comprising 72 parts, is the most remarkable. Being constructed of raised paper, it is so small (to say nothing of its portability) that the separate portions of it will occupy no more space than ordinary-sized volumes on the shelves of a library.

Sardinia and Piedmont.—It was gratifying to me to direct attention some years ago to a very remarkable map of the Island of Sardinia, executed by that accomplished geographer, General Alberto della Marmora; and when I last traversed the Alps of Piedmont, I rejoiced to see how much progress had been made in delineating the features of that region, which, in all ages, has been of such high interest to the military topographer.

We have recently received, through our Correspondent at Turin, the Chevalier Cristoforo Negri, a summary of the progress and actual state of the cartography of that kingdom, drawn up by Captain Charles Dal Pozzo di Mombello, of the Sardinian Staff, which demonstrates that this small and flourishing kingdom has realized the same geographical objects as the largest and richest states.

In the last century the maps of Piedmont, like those of most parts of Europe, were very defective, and, in the early part of this century, the continuance of war prevented the establishment of a correct survey; the only general map then in use being one on various scales, made by the engineer Borgogno, and of which there was a map reduced to one scale by M. Morno. During the French dominion in Italy a cadastral survey was begun, but it was only after the restoration of the Royal Family, and during the subsequent peace, that great geographical works could be successfully carried out. France had then measured the meridian between Dunkirk and Formentera. Perpendicular to this she had also measured an arc from Bordeaux on the ocean to the frontiers of Savoy; whilst, in the same direction, Austria had on her part finished an admeasurement from Fiume on the Adriatic to Rivoli, near Turin.

It remained for the Sardinian Government to complete the great line of the measurement of an arc across her snowy Alps. This operation was commenced in conjunction with Austria, and executed by a joint commission, composed of topographers and astronomers of the two countries. Large triangles were abandoned, owing to the great irregularities of the ground, and those of medium size adopted. These observations, commenced in 1822, produced determinations of latitude and longitude, and fixed the azimuth of the different triangles; and, through the concurrence of the French and Swiss astronomers, the important result was obtained in one night, by fire signals, of the difference of longitude between the Hospice of Mount Cenis and the point of Solignat, in the heart of France. The details by which these great data were obtained, and the Alpine interval filled up, are so accurately given by Captain Dal Pozzo, that I hope his notice will be published in our volumes, as a record highly interesting to practical geographers. In it our associates will also find a good account of the methods employed for the exact determination of all the heights, from the faro of Genoa to the highest Alps; whilst the completion of the zenith distances is all but completed. It is also to be stated that Sardinia has for some time possessed a general map of all her dominions on the scale of $\frac{1}{50000}$, the lithographic sheets of which are now being issued at a very small cost to the public. The list of all the other works executed by the Sardinian Government, which is given by Captain Dal Pozzo, must increase our desire to possess such valuable documents, which illustrate the highly diversified topography of a region inhabited by so intelligent and industrious a people, and who have always maintained their independence amongst their native mountains.

Mountain Systems of M. Elie de Beaumont.

Looking to the too great length of this address, and seeing how well known the progress of what may be called the "Home Geography" of Europe, is made known through many channels, I shall on this occasion refrain from alluding to the various maps and charts of France and England which have been published. But I must speak of a work by my eminent friend M. Elie de Beaumont, entitled 'Essai sur les Systèmes de Montagnes,'* which well merits your attention for its bearing upon physical geography.

The chief object of this work, which embodies certain leading views promulgated by the author in the last twenty years, is to show how mountain chains have received their principal elevation and main direction at particular periods in the history of the earth;—such periods of great physical disturbances agreeing, to a great extent, as he believes, with distinct and successive geological formations.

I am not here called on to discuss those geological views which have given rise to much controversy, illustrated as they are by an ingenious mathematical theory, which has already been scrutinized by Mr. Hopkins, the late President of the Geological Society. We may, however, thank M. de Beaumont for inciting us to work out with accuracy the direction of mountain chains. For, to use his own powerful language, "The study of these features constitute the very essence of topography, and their careful analysis may enable us to obtain general laws. These signs of the revolution of the surface are, in short, the mutual links between the daily wear and tear of the elements, as determined by the present relief of the ground, and all former events which fashioned out that outline."

"In endeavouring (he adds) to co-ordinate the elements of the vast assemblage of characters, by which the hand of time has engraved the history of the globe upon its surface, it has been found that mountains are the capital letters of this enormous manuscript, and that each system of mountains constitutes a chapter." †

Ancient Geography.

In concluding the address of last year, I reminded you that our volumes occasionally contained contributions of great merit on comparative or ancient geography. In the twelve months which have elapsed, several subjects of this nature have been brought before us. The first

* Paris. Bertrand. 1852.

† Notice sur le Système de Montagues, p. 3. Paris. Bertrand. 1852. 3 vols.

of these was an elaborately detailed journey of the celebrated American traveller, the Rev. Dr. E. Robinson, through various tracts of the Holy Land. This memoir throws light on topics of profound interest, and, when published, will doubtless much gratify our readers. Another paper of this class is an account of a brief excursion to the supposed tomb of the prophet Ezekiel, and the sacred cities of Nazif and Kirbelah, to the west of the Euphrates, by Mr. T. K. Lynch, and communicated to us by our medallist, Colonel Rawlinson.*

Besides these, I have also lately had placed in my hands a series of original papers relating to regions in Greece and European Turkey, which General Jochmus, formerly of the Turkish army, and late Minister of Foreign Affairs of the Germanic Empire, has written on the spot, in exploring the sites of ancient battles or the marches of chiefs renowned in antiquity. Devoting great attention to a comparison of the localities chronicled by Herodotus, Arrian, and the classic writers, he seems to have succeeded in defining the line of march, as well as the principal halting-places, of Darius Hystaspes, from the Bosphorus to the Danube. Again, in respect to Alexander, a point probably new to historians, which General Jochmus seeks to prove, is, that the battle with the Tribelli took place on Lake Devno, and not on the Danube, as usually supposed; the further route of the great conqueror being illustrated by detailed maps. Whilst the scholar will take real pleasure in this elaborate document, and in several memoirs descriptive of ancient sites in Greece, which illustrate them in a new manner, General Jochmus brings to us contributions respecting the physical outlines of the chain of the Balkan and its passes, and affords curious information respecting the state of Bulgaria and European Turkey; subjects of deep interest to all geographers and public men. As this enterprizing officer, now about to travel in distant parts, has confided these papers to me, and as Colonel Chesney, to whom I referred them, has formed a high opinion of their merits, I trust that our Society will find the means of publishing these valuable documents on Comparative Geography.

The second expedition of our medallist, Mr. Layard, and his last discoveries among the ruins of Nineveh and Babylon, have been described by that traveller in a style so natural and so attractive, as to have insured for his work the admiration of all those who can appreciate the enthusiasm, good judgment, endurance, and perfect knowledge of the natives which it must have required to realize results so glorious to

* Whilst these pages are printing, I learn that Colonel Rawlinson has discovered cylinders with inscriptions, at Kalch Shirgah, which indicate, he writes, a much higher antiquity than those of Nineveh, and carry back the historian to a very early age in sacred history.

our country. Although I am not gifted with the learning required to point out the whole value of such discoveries, I may be permitted to admire the adventurous spirit whose influence over wild tribes marked him out as the man who possesses, in an eminent degree, the first qualities of a geographical explorer.

And here let me remind this Society, that many of the monuments which have been recovered from oblivion, and brought to our halls by their discoverer, Layard, would have been unintelligible masses, and could have thrown no light on sacred history, but for the learning of Rawlinson. Well may we rejoice that this distinguished scholar was singled out in 1846, by one of my predecessors,* eminent for his acquaintance with comparative geography, to receive a gold medal for having read off the Persian cuneiform inscriptions on the walls of Ecbatana. That effort was followed by the still more difficult decypherment of the most extensive cuneiform inscriptions in the world on the lofty cliffs of Behistan, where the adjacent Persian writings on the wall were the means of interpreting the more copious Assyrian alphabet; thus affording the keys by which the real history of Nineveh and Babylon were opened out to us.

Asia Minor.

From the consideration of the comparative geography of Turkey in Europe, and Assyria, the transition is natural to Asia Minor—that intermediate region so full of historical recollections, and of whose geography so little has been correctly known. Various living English, French, and German travellers have indeed been good contributors, at the head of whom I naturally place my predecessor, Mr. W. J. Hamilton, whose excellent work and map obtained for him one of our gold medals.

We have, however, recently been presented with the first volume of the 'Asie Mineure' of M. Pierre de Tchihatcheff, which, when completed, will exceed in details and illustrations anything which has been yet attempted respecting this remarkable country. After giving to the world, and at his own expense, very copious illustrations of the outlines, structure, and statistics of the Altai Mountains, M. Pierre de Tchihatcheff visited Asia Minor; and the volume and map now before us are the results of four years of laborious investigations, to be followed by other volumes illustrative of the climate, vegetation, antiquities, geology, and statistics of that peninsula. The first part, or that now issued, refers only to the physical geography properly so called, and is accompanied by a beautiful large

* Mr. W. R. Hamilton. Trust. Brit. Mus.

map, which, prepared and collated by General Bolatoff, is a fine sample of good execution, and a monument of industry.

Not content with directing attention to the tombs and monuments of a region which has, as he says, been "by turns the cradle and the burial-ground of nations, of sciences, and of arts," M. de Tchihatcheff has striven successfully to make us better acquainted with that which is our special province, the grander works of nature. Such of you as will follow him through his descriptions will find that, however elaborate, they are always conveyed in language so elegant and clear, that no ambiguity is left on the mind, and all the natural objects are strikingly placed before the reader. Original and spirited, M. de Tchihatcheff has a wonderful facility of writing; and his diction, always appropriate, never, as I can testify, requires correction. You will, doubtless, admire with me the man who spends his fortune and risks his life in thus advancing knowledge; and it is peculiarly grateful to me to have been your President, when in recompense for his successful labours, the Royal Geographical Society replaced the vacancy occasioned by the death of Leopold von Buch, by inserting in our list the name of the explorer of the Altai Mountains and of Asia Minor—who has produced works which have for ever associated him with those countries.

Projects of New Communication with the East Indies.

The communication with our eastern possessions by the line of the Euphrates, or by what may justly be called Chesney's line,* as defined by our able associate, and explained by him to the British Association at Belfast, has met with a zealous advocate in Dr. Thompson, who was for some years resident physician of the Christian hospital of Damascus. Another plan of this gentleman is to construct a grand and entirely new line of railroad across Persia.

It is scarcely for us, as geographers, to try to estimate the ultimate success of the gigantic scheme of a railroad over the wilds of Persia and Afghanistan, the realization of which seems so distant; but in justice to our associate the eminent engineer, Robert Stephenson, who first threw out this idea, it is right to state that he never contemplated the execution of such a plan, until the wild countries through which a railroad must pass were brought into order, and the tracts adequately peopled.

In anticipation, however, of all such possible future projects, our

* There is good reason to believe that the Divan has a strong disposition to extend a line of railway to Constantinople. I also learn from Col. Chesney, that two iron steamers have been constructed for the Sultan, at Liverpool, to navigate the Euphrates.

first concern in this day is the construction of that line of railroad across the south-eastern parts of Europe, which will put us into the most rapid communication with our Indian possessions, whether the remainder of the journey be performed by the present overland route and the Red Sea, or by Chesney's new line of the Euphrates. With this view it has been suggested that the starting point from Europe should be Saloniea in preference to Trieste and Marseilles; seeing that when the present Austrian railroad reaches Belgrade, it will then become a work of no great engineering difficulty to prolong it southwards up the river Murava, across a comparatively low watershed, and down the valley of the Vardar to Saloniea, gaining thereby greatly over the journey by Trieste to Alexandria, and abbreviating the sea voyage by about one-half. By this means telegraphic communication with India would be shortened by forty-eight hours, and the route, to travellers, by at least thirty hours. The chief objection to the execution of a scheme so favourable to Austria, and affording a fine exit for Hungarian produce, exists in the passage through Macedonia, a Turkish province, in which foreigners can hold no property, and where the lands of the Christian subjects of the Porte do not afford that security required for investments of European capital. Under such difficulties the route by Marseilles, Trieste, and Fiume, may therefore be long in use before that of Saloniea be made available.

In connection with the subject of intercourse with the East, we are bound specially to recollect the services which have been rendered by our associate, Captain W. Allen, R.N., in two memoirs recently read before us. The first of these, the result of a personal survey, was his account of the ancient port of Seleucia, and the causes of its silting up, with a suggestion as to the best method of opening it out. The other memoir by Captain Allen is of a much more original and comprehensive nature; for whilst it involves geographical speculations concerning the desiccation of the Dead Sea, which have an important bearing on geology, it points at the same time to the *possibility* of uniting, at a future day, the Mediterranean with the Red Sea, by inundating the great depression of the Dead Sea which lies between them.

There is certainly no natural feature of the earth's surface more astounding or more difficult of explanation, than the existence of this long, deep fissure, which, being 630 feet below the Mediterranean at the Lake of Tiberias, deepens in the Dead Sea to 1300 feet below the general sea level! With the nature of the hilly country between the Mediterranean and the Sea of Tiberias we are pretty well acquainted; and we are reminded by Captain Allen, that a line of commu-

nication might be established without traversing any very high ground. Hence it is possible that the modern spirit of enterprize might adopt the suggestion of a ship canal, as shadowed out by this officer, through which the waters of the Mediterranean, rushing for a number of years, might be easeaded into the low country, and thus submerging a great area, now pestilential and of little or no value, render the Dead Sea a south-eastern extension of the Mediterranean. But still there would remain a space of land to be cut through from the Dead Sea depression into the Red Sea; and the first question is, what is the nature of that barrier, and what its altitude?

I will not now stop to discuss the value of the ingenious theory of Captain Allen, which regards the Dead Sea as simply the desiccated bottom of a deep former bay of the Red Sea, the connecting strait with which is now occupied by the grounds of the Wady Akabah. He supposes that the exclusion of the Dead Sea may have been produced by the formation of coral reefs, or, in other words, that a slight barrier may now only exist to prevent the Red Sea from re-occupying its presumed ancient strait and deep bay. Evaporation in such a climate would, it is believed, have sufficiently drawn off the waters of the Dead Sea, during long ages after their separation from the Ocean, and have thus brought them, by a gradual process of reduction, to their present level.

But before we can arrive at any explanation of this problem in ancient or geological geography, or form any rational conjecture of the eventual possibility of opening such a water-communication between Europe and Southern Asia, it is essential that the true physical features of the region, particularly of the tract between the Dead Sea and the Red Sea, be delineated. For this purpose the proposal of Captain Allen to effect, in his own person, a survey of such lands, accompanied by a competent officer of the Royal Engineers,* is well worthy of our country, and will, I hope, be ordered by Her Majesty's Government; if only to clear up the obscurities respecting this singular region, and to determine with accuracy the relative heights of a country so near to the birth-place of Christianity, and which was the site of so many events recorded in Sacred History.

Arabia.

In carrying out the wishes of British geographers, to which I

* Steps were taken a few months ago to carry out this project, and General Sir J. Burgoyne, with whom I consulted, was quite prepared to furnish the requisite engineer officer, but the season was considered too far advanced. I trust that the Government will sanction the execution of the enterprise next winter or spring.

adverted at the last Anniversary as connected with the exploration of the interior of Arabia, it has given me great pleasure to see, that by the employment of the small sum at our disposal for that purpose, we should have been so fortunate as to secure the services of the author of the "Happy Valley of Scinde," who, on his return to Hindostan, will accomplish, if possible in a private and quiet manner, a journey across the interior portions of Southern Arabia. Lieutenant Burton does indeed seem to me the very person fitted to accomplish such an enterprise, whether we look to his capacity for observation, his knowledge of Arabic and other Eastern languages, or his facility of assuming the character of a travelling Mussulman. I repeat my conviction, that there is no tract with which it more behoves our rulers to open out a friendly intercourse than the centre of Southern Arabia, situated as it is in the direct line of communication between Hindostan and Europe, and containing valuable supplies of horses, and other natural productions, which ought to be re-opened to the civilized world.

Attaching great importance to the success of this enterprise, I feel quite certain that it is in excellent hands, and I trust that Lieutenant Burton will give us a perspicuous account of his wanderings through a region so famous in ancient history, and of which we are now so profoundly ignorant.

New Maps of Hindostan.

Having spoken last year at some length of the great northern mountain-barrier the Himalaya, which separates our eastern possessions from Tibet and China, let me now direct your attention to the last year's labours of the veteran geographer and founder of the Geological Society of London, my valued friend Mr. Greenough. Whenever the day shall come—(and may it be far off!)—when the person occupying this chair shall be called upon to treat of the labours of this distinguished man, then will there be poured forth an enumeration of his works which will satisfy mankind, that in this generation no individual among us has accumulated greater stores of geographical and geological knowledge; and that no one has made greater efforts to generalize detached data, and group them together for the benefit of our race. On this occasion it only behoves me to speak of one of his last efforts, or that of the illustration of Hindostan, as put forth in maps exhibited before the Royal Asiatic Society. Defining on one of these, each of the ten water basins of the peninsula, and noting all their affluents, and the number of square miles drained by each, he read a valuable memoir to the Asiatic Society. Another work, and that to which I now particularly

advert, is a grand original, physical and geological Map of all India, about 7 feet long and 5¾ feet wide, which he has prepared himself, directing the insertion of every stream and hill, and sedulously consulting every authority for the geological attributes of each district between the plateaux N. of the Himalaya and Cape Comorin. On this Map the spectator sees the delineation of coal tracts, the larger portion of which are unquestionably of tertiary age, and not like the old coal of Europe and America; the range of the diamond deposits; the vast territories occupied by granitic and eruptive rocks; the demarcation of masses of secondary age, in which the cretaceous deposits of the age of our chalk play so subordinate a part, whilst the nummulitic formation, or oldest tertiary, has so grand a development, particularly in the north; the Silurian and other palæozoic rocks also being only known in the north-western extremity of the Punjaub and in the Himalaya mountains.

Such a labour of love as this on the part of such a man, seems to me to call not only for the special acknowledgments of all geographers and geologists, but also for the approbation of the Board of Control and Directors of the East India Company, who would do real service by publishing this great map, and thus render the name of Greenough as well known in our Eastern Empire as it is in Europe.

China.—Aracan.

If at our last anniversary we adverted to the natural features of China, which had recently been described in the works of the Missionaries Huc and Gabet, or of our enterprising countryman Fortune, there is now opened out to us a vista of unbounded interest.

Internal political commotions have reached such a crisis, that whether the Old Imperial Dynasty be sustained, or a new order of things be established, it is highly probable that the powers of Europe and America will soon find a much more open road for their commerce in that great empire.

Whilst geography and all the affiliated sciences will, no doubt, largely profit by this discovery, as we may call it, of China, it may be doubted whether even the gold of Australia and California will have created greater changes in the establishment of new seats of power, than this unfolding of that hitherto unknown and rich region of the earth. Already, indeed, tens of thousands of Chinamen have sought and gained their livelihood by industry in the islands of the Indian seas, California, and other lands.

The strong frames of this people, and their adaptation to labour in the hottest and dampest soils, specially qualify them to carry out enterprises in climates where Europeans would fall victims to malaria. The

extension, therefore, on the one hand, of their redundant population to regions which call for improvement, and the introduction of foreigners into their own country for the purposes of trade and commerce (if ever realized), would form a grand social revolution more influential on the future prospects of mankind than the conquests of a Tamerlane or a Genghis Khan.

The view which now lies open to geographers, geologists and travellers, is truly so full of excitement, that as one of a race eager for fresh knowledge, I only regret that my sexagenarian condition prevents my hoping to take any share in the first real geographical explorations in the Chinese empire.

In briefly alluding to China and the East Indies, I may remind you that we were gratified last session by the reading of an interesting memoir on a portion of the province of Araean, the author of which, Captain Tickell, enlivened his paper with clever sketches, which conveyed to us clear ideas respecting the customs, habits, and costume of the people who inhabit the banks of the river.

Africa.

The progress made by the government expedition to explore Central Africa, which was originally planned by the lamented Mr. James Richardson, with whom Drs. Barth and Overweg were afterwards associated, calls first for our notice. Although Richardson was cut off before he could mature his project, he has left us, in the interesting diary of his last adventures in Africa, as published by his widow, full proofs of his capacity to accomplish his arduous mission, and of the sincerity with which he applied himself to better the condition of those natives in and beyond the great Sahara, of whose habits and manners he has given as such graphic delineations. These memoranda, written on the spot, and tinged with a shade of melancholy which seemed to presage his death, breathe the spirit of an enlightened man and a determined traveller, who willingly sacrificed life and everything in the hope of diffusing the blessings of civilization, commerce and religion, through those benighted regions.

Other and subsequent features of this mission are recorded in newspapers and periodicals, from which I have gleaned partial information; though I should naturally have preferred to have had the necessary documentary evidence which reached our country laid before this Society. The want of this knowledge has alone prevented my previously rendering justice to the brave men who have been engaged in this enterprise.

Since the last anniversary I have, however, been informed, through the Chevalier Bunsen, who has taken a lively interest in this expedition, and also through Mr. Petermann, that the travellers Barth and Overweg accompanied an army of the Sheikh of Bornu, hoping to explore the region to the east of Lake Tchad, as far as Borgu and Wadai, but that army being defeated and put to flight, they only saved their lives and instruments by a quick retreat.

Having again reached their residence at Kuka, they next joined another razzia, led on by the Vizier of Bornu himself, directed against the Sultan of Mandara, a country to the south of Bornu, already known through Major Denham, who there met with a narrow escape on a similar mission. On this occasion the army was more fortunate, the enemy retreating as it advanced; and thus the travellers were enabled to proceed at least 100 miles further than Major Denham in his memorable excursion, and were only there stopped by the Terbenel, a very considerable river running into the Tchary. The regions visited are described as most fertile and rich. From the end of March to the end of May last year, Dr. Overweg made a successful journey from Kuka in a south-westerly direction, and reached to within 150 English miles of Yacoba, the great town of the Fellatahs; while Dr. Barth went south-east on a journey to Baghirmi, a powerful kingdom between Lake Tchad and the Upper Nile, which had never been previously visited by any European. Dr. Barth reached Máseña, the capital of the country, on the 28th of April last year, which place formed his head-quarters during the three succeeding months. He collected, as I am told, a large mass of information respecting the history, geography, and ethnography of Baghirmi and Waday, which he has embodied in an account addressed to the Foreign Office. He returned to Kuka on the 20th of August, and rejoined his fellow traveller at that place. The travellers then intended to set out together on a journey to the eastern side of Lake Tchad, but Dr. Overweg soon after was seized with fever, and fell, alas! a victim to it on the 27th of September last.

Undismayed by the loss of both his companions, Dr. Barth was determined to leave Kuka for Timbuctù in November last, and after the accomplishment of this journey, to explore the regions between Adamaua and the river Kawara, or the lower portion of the valley of the river Tchadda, supposed to be the Benue in Adamaua, a splendid river, which there rises, during the rainy season, 40 to 50 feet.

Dr. Overweg's journals and papers have lately been received at the

Foreign Office; and I am told by Mr. Petermann that they contain important astronomical observations made in the Sahara, on Lake Tchad, and in the regions to the south of it. Besides these observations, which are now undergoing calculation at the Royal Observatory at Berlin, Dr. Overweg's seven weeks navigation of Lake Tchad, and his geological researches, will doubtless claim particular attention. One of the most important documents as yet sent home by Dr. Barth, is, I am told by Chevalier Bunsen, a map of Central Africa, founded entirely on his own observations and labours, which extends from N. lat. 4° to 15°, and E. long 8° to 23°. Mr. Petermann is directed to construct for the British Government a large map of that region from the combined researches of Dr. Barth and Dr. Overweg.

Now, indeed, that Dr. Barth will soon be joined by that accomplished young astronomer, Dr. Vogel, who has been heard of as proceeding from Tripoli to Murzuk, we may anticipate great results, to one of which I shall presently allude. Already, indeed, the explorations of Barth and Overweg have revived a hope, which began to be entertained after the journeys of Lander, Clapperton and Denham, of opening out a profitable trade with the interior tribes of Africa.

At the close of our last session Lieut. Lyons McLeod, R.N., brought before us a project for ascending the Niger, first in a steamer to be purposely prepared for that object by Mr. Macgregor Laird, who has a contract to that effect with her Majesty's Government; and next in the higher and shallower parts of the river in an ingenious steam-launch. Whilst we encouraged this scheme, it was also taken up by the Chamber of Commerce of Manchester; and thus backed, it was brought by myself, as your President, under the consideration of Her Majesty's late Government.

In the first instance it was supposed that an expenditure of not less than 5000*l.* might be required; but on referring the case to our Expedition Committee, the more extended plan was reduced to the simple recommendation of ascending the main river as far as the steamer could proceed. The survey in this case was to be restricted to scientific observations, and to establishing the groundwork of subsequent and more extensive explorations; the expenditure in this case not exceeding 2500*l.*

The change of government necessarily delayed the execution of the project. In the meantime the last report from Dr. Barth has naturally produced a strong desire to see the original plan somewhat changed by an ascent of the river Tchadda, the great tributary of the Niger,

by steam; and, if possible, to the very spot where the adventurous German traversed what is supposed to be its upper portion (or the Benue, there 9 feet deep), in his journey from Bornu to the fertile country of Adamaua.

Every one must wish to see an enterprise realized, which brings us into communication with some of the most industrious nations of the interior of Africa, and which, by establishing a regular commerce, might go far to check the slave trade. But the period of *this* year is already passed, when alone any such enterprise could be prepared without encountering the risk of loss of life which characterised a previous expedition; for, according to Macgregor Laird and other authorities, the effort must be made when the river is on the rise.

The great feature in the new proposal is, that the Tchadda should be ascended during the rains or early in the spring (about the end of May or beginning of June), and that, forcing up by steam-power against the current, the tracts so fatal to Europeans in the hot and dry season may then be traversed without danger. But as several months are required to construct the proper river steamer, I have no doubt, from what I know of their intentions, that her Majesty's Government will authorize Mr. Macgregor Laird to prepare his vessel, and will further organize such an expedition for the early part of next spring as may ensure a successful issue. If that expedition be accompanied by a good naval surveyor, with scientific medical men, and the crew be exclusively composed of black seamen, all the prudential cautions which can be suggested will have been taken, and we may then reasonably look to the commencement of a successful commercial intercourse with Central Africa, which her Majesty's Secretary of State for Foreign Affairs, the Earl of Clarendon, now a Fellow of our Society, has taken very decisive steps to promote.

This would, indeed, be the true method of effecting the first great change in the social condition of so vast a number of human beings; for, whilst the people to whom I have alluded, are by comparison in an advanced state, we learn from the explorations of the Piedmontese agent, M. Rollet, and the descriptions of the missionary Knoblicher, that the inhabitants of the region high up the Nile are in the most abject state of ignorance, and little raised above the brute creation.

If it be the destiny of Dr. Barth, and the astronomer, Dr. Vogel, to succeed eventually in traversing Africa, as they hope, and as first proposed by our medallist, Carl Ritter, from the environs of Lake Tchad to the eastern shore, near Mombas, determining by the way the outline of the true water-shed of the Nile, and revealing to us the real

state of the inhabitants, they will have achieved the greatest geographical exploit of modern times.*

In anticipation of the eventual completion of a triumph like this, we may well look with satisfaction to the rapid strides which are everywhere being made to dispel our ignorance of Central Africa. Among these, the adventures of the Hungarian, Stanislaus Magyar,† and his penetration from the west coast, near Angola, to a central point, are very striking; whilst the complete traverse of Africa by a caravan of native traders from Zanzibar on the E.N.E., to Angola on the W.S.W., of which we have had an interesting account, through the Foreign-Office, from Consul Brand, has confirmed and extended the ideas previously derived from African sources, as compiled by Mr. Macqueen, and illustrated by Mr. Cooley. The last-mentioned geographer has, indeed, given us a well methodized memoir, explaining how the details related by the conductors of the caravan above alluded to, agree with his views obtained from Portuguese authorities, as to the form and position of the great interior lake of Nyassi which the traders traversed.

The valuable map by Mr. Cooley, to which I alluded in my last Address, has been presented to us by its learned author. In it geographers will recognize for the first time the delineation of lakes, rivers, and tracts between the equator and the southern tropic, the routes to Lake Nyassi, and across the countries of the Moenemoezi, Cazembe, and Muropue. In casting the eye on this map, English geographers may, indeed, be proud to see that very nearly the most central point of Southern Africa is the town of Sesheke, on the river Liaubae, or Luambege, reached by our associate, Oswald, in company with the missionary Livingston, S. lat. 17° 26″, E. long. 26° 50″, whilst far to the N. of this, or in S. lat. 10½°, the Hungarian Stanislaus Magyar is said to have reached the centre of a broader part of the continent in E. long. 28°.

Lastly, in relation to this most interesting continent, of which I spoke at great length at the last Anniversary, it is to be noted, that

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* In Eastern Africa the Rev. Mr. Krapf continues his visits in various directions in the neighbourhood of Mombas. And in the 'Church Missionary Intelligencer' for June and July, an interesting description of the late visit of this enterprising missionary to Usambára may be read.

Our associate, Dr. Irving, R.N., has given a lively account of his mission, in company with Commander Foote, to Abbeokuta, in December last year; and as this intelligent physician is about to revisit Africa, much new matter may be safely expected from one so conversant with the inhabitants of Western Africa. —See 'Church Missionary Intelligencer' for June.

† This traveller has penetrated nearer to the equator than any modern traveller.

the portion of Southern Africa around the Lake Ngami, to which our attention was specially drawn last year, has been reached by Messrs. Green, Wilson, Edwards, and Campbell, who travelled round the lake, which is found to be about 65 miles long and 12 to 14 miles broad.*

It would appear that the Portuguese, coming from the west coast to the N.W. of Morami town, pass down the Zambese river in canoes, and carry on an active barter with some of the population before alluded to, who inhabit a rich country lower down the stream.

The new feature of interest in this part of Africa is, that whilst the river Zouga flows out of the lake Ngami at its eastern end, the large river Teougha, or Teoge, enters it from the N.W. This stream has been ascended for about 150 miles, and would have been still further explored, had not the oxen of the travellers been destroyed in great numbers by the attacks of the Tsetse fly. The longitude west was computed by Messrs. Green to be 22°. Mountains reported to be covered with snow are said by the natives to lie towards the sources of the river Teoge; and friendly relations have been established with the powerful chiefs Seeheli and De Babi, who live upon its banks.

In reviewing with pride these recent efforts to extend our acquaintance with the interior of Africa, we must not forget, that whilst the ancients unquestionably knew much more of this vast continent than ourselves, the very tracts around Timbuctù, and in Soudan and Ethiopia, as well as the banks of the Upper Nile, were all explored and described in the fourteenth century by that celebrated Moor of Tangiers, Ibn Batuta, whose extraordinary travels in many other distant regions, including Hindostan, are known to the English public through Dr. Lee's translation published in 1829.†

United States.

In North America two works have been published by the Government of the United States, each of which imparts to us much knowledge of vast countries hitherto slightly known.

That singular region around the great salt lake of Utah, at the eastern frontier of the Rocky Mountains, which was partially explored by our medallist, Fremont, and which has since been occupied by the new sect, the "Mormons," has been regularly surveyed and described by Captain Stansbury of the United States Staff Corps. Accom-

* These facts were stated in the 'Graham's-Town Journal,' Feb. 12, and 'The Friend of the Sovereignty.' Bloem Fontein, Jan. 13.

† An independent Portuguese translation from the Arabic, by Moura (vol. i.) has recently been presented to our Library by His Excellency Count de Lavradio, the Portuguese Minister.

panied by detailed maps and many lithographic sketches, this work, published by the Government of the United States, has excited much interest, from its description of the singular structure of the country, and by sketches of the singular sect of people by whom it has been colonized, and who seem to bid fair to establish themselves soon as one of the independent states of the Union. The accurate survey of large tracts in the region around the great salt lake, wherein fresh water is with difficulty found, was a feat worthy of the successor of Fremont; and we cannot too highly commend the vigour of mind and ready resources, with which Captain Stansbury overcame all such obstacles.

In no region is the direct dependance of the actual condition of a country, or the geological mutations which its rocks have undergone, more manifest. Whilst the palæozoic strata (Devonian and carboniferons) undulate over vast prairies between the western boundary of the settled portion of the United States and the edge of the Rocky Mountains, no sooner do the older masses (probably Silurian) approach the latter, where eruptive rocks have been protruded to the surface, than they lose their normal characters and become variously modified. The mineral distinctions of this region are its crystalline structure, and the formation of large bodies of rock salt, which impregnate the waters derived from the atmosphere and thus render large districts sterile. There are, however, tracts of considerable extent, in which the Mormons live, which are highly fertile, and particularly the chief valley, as watered by the river Jordan, which, just as the river of our sacred history empties itself into the Dead Sea, here finds a receptacle in a similar inland sheet of water. The pages of Captain Stansbury must, indeed, be attractive to every class of readers, and to none more so than those who desire to form a just and unexaggerated account of the Mormons.

A very remarkable American work of the year is a Report of a Geological Survey of Wisconsin, Iowa, Minnesota, and a portion of Nebraska Territory, by Mr. D. Owen, U.S., geologist. When it is considered that this survey relates to a country more than twice the size of Great Britain, or 750 miles in length by 350 in breadth, large tracts of which had never before been explored, and that Mr. Owen and his associates, Dr. Norwood, Colonel Whittlesey, and others, have not merely reported on its geological and mineral structure, but have also published a geological map of so large a territory, determining also many altitudes and illustrating its climatology, it will be admitted that even the pure geographer is as much interested in these important results as the geologist and naturalist. One of the chief geological

facts ascertained in reference to the origin of life in the crust of the globe is the discovery of certain fossil animals (trilobites) in strata lower than any in which they had been found in America, but which are precisely on the same horizon as the lowest fossil-bearing Silurian rocks of Britain, Scandinavia, Russia, and Bohemia, where trilobites also occur in the same relative position. Excuse me, then, if I say that I felt no small pride when I saw that Mr. Owen had mapped all these rocks as Lower Silurian, and as agreeing with those, which under that name I have defined to be the lowest fossiliferous rocks of Europe. These and other palæozoic rocks, the equivalents of our Devonian, are surmounted by carboniferous masses of such extent, that one of them may be mentioned as a coalfield larger than England!

I rejoice in seeing the general government thus rivalling the state governments, in unfolding the real nature of the topography, geology, and mineral structure of their lands. In this way our sagacious kinsmen truly plant guide-posts for the new comers into distant settlements, destined doubtless to become at some future day powerful as European kingdoms. In commending the execution of the maps, illustrations, and woodcuts of this work, and the clear and methodical descriptions of Mr. Owen and his associates, I am lost in admiration of the great labours in the field (often under very severe privations), by which alone they could have produced a work which is a substantial addition to those volumes of Hitchcock, Hall, the brothers Rogers, Dana, Conrad, and others, which have already shed such a lustre on the geology and geography of the United States.

The very efficient manner in which the Coast Survey of the United States is conducted under the superintendence of Professor Bache has been adverted to by my predecessor. I have now the pleasure of mentioning, that the annual report of that distinguished "physicist," detailing the progress of the work during the year 1851, is, if possible, still more worthy of notice than any which have preceded it; for in this document you have before you the ways and means, by which such results are obtained along all the eastern coast through upwards of 19 degrees of latitude, and can mark with admiration the rapidity, with which the surveys of the western shores, or Californian coast of that continent, have been carried on. The systematic co-operation of able surveyors of the naval and military services, combined with and subordinate to a central system of direction of the Treasury, and superintended by astronomers, whose chief is Professor Bache, could not fail to make this one of the best exemplifications of applied science in modern times. The precision with which every new observation is recorded, the light

which is collaterally shed on meteorology, magnetism, the tides and currents, as well as on hydrography and pure geography, render such Reports encyclopedias of great value. Among these collateral branches I must indeed specially allude to an admirable illustration of the true nature of the coral reefs between the coasts of Florida and Mexico—the "keys" of the seamen. In a separate Report on the topography of that tract, in relation to former, present, and probable future condition of such reefs, Professor Agassiz has successfully shown how all such surveys ought to be made in conjunction with naturalists. For, quite independent of the important additions to natural-history knowledge which are obtained, statesmen as well as hydrographers thus ascertain the causes of increase or decrease of coral reefs, and learn, that whilst no human power can arrest the growth of such reefs, there are channels amidst them which will remain deep for long periods of time, and the outlines of which, when well defined by lighthouses, may be the salvation of much life and property. In other words, the fixed and stable points of land and the channels which are dangerous, are thus accurately defined by the great naturalist, Agassiz.

Allusion has already been made to the remarkable explorations of our kinsmen in the Arctic regions, and to their gradual extension of the whale fisheries in and beyond Behring Strait. To the current charts and recent operations of Lieut. Maury, as well as to a great expedition now in preparation by the United States, a distinct reference will be made when I come to treat of the Ocean at large. But before we quit the subject of American books, let me say that our Transatlantic brethren have eminently displayed the true interest they take in the cause of science by the recent publication of the American Ephemeris and Nautical Almanac for the year 1855, under the superintendence of Lieut. C. H. Davis, U.S. navy, aided by Professor Pierce, and other mathematicians.* This work is truly scientific in all its bearings, beautifully printed on excellent paper, and admirably adapted for reference by the order and regularity of its arrangement. The subject-matter is divided into two distinct parts, the first of which is appropriated to nautical requirements, and is calculated for the meridian of Greenwich; the second, being devoted to the use of astronomers, is adapted for the meridian of Washington. As this book, which marks an interesting epoch in American philosophy, has hardly yet appeared in this country, a copy is now placed on the table for the inspection of Members by my predecessor, Admiral Smyth, who has thus called

* For the possession of this work, as soon as it reached England, I am indebted to Mr. Ingersoll, now Minister of the United States in London.

my attention to a work which is of so great value to all scientific geographers.

I must also seize this oeeasion to congratulate you on the establishment in the last year of the Amcriean Geographical and Statistical Soeiety at New York, of whieh thc first bulletin only has becn received. I have only to regret, that at the first meeting the memoir read by Mr. Hopkins, late Consul at Paraguay, on the Geography and Statisties of that new state, should have contained eertain invidious allusions to Great Britain, which I really think the author himself will, on reflection, agree with me, are ill suited to the halls of science. In no instanee have the geographical, or any other scientific institutions of our eountry, introduced similar eomparisons: on the eontrary, we have always striven to promote the harmony of nations, and especially between the United States and ourselves. I feel eonfidcnt, therefore, that a society, presided over by those distinguished men, Bancroft and Grinnell, will keep its future communications free from all politieal disquisitions. And here, I further regret to be obliged to state, that the account of the statistics of Paraguay, given by Mr. Hopkins, is at variance with the relations of other persons. Thus, the aecomplished Swiss botanist, Rengger, long a *détenu* there under the Dietator Francia, estimates the population at about 200,000 (a number differing little from the old Spanish census), whilst Mr. Hopkins, possibly through an error of the press, makes it 1,200,000.

But passing from the criticism of a portion of a single memoir, let mc say, that in thc very same number the American Geographical Society shows the best and truest spirit, when it memorializes its Govcrnment to survey thc Rio de la Plata and its tributaries eorrectly with a steam-vessel—a project whieh must meet with the approval of the geographers of all nations. Evcn whilst I pen thesc lines I hear with plcasurc of a new maritime exploring expedition of the Unitcd States, eonsisting of five vessels, commanded by that exeellent officer Captain Ringgold, whieh must prove as important to eommerce as it is sure to produce a good survey of large portions of the North Paeifie, into Behring Strait, and edges of the Arctie Ocean.

Possessing so large a portion of the sea-board of the W. eoast of Ameriea, our brethren are thus taking a step of great eonsequenee to them, whether we consider the grand trade they are opening out with China and Japan, or their new whale fisheries. I have already alluded to a somewhat similar expedition into those seas projected by the Russians; and thus, through the efforts of the two eountries most interested in aseertaining the real geography of sueh regions, it is by

no means improbable that, independent of many scientific and commercial advantages, the first reliable intelligence respecting the fate of our missing Arctic explorers may be brought to us by Captain Ringgold and his associates, who, expecting to be employed from four to five years in this noble service, will thus apply steam-power in a direction where Great Britain has not used it.

South America.

Isthmus of Darien.—Your attention has been from time to time called to various schemes for traversing the isthmus of Central America by a railroad or canal, and recently the narrowest part of the isthmus, or that of Darien, previously little known, has been partially explored by Dr. Cullen, and afterwards by Mr. Gisborne, who was sent out for the purpose by Messrs. Fox and Henderson. A new and mighty project has, in short, been brought forward by those enterprising men, for cutting a ship canal from Port Escoces on the eastern, to the gulf of San Miguel on the western side of that part of the isthmus; without locks, and deep and wide enough for the passage from sea to sea of ships of the largest class: an undertaking which, however gigantic it may appear at first sight, there seems little doubt, from the information we have as yet obtained, is capable of being accomplished by modern engineering. It only rests for the merchant princes of the world to determine whether the advantages to commerce are sufficient to induce them to raise the capital, which must be provided to carry out this magnificent plan upon the scale proposed; for further details respecting which I beg to refer you to the admirable paper of Capt. Robert FitzRoy, lately read before the Society, and now in course of publication in our own Journal. In that memoir he has carefully collated all the information he could collect respecting the line of country, through which it is proposed to carry this great oceanic canal.

In alluding to it, let me do homage to the sagacity of Humboldt and say, that should this scheme be eventually carried out, it will but verify the accuracy of the predictions of the illustrious traveller, and justify his endeavours for the last forty-five years to induce us to look to the east rather than to the west of Panama, for the line which would offer the greatest facilities for such a project. To quote his own words, in a letter to Sir Woodbine Parish, "All the secret of the isthmus lies to the east and not to the west of the meridian of Portobello and Panama."

It will also, perhaps, be recollected that in a former address to this Society as far back as 1844, when alluding to the various schemes for

a passage across the isthmus, I mentioned that Mr. Pitman, after a careful examination of the narratives, and descriptions of the country given by the Old Buccaniers, had also arrived at the conclusion that, of the lines projected, "that of Darien was the most attractive on account of the excellent roadsteads in both seas on that parallel."

From what we now know there will not be the difficulty to which I then adverted of cutting through a cordillera; for if the eye survey which has already been made approaches to correctness, a line may be taken, which traverses no altitude exceeding 120 feet above the ocean. The real and substantial obstacle is the climate, and its six wet months, which proved so disastrous to the Scotch colony in the reign of William III., and which it is probable will render it necessary to employ Coolies, Chinamen, or other inhabitants of a hot and moist climate, to execute the task.

Whatever may be the result of the various plans for facilitating the communication between the Atlantic and Pacific oceans, which have been submitted to the public, we, as geographers, are sure to be gainers by the necessity they entail upon the projectors to obtain by every means in their power the most accurate geodesical data, respecting a most interesting portion of the western world, which has hitherto been very imperfectly delineated, though the old Spanish maps are by no means to be despised, and are indeed the only documents which can be at all relied upon.

The country of New Granada, to which the Isthmus of Darien belongs, has been made better known by a work recently published by General Mosquera, the former President of that Republic, containing much valuable information regarding its geography and resources; it comes very opportunely at this moment to meet the eager inquiries of the public respecting that part of South America. I may also refer you for much interesting information regarding the same region to the voyage of H.M.S. 'Herald,' published with the aid of her Majesty's Government by Mr. Seeman, and which abounds with interesting natural history details of the countries north of the Equator, and bordering upon the Pacific as far north as Behring Strait, whither they were bound in search of our gallant countrymen in the Arctic seas.

The Survey of the New boundary line between Mexico and the United States, which has been recently resumed, comprising as it will a line running east and west, between the Atlantic and Pacific oceans, for upwards of 2500 miles, through a country never before scientifically explored, will no doubt be productive of results of the highest importance not only to geography but to science in general. No pains have

been spared by the government of the United States to make it so; Mr. Bartlet, their Commissioner, being accompanied by several experienced naturalists, who have already made extensive collections both in botany and zoology of great interest:—in addition to an extensive series of astronomical, magnetic, and meteorological observations established by competent officers from ocean to ocean.

Paraguay.—A diplomatic mission, despatched last year by the governments of England and France, to open a direct intercourse with Paraguay, has ascended the river Parana and reached Assumption, where, by the last accounts, the Envoys had been received in the most friendly manner by the ruling authorities. We may, I trust, therefore, anticipate that European travellers who may hereafter be desirous of exploring this interesting portion of South America, need no longer apprehend the fate of the botanist Bonpland, so many years detained there by the Dictator Francia; or even of Dr. Weddell, who so lately as 1845 was refused permission to enter the country, when he had descended the river from the Brazilian province of Cuyaba, little anticipating any impediment to his travels in that direction after Francia's death.

As it is understood that one of the objects of the mission above alluded to is to open some channel by which the various products of the interior may be brought down to the coast, and made available for the markets of Europe and North America, it may be as well to allude to an opinion very confidently expressed by Dr. Weddell, after his own voyage down the river Paraguay, that, so far as Bolivia is concerned, the easiest outlet for her productions will be by a line of road run through the province of Otuquis direct to the river Paraguay, north of the river Pileomayo, whence the communication is easy and uninterrupted by the Rio de la Plata to the ocean.

The government of Bolivia, long impressed with the same conviction, has offered a considerable premium to the first steamer which, ascending the river Paraguay from the Atlantic, shall reach the mouth of the river Otuquis, which falls into it about 20° latitude. Our enterprising brethren in the United States will probably be the first to realize the facilities of this communication, the President having lately announced that it is his intention to equip a small steamer for the express purpose of exploring the higher waters of the Paraguay. It was supposed that either the river Pileomayo, or the Vermejo, offered a water communication with Upper Peru which might be made available for commercial purposes; but an attempt made in 1844 by the government of Bolivia to send a small vessel down the former river,

has shown that below Cayza it becomes too shallow for the purposes of navigation; and the fact of the Vermejo running through the Gran Chaco, which is solely inhabited by naked and hostile savages, must render that channel a very unsafe one for commerce for some time to come.

The results of the last exploration of the Vermejo by Don Pablo Soria in 1826 were supposed to be irrecoverably lost by the seizure of all his papers by the Dictator Francia. It has, however, recently transpired, that the original survey of the river, made by his pilot Delcalzi in descending it, still exists in the public archives at Assumption, where it was deposited by Francia's orders. M. Helmrichen, a German naturalist to whom we owe the information, was permitted to make a tracing of this interesting document; and although his recent death of small-pox at Rio de Janiero has unfortunately retarded its transmission to Europe, the Austrian Consul there having taken charge of his papers, it is to be hoped that they will not be lost to the public.

Bolivia.—Dr. Weddell's narrative of his journey with M. Castlenau through the southern districts of Bolivia, has been published, as well as a brief notice of a subsequent journey in a more northerly direction, extending to Tipuani. Both are replete with new and highly interesting information respecting countries hitherto very little known and most imperfectly described.

The French government, in continuation of the objects contemplated in a former journey with M. Castelnau, have resolved upon again sending out M. Emile Deville, who was one of the same party, to complete, as far as possible, a scientific exploration of other interesting portions of the interior of the South American continent, and at the request of the Minister of Public Instruction, a Commission of the Academy of Sciences, comprising M. Elie de Beaumont and others, have marked out his route, and furnished him with the necessary instructions. He is to proceed in the first instance to Rio de Janeiro, and crossing the province of St. Paul's, follow the river Ticté to the Paranà, whence, travelling through Paraguay, he is to proceed northwards to the province of Matto Grosso, and from Villa Bella descend the Guaporé and Madeira to the Amazons, returning by Pará.* It is an arduous

* The difficulties which will probably beset this expedition, should it ever reach the southern sources of the Amazons, may be predicted from an account of an effort recently made by our associate the British Consul-General in Bolivia, Colonel Lloyd, to ascertain the capabilities of intercourse between that republic and the navigable portion of the Amazons, which document Her Majesty's Secretary of State for Foreign Affairs has permitted me to peruse since the address was delivered. Having penetrated from Cochabamba across the Cordillera which separates the dry and healthy region of Bolivia and Peru from the perpetually humid and pestiferous

undertaking in which M. Deville has the best wishes of every geographer and geologist, whilst it must be acknowledged that the liberality with which the government of France is always ready to promote such enterprises, and to aid in the publication of their results, well deserves our grateful thanks.

Chili and Peru.—The physical geography as well as natural productions of the countries bordering upon the Pacific—thanks to the indefatigable labours of Gaye and Domeyko—are now known with much more accuracy than before. Their mineral riches seem as various as they are inexhaustible.

Colonel Lloyd, now her Majesty's Consul-General in Bolivia, and so very creditably known to us in our early days as the author of the first good physical paper on the American isthmus, recently came before us as the contributor of a highly interesting Report, addressed to His Royal Highness our Vice-Patron. In it we have a very able account of the great quantity of silver which is likely to be produced in the Chilian province of Copiapo alone, whilst the search for new veins of the precious metals was leading to further explorations of the Andes: these promise ere long to make us as familiar with that portion of the Cordillera as we are with the sea coasts which bound them, and which have been so carefully surveyed by our naval officers.

On Peru a work has been lately published at Geneva, by our corresponding member Professor Paul Chaix, giving an account of the first discovery and conquest of that portion of America by the Spaniards, which, though not professing to give much new matter, will, no doubt, from the known ability of the learned author, become a popular book among French readers.

On a more magnificent scale a great work has been recently published at Vienna, entitled 'Antiguedades Peruanas,' by Don Mariano

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tracts on the east, and having advanced after very great privations and at much risk (nearly all his people being laid up with ague and fever) to beyond the Indian settlement of Chimore, on the river of that name (an affluent of the Mamore), Colonel Lloyd returned to his post under the conviction, that no valuable commercial intercourse can be established by passing through a country in which during many months the numerous rivers unite and form one great system of lakes; where the hot, moist climate, and rank vegetation are peculiarly hostile to white men; where the air is darkened by myriads of insects; and where scarcely any change of season purifies the atmosphere! As I know that Colonel Lloyd is a person who can surmount many a real obstacle, I think that his Report must be considered as quite decisive on the point of intercommunication along that line. It is, however, possible that on reaching the River Grande or Guapai the French expedition may find a more practicable intercourse, far to the east of Lloyd's line of exploration.

At our last meeting, a Memoir, accompanied by a map, on the Rio Negro, or head-waters of the Amazon, by Mr. A. R. Wallace, was laid before the Society, and has been directed to be published in the Journal.

de Rivero, Director of the National Museum at Lima, aided by Dr. Von Tschudi, the well-known author of the 'Fauna Peruana,' and of a highly interesting book of travels in that country (now translated into English), of which I cannot speak too highly, whether as an example of the costly and highly finished style of Austrian lithography (almost rivalling, in accuracy and beauty, the illustrated work upon Mexico published by Lord Kingsborough); or as an invaluable contribution to the history of the early Peruvians—of the political and religious institutions of the Incas and of the state of the arts and sciences in Peru, as exemplified in their public works and manufactures. No expense has been spared by the Peruvian author to do honour to his country in this splendid publication.

Australia.—Its Gold—Its Geographical Exploration.

The golden shower which has been distributed over our great Australian colonies has been realized to an extent beyond any imaginable former estimate; for no one could have attempted to predict the quantity of auriferous wealth of any given spots in unexplored regions, though a geologist like myself, anticipating from their structure, in 1844, that gold would be found in them, was aware, as early as 1846, that specimens of the precious metal had even then been detected.*

The coincidence of mineral structure which I pointed out between the eastern watershed of Australia, as described by Strzelecki, and the Ural Mountains which I had examined, is now seen to be accompanied by other phenomena common to the two chains, to which it is well to advert. The Ural Mountains are notably auriferous on the eastern or Siberian side only; and as far as surveys have gone, it would appear that one flank only of the Australian watershed exhibits rich accumulations of gold débris; but in this case it is the western or interior side of the range. It is, however, to be observed, that in his recent exploration of vast tracts along the southern frontiers of the colony of New South Wales, where they unite with the Province of Victoria, as described in reports printed by order of the House of Commons, the Rev. W. B. Clarke has shown, that whilst no copious deposits of large-grained gold (with a partial exception near Araluen) have been found on the banks of those rivers which flow to the E. or S., yet still that in many localities, and over a very wide area, fine-grained gold is disseminated through the alluvia. In clearing up the geological structure of that region, this author has also given reasons for supposing that the various affluents of the Snowy river which descends to the S. from the

* See anniversary discourse of 1844; and 'Russia and the Ural Mountains,' vol. i., p. 392.

high Alps, named Mount Koseiusko by Strzelecki, may be profitably worked for gold when the richer natural magazines are exhausted. But still the fact remains, that it is only on the interior flank of the watershed that the great prizes have been found. Such are the tracts of Victoria, whether around Mount Alexander and along the banks of the Loddon, which flows into the Murray, or the Ovens Diggings to the N.W.; such are the rich accumulations along the feeders of the Macquarrie to the W. of Bathurst; those near Wellington, as described in a report of the Surveyor-General Sir Thomas Mitchell, and numerous fresh auriferous spots noticed by Mr. Stutchbury in his successive mineral reports; such again are the numerous creeks which supply the head waters of the Peel river. Another striking similarity to the Ural Mountains is, that like them the Australian range is in many parts a mere plateau with a scarcely perceptible dividing ridge, along which, however, eruptive or metamorphic rocks peer out, at numerous intervals, rising, though rarely, to altitudes varying from 3000 to 6000 feet. Thus, at the source of the west-flowing Peel river, the Hanging Rock of the colonists, is an eruptive boss like the Kateh Kanar of the Ural,* from which various fissures and chasms are said to radiate, in which minor streams meander through slaty and quartzoze rocks, which have been the chief sources of the gold ore. In like manner M. Stutchbury describes numerous protrusions of granitic, syenitic, and other igneous rocks through metamorphosed strata of schist sandstone and limestone of palæozoic age around Wellington and in the affluents of the Macquarrie. Noticing the same general cause and effect in the loftier southern Alps of this chain, Mr. Clarke goes still further in his effort to discriminate a succession of igneous phenomena, showing (if I read his reports aright) that the gold is sometimes diffused, though in minute quantities, through the granite itself. The same author has also discovered traces of quicksilver and tin.

But I am not here in the capacity of a geologist, nor do I venture to speak of the varieties of intrusive rock, whether they be granites, syenites, porphyries, or greenstones. It will be rather the province of the President of the Geological Society to estimate and compare the value of labours respecting these and other mineral products, including traces of other native ores; though in referring to geology I must express my thanks to Mr. Clarke for having first elicited the fact of the presence of true fossils of Silurian age in some of the less metamorphosed limestones of the S.W. tracts of New

* I gather this from conversation with Mr. Stuart Donaldson and from a Report of Mr. Hargraves printed in the last Blue Book.

South Wales and the adjacent region of Victoria Land, and also for the indication of intersection of certain rocks, near to which metallic ores prevailed; since these are phenomena which have been observed in other auriferous regions.

In referring to a Memoir on the Auriferous Rocks of Victoria, by Mr. G. H. Wathen, which was read before the Geological Society,* I was indeed gratified to find, that the very rich tracts around Mount Alexander present exactly the same phenomena as I had described in the Ural Mountains,† in the accumulation of the loose auriferous detritus, which is piled up at various altitudes above the present water-courses, and was manifestly placed there by much more powerful bodies of water than any which now flow in the valleys. I further learn from several sources, and particularly from Mr. Stuart Donaldson, who has travelled extensively along nearly the whole of the gold-bearing regions in both colonies, that the spots which are most copiously auriferous are the slopes which face abrupt precipices on the sides opposite to which the smaller streams, rivulets, or water-creeks of the present day flow.

Whilst I have reason to believe that not less than near 20 millions sterling have been extracted from Victoria and New South Wales in the last year, it must be borne in mind, that all this vast produce has been gathered out of what geologists consider the mere upper rubbish of the surface of the earth, which has been spread at all elevations in former periods of powerful abrasion, and when our present continents were subjected to powerful denudations by water. Let me repeat, therefore, an opinion I have so often expressed, and which is now sustained by numerous fresh proofs, that the *chief* bunches or strings of gold having been found towards the *upper part of the veinstones* in which the ore was originated, a former destruction of the sides of these mountains which were auriferous, and the wear and tear of ages have naturally brought together for the use of man, by the application of comparatively little labour, those ready-made deposits of the gravel of gold, by the discovery of which he has been enriched in all ages. On the other hand, as no mines worthy of notice have yet been established in the solid rock of Australia, neither is it likely that any such will be sought for so long as the

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* Quart. Jour. Geol. Soc. Lond. vol. ix., p. 74.

† See Russia in Europe and the Ural Mountains, 1845, vol. i. p. 471, et seq.; On Australian Gold, as then known to me, Trans. Roy. Geol. Soc. Cornwall, vol. vi. p. 324, 1846. Quarterly Review, vol. lxxxvii., p. 396; Trans. Brit. Assoc., Advt. of Science, 1849. Trans. of Sect. p. 60.

gravel, sand, or shingle of certain districts afford such notable quantities of the metal.

Australia will doubtless undergo the same changes as Europe, Mexico, and South America; for the history of the gold-miner is the same in all countries. So long as the precious thing is to be had in the superficial debris of newly-colonized tracts, he clears the ground with great profit; but afterwards, when he endeavours to extract it from the solid rock, whose *original surface* as broken up by great former operations of nature, gave rise to the copious golden deposits which have been spread out at various levels, the result is too often fallacious. For, although cases have occurred and will again occur, wherein profitable gold mines are opened in the solid rock, the majority of such enterprises fail, whether from the irregular dissemination of the ore in a hard and intractable matrix and its usual thinning out downwards, or from the great expense of its extraction. Those persons, therefore, who are apprehensive that gold is becoming too abundant for modern requirements (a fear in which I do not participate), should first look to the new maps of Eastern Australia and the Victoria Province, prepared by Mr. Arrowsmith (particularly to the very detailed map of the gold-bearing region near Mount Alexander, as taken from the trigonometrical survey of Mr. Urquhart), to see how small are the really auriferous areas in comparison with the remainder of that continent. They should then reflect on the fact, sanctioned by the experience of ages, that when the broken materials on the surface are dug out and sifted, the golden flood-time of the period has passed—not, however, before it has served the purposes of Providence in providing for a great augmenting population, and in converting wild tracts into flourishing hives of human industry.

Passing from the finding of gold to the change which its abundance has already produced, it is pleasing to observe the rapid advance which, under the admirable system of police and protection to property organized by its Governor Sir Charles Fitzroy, the great colony of New South Wales has undergone, and how about a million sterling is realized from the gold fund for the purposes of Government. A similar progress, and under more difficult circumstances, has been made by Governor La Trobe in Victoria, and it requires no prophetic vision to anticipate that, as our country has given to North America its masters, so will she be the founder of another great people of her own lineage and laws, which will extend themselves northwards to the warmer climes of the vast continent of Australia. There will Englishmen find their advantage, not merely by digging for gold

(which will, however, I doubt not, be found, at intervals, in greater or lesser quantities along the western and northern flank of the chief watershed), but in the cultivation of all those natural productions which such climates and soils will afford.

Already I learn that, in a district not more than 100 miles to the north of Sydney, wines of good quality are produced; and there is no reason to doubt that still farther to the north, cotton and the various plants of the East may very profitably be grown.* With such capabilities before them active speculators will therefore always be found to draw out wealth from that best of all mines, the rich cultivable soil.

And here I have true pleasure in referring to the 'Australia' of Mr. Montgomery Martin, as a publication of very great merit, for its well-digested contents illustrative of the history, topography, and great natural resources of this vast region. The able manner in which our associate has treated the subject of emigration ought to dispel any alarm created by the present flow of our countrymen to the diggings.

The colonies of New South Wales, Victoria, Adelaide and Perth, are flourishing and progressing so rapidly, that as geographers we are now led to speculate on the approaching solution of one of the most curious of all the problems which can interest this country—the true condition of the interior of this vast continent. The noble efforts of Mitchell, Sturt, Erle, Kennedy, and others, in overcoming the most extraordinary difficulties, have, indeed, carried inquiry to vast distances beyond our own frontiers. Alas! the chivalrous Leichhardt, after greatly extending our knowledge of the earth's surface, has too probably fallen a victim to his bold endeavour to penetrate across a portion of the continent. But no sooner is this calamity brought under our consideration, † than another stout-hearted volunteer has presented himself, in the

* After this was written, both cotton and silk, the produce of these tracts, were laid on the table by Mr. Stuart Donaldson, at the anniversary meeting of the Society.

† From information recently communicated to me by Mr. G. F. Leslie, a proprietor in the extreme northern British district of Darling Downs, from which Leichhardt started, in 1848, to traverse the continent, it would appear that some hopes are entertained that the adventurous traveller may still be heard of. His project, when he proceeded westward from Darling Downs, was to keep to the banks of the Victoria, as far as the course of that stream to the N.W. Leichhardt's last words were, in taking leave of the colonists, "Do not despair of me for four years." Among his followers was an adroit Scotchman, Donald Stuart, who, formerly a convict, had proved most trustworthy, and had a thorough acquaintance with the natives, among whom he had passed many years, and with whose habits he was so familiar, that he could obtain a livelihood where other civilized men would die. Such a companion, it is supposed, could scarcely be lost; and if even he and Leichhardt had been murdered by the blacks, it is believed that some of the oxen, mules, or horses of the expedition would have found their way back to their homes.

person of Mr. Ernest Haug.* Seeing that the great obstacle to the successful passage across this continent is the want of water, this traveller first proposed to us the employment of camels or dromedaries, which might be imported at no great cost from India—a plan to which I called your attention in the year 1845, as having been then suggested by our member Mr. Gowen.

Other persons well acquainted with Australia, including Dr. Blundell, who has addressed a sensible letter to me on the subject, and Mr. Kent, approve rather of bullocks and mules as presenting more effective means of transport through the thick and thorny bush. They also think that no successful effort towards an exploration of the interior can be attempted from the shores of Western Australia. This, indeed, has already been rendered manifest by the report of Mr. A. C. Gregory, the Assistant-Surveyor at Perth, which explains the ineffectual efforts of himself, Capt. Sanford, and party, to penetrate through the thickets of acacia on the banks of the Murchison river, in S. lat. 27½, where they could find no fresh water for considerable distances on either side of its banks. Now, as the last surveys of that undaunted traveller Sturt have taught us, that equally in proceeding from the south, a dry, saline desert is reached, in which all rivers are absorbed or evaporated, so we can reasonably look to the east and north sides only of the continent, as [illegible] unexplored

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are destined for future settlements. Whether, therefore, our Government may or may not approve a search from Cambridge Gulf along the Victoria, in which Mr. Haug and the explorers may reach the watershed, and afterwards pass to the head of the Gulf of Carpentaria, we can scarcely doubt that a noble bay which advances 500 miles into this continent, will, sooner or later, become the great line of intercourse between our Australian and Indian dominions. For here it must be

* The project of Mr. Haug has been subjected to the examination of a very competent Committee, and if approved will be recommended by our Society to the consideration of the Government.

recollected the head of the Gulf of Carpentaria is less than 700 miles distant from our most northern settlers, and that the intervening tracts have been ascertained by Leichhardt to be well adapted to cultivation.

The maps of our Eastern Australian colonies and of Victoria or Melbourne, which are about to be issued to the public by Mr. Arrowsmith, will be a great addition to our acquaintance with these lands, the former being on a scale of 20 miles to the inch; the latter, much more detailed, is on the scale of 8 miles to the inch. Some intelligent colonists have expressed to me their regret that of the vast regions which have been surveyed and chained, so small a portion had yet been published. They think that in these days of rapid colonization, and when so redundant a population is attracted to Australia, they might be made acquainted with the *outlines* of the geography of the yet unsettled regions which have been obtained through the successful explorations and skill of the Surveyor-General, Sir T. Mitchell, and his associates. For although not presenting so perfect a facies of physical geography as the beautiful map by the same authorities of the colonized parts known under the name of the Map of the 19 Counties, such outlines would be useful approximations to truth, by which the vast interior tracts watered by the affluents of the Darling and Murray rivers, might be delineated on a general scale.

No region of the earth presents a greater geographical problem to solve than Australia, in the apparent termination in the interior of so many of her vast rivers—some of which are of great breadth and depth, even near their sources in the eastern Cordillera, and end in being evaporated in saline western deserts of little altitude. The restless settler, forcing onwards wherever fine herbage leads him, will, it is true, eventually find his way to the very limits of productive lands. But what we geographers regret is, that so very much of the territory, which lies between such distant outposts and the regularly settled countries, has not yet been inserted on any map; and I therefore hope that by some means or other all the knowledge acquired with so much labour by our distinguished associate Mitchell, will soon be made public.

Great Circle Sailing.—Before we consider some additions which have been made to our acquaintance with hydrography and the currents of the ocean, the collateral subject of what has been called "Great Circle Sailing" may naturally be spoken of. To geographers it seems surprising that there should be any novelty in the navigator being counselled to steer by a path which follows the real form of the globe, in preference to the necessarily faulty direction which is given to him by a course laid down on a Mercator's projection, every degree of which, as

it recedes from the Equator, becomes more and more erroneous as it approaches towards the Poles. In truth, all really scientific seamen, from the time of Columbus, must have more or less attended to this rational system of sailing, about which so much has recently been said; and I should not have called your attention to it, if it were not for a very ingenious invention of Mr. Moore, termed by him the "Great-Circle Indicator," which is designed to obviate the elaborate calculations beyond the reach of many practical seamen, and by which any of them may at once decide on their real course. It is for nautical authorities to pronounce on the adaptation of this clever instrument to its ends, and to say whether this contrivance will best answer the purpose for which a set of diagrams have also been prepared by Mr. Russell. If the latter would be less costly, it is right to state that Mr. Moore is of opinion that, if largely purchased, his brass Indicator might be sold at no greater charge than 20*l*.

The Ocean—its Currents, Tides, Depth, and the Outlines of its Bottom.

When, a short time ago, I was conversing upon comparative or ancient geography with a friend whose mind ranges over all subjects, from the epic to the abstrusest mathematical problem, I was reminded by him that those who are acquainted with the writings of the ancients would see with admiration how often a piece of knowledge, or a thought belonging to those by-gone days, emerges with an applicability to our new geographical views which is truly astounding. Take, says he, the Homeric view of the ocean; it was an ocean, and yet an *ocean stream*. It covered the immeasurable earth, and yet it ran round the boundaries of all known lands. Thus, the most learned of our popular poets has also spoken of the region

> 'Where jealous Ocean, that old river, winds
> His far extended arms, till with deep fall
> Half his waste flood the large Atlantique fills.'"

When the poet goes on to pour his flood into

> 'Slow, unfathom'd Stygian pool,'

we have only to vary the reading, as Dr. Whewell suggests, to

> 'Half the broad Pacific's tideless pool.'" *

* Though there are many tides in the Pacific, this idea of a tideless pool may be correctly applied to the central Pacific around Tahiti. Geographers will do well to refer to the Appendix to Captain FitzRoy's second volume of the Surveying Voyages of the Adventure and Beagle, to see the value attached by that successful navigator to the essays of Dr. Whewell, and also to appreciate the importance of the views of so experienced and scientific a seaman.

But the point for us is not merely to occupy ourselves with finding that the ocean, as the ancients imagined, does "wind its extended arms" like those of a river. However we may regard this as a flight of imagination, or admire it as the foreknowledge of our ancestors, our duty is more stern, and we must pass from the myth, to ascertain what arms this jealous ocean has, how far they extend, where they wind, and where they end in "steep fall;" which last words, brought down to our geographical prose, means merely an accelerated current. Now, although we have had many admirable contributions to answer these questions, and above all comparison those of the illustrious Rennell, who led the way in all these inquiries, there still remained a vast deal to be accomplished. The memoir of Mr. Findlay, recently read before the Society, illustrated as it was by a series of admirably constructed large charts, in which all the cold or polar currents were marked in a blue colour, and the warm currents in a red tint, is certainly the most complete general view, which has been taken in our day of this grand subject—a full and accurate acquaintance with which is of such importance in the intercourse between distant nations. In these valuable documents, and particularly in the work of the same author to which I called your attention last year, we not only see the extent of our present knowledge as to the nature and distinction of upper and under currents, but also the desiderata which remain to be filled up. I cannot here, indeed, attempt to convey to you an adequate view of Mr. Findlay's labours of compilation and deduction, and must restrict myself to saying that, taking into account the known currents of the Atlantic and Pacific, and having regard to additional observations, he reduces the motions of each of the two oceans to systems of revolving, re-entering currents; one such circle, or orbit, existing in each case to the N. and S. of the equator.

The currents of the ocean are so complex and numerous, that it is not to be expected we can obtain all the requisite materials to form a correct view from ordinary navigators, who are occupied in trade and commerce. And this brings me back to a point on which I dwelt last year:—or an expedition "ad hoc," and entirely devoted to the survey of the *Tides of the Ocean*. Such an expedition, connected as it must be with a special attention to the currents, would, I repeat, be truly worthy of this maritime nation, and all geographers would rejoice if its conduct were confided to our associate Captain FitzRoy, whose tried capacity as a naval surveyor and sound nautical accomplishments particularly qualify him for such an employment. For

we must recollect, that in addition to the researches of Sir John Lubbock in this country, and those of Professor Bache in the United States, the able, consecutive, and elaborate investigations of Dr. Whewell, founded on real data, have led far towards the establishment of definite laws respecting the tides. It is, therefore, much to be desired that the naval authorities of Great Britain, honouring these skilful gratuitous labours, should, without delay, accede to the prayer of the British Association, and send out such an expedition as is here proposed—one which would enable Dr. Whewell to complete a generalization worthy of this age of inquiry, and of the greatest utility to navigation.

In the meantime it is a subject of congratulation, that a Peer of the realm distinguished for his acquirements in astronomical science, sustaining the same objects for which we are contending in common with the British Association and the Royal Society, should have brought this important subject before Parliament, directing specially the attention of the Upper House to the very great importance of such observations and generalizations as those of Lieut. Maury of the United States Navy. This meritorious officer, some of whose researches were adverted to by my predecessor, has recently issued a circular which calls for the co-operation of the principal maritime nations in collecting materials for wind and current charts. The prayer of the British Association for the Advancement of Science, and of the Royal Society, that a more extended and systematic direction be given to meteorological observations at sea, as prepared by Lieut. Maury, will, I trust, meet with favour in the eyes of the British Government. The Royal Society says truly that, short as the time is that the system has been in operation, the results to which it has led are of very great importance to the interests of navigation and commerce: and it is earnestly to be hoped that the system of co-operative observation may be zealously promoted. In short, when Lord Wrottesley explained in Parliament what enormous spaces of the ocean were still blanks as to any records of the winds, or of the currents and temperatures of the sea, the words which he added will find a response in the breasts of all whom I now address:—"That these blank spaces are a reproach to the civilization of the present age; that it is our duty not to rest satisfied until we know all that can be known about the globe we inhabit that can be rendered in any way profitable to our common species; and that, therefore, the principal maritime nations should share the labour of exploring these vacant spaces."

Our neighbours, the French,* have, indeed, shown their desire to promote useful surveys of distant seas by the addition they have recently made to our knowledge of the hydrography of the Chinese seas, resulting from the researches of the 'Capricieuse' corvette, under the command of Captain Roquemaurel, who has trigonometrically surveyed the eastern coast of Corea and Chinese Tartary for an extent of 130 leagues. One of the results is the ascertainment of an excellent port in the Golfe d'Anville, nearly in the same parallel as the strait of Matsmai, from which it is about 130 leagues distant; parallels in which it is suggested some profitable whale-fishing grounds may also be met with.

As the phenomena of tides, currents, winds, and the condition of the atmosphere and ocean are in great measure dependent on the outline of the solid portion of the earth, so has this year brought with it the most remarkable hydrographical observation of modern times in the detection of an abyss in the ocean said to be nearly double the depth of any of which we previously had a conception.

Hitherto, indeed, it had been the prevalent belief (an opinion supported by La Place himself), that the depressions of the crust beneath the ocean were probably of about the same extent as the elevations above the sea. Some observations of our scientific associate Captain Denham, R.N., have, however, gone far to modify if not to set aside this hypothesis. By soundings† in the ocean, mid-way between the Cape of Good Hope and Tristan d'Acunha, he has concluded, after several times dropping the plummet and by finding the line always stop at the same point, that the sea has there the enormous depth of 7,706 fathoms, or double the height of Chimborazo, the giant of the Andes.

It is, also, a triumph of nautical skill and perseverance that the 'Herald,' and her companion the 'Torch' steamer, should have been enabled to lie at anchor more than three weeks on the comparatively shallower banks in the middle of the wide Atlantic ocean, such a position having greatly astonished those mariners whose course happened to cross these new and unheard of anchoring grounds. When so stationed Captain Denham further ascertained, by sending down thermometers,

* Since our last anniversary the Meteorological Society of Paris has been established, and is now organized in so satisfactory a manner, that I have joined it myself, and trust that many of my countrymen may do so likewise.

† The soundings were made with peculiar lines given to him by Commodore McKeever, of the United States Navy. But I must state that some naval surveyors are of opinion, that the results may have been more or less deceptive, in consequence of the line not lying in a straight direction between the ship and the plummet, whether by the vessel drifting during so long an operation or by the influence of currents and other causes.

that, whilst the surface-water was at 90°, the cold never exceeded 40° at any depths which were sounded. In addition to important magnetical observations, he has excited great interest amongst geologists by proving, that, within one cast of the lead, coral reefs rise suddenly like a wall, from *no bottom* at 200 fathoms to 19 fathoms from the surface; thus illustrating one of the phenomena on which Mr. C. Darwin has thrown so much light.

In looking at the statement of Captain Denham, and at the vast number of desiderata that remain to be inquired into, it is not, therefore, too much to affirm, that until our submarine knowledge shall have been vastly more extended than it is; until, in short, we know as much of the earth beneath the waters as of that which is above them, we are wanting in several of the most essential elements to explain the proximate causes of the deflection of the great oceanic currents to which we have been adverting, as well as of the origin of many climatal peculiarities.

The geologist, meteorologist, and geographer, are indeed each of them equally interested in the determination of grand problems like these, which will teach us the forms of the submerged lands around which run the various streams delineated in the maps of Mr. Findlay. Such, for example, as that which, with its superjacent floating masses of "Sargasso," or sea-weed, circles in the N. Atlantic, or the great whaling grounds of the North Pacific, around which the North Equatorial and Japanese currents flow: or, again, that mass between New Zealand and Australia which is encircled by the Australian current.

In this last instance the geologist again steps in to help to solve the problem. The discovery of the enormous bird, the Dinornis, in the comparatively small tract of New Zealand, has naturally led him to suppose that there was once a much larger adjacent mass of land to provide for the sustenance of such huge creatures; and hence it is a fair inference, that the nucleus, around which the Australian current runs, is the central and higher portion of what was a large continent once united with New Zealand.*

In the meantime, passing from such theoretical views, I seize on the one great submarine phenomenon indicated by Captain Denham, to assure you that however it may be modified, I view it as of singular

* The same reasoning may be applied to the Island of Madagascar, where eggs of birds have been found, which contain the substance of 240 hen's eggs. This isle may be the remnant of a former vast eastern continent now submerged. See Professor Edward Forbes's proofs of the existence of such ancient continents, derived from the present insulation of certain groups of plants and animals.—*Memoirs Geol. Surv.*, vol. i.

importance in enabling naturalists to account for the marked separation of the tribes of marine beings which at present exist in regions widely separated from each other. For, vast depths are to many inhabitants of the sea (including all the mollusca) what great and snowy heights are to the animals of the land—perfectly impassable barriers. Now, whilst we have, in the profundity of parts of the present ocean, a distinct reason for the separation of aquatic races in our times, the near approach, on the contrary, to a general and uniform distribution of marine mollusca in primeval periods, as registered in the ancient sea bottoms, which have been raised to form our present continents, compels me to believe, that the earlier geographical outlines of our planet were infinitely more simple than the present. In other words, that the oceans were then broader on the whole, the lands of less altitude, and the cavities in the sea bottom by no means so deep as those of our actual highly diversified outlines. For, had such very varied outlines prevailed in primeval periods, most unquestionably the same land-plants which are found in the old coal formation could not have lived from Spitzbergen and the Polar regions to temperate and even warm latitudes, and in nearly all longitudes; nor could the same tribes, and often the small species of shells and other animals, have inhabited the most distant seas at the same period.

It is this varied outline, as brought about after many revolutions and changes of the crust of the globe, which presents to the meteorologist that mass of complicated problems, so few of which have yet been sufficiently solved to enable us to arrive at definite laws respecting weather, or the causes of its seemingly capricious changes. But still, notwithstanding all its variations, there is a mean distribution of heat and cold, which restricts certain groups of creatures to each continent and sea; and the more we can approach to a correct delineation of these zones beneath the waters, as well as those above them, and comprehend the nature of all tides and currents, the more perfectly shall we attain some of the highest aims of the physical geographer.

Conclusion.

If the discourse which I have now read to you has fallen short of that which I delivered at the last anniversary, in analyzing the recent labours of geographers, you will, I trust, extend to me the same indulgence which you granted on a former occasion. In the year 1845, when I took leave of you after a former term of office, I pleaded incessant occupation in preparing a large work on Russia and the Ural Mountains as an apology for all defects. After

an interval of eight years, I again say farewell with a similar plea; for during the past year I have been endeavouring to put my various geological writings into order and to produce a condensed view of the history of the older rocks. That work, which but for my occupation with this discourse would now have been published, may at all events have a bearing on geography. It may induce some of my associates to ponder upon the difference between the outlines of the earth during such early periods and those which now prevail, and to understand how, under dissimilar physical conditions, races of animals, very different from those of the present era, were the primeval inhabitants of our planet.

Yet despite of all the labours of geographers, geologists, and naturalists, we have only to cast our eyes over the surface of the globe to see how vast is the unknown which remains to occupy the intellect and rouse the energies of geographers for ages yet unborn. We are, indeed, only approaching to the delineation of other and vaster fields, in completing the surveys of which our successors will, perchance, smile as much at our ignorance, as our contemporaries may sneer at the geography of the ancients. But the true inductive philosopher stands aloof from such criticism. He knows that every advance must depend on new observations, and that each successive generation can but establish some additional stepping-stones, whereby man may reach nearer to those limits, which must ever separate him from omniscience.

In the mean time, as one among the zealous votaries in search of new phenomena on the surface of our planet, I have a true satisfaction in reflecting that I have taken an active part in the establishment and progress of a Society like this, upon the continuance of whose welfare the cause of sound geography mainly depends. I have, indeed, been delighted to learn at the close of my Presidency, that the prayer to have suitable apartments allotted to us, which has been so long urged, and was so graciously entertained by our Royal Vice-Patron, has met with the sincere good will of the present accomplished Premier—one of our original members, and for many years the President of a learned body whose pursuits are closely connected with our own.

As her Majesty's Government fully admits that no scientific body can have stronger claims to such a consideration, and has expressed a wish to befriend us, I have a confident expectation that in the next autumn we shall assemble in halls of our own, though perhaps they may be granted to us for a term only, and until we can find a fitting resting-place in a great national Institute, in which the science of Britain will be for the first time united.

You were doubtless also well pleased to recognize, in the notice of a motion in the House of Commons given by the patriotic leader of British economists, the expression of an honest desire to promote, by every means in his power, the objects for which we are associated. Does not, indeed, the unprecedented augmentation of our members during the last year, including as it does the names of many distinguished statesmen of all shades in politics, sufficiently testify, that whilst we pursue geography for the love of the science, we at the same time are doing public service, and are laying the foundations of new and great commercial interests of our country ?

The very name of my successor is an earnest of this feeling; for in the Earl of Ellesmere you have selected a nobleman who, succeeding to large hereditary estates, has attained the more durable distinctions of successfully communicating knowledge by his pen, and of aiding its diffusion among all classes with a liberal hand. To him I confide your interests, in the hope that he may enjoy as much true satisfaction as I have had in presiding over you; and in the full conviction, that he will record with an eloquence to which I can lay no claim, the fresh triumphs of geographers in all parts of the world.

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