the eminent Willdenow, observing the love of the study of nature in Alexander, initiated him in botany. Thus prepared, the two brothers entered the University of Frankfort on the Oder, and subsequently that of Göttingen, where they were taught by Heyne and Eichhorn, and where Alexander specially profited by the lectures of that great zoologist, the striking and original Blumenbach. He next repaired to the Mining School of Freiberg, in 1791, to complete that education which should qualify him for examining the earth, its constituent parts and superficial products. There he met with Leopold von Buch, also a disciple of Werner, the great geologist of the day, who, by his eloquent lectures, had given an European character to that small but justly celebrated mining school.

The friendship then formed between Humboldt and Von Buch was kept up through life; and it is highly to the credit of Werner and his little mining school of Saxony, that he should have launched two such men,—the one to become the greatest geologist which Germany has produced, the other the most universal geographer, traveller, and natural philosopher of this century. In their observations of nature, they both, however, soon emancipated themselves from some of the untenable dogmas of their master. Honoured as I have been in my humble career by the encouragement of both these great men, I may be permitted to state that, as Von Buch was the senior scholar at the Mining Academy of Freiberg, so he seemed to preserve through life a commanding influence over his illustrious friend on all those subjects connected with the structure of the earth in which I have been most occupied. No two men could be more dissimilar in character. Possessing a warm temperament and a somewhat abrupt address, Leopold von Buch contrasted strongly with the bland and captivating Humboldt; yet each of these Freiberg scholars secured the sincere affection as well as admiration of their contemporaries in their respective careers through life.

Whilst he held official appointments in the department of mines of Prussia, and at Bayreuth and Anspach, Humboldt prepared his works, the 'Flora Subterranea Freibergensis et Aphorismi ex Physiologia Chemica Plantarum,' and the 'Floræ Freibergensis Prodromus.' Even as early as 1797 he showed the great versatility of his powers by another work, on a very different subject, 'The Nervous and Muscular Irritation of Animal Fibre,' due to his intercourse with Galvani.

After the death of his accomplished mother, Humboldt began to arrange the scheme of his future travels. His strong desire to undertake these travels was, as he himself assures us, raised into a passion by Forster, one of the companions of Cook in his voyage round the world, and whose acquaintance the young Prussian scholar had made at Göttingen, and with whom he made geological excursions both in England and on the Rhine. And here I may state that it is the opinion of the eminent geographer, Carl Ritter, as expressed to me in a letter just received, that the whole of the future life of Humboldt was powerfully influenced by the voyager Forster, whose well-told tales of adventure first excited in his breast that ardour for travel and research in the domains of nature which characterised him ever after.

Studying meteorology in Paris, and collecting materials for the purpose of explorations, he formed the acquaintance of his future companion Aimé Bonpland, with whom he was to have proceeded in the expedition of Baudin, destined to survey South America. But, impatient of the delays attendant on that French expedition, he went to Madrid with his young botanical friend, to obtain the royal Spanish authority for their exploration of South America. After a short excursion to Egypt, they sailed in the Spanish frigate *Pizarro*, which fortunately reached Cumana in July, 1791; having visited Teneriffe and examined its wonders by the way, and having almost miraculously escaped the British cruisers.

I will not occupy your time by alluding to all the tracts in South and Central America successively visited and explored by Humboldt. Suffice it to say that, during four years of indefatigable surveys and researches, including his daring voyages up the great rivers Orinoco, Negro, and Amazon, he enriched science by his numerous astronomical determinations, and observations on the meteorological, botanical, zoological, mineralogical, geological, and ethnological phenomena. The exploration of the course of the Amazon was followed by his ascent of Chimborazo, where, at the height of 19,300 feet, he and Bonpland made observations, notwithstanding their great sufferings, caused by the rarefaction of the atmosphere and the intensity of the cold. From Quito and Peru he repaired to Mexico, making by the way observations on the narrowest portion of the isthmus which connects Central with South America, which led him to entertain those ideas on the practicability of an Inter-Oceanic Ship Canal in that paral-

lel, to which the attention of this Society has been called on a former occasion.

Returning to France from the United States in 1804, Paris was his chief home from that year to 1827. Arranging there his splendid collections, and surrounded and honoured by all the leading members of the Academy of Sciences, he published successively that series of volumes which, showing his mastery over all the kingdoms of nature, have rendered his name famous for all ages. Although in these efforts he was assisted by Arago, Gay Lussac, Cuvier, Klaproth, Valenciennes, and Latreille, his grand generalizations have drawn from his contemporaries the admission, that since Aristotle, Humboldt is almost the only example of such achievements.

In 1829, on the invitation of the Emperor Nicholas, who defrayed the expenses of the journey, Humboldt, being then in his sixtieth year, undertook his memorable expedition into Siberia, accompanied by the eminent mineralogist Gustav Rosé and the profound microscopist Ehrenberg. This journey, hurried as it was—for he travelled 11,500 miles—was not only fertile in those results which are recorded in his 'Asie Centrale,' and in the excellent mineralogical work of his companion Rosé, but was also productive of many important data relating to terrestrial magnetism.

We know, indeed, that his Siberian travels gave rise to that influence, which was constantly exerted by him in succeeding years in urging the various European Governments to establish magnetic observations in distant lands, and particularly over wide regions in Russia, America, and England. When the British Association inaugurated the formation of the Physical Observatory at Kew, which has put forth such good fruits, we well know the strength we obtained when we appealed to him; for then it was that he vigorously maintained the necessity of rendering physical observatories independent of astronomical observatories. We also know how such physical observatories, both here and abroad, have enabled our eminent associate Sabine to investigate the laws of magnetical phenomena.

It is unnecessary that I should here mention all the publications of Humboldt which have been prized by our generation. It is enough to say that the same marvellous man, who made such gigantic journeys in distant lands, and published splendid works in illustration of them, has also produced, both in the French and German languages, a variety of works on astronomy, on geology ('Classification des Roches'), on the geographical distribution of

plants, on the distribution of heat in the globe, on electrical fishes, and even on the political condition of Cuba.

His great work, 'Kosmos,' which it had been the main object of his life to produce, shows what a profusion of clear recollections of natural phenomena was stored up in his capacious mind, and with what eloquence he could put forth that extraordinary knowledge. To the first part of the last volume I specially called your attention at the preceding Anniversary, as in it the author had descended from the heavens and atmosphere as treated of in his earlier volumes, and dealt more specially with that planet to which my own occupations have been restricted.

We have yet to receive the final instalment of the veteran philosopher, and doubtless the very last words he wrote will be treasured up and given to the world exactly as he left them. And if the pen fell from his hand, leaving that last sentence unfinished, let no one endeavour to complete it; for the true peroration of this great work will be found in the eulogiums which will everywhere be recited in honour of its author.

As one of the first acts of the Council of this Society was to place Humboldt at the head of our Honorary members, so he lost no opportunity of testifying the deep interest which he took in our welfare, often speaking of our volumes in terms of strong approbation. Always regretting that his travels had not extended to Hindostan and the Himálayan Mountains on the one hand, and to Africa on the other, he ever strove to promote researches in both these regions.

In his 'Asie Centrale' we perceive how sedulously he had studied the works of every geographer and traveller which had shed light upon the configuration, direction, and altitude of the great chains which traverse Asia; the labours of all our English authors and explorers of the great Himálya range being thoroughly well known to him. Panting to obtain an insight into the regions lying to the north of that chain, it was through his stimulus that the expedition of the brothers Schlagintweit was organized, and through his influence that these young men, whose scientific acquirements he highly valued, were sent to push their researches farther to the north than previous explorers. The delight which he took in their progress was seen in the warm and affectionate commendation he bestowed on them for traversing the Kuen Lun and reaching the Trans-Himályan region of Yarkand. I can also well imagine the profound sorrow he must have felt when Adolphe Schlagintweit, the one of these

three brothers who has fallen a victim to his zeal, was assassinated before the walls of Kashgar; all his valuable observations and papers being lost with the death of the courageous traveller.

Keenly intent upon every exploration of the interior of Africa, Humboldt was naturally proud that his countrymen Overweg and Barth should successively have distinguished themselves in the British expedition which commenced under the guidance of Richardson, and it was mainly through his exertions that the accomplished young astronomer Vogel was added to the list of those who were endeavouring to define the geography and condition of inner Africa.

That Humboldt lived unto his ninetieth year is chronicled; but knowing well his habits, I may be permitted to say that in reality he lived upwards of a century: for, whilst the average daily amount of sleep of man is seven or eight hours, the rest he took from his earliest youth never exceeded four hours; all his waking moments being so vigorously and profitably employed as virtually to constitute a century of highly-strung mental existence.

Though he was a good listener, and a clear questioner whenever he sought to obtain knowledge from others (which, by the bye, he never forgot), it may be also said of him that in his long career he talked more than any one of his contemporaries with whom I have been acquainted. His correspondence was particularly extensive, and the piles of letters which he had to answer almost overpowered him. And yet a few months before his death he not only took the trouble of replying to many of his old scientific correspondents, but I have before me the copy of a long and kind letter which he wrote last year to our worthy associate Mr. John Brown, with whom he was personally unacquainted, thanking him for the present of his volume on 'Arctic Discoveries.'

Nor is it to be forgotten that he took particular delight in conversing with women, and that he was a great favourite with them; his soft voice and persuasive diction, in which he conveyed instruction without hard words or ostentation, being peculiarly grateful to the gentler sex, to say nothing of that *piquant* irony in which he frequently indulged.

But it was not merely by his courtesy and correspondence that Humboldt won the affectionate attachment of mankind. He was invariably the ardent and disinterested promoter of merit and desert, under whatever form they were presented to him. Every young man struggling with difficulties, who had shown signs of energy in the cause of science, was sure to find in him a

zealous and generous protector.* Thus, as it was the constant practice of his life to spare no trouble in sustaining those who had need of support, his loss will be deeply felt by men of science, art, and letters, not only in Germany, but throughout the civilized world.

During the career of the illustrious traveller, we know that he paid many visits to England, one of the first of which was in 1799, when he became acquainted with Robert Brown, and to this event I shall allude in speaking of that great botanist, for whom he had the sincerest regard. It was, indeed, one of his many good acts, that he induced the King of Prussia to bestow on that Robert Brown, so little known to public men in England, the high honour of the Order of Merit.

When in England in 1826, though then only fifty-seven, he had been before the world as a celebrated author during so many years that he was already looked upon as becoming old. But from that date he was destined to play for thirty-three years a new, and in many respects, a more important part. In 1827 he took up his residence in Berlin, and soon became a favourite of Frederick William III., and afterwards of the present Sovereign of Prussia. There are those, I know, who have regretted that the philosopher was thus converted into the courtier, but this opinion has no good foundation. In truth, he found in King Frederick William IV. a reciprocity of sentiment and a love of knowledge which might, with his influence, be turned to great advantage in the encouragement of all those who were busily engaged in the pursuit of scientific researches, and most efficaciously and warmly did Humboldt work on in this praiseworthy career. Impressed with the strong desire to aid every meritorious man of science, he was indeed fortunate in being the bosom friend of a warm-hearted Monarch, who invariably responded to his call. No one who has witnessed the free and unreserved converse between Humboldt and his Sovereign could fail to be convinced, that he

* Whilst these pages were passing through the press, I perused in the 'Boston Weekly Courier' of the 26th May the eulogy of Humboldt, read before the American Academy of Sciences by my eminent friend Agassiz, informing the public how, at a critical period in his youthful days, when from want of means he was about to leave Paris, the young naturalist was unexpectedly relieved by a liberal donative from the great traveller, sent to him in the most delicate manner, and was thus enabled to continue studies without which his career might have been nipped in the bud. After an eloquent analysis of the various works and generalisations of the deceased, and a warm encomium of his deep-searching volume, the 'Views of Nature,' Agassiz says with truth,—"Every child in our schools has his mind fed from the labours of Humboldt's brain wherever geography is no longer taught in the old routine."—*June* 15, 1859.

never played the courtier's part but in the hearty desire of attaining some good and noble end. His liberal opinions were indeed so well known, that an occasional witty sarcasm on any monarchical abuse was tolerated in him as coming from one who, he himself said, was styled a French Jacobin.

Visiting Prussia in 1840, eleven years after the Siberian journey of Humboldt, and repeating my visits in each following year whilst I was exploring a great part of the empire of Russia, I invariably received from him the most important suggestions, as well as the most marked attentions. The great traveller, having performed his long journey in an incredibly short time, was well aware that he had done little more than sketch out broad views of the geography, natural history, ethnography, and terrestrial magnetism of the vast regions over which he had passed, and consequently he much desired that other men should solve various problems which he had only time to touch. One of the largest of these problems that remained to be worked out was the geological structure of Russia; and when he saw the determination of my associate, De Verneuil, and myself to endeavour to elaborate the true geological succession of Russia in Europe and the Ural Mountains, he took especial pleasure in assisting us. In saying to me, "You will now be able to tell us the true age in the geological series of those sandstones which occupy so vast a region in the ancient kingdom of Permia," he gave me the first impulse to pursue researches in several of the distant provinces of Russia which ended in the establishment of the Permian group of rocks, as the youngest of the palæozoic formations, and in my attaching to it a name which has now become current in science.

Again, in his luminous conversation and writings on the great Aralo-Caspian depression of the earth's surface, he stimulated me to those endeavours which showed how in that vast low region, the physical geography of which he had described so well, the geologist could bring forth evidences of a transition from a lacustrine condition, through a brackish water period, into one of purely marine conditions.

With his views on the grandeur of the phenomena by which many ancient igneous rocks, differing from the eruptions of mere volcanos, have been extruded from fissures in the crust of the earth, and have been spread out over vast spaces, I agree, in common with his eminent friend M. Elie de Beaumont, as shown in my last Anniversary Address. Assuredly no man of his generation had seen more of

volcanic rocks than Humboldt, and his judgment on this point must be viewed with profound respect.

During my last conversation with him at Potsdam, in September, 1857, I grieved to see that his physical powers had become much feebler in the lapse of a year, and that he was under the necessity of leaning on his servant as he walked. And when to my sorrow I also perceived that the health of the Sovereign of all others who so heartily cherished the cultivators of science and letters was failing, and that this change was making a deep impression on Humboldt, I feared that I might never more converse with the illustrious man. But whilst the frame was gradually bending and giving way, the bright intellect continued clear to the last; and one of his letters, which was written to me only a few weeks ago, exhibited the same suggestive mind and active interest in obtaining knowledge as in the best days of his bodily vigour.

One of these precious letters received last summer displays that love of youthful persons by which Humboldt was always characterized. The joy which the veteran philosopher experienced on possessing "cette patience de vivre" (as he termed his long life) which had enabled him to witness the happy union of the eldest daughter of our beloved Sovereign with the heir to the crown of Prussia, and to join in welcoming the accomplished Princess Royal to Prussia, is expressed in terms which showed how justly he estimated the influence which her graceful and captivating manners, and her good sense and right feeling, must produce upon the nation of her adoption. Even in the very last letter which I received from my illustrious friend, dated the 15th of last March, though it chiefly related to the means of facilitating the investigations of a Prussian traveller, from Tunis southwards, into the wilds of North Africa, there is a strong and warm expression of the gratification which he had felt in having lived to be present at the baptism of the first child of the Prince and Princess Frederick William, and of his conviction that his happiness was shared by all good Prussians.

This was, I apprehend, the last public ceremony at which Humboldt assisted. The lines with which he concludes his letter are penned with a tremulous hand, and in reply to my inquiry after his health he writes: "Mes forces musculaires reviennent très lente-
" ment, et je souffre sous le poids d'une correspondance de 1800
" à 2000 lettres et paquets par an. Une sorte de célébrité qui
" se répand avec l'âge, et s'augmente à mesure que l'on devient
" imbécile."

Valuing the knowledge I obtained personally from him, and the hearty kindness and zeal with which he uniformly aided me, I would that it were in my power to render ampler justice to so great and so good a man. But many of the works of Humboldt, particularly his records of the physical phenomena of the universe, lie beyond the critical scope of a geologist like myself. These works will doubtless be crowned with appropriate laurels by those who can duly scan their lofty merits. This humble offering comes from one who, profoundly admiring the works of the great philosopher which lie in his own line of research, will ever be proud of the recollection that he was encouraged in his career by the truly illustrious Humboldt.*

All praise to the gallant and intellectual nation to which he belonged for the respect and love which they bore to him through life, and for the profound sorrow which they testified on his decease. Never probably was the body of any man followed to the grave with deeper and more touching respect, nor by a larger number of people of all classes, from the Regent and Prince Royal of Prussia and the other members of the Royal Family to the humblest citizen. And when the account of his last moments was conveyed to the Monarch whom he had so long and so faithfully served, I feel convinced that the oppression of mind caused by a severe malady would be dissipated, and that all the affectionate recollections of the benevolent Sovereign were revived, as he wailed over the death of his bosom friend.

When presiding over this Society in the year 1853, I opened my Address by lamenting the death of the great Prussian palæontologist and geographical geologist, Leopold von Buch, and said that "in losing him we were left almost alone with Humboldt as the last of that race of philosophical generalizers who are capable of placing before us in one work all the natural features and contents of a vast region."

It was on that occasion that the deepest feelings of Humboldt were poured forth in a letter in which he announced to me his irreparable loss. "Suis je destiné," he wrote, "moi vieillard de 83 ans,

* Among the numerous portraits of Humboldt, there is no one which comes so home to the geographer as that little sketch of the veteran who, seated in his cabinet, is surrounded by his books, packets of correspondence, and the map of the world which he had so illustrated. In the corner of this coloured lithograph is his own affirmation that this is "Ein treues Bild meines Arbeits Zimmers als ich den zweiten Theil der Kosmos schrieb." A very striking little photograph of him, the last likeness which was taken, has been sent me by the brothers Schlagintweit, who were with him just before his last illness, and to whom he granted this favour.

de vous annoncer, cher Chevalier, la plus affligeante des nouvelles, à vous pour lequel M. de Buch professait une si tendre amitié, à ce grand nombre d'admirateurs de son génie, de ses immenses travaux, de son noble caractère." Then, after describing the course of the malady which caused the death of the great geologist, and recapitulating their long and unvarying intimacy during 63 years, Humboldt adds:—

"Ce n'était pas seulement une des grandes illustrations de notre époque, c'était aussi une âme noble et belle! Il a laissé une trace lumineuse partout où il a passé. Lui pourroit se vanter d'avoir énormément étendu les limites de la science géologique, toujours en contact avec la Nature même. Ma douleur est profonde: sans lui je me crois bien isolé; je le consultai comme un maître, et son affection m'a soutenu dans mes travaux."

Expanding the term "geological science" into "all science," let these his own lines, penned in the moment of grief for the loss of his most valued friend, be applied by geographers to the memory of the great man himself, whom we all consulted as a master, and we then have in his own emphatic words the true characteristics of the universal Humboldt.

THE ARCHDUKE JOHN OF AUSTRIA.—The last surviving brother of the Emperor Francis, the beloved "Unser Franz" of every Austrian, has paid the debt of nature at the good old age of seventy-seven. One of nine brothers, most of whom were distinguished for their acquaintance with the sciences, and one of whom—the Archduke Charles—was the able opponent of Napoleon in the art of war, our deceased foreign member may, without any flattery, be singled out as a Prince who, loving geographical science, was at the same time an accomplished mineralogist and botanist, and who has passed a life so full of good deeds, that his memory will ever be cherished throughout Germany.

Brought up as a soldier to oppose the armies of revolutionary France, the Archduke was eminently successful when, leading the faithful Tyrolese, he commanded the army of Italy, which, in 1809, defeated the Viceroy Eugène Beauharnais at Sacile, on the Licenza (N.N.E. of Venice), and forced him back to the Adige, after a heavy loss. Then followed a short period of glory for Austria; for though Napoleon was master of the city of Vienna, he lost his prestige in the sanguinary repulse which the Archduke Charles inflicted on him at Aspern; and the Austrian capital was so crowded with wounded and dying French soldiers, that, if not reinforced

by some extraordinary intervention, it is quite possible that Vienna in 1809 might have been to the great captain what Moscow was to him in 1813. Unfortunately for the Austrian cause, the Archduke John had before this been ordered to retire from the north of Italy, and to unite with the main army near the metropolis.

Every old soldier knows what must have been the effect of such a command on a hitherto successful army, which was ordered to retreat over the parched plains of Italy, and then through mountainous tracts, for a vast distance.

Losing the heavy train and guns of a noble army of 40,000 to 50,000 men, he eventually reached Presburg on the Danube with scarcely the half of that number. But whilst this was the poor relief brought to the left flank of the Austrian army, what was the reinforcement which the Emperor of the French received in Vienna? Why, that of the very generals and soldiers who had been held at bay by the Austrians in Italy. These were now converted into a triumphant advancing force, which, when led by Macdonald, enabled Napoleon to win the hard-fought day of Wagram.

Singularly modest, the deceased Archduke never spoke of his own conduct; but, extracting information from those who had been his companions during those terrible campaigns, I firmly believe that when the truth is ascertained, he will be entirely exonerated from the blame, attributed to him by historians, of not having promptly aided his brother Charles in the battle of Wagram; the fact being that the counter-orders sent to him prevented his coming up till the main Austrian army was in full retreat.

Naturally disappointed and disgusted at the results of a war which had humbled Austria after her heroic efforts, the Archduke betook himself to those mountains of the Styrian Alps where I first made his acquaintance, when exploring their defiles in 1829 in company with Professor Sedgwick. At his favourite Bad-Gastein he welcomed us with frankness and cordiality, and after a table d'hôte dinner at mid-day, where ministers, generals, and geologists were commingled, we made a most enjoyable excursion to the foot of the snow-covered peaks which the Prince had ascended, and of which he gave us mineralogical descriptions. Never shall I forget the joyous conversation he maintained, always full of noble and liberal sentiments, until late in a fine starry, moonlight night we regained our hostelry. Nor can I be oblivious of the kindness with which on another day, just after sunrise, he laid out upon the floor of his little bed-room at the curate's house a large and detailed map of all parts of the Austrian Alps, and how we went upon our

knees with himself whilst we examined upon the map every recess of those mountains.

In the following year, being at Vienna when the present Emperor was born, I met with marked attention from the Archduke John, who was the chief of the Engineer corps; but it was on revisiting Grätz, where I had been in the previous year, that I best learnt how to admire him. There it was that he had already established that scientific institution, the Johanneum, in which the natural history productions of the Austrian Alps were so admirably displayed, and where able men, attracted thither by the good Prince, expounded the truths of geography, botany, mineralogy, and mining.

It is enough to say that here taught and wrote my eminent and valued friend Haidinger, now worthily at the head of the geologists of Austria, who took a leading part in founding the Imperial Geographical Society, and who is constantly affording us valuable information. It was by visiting the valleys of those Alps in these and subsequent years, where the industry of the honest and trusty Styrian works the iron-mines, that I could still better estimate the noble and disinterested character of this true-hearted Austrian Prince.

Visiting him at Frankfort in 1848, when he was Reichs-verweser of the German Confederation, and calling on him at his first and only hour of leisure, six in the morning, I learnt from himself that he sighed to regain those mountains amidst which I had known him to be so happy. Thither he did return, and there ended his days in the society of the wife of his choice, and blessed with an accomplished and promising son, the Count de Meran, now in the Austrian army.

The Archduke John, who had visited England and remained some time in the year 1816, had a true regard for many of our countrymen with whom he associated; and of those now living, I have especially heard him speak in affectionate terms of that pattern of an English gentleman, our associate, Sir Thomas Dyke Acland.

As not only Austria but all Germany mourns his loss, so your President, who was honoured with his friendship, has striven to do honour to this virtuous and distinguished member of the Imperial house of Hapsburg.

M. Gerold MEYER, of Knonau, the noted Swiss historian and geographer, who died recently, was one of our foreign Correspondents. Being the keeper of the archives of Zürich, so rich in the original documents relating to the history of Switzerland from the ninth to the fifteenth century, he detected letters which

some English readers will find an interest in perusing, viz., the correspondence of our Elizabethan divines with the Swiss reformers, which will, I understand, be published by the Parker Society under the name of Zürich Letters. M. Meyer was the author of the 'Erdkunde der Schweiz,' and the projector of, as well as largely a contributor to, that instructive work the 'Gemälde der Schweiz,' of which nineteen volumes have been published.

Robert Brown.—At the head of the men of British science who have been taken from us since the last Anniversary, I at once place the name of that eminent Scotchman, Robert Brown, who, having earned for himself the title of the "Prince of Botanists," had won, at the same time, our kindest remembrance for having taken an active part in the foundation of this Society.

Born at Montrose in 1773 (his father being the Episcopalian minister of that place), young Brown there received his early education, which was completed by a course of studies in the Universities of Aberdeen and Edinburgh. From 1795 to 1799 he served as assistant-surgeon, with the rank of ensign, in a Regiment of Scottish Fencibles; and it was in the last-mentioned year (after the Irish Rebellion was quelled) that, during a leave of absence, he was kindly befriended by Sir Joseph Banks, who shortly after proposed to him to become the naturalist of that world-wide scientific expedition which, sailing in 1801, and returning in 1805, enabled our deceased member to make collections, discoveries, and comparisons in Australia and other distant lands, which threw an entirely new light on the geographical distribution of vegetable life.

As the late President of the Royal Society has already pointed the attention of men of science to the chief works of Robert Brown, and as, doubtless, his memory will be still more minutely scanned by the President of the Linnean Society, of which body he was the main-stay for many years—whether as Librarian, Secretary, Vice-President, or President—it is unnecessary that I should on this occasion enumerate all those publications on which his fame rests. For these works he received numerous distinctions, having been elected an honorary member of every academy in Europe, including that great scientific honour, of being one of the eight Foreign Associates of the French Academy of Sciences; whilst he had also received from the Royal Society the highest distinction of that body —the Copley Medal.

In reference to our own Society, let me say that, in 1830,

Robert Brown, who was a constant attendant at the Raleigh Club of Travellers, united with Sir John Barrow, Mr. Hobhouse (now Lord Broughton), Mr. Bartholomew Frere, myself, and other members of that club, in drawing out rules and a plan for the establishment of a projected Royal Geographical Society. For this purpose we held several meetings as a provisional committee, at all of which Mr. Brown was present. We also printed documents explanatory of our project, which were duly circulated, including the laws which still regulate the Society, and which, on my own proposal, were essentially those of the Geological Society.*

As no words of mine can do sufficient justice to the merits of a man whose eulogy has been, or will be, chaunted by all the eminent botanists of the age, I willingly extract some sentences of a letter which I received a few months ago from Baron Humboldt, who, after alluding in feeling terms to the death of his former companion Bonpland, and to the oldest of the three (himself) being left alone, thus speaks of our deceased member:—"The enormous loss of "Robert Brown is perhaps more deeply felt in Germany and "other countries than in England. It was the protection af- "forded to me as early as 1799 by Sir Joseph Banks which first "made me acquainted with that Robert Brown who afterwards "gave so vast an impulse to the three great objects which must for "ever remain attached to his name — the minute development of "the relations of organization in natural families, the geography "of plants, and the estimate of their numerical proportions. The "physiology of plants, and an elaborate dissection of them, con- "stituted invariably with him the foundation of all systematic "botany. In short, Bonpland, Künth, and myself had the happiness "in 1822 thus to dedicate to him our 'Synopsis of the Equinoctial "Plants of the New World:'—

"ROBERTO BROWNIO
Britanniarum Gloriæ atque Ornamento
Totam Botanices Scientiam
Ingenio mirifico complectenti."

These remarkable words, coming from such a source, and constituting an epitaph which should be inscribed on the tomb of the

* It is here my duty to state that of which I was unaware when the Society was founded, that another individual had early in 1830 not only sketched out the establishment of a Geographical Society like our own, but had enrolled in it many names. That person was my esteemed and distinguished predecessor, Admiral W. H. Smyth, whose services to us were afterwards tested by the skill and zeal with which he administered our affairs; and who, by giving a new impetus to us when we were in a declining state (1849), was really the renovator of our body.

great botanist, were written seventeen years before he received the highest honour of the Royal Society, and thirty-six years before his decease.

The truth of the above-mentioned remark of Humboldt, that the loss of Robert Brown has been more felt in Germany and other countries than in England, has very recently been realised by the publication of an eloquent éloge of the deceased by his great German botanical contemporary, our associate Dr. Ch. von Martius, of Munich, who opens his essay by declaring that, next to Linnæus, the three other names ever to be memorable in the history of botany are those of Jussieu, De Candolle, and Brown.

Referring my hearers to the full translation of this treatise * for the clearest definitions of the researches and discoveries of the deceased, in establishing the surest foundations of phytogeography, as dependent on the morphology, development, geography, statistics, and history of plants, let me cite one or two sentences from the essay of the eminent Bavarian :—

"Not one of those essential parts of the plant on whose manifold forms and combinations depends the glorious wealth of the vegetable kingdom was passed over by the searching eye of Robert Brown. From the microscopic germ of the moss and the vegetable ovule to the flower; from the stamen and its pollen to the carpel and the fruit, he examined and compared all the organs in plants, of the most diverse orders, and in all stages of development.

"Governed by the deepest sense of natural truth and natural relations, he established the soundest views upon the nature and developmental history of these organs. Thus he vastly contributed to the consolidation of that theory (morphology) which gives to systematic botany its true claim to rank among the sciences.

"In these morphological researches of Robert Brown there was a peculiar affinity to the spirit of the Germans, and thus this is a deep-rooted cause of the powerful influence which he has exerted upon botany in our country."

After a lucid and critical review of his scientific labours, Dr. von Martius passes to the consideration of what he justly terms the fairest and most glorious aspect of the man — his moral nature. And here, together with all my countrymen who knew Robert Brown, I can bear witness that our foreign contemporary has struck the right note when he thus speaks :—

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* *See* 'Annals of Natural History,' vol. iii. p. 231.

"Robert Brown was a truly great and good man. Love of truth above all things, calmness, sincerity, modesty, tender sensibility, and goodness of heart—these features of his character stood constantly under the government of a penetrating and massive judgment. So energetically did these characteristics regulate his activity as inquirer and author, that we may affirm that every act of his investigations, and every assertion in his writings, bear the stamp of this perfectly-balanced character.

"It is indeed often the case that an extraordinary intellect rests, like a column, upon a slender moral foundation; but Robert Brown's rose, like a pyramid, from a broad and strong base. In recognition of this worthy combination, all naturalists offered admiration to his intellect—to his character, reverence and love."

"It has been thought strange," continues Dr. von Martius, "that a man of such extraordinary scientific importance, to whom the homage of the world was offered, played no prominent part in public life, or in the brilliant society of London."

On this last point I may, however, say that, although my deceased friend communicated much pleasure to others when surrounded by a small social circle, he had little relish for fashionable or political society. Still it is deeply to be regretted, that those who occupy lofty stations in our land should not have better appreciated so remarkable a countryman. Indeed, I cannot forget the remark made to me by Humboldt when, in 1842, in accompanying the King of Prussia to England, he honoured me by meeting the "Princeps Botanicorum" at my own house, "that it was painful to him to find that a man of such true eminence as Robert Brown was almost ignored among the higher circles of English society."

I may state that, in the latter years of his life, this great botanist devoted much of his time to the minute examination of those fossil plants, the structure of which is admirably exhibited by having been preserved in crystalline matrices, siliceous or calcareous; and he spared no expense in having these specimens so cut and polished as to facilitate the endeavours of his successors to follow up a line of research in which he modestly styled himself only a pioneer.* For, although he had established some of the

* His highly instructive collection of fossil plants has been bequeathed by Mr. Brown to the British Museum, on the condition of the Trustees allowing it to form part of the Botanical Exhibition, under the charge of the Keeper of Botany. This provision has been complied with; and the collection, as well as the inimitable portfolios of the drawings of Ferdinand R. Bauer, also left to the Trustees, are now under the charge of Robert Brown's valued friend, Mr. John Bennett, his successor as Keeper of Botany in the British Museum.

noblest generalizations in the relations and classification of living plants, he was much too sagacious and circumspect to pronounce hastily on the affinities between the lapidified, extinct groups of vegetables and those which now prevail.

Those persons who, like myself, were intimately acquainted with this distinguished and benevolent man, can testify that in every action of his life he preserved the most scrupulous rectitude of conduct, dictated by the sincerest love of truth; * and that, whenever occasion required, he gave ample proofs of a lofty and independent spirit. No event within my recollection called forth, in a more marked manner, his love of independence, than when, in the year 1830, a great majority of the men of science having publicly expressed a wish that Sir John Herschel should become the President of the Royal Society, a Prince of the blood royal was proposed in opposition to the man of our choice. Then it was that, co-operating with my deceased friend, I saw the influence produced upon my associates by the honest and unflinching exertions of this respected leader in science. The result of that struggle, as is well known, was the election of the Duke of Sussex by a small majority; whilst it is a fact highly creditable to the memory of that kind-hearted and accomplished Prince, that he subsequently lost no opportunity of paying marked attention to those Fellows of the Society who had conscientiously supported his opponent, at the head of whom stood Robert Brown. In truth, his Royal Highness, to his great honour, farther distinguished himself, in the year 1838, by welcoming Herschel on his return from the Cape, and by presiding over the entertainment given to that great astronomer by 400 men of science, at which I had the honour of acting as a vice-president in union with Robert Brown.

As an attached friend of the dying philosopher, it was my privilege to witness how his noble, calm, and unruffled spirit was preserved to the last ebb of life; and it was a sad but gratifying solace to me, that I was one of his scientific associates who, well knowing how to estimate the value of the man, had the privilege of following to the grave the remains of the truly illustrious Robert Brown.

HALLAM.—The celebrated historian, Henry Hallam, has gone from among us, full of years and of honour. Many an abler pen than

* My friend Dr. Fitton also possesses a letter from Baron Humboldt to himself, in which the great traveller, besides an enumeration of the works of Robert Brown, also dilates on his many private virtues, as well as on the simplicity of his character.

mine will, doubtless, pay abler tributes to his memory, though no one of his friends entertained a deeper regard for him than myself.

Disdaining to court popularity, and dealing sternly with those whose writings or conduct savoured of untruthfulness, he possessed at the same time as kind and as genial a nature as it was ever my good fortune to estimate. Admiring his character throughout no short space of time, I can fairly say that with every year my respect for him increased. Whether I watched him and felt for him when his strong mind was bowed down by those domestic afflictions which succeeded each other in so lamentable a manner, or when, rising out of his sorrows, he poured forth his terse and forcible conversation, and was the charm of that social circle in which he shone, even amidst such contemporaries as Sydney Smith or Samuel Rogers; in every trait of his life he won my regard, and invariably impressed me with the sincerest esteem for his whole character.

Having gained a wide renown as a historian and a man of letters, Mr. Hallam had a real pleasure during the last quarter of a century in upholding and supporting all those branches of knowledge, whether in science or in art, which elevate humanity. Thus reverting to the mathematical pursuits he had cultivated at Cambridge, he was elected a Fellow of the Royal Society in 1821; and seeing how the then new science of geology was opening out great and fundamental truths of nature, he also willingly joined the Geological Society. In 1830 he was one of those who founded the Royal Geographical Society, and having been more than once upon our Council, he invariably afforded us his warmest support, and has often spoken to me in commendation of our Journal.

Among the numerous honours which were deservedly heaped upon him by the various academies of Europe, there was no distinction which Mr. Hallam justly valued more, than that of being selected as the Historiographer of the Royal Academy of Arts of this metropolis. Succeeded as he has worthily been in that post by my eminent friend Mr. Grote, I may here be permitted to quote a few words of the eloquent eulogium which at the last anniversary festival of the Royal Academy fell from the lips of the author of the 'History of Greece,' as illustrative of the character of his great predecessor:—

"There lives in his chapters a conscientious sense of the almost judicial obligation of an historian, the obligation of studying with care original and contemporary authorities, but at the same time of rising above contemporary prejudices, and of judging with equitable

independence the ever-renewed and ever-varying party-conflicts in history. I know no compositions in which these first conditions of historical worth, copious original research, and equitable criticism, are more constantly combined than in those of Mr. Hallam. And it is, in my judgment, an additional merit that his History is devoted to the gown rather than to the sword; that he has left to others the exciting tales of battles and sieges, of exhibitions of armed force, either in strategic movement or tumultuous outbreak—*pugnas et exactos tyrannos*—which have always charmed the popular mind in description, however distressing they may have been, in the reality, to the generations that underwent them. Mr. Hallam has set before us the energies of the unarmed citizen; the pacific manifestations of the human mind, in its legal and institutional development; in philosophy, literature, and poetry; and though last, not least, in those Fine Arts which form the collective bond of sympathy among the present company. To succeed to an historian who to these literary accomplishments added all the social excellences of an English gentleman, is a distinction of which any living author may be proud."

As a Trustee of the British Museum, Mr. Hallam's just appreciation of works of ancient art, and his thorough acquaintance with the rarest books, were combined in him with the soundest judgment in the management of the establishment; and when his last illness fell upon him, and deprived the Board of his solid advice, every trustee felt as myself, that he had lost the invaluable support of a just and enlightened associate.

The chronicler who may endeavour to render justice to the memory of the deceased will necessarily dwell upon those records of the Middle Ages which demonstrate how our liberties arose, and then follow out the processes by which our freedom was consolidated and maintained, as put forth in that noble work 'The Constitutional History of England,' which breathes such a racy love of free and well-balanced institutions.

It is my humbler province only to indite these few lines expressive of my admiration of the scholar and historian who was an honour to our age, and to record with just pride that I had the privilege of enjoying the personal friendship of the great, good, and virtuous Henry Hallam.

The Earl of Ripon.—In continuing this Address as usual with some allusions to the Fellows of our Society who have been taken from us in the past year, I will not endeavour to put before you a

chronicle of the progress of each person through life, but simply dwell on those circumstances which connect that individual with our geographical pursuits, accompanied by a very brief sketch of his public character.

In alluding to public men, I naturally first notice the career of the patriotic and accomplished nobleman, our first President, the Earl of Ripon, who, having reached his seventy-seventh year, died in January last. Entering into public life in 1804, and into Parliament in 1806, Lord Ripon was connected by official duties with the successive Governments of the Duke of Portland, Lord Liverpool, Lord Castlereagh, and Mr. Canning, and on the death of the last of these statesmen was, when Viscount Goderich, for a brief space the Premier. Subsequently he joined the Ministry of Earl Grey, and was Secretary for the Colonies at the time when, at the request of some of the founders of this Society, he became our first President. During the period of his Presidency he never failed to take a lively interest in our welfare; but feeling that the duties attached to an important office in the State were incompatible with a due attendance to our concerns, he relinquished the office into the hands of his friend Sir John Barrow, who had, in fact, taken an active part in inducing his Lordship to become our leader.

Though the late Lord Ripon retired from office in 1834, yet on the return of Sir Robert Peel in 1841 he undertook first the Presidency of the Board of Trade, and afterwards that of the Board of Control, which last place he held until the dissolution of Peel's Government in 1846, when he retired from public life.

In this last official post Lord Ripon showed an anxious desire to promote, by every means in his power, the advancement of scientific and useful researches in the interior of India, as I can testify; for upon my representing to him the great advantage which would accrue from selecting by preference those medical students who had received a good scientific education for Indian service, he willingly nominated as an assistant-surgeon the son of my venerated friend Dr. John Fleming the celebrated Scottish naturalist, and Dr. Andrew Fleming has since well requited his Lordship's aid by arduous geological and other researches.

Though it is not within my province to trace the public life of the late Lord Ripon, still it is very gratifying to me to be able to say that he was invariably and intimately connected with all the liberal parliamentary measures which were passed during his official career. Thus, whether we turn to the long debates which

led to the emancipation of the Catholics, the abolition of the Slave Trade, the repeal of the Corn Laws and of the Test and Corporation Acts, and even to the Reform Bill itself—to one and all of these national enactments he gave his steady support. He was, indeed, mainly instrumental in propounding one of those great questions—a change of the Corn Laws—to the House of Commons, and finally he carried another (the Abolition of Slavery) through the House of Peers.

Of our first President let me also say, that in the last years of his life he was specially exempt from that failing—the passion for worldly distinctions—which, usually increasing with advancing years, has of late prodigiously increased. For although he might surely have obtained the honourable distinction of a broad riband at the hands of his Sovereign for his long public services, he never sought it, but lived on unostentatiously and happily in the bosom of his attached family, and surrounded by friends who best knew how to appreciate his private worth and public virtue.

Warburton.—In the decease of Mr. Henry Warburton I have lost one of my earliest geological friends,—one to whom I was indebted for much sound advice and assistance when I first wielded the hammer of the geologist, and became an author.

Mr. Warburton, who had received a good classical and mathematical education at Cambridge, where he was distinguished, devoted himself much to the pursuits of physical science. At the early age of twenty-four, and in the year 1809, he became a member of the Royal Society. Joining the Geological Society in 1803, or soon after its foundation, we find that in the year 1814 he was already one of its secretaries, his friend Wollaston being then also upon the Council, and in 1816 he became a Vice-President of the same body. When the Geological Society acquired a Royal Charter, the name of Henry Warburton was associated with the names of William Buckland and George Bellas Greenough in the deed of incorporation. The progress and welfare of that Society were, indeed, ever dear to Mr. Warburton; and although his name appears rarely in the Geological Transactions (his principal memoir being on the Bagshot Sands),* I can appeal to all his surviving geological contemporaries for a confirmation of the fact, that his literary labours were unceasing, whether in drawing up those rules and regulations whereby the rising Society was held together, or in assiduously preparing

* Transactions of the Geological Society, vol. i., 2nd series, p. 48.

for the press any memoir which was communicated by an unpractised writer.

In subsequent years, and when he sat in Parliament (i. e., from 1826 to 1848), Mr. Warburton was placed during the years 1843-4 at the head of that Geological Society for which he had so long and so zealously laboured. Regardless of his own reputation, and occupied with public affairs and close committee work in the House of Commons, he neglected to write out and print his Anniversary Addresses, though he delivered them extempore and with much effect from the chair in Somerset House.

It will ever be remembered to the honour of our deceased member, that he was the intimate friend of the illustrious Wollaston, of whose writings and discoveries he was well qualified to judge; for Henry Warburton was never superficial, and every subject with which he grappled was thoroughly mastered. As in commencing my scientific career I looked up to him as a guide, so shall I never forget my last interview with Wollaston a few days before his death, when Warburton, in watching over his friend, was taking down the words of that bequest which the great philosopher made to the cultivators of the science of geology.

The unwillingness of Warburton to appear as an author in his own name, founded, I believe, on his keen sense of the necessity of rendering every phrase precisely accurate, soon after proved of signal disadvantage to the memory of the man who of all others he most truly loved and respected. The biography of the great Dr. Wollaston had to be written, and Warburton undertook the task; and though I have reason to think that he had made some progress in the work, he never completed it. That this delay prevented the Éloge of Wollaston being penned by Cuvier himself, is, indeed, too true, inasmuch as that great man, then Perpetual Secretary of the French Academy of Sciences, urged me (during one of my visits to Paris) to induce Mr. Warburton to delay no longer, and furnish him with the necessary materials to do justice to our deceased countryman, as one of the eight Foreign Members of the Institute. Yet with all this procrastination as respected the publication of any work in his own name, Mr. Warburton, I repeat, afforded constant literary aid to all those who were struggling on to advance science, and was, in truth, a terse and lucid writer.

In like manner his Parliamentary contemporaries will, I am sure, bear me out when I say, that if a bill had to be accurately and perspicuously drawn, or the Report of a Committee to be well put

together, Mr. Warburton would spend days and nights in the laborious work, which was to him a labour of love. The voluminous Report on the Coal Trade of England, published by order of the Houses of Parliament, is one of the most pregnant proofs of his assiduity as a compiler, and, at the same time, of his knowledge as a geologist.

His Anatomy Bill, in the carrying out of which he laboured many years, is also to be specially mentioned in dwelling upon his scientific merits; whilst those who contend for the advantages flowing from such a thoroughly liberal system of education as has been sustained by the eloquence of a Brougham, a Mackintosh, a Romilly, and others, will never cease to respect the memory of Henry Warburton as one of the founders of the University of London, and a most zealous champion of its rights and liberties.

Retiring from public life in 1847, he returned to his early relish for mathematical studies, and produced two papers "On the Partition of Numbers," and "On Permutations and Combinations," which were printed by the Cambridge Philosophical Society. A scientific contemporary has said, that "both these papers show a great command over the German factorial notation, and add several curious theorems to their subjects."*

In private life Mr. Warburton had many attached friends, among whom I was one, in common with Wollaston, Chantrey, and many of those cultivators of science and art who, setting aside some peculiarities of manner, esteemed him for his strong mind, sincerity, and worth.

Those who, like myself, truly valued the man, and who visited him in his house in Cadogan Place, had to pick their way through piles of books and bottles of acid, with which every room, and even the passages, were encumbered, until they reached the back-attic, into which the philosopher was driven. But this singular mode of life was not caused by parsimony; for Mr. Warburton was most liberal in his donations for the advancement of knowledge, and in addition to large sums contributed in many other ways, I may state that he gave 1,000*l.* towards the publication of the first geological map of England, as prepared by his distinguished associate, one of our former Presidents, the late Mr. Greenough, like whom he was one of the earliest members and supporters of the Royal Geographical Society.

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* President's Address to the Royal Society, 'Proceedings R. S.,' 1858, p. 556.

Lieutenant Henry RAPER,* eldest son of the late Admiral Raper, so well known for his improvements in maritime signals, was born in the year 1799, and entered the navy at the early age of twelve, on board the *Mars*, of 74 guns, commanded by his father. Shortly afterwards he went to the Royal Naval College at Portsmouth, where he won the silver medal for his acquirements in mathematics.

Having passed a distinguished examination at the College, Mr. Raper returned to service afloat, and was some months in the *Nymphen* frigate. In October, 1815, he joined the *Alceste*, of 38 guns; which ship, after conveying Lord Amherst as ambassador to China, was lost on her homeward voyage, by striking on a sunken rock in the Strait of Gaspar, on the 18th of February, 1817. Here he participated in all the hardships experienced on the rocky islet, Pulo Leat, to which the crew escaped; there they were in danger of death from thirst, and constantly threatened by ferocious Malay pirates, whose proas, to the number of sixty, completely blockaded them. After being relieved from this critical situation by vessels despatched from Batavia, Mr. Raper served successively on various stations in the *Tyne* and *Seringapatam*, till, at his father's express wish, he joined the *Adventure*, sloop of war, commanded by Captain W. H. Smyth. The service which this ship was then employed upon in the Mediterranean gave him an opportunity of improving his talents in navigation, surveying, and nautical astronomy; and he was placed in charge of the chronometers, in conjunction with his former college-associate the late unfortunate Captain Graves, who was murdered at Malta in August, 1856. Having been promoted to the rank of Lieutenant on board the *Euryalus*, from which frigate he was shortly afterwards removed into the *Dispatch*, Raper remained in that brig until she was paid off, in 1824. When the late Admiral Beechey, who had been one of the *Adventure's* officers, was commissioned to the *Blossom* in January, 1825, for his interesting voyage to Behring Strait *viâ* Cape Horn, he placed the filling up of three vacancies in the hands of his former commander, Captain (now Admiral) Smyth. One of these being the post of First Lieutenant, the Captain pressed its acceptance upon Raper, and had nearly prevailed; but an erroneous notion that a slight which the Admiralty had shown to his father might be visited on him, made him at last decline.

* This sketch of the career of Lieut. Raper is contributed by my eminent friend Admiral Smyth.

Having thus virtually abandoned the active line of his profession, he betook himself very assiduously to the cultivation of its scientific departments; and his efforts were crowned with such success that his name must ever be enrolled among the improvers of hydro-geographical knowledge. In 1832 he was selected by the Admiralty to form one of a committee to improve the method of measuring the tonnage of ships; and the Report, which was principally drawn up by him, was equally clear and convincing.

In connexion with this Society, of which he was one of the earliest members, has Lieutenant Raper repeatedly served on our Council. In 1840 he published his 'Practice of Navigation,' a book of sterling merit, for which we awarded him the Gold Medal in the following year. That this prompt appreciation of the work was a just one, was evidenced by its being soon afterwards adopted in the Royal Navy, and by the ships of the East India Company. Moreover the third edition of it was noticed from this chair by Admiral Smyth, in 1850, as well generally for the useful additions engrafted on its pages, as particularly for its admirable and well-organized table of 'Geographical Positions' of all the places on the globe; and which, with infinite skill and labour, he increased from 2,300 to no fewer than 8,800. In this edition he also introduced those significant symbols for the admission of great local information in a limited space, which promise to render chorographic details of readier reference than under any other form; and the whole is so stamped with worth as to prove unequivocally the industry, method, and varied attainments of the author.

This highly useful book was to have been followed by a second volume containing a theoretical discussion of all the data and details contained in the first—in fact, to prove analytically what he had expounded synthetically. As this work advanced it assumed increased importance, from combining astronomy, geodesy, mechanics, geometry, and physics; but, unfortunately, he did not live to complete it. His manuscripts are left, but from their unarranged state and nature, their publication is rendered very unlikely.

Lieutenant Raper became a Fellow of the Royal Astronomical Society in 1829, and not only served upon its Council repeatedly, but for several years filled the important post of Secretary, with credit to himself and advantage to the Society. He maintained his habitual cheerfulness and continued his labours to the last; insomuch that in July, 1858, he communicated to the Astronomical Society his improved method of 'Clearing a Lunar Distance.'

Meantime his malady increased, and he died at Torquay, in January last, in the 60th year of his age. His death has occasioned a blank in pursuits which require a mind of no common order, and his loss will be severely felt by his widow and a numerous circle of friends.

Sir Arthur de Capell BROOKE, who died recently at his seat of Oakley in Northamptonshire, like several other associates who have been recently taken from us, was also one of our earliest members. Though a person of retiring and unostentatious habits, who seemed to have no desire to take that part in public life for which his descent, property, and station befitted him, Sir Arthur had all the spirit of an adventurous traveller. In truth, it was he who had the merit of establishing the Raleigh Club, which has now merged into the Club of the Royal Geographical Society. An original member of the Travellers' Club, which bore in the first instance a geographical character, our deceased associate felt so strongly that many of the newly elected members did not sufficiently represent the spirit of foreign exploration, that in the year 1821 he induced a certain number of his qualified associates to unite with him in setting up a Dinner Club which should bear the name of the illustrious Walter Raleigh. Of this club, which contained the names of most of our leading travellers, including men who had explored Africa, the Indies, America, and the Polar Regions, Sir Arthur Brooke continued to be President for many years, and during all that period, when dinner clubs were more in vogue than at present, I can testify that it was considered a feather in any man's cap to be elected a member of the Raleigh.

Sir Arthur Brooke was also a Fellow of the Royal Society, and was favourably known to the public as the author of 'Travels in Norway,' a work which gives a striking picture of the physical features and natural history of that rugged land of glaciers and deep fiords.

Mr. William WEIR, who was suddenly cut off in the midst of his active and useful career as a man of letters, and who had distinguished himself by numerous contributions to the periodical and daily press (latterly as Editor of the 'Daily News'), was a sound geographer.

Reared in the Scottish and German universities, and entering into the profession of the law, his strong and cultivated mind could unquestionably have secured for him a high position in public life, had not an incurable deafness compelled him to abandon

the long robe and take to journalism. At one time this Society was so fortunate as to secure his services as the Editor of its volume; and having then formed his acquaintance, it gives me pleasure to state that I esteemed him as a sensible, right-minded, and truly learned geographer, as well as a man of the kindliest disposition.

It has been well said of Mr. William Weir that he was master of the library of Europe; for he was in himself an encyclopædia of law, history, literature, biography, and bibliography, as well as of geography. Rightly did some of his surviving friends and admirers endeavour to raise a sum of money as a testimonial to his varied merits, in order to assuage the lot and enlarge the narrow means of those with whom Mr. Weir hoped to spend the tranquil evening of his days. Although the appeal has not yet been adequately responded to, I sincerely trust that those who admired his lofty integrity will still unite to effect the praiseworthy object of thus honouring the memory of William Weir.

The Earl of HADDINGTON, who died at the age of 78, was educated at Christ Church, Oxford, and, as Lord Binning, represented Rochester in the House of Commons from 1818 to 1826. On the formation of the late Sir Robert Peel's first administration, in December, 1834, he was appointed Lord-Lieutenant of Ireland, a post which he held up to the dissolution of the Government. When Sir Robert Peel again took office, in the autumn of 1841, his Lordship was selected for the post of First Lord of the Admiralty, with a seat in the Cabinet; and seeing the usefulness of our Society in the advancement of nautical science, he joined us in that year. He held the chief naval office up to January, 1846, when he was made Lord Privy Seal, and retained that position until the final dissolution of the Peel Government.

His Lordship, although opposed to the Reform Bill and other measures of the Governments of Earl Grey and Viscount Melbourne, adopted the enlarged views of Sir Robert Peel on the repeal of the corn laws and the commercial reforms which followed. After the retirement of Sir Robert from office, the late Earl rarely interfered in politics. In 1814 his Lordship was made a Privy Councillor, and in 1853 he was installed a Knight of the Order of the Thistle. He was Hereditary Keeper of Holyrood Palace, one of the Elder Brethren of the Trinity House, a Trustee of the British and Hunterian Museums, and Deputy-Lieutenant of Haddingtonshire.

LIEUT.-GENERAL SIR C. FELIX SMITH, K.C.B. — This distinguished officer, who died at Worthing in August last, aged 71, served in

1807 at the capture of the Danish islands of Santa Cruz, St. Thomas, and St. John; and in 1809 at the siege of Fort Bourbon and the capture of Martinique, where he was wounded. He was senior engineer in charge of Cadiz and its environs, in the operations connected with the battle of Barrosa in 1811, and commanding engineer at Cadiz prior to, and at the raising of, the siege in the following year. He was subsequently present at the combat of Osma, the battle of Vittoria, the actions of Villa Franca and Tolosa, and at the siege of St. Sebastian, in the earlier part of which he acted as commanding engineer. He was afterwards present at the capitulation of Paris, and remained there for some time with the army of occupation.

Sir Felix became a Lieutenant-General in November, 1851, and Colonel-Commandant of the Royal Engineers in 1856. He received a medal and one clasp for his services at Vittoria and at St. Sebastian. In 1814 he was nominated a Knight of the Order of Charles III. for his skill in the gallant defence of Tarifa in 1811. He was Commander of the British military force in Syria, and was severely wounded at St. Jean d'Acre, for which last services he received in 1841 the thanks of both Houses of Parliament.

Sir Belford Hinton WILSON, who was born in 1804, entered the military service of the republic of Columbia in 1822, and attained the rank of Colonel; served as aide-de-camp to General Bolivar from 1822 to December, 1830; became British Consul-General in Peru, April, 1832; Chargé d'Affaires in Peru and in Bolivia, November, 1837; and was Chargé d'Affaires to Venezuela from November, 1842, to November, 1852. He received the Order of the Bath for his diplomatic services.

Major Henry Seymour MONTAGU, a school-fellow and brother-officer of our respected associate Lieut.-General Sir George Pollock, went to India in 1801, and served in the same regiment as the late Sir William Nott. He was afterwards appointed aide-de-camp to the Earl of Minto, and held several high appointments in India. Having returned to England, he travelled extensively on the continent, and was much attached to geographical pursuits. He was also a warm promoter of various charitable societies.

MAJOR-GENERAL SIR WILLIAM REID, K.C.B.—This highly distinguished officer of Engineers was a man of so observant a mind, and was so possessed of sound sense united with a calm but resolute temperament, that he was by nature destined to succeed in any employment he undertook.

Joining the army of Wellington in 1810, he was present as a subaltern officer of engineers at all the great sieges and battles in the Peninsula, from that date until the close of the war, when he obtained his company. He was afterwards present at the bombardment of Algiers in 1816, and commanded the Engineers under Sir De Lacy Evans in Spain.

In 1832, when employed at Bermuda, and when devising the reconstruction of extensive Government buildings destroyed by a hurricane, he was led to follow out that series of inquiries into the causes of such storms, and collected numerous data to work out their giratory character, which had been shortly before put forth by Mr. Redfield of New York. These effects resulted in 'Reid's Laws of Storms,' which work, published in 1838, has passed through several editions, and has been translated into various foreign languages, even into Chinese. By the law which he evolved, he taught the mariner that the old method of running before the wind in such storms might lead to destruction, and that true safety was to be sought by veering to the one side or the other, and thus escaping from the whirlwind.

It was infinitely to the credit of my old friend Lord Glenelg, then Colonial Secretary, that in consequence of the talent displayed in that work, his Lordship appointed Colonel Reid to the Government of the Windward Islands; and I mention this circumstance because science is not often so appositely rewarded.

As an administrator, Sir William Reid was never more distinguished than in methodizing and controlling the proceedings of the Great National Exhibition of the Industry of all Nations, with which our Vice Patron the Prince Consort has so eminently identified his name; and His Royal Highness never better demonstrated his right appreciation of true merit than in warmly acknowledging the value of the services of the Chairman of the Executive Committee of that great undertaking, and in procuring for William Reid the honourable distinction of a Knight Commandership of the Order of the Bath, and the Government of Malta.

Possessing a genuine enthusiasm under a calm and tranquil exterior, Sir William not only thoroughly performed his arduous duties at Malta during the Crimean war, but lost no opportunity of improving the estate committed to his charge, by ameliorating its agriculture, replenishing the old library of the knights, and by founding a botanical school for the working classes.

He died in his sixty-sixth year, sincerely regretted by every one who knew him.

Admiral Sir Charles OGLE, Bart., who died in June last, at the age of 83, was the eldest son of Admiral Sir Chaloner Ogle, who, like his deceased son, died the senior Admiral in the British navy. Sir Charles Ogle took deep interest in, and was a munificent contributor to, the different charitable institutions connected with the naval service, and had been for many years President of the Royal Naval Benevolent Society.

Vice-Admiral Percy GRACE, a distinguished officer of the old war time, was the brother of Sir W. Grace, Bart.

He began his naval career in 1801 on board the *Ganges*, 74, and was present at the battle of Copenhagen. He next served on the East and West India and North American stations; and when in the *Greyhound*, distinguished himself at the capture of the *Pallas* French frigate and two armed Indiamen. He was then wrecked, and became a prisoner at Manilla and Batavia. Being in the command of some boats as a Lieutenant, he captured two Malays, after a sharp fight, and was wounded. In the boats of the *Semiramis* frigate, he contributed to the capture of five French vessels, four miles up the Gironde; and about March, 1810, he received the well-merited thanks of his captain for the part he took in the capture of *Le Pluvier* of 16 guns. It was not till June, 1814, after having seen more service on the coast of North America, that he was rewarded with the rank of Commander. In command of the *Cyrené* he displayed much activity on the coast of Africa and in the Mediterranean; and subsequently he became senior officer in the Levant. He was made Post Captain in 1825, and had been an Admiral a few years when he died, to the regret of numerous friends.

CAPTAIN SIR WILLIAM PEEL, R.N.—Of all the naval worthies who have recently been taken from us, no one has been so mourned for by the nation as that chivalrous and noble seaman William Peel, the third son of the late illustrious statesman. It is not for me to attempt to detail his daring exploits in the Black Sea, or when in heading the Naval Brigade in the late Indian warfare he showed what efficient services could be rendered to the army by his hearty and devoted co-operation.

Serving at St. Jean d'Acre as a midshipman, under Admiral Sir R. Stopford, he obtained the rank of Commander in 1846. After distinguishing himself in the Black Sea and Crimea, where he was

wounded, he was employed in the Chinese seas, when, providentially for our Indian empire, he was sent directly with troops by Lord Elgin to Bengal, to aid in quelling the mutiny. Ascending the Hoogly in the *Shannon*, he proceeded to Allahabad and Cawnpore, and we all know how, by his energy, heavy guns were brought into action, and how materially he contributed to the capture of Lucknow, in which operation he was again wounded. Alas! that after these triumphs he should have been cut off by smallpox at the early age of thirty-three!

In truth, every Englishman who looks mainly to our navy for the preservation of our independence as a nation must deplore the loss of such a hero at a critical period in our history, when the defences of the country so seriously occupy the thoughts of all persons, and particularly of all old soldiers and sailors.*

Apart from his glorious but too short naval career, Captain Sir William Peel had the true spirit and capacity of an explorer, and had indeed already proved that he was a real working Fellow of the Royal Geographical Society. His journey across Nubia † under the severest privations convinced us that into whatever part of the world he roamed, whether as a traveller in search of the truths of Nature or in following the path of duty, he was unquestionably one of those who, had he been spared, would have materially en riched geographical science.

In short, whether we appeal to his brave messmates of both services by whom he was sincerely beloved, to the explorers of distant lands among whom he had enrolled himself, or to the public at large, most certain is it that few men have ever fallen in the country's cause who have been more affectionately remembered than William Peel.

Commander George Frederick Mecham, R.N., one of our Arctic heroes, has been taken from us at the early age of thirty.

He was promoted for his valuable Arctic services in the expeditions of Captains Austin and Belcher, 1850-4, during which he made the longest overland search on record. On his return he was appointed to the command of the *Vixen*, and, whilst in command of that vessel, died suddenly at Honolulu of bronchitis. Shortly before his decease he sent to this Society a paper on the different spe-

* *See* the able work on our National Defences, by that distinguished strategist of the days of the Peninsula and Waterloo, my valued friend Lieut.-General Shaw Kennedy, C.B. (Murray, 1859.)

† 'Ride through the Nubian Desert.' (Longman.)

cimens of sulphur, boracic acid, &c., collected by him at the volcano of Kilanea.

Commander PAULSON, R.N., closes the list of naval officers who have been taken from us. He served in the Burmese war as a Lieutenant, and attained the rank of Commander in 1842, when the *Royal George* yacht was placed under his orders.

Sir James RAMSAY, Bart., of Banff House, Perthshire, and the eighth Baronet of the name, who died in January last, was a lover of scientific pursuits and a respected country gentleman.

Sir Edward North BUXTON, Bart., who died at the early age of forty-five, was son of the justly respected Sir Thomas Fowell Buxton, whose name is for ever associated with the emancipation of the African negro. He was born in 1812, succeeded to the Baronetcy on his father's death in 1845, and in 1847 was elected as representative for South Essex. In 1855 he was obliged to go abroad with his family on account of his health, and he spent the winters of 1856 and 1857 chiefly at Nice. His visit to Piedmont will long be particularly remembered, on account of the beneficent influence which he exercised in calming down that unseemly strife which had divided the Italian from the Vaudois Protestants. In this good work he persevered, and he deemed it so important that the true character of the Italians should be clearly known, that he took a journey from Cromer last September purposely to state his views to the religious conference assembled at Berlin.

REV. DR. JENKYN.—The late Rev. Dr. Jenkyn displayed in early age a thirst for knowledge, which distinguished him through life. Placed under the able tuition of the late Rev. Dr. Pye Smith, he formed a friendship with him which lasted till death; and from that excellent man he doubtless derived that love of natural science which was so marked a feature of his intellectual character.

His ardent attachment to geological science is well known, and his 'Elementary Lectures on Geology' in a popular educational periodical were characterised by a leading member of the Geological Society as being the best work of the kind for the masses that he had seen. In 1853 he was elected Fellow of the Royal Geographical Society. He died at Rochester, deeply and deservedly regretted by those who knew him, in the sixty-fourth year of his age.

He published works on religious subjects to which it is not my province to advert, and was for some years President of Coward College, London.

Mr. Richard TAYLOR, the well-known printer and accomplished naturalist and scholar, was born at Norwich in 1781. In the year 1807 he became a Fellow of the Linnean Society, and in 1810 was elected its under-secretary, an office which he retained for nearly half a century, and in which he earned for himself the cordial esteem and good-will of every member of the Society. In his diary, under date of the anniversary of 1849, he notes that he had "served with the naturalists M'Leay, Bicheno, Boott, and Bennett, under the successive Presidencies of the founder, Sir J. E. Smith, of the late Earl of Derby, the Duke of Somerset, and Dr. Stanley Bishop of Norwich." To the names of these Presidents he might subsequently have added those of Robert Brown and of Thomas Bell, the actual President of the Linnean Society, by both of whom he was highly esteemed for his strict sense of honour, his amiable disposition, and his entire devotion to the interests of the Linnean Society.

Among the numerous other learned bodies of which he was a member, the Society of Antiquaries, the Astronomical Society, and the Philological were those bodies in which he took the deepest interest. He also attached himself from its commencement to the British Association for the Advancement of Science, many of the meetings of which he regularly attended, and at which he was always cordially welcomed by numerous friends, including myself.

In 1822 he joined Dr. Tilloch as editor of the 'Philosophical Magazine,' with which Dr. Thomson's 'Annals of Philosophy' were subsequently incorporated. In 1838 he established the 'Annals of Natural History,' and united with it, in 1841, Loudon and Charlesworth's 'Magazine of Natural History.' He subsequently (at the suggestion and with the assistance of some of the most eminent members of the British Association) issued several volumes of a work intended especially to contain foreign papers of a high order of merit, translated into English, under the title of 'Taylor's Scientific Memoirs.' But his own principal literary labours were in the field of Philological research. In 1829 he prepared a new edition of Horne Tooke's 'Diversions of Purley,' which he enriched with many valuable notes, and which he re-edited in 1840. In the same year (1840) Warton's 'History of English Poetry' having been placed in his hands by Mr. Tegg the publisher, he contributed largely, in conjunction with his friends Sir F. Madden, Benjamin Thorpe, J. M. Kemble, and others, to

improve the valuable edition published in 1824 by the late Mr. Richard Price.

Early in the summer of 1852 his health gave way, and he found it necessary to withdraw from the excitement of active life. Increasing years brought increasing feebleness; and the severe weather of November last brought on an attack of bronchitis, of which he died.

Mr. Abel SMITH was one of those men of calm, retired character who, in the very centre of the busiest capital in the world, and engaged in the most important transactions, pursued his tranquil way in performing good works.

Born in 1788, he early in life became possessed of ample fortune, bequeathed to him by an uncle; and after the death of his father, he became chief of the banking-house in Lombard Street, known as that of Smith, Payne, and Smith. He took great interest in all the scientific discoveries and inventions of late years, and carried out his views of the importance of education by promoting the improvement of the poor. Opulence never affected the simplicity of his character and habits. Careful and discriminating in all his transactions, and weighing with much consideration the claims made upon him, he was princely in his charities and also in his acts of pecuniary generosity. Appeals were seldom made to him in vain; both his sense of duty and the gratification of a most benevolent disposition leading him to give bountifully in cases of real distress and difficulty.

Mr. Abel Smith entered Parliament in 1809 and continued until 1846, during the last fourteen years of which he was returned for the county of Herts.

Richard Holmes LAURIE, the well-known publisher of nautical works, was born in 1777. From the year 1818 he relinquished all other collateral branches of publication, and contented himself with maintaining the character of his nautical works for excellence and minute accuracy. These works, unattractive, and not much known to the general public, have high claims to consideration from their wide-spread circulation and great general utility among geographers. Mr. Laurie was very highly respected for his strict integrity. He was one of the oldest members of the trade, and almost the last connecting link between the old and new systems of publication.*

* In addition to the above the Society has to regret the loss of the following Fellows, viz.:—Alexander Cumming, M.D.; H. Stewart Dykes; Sir Isaac L. (Baron) Goldsmidt, Bart. (whose liberal support of science and letters was widely felt); the Rev. J. W. Martin, LL.B.; James Morison; Aristides Franklin Mornay; and Thomas Lister Parker.

William Kennett Loftus, who, though not a Fellow of this Society, had contributed some important papers to its Journal,* comprising Notes of a Journey from Busrah to Bagdad, and on the Determination of the River Eulæus of the Greek Historians, died in November last, at the age of thirty-seven, on board the *Ty burnia*, on his way home from India. Mr. Loftus was a good scholar, and had passed much of his life in the East. He served four years in Mesopotamia under Colonel Williams (now Sir W. F. Williams of Kars), as naturalist and geologist to the expedition sent out for the settlement of the Persian frontiers. On his term of service expiring, he was sent by the Assyrian Society to investigate the ruins of Babylon and other ancient Biblical cities. The results were published in a book entitled 'Travels and Researches in Chaldæa and Susiana,' which reflected much credit on this young geographer and archæologist. Afterwards appointed as a geological surveyor on the Great Survey of India, he laboured zealously at his work till he was struck down by a sun-stroke. He went to Rangoon to recruit his health, and not succeeding, was ordered home, and died on the voyage.

Adolphe Schlagintweit.—In closing this obituary, it is my melancholy duty to state that the event which was foreshadowed in the Address of last year has been realized; and that the bold and accomplished explorer, Adolphe Schlagintweit, is no more!

The documents which attest that he was assassinated before the walls of Káshgar (midway between Yárkand and Kókan) were officially transmitted by Lord Stanley, the Secretary for India in Council, and laid before the Society.† It appears that Adolphe Schlagintweit, who took a route farther to the west than his brothers Hermann and Robert, had succeeded in penetrating farther than they did into Central Asia; for he not only reached Yárkand, where he was well received, but was on his route to Kókan, when, in one of those religious forays made by the fanatical Turks or Crescentaders from Kókan against the Chinese, he was killed in August, 1857, by order of a savage Mohammedan chief, named Wulli Khan.

When we know that the deceased had overcome the greatest difficulties of his perilous journey, had traversed the western pro-

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* *See* vols. xxvi. and xxvii.

† These papers have since been printed by his brothers Hermann and Robert for private listribution.

longation of the Kara-Korum chain, and that northernmost ridge of those vast mountains which his brothers consider to be the Kuen Lun of Humboldt, it is deeply to be deplored that the great amount of knowledge he had accumulated should thus have been lost.

Although it is known that the adventurous Conolly did, when at Bokhara, penetrate from that place to Kókan, no European of modern times has succeeded in passing from India over the snowy chains of the Kara-Korum and Kuen Lun, to descend into Turkistan, except the Schlagintweits; and it is most distressing to have to record that he of the three brothers who pushed his adventure the farthest should have been cut off at a time when his note-books and observations must have been of the highest value.

As Englishmen, we have, however, the consolation of reflecting, that our authorities who gave the warmest support to the deceased traveller whilst in life, have never ceased to endeavour to trace the history of his last days, and are even now energetically endeavouring to recover his lost papers.

No individual has taken a more lively interest in these last-mentioned researches than our distinguished associate, Captain Richard Strachey, who, with his brother, one of our medallists, is so well known to us by his explorations in the Himálayan Mountains and Thibet. Seeing what has also been done by Lord W. Hay, Colonel Edwardes, and Mr. Knox, as well as by the Russian Consul at Chúquchak, M. Vardouguine, we may rest assured that every effort will be still made to recover the lost records of the zealous and intrepid Adolphe Schlagintweit.

Geographical Progress in the Past Year.

In proceeding, as on former occasions, to bring before you a review of the progress of geography during the past year, I must claim your indulgence when I say that, from my numerous avocations, I have found it impossible to prepare a more complete retrospect than that which I now offer.

In truth, the field of exploration and discovery is becoming too vast to permit any one man—however zealous and laborious—to accomplish such a task without many omissions; to say nothing of the difficulty of condensing into one Report the merest outline of all the geographical literature of the year.

The account of the progress of the British Admiralty Surveys, which—as usual—is first given, is indeed as perfect as at any former period; for, in continuation of the practice of Admiral Sir F. Beaufort, his revered predecessor, Captain Washington, the hydrographer, has prepared this document with his well-known and acknowledged skill.

Let us, therefore, begin with this National Maritime Survey, after the reading of which I will endeavour to pass in review the most important geographical discoveries in various parts of the globe, as well as to note the progress of publication in various countries.

Admiralty Surveys.

The Coast surveys in course of execution under the orders of the Admiralty, both at home and abroad, have made fair progress during the past year. They are conducted by twenty different surveying parties—one half of which are employed on portions of the coasts of the United Kingdom, the remainder in the colonies of Australia, Cape of Good Hope, West Indies, Nova Scotia, Canada, and British Columbia; also in the Mediterranean, in Banca Strait, and on the coasts of China and Japan.

England.—On the east coast of England, the only work of importance has been the re-examination of Hartlepool bay by Captain Bedford and Lieutenant Horner, with a special view to discover if any silting up had taken place since the first detailed survey of the bay was made by Commander Slater in the year 1829, and repeated by Mr. E. K. Calver in 1843. The new plan is drawn on a scale of eight inches to the nautic mile, and is sufficiently minute to have enabled Captain Bedford to furnish the Refuge Harbours Commission (at whose instance the survey was made) with a decided opinion, or rather proof, that no perceptible change had taken place in the depths within the last thirty years. Fortified by this result, the Commissioners have recommended Hartlepool bay as one of the sites for a refuge harbour on the east coast of England.

On the south coast, Commander Cox and Messrs. Usborne and Davis are continuing the survey of Hamoaze, and have completed St. John Lake and St. Germans River, including 33 miles of river bank line and 13 square miles of soundings. In the Channel Islands, Commander Sidney has re-examined the harbour of Braye, in Alderney, and the Great Bank off Guernsey. A valuable addi-

tion to the navigation of the Channel has been made in the publication by the Admiralty of the 2nd volume of the 'Channel Pilot,' containing Sailing Directions for the north coast of France, from Dunkirk on the east to Ushant on the west, comprising the Channel Islands. The work has been carefully compiled by Mr. J. W. King, of the Hydrographic Office, from the 'Pilote Français,' the labours of Rear-Admiral Martin White, Mr. C. Burney, R.N., and others.

In Cornwall, Captain Williams and Mr. Wells have surveyed eight miles of open coast from the Rame Head westward to St. Germans beacon, including Whitesand bay and Port Wrinkle, sounding over an area of 230 square miles between the Beacon and Falmouth, with plans of the small harbours of Boscastle and Port Isaac, on the north coast of the county; they have also executed a very detailed plan, on the scale of 100 feet to an inch, of the Eddystone rocks off Plymouth, showing the exact outline of the granite mass that forms the base for that wonderful structure, the Eddystone Lighthouse, erected by Smeaton in 1760, and which has hitherto withstood the force of the Atlantic waves. A similar structure, in a still more exposed situation, has just been completed, under the direction of the Trinity Board, by their skilful engineer, Mr. James Walker, ably seconded by Mr. Douglas, on the Bishop rock, six miles south-west of the Scilly Isles. These noble light-towers, like the two similar buildings on the Bell rock on the east coast of Scotland, and of Skerryvore on the west, are national works in the cause of humanity, and for the safety of our shipping, of which the country may be justly proud; and they will transmit to distant posterity the names of the eminent engineers Smeaton, Walker, and the Stevensons, father and sons.

In the Bristol Channel and its approaches, Commander Alldridge and Mr. Hall, in the *Asp*, have made a survey of Swansea Bay and its immediate neighbourhood, which has revealed some patches of hard ground—probably oyster beds, not before known. This plan, which shows sixteen miles of coast line and 20,000 casts of the lead, is drawn on the scale of nine inches to a statute mile, and proved very useful to the Refuge Harbours Commission in its examination of Swansea Bay and the Mumbles, which had been mentioned as a site for a refuge harbour; and, although the Commission has not recommended it as such, there seems a fair probability that the shelter afforded by the Mumbles Head, the abundance of stone for construction, and the increasing want of some shelter

for the rich copper ore ships, which are frequently obliged to ride out southwesterly gales in this exposed roadstead, will lead the enterprising merchants of Swansea to consider whether, notwithstanding their recent spirited outlay on docks, they cannot construct a sufficient breakwater out of their own resources. The requirements of the Harbours Commission have also led to the publication of a chart of Lundy Isle, on the scale of 4½ inches to a mile, and of the two sheets of the upper portion of the Bristol Channel, on the scale of two inches to a mile, which are rapidly advancing to completion.

Scotland.—In Argyleshire, Commanders Bedford, F.R.G.S., and Creyke, and Mr. Bourchier, R.N., have been employed on the coasts of Mull, and an useful Chart of the Sound of Iona from their survey has been published on the scale of 3 inches to a mile. In this immediate neighbourhood the geographical features of the country have suffered some change from the breaking down of the reservoirs of the Crinan Canal, caused by the heavy rains. In restoring this navigation, we may express a hope that the dimensions of the locks of this canal will be placed more on a par with those of the Caledonian Canal, so that the greater part of the vessels that navigate the one should also be enabled to pass through the other; seven out of the fifteen locks might also be dispensed with, and an uninterrupted level be carried from the top of the rise near Loch Gilp Head on Loch Fyne, to the descent into Loch Crinan on the north. This event, too, has again opened the question of the Argyle Canal, to connect by a short link of about one mile East and West Tarbert lochs.

In Skye, Commander Wood and Mr. Forbes have surveyed twelve miles of the open coast on the south-west face of the island from Loch Bhreatal northwards to Loch Bracadale, including the smaller inlets known by the names of Lochs Eynort and Harport, and the district of Minginish, with its magnificent mural cliffs, rising 800 feet almost precipitously from the sea. On the coast of Inverness-shire, Mr. Jeffery has completed the shore line and outlying rocks and soundings as far south as Ru Arisaig.

In the Hebrides, Captain Otter, in H.M.S. *Porcupine*, with her tender the *Seagull*, Lieutenant Chimmo, aided by his staff of Lieutenants Dent and Hawes, and Messrs. Stanley and Cramer,*

* It is with extreme regret that I mention that the preparing and colouring the sheets containing the survey of Loch Roag was Mr. Cramer's last work: over-anxiety on account of domestic illness, with the rigorous climate of the Hebrides, brought on an attack of disease from which he could not rally, and at the early age of thirty-five an accomplished artist and an honest, hard-working man was lost to his country.

has surveyed Loch Roag on the west side of Lewis, and made a beginning on Loch Maddy on the east shore of North Uist; he has also examined the dangerous rocks the Haskier, seven miles to the westward of that island, an outlying group, on which it is proposed to place a light for the safer navigation of those seas, and to lead up to the northern entrance of the Sound of Harris. In connection with the Skye survey, the *Seagull* was employed in sounding over an area of several square miles between the south of the island and the detached islets of Canora, Rum, and Eig. In the island of Harris, Lieutenant Thomas has surveyed West Loch Tarbert, and connected it with the eastern loch, which he completed last season. All these plans are projected on the scale of six inches to a mile. Some of the original drawings have been exhibited at our evening meetings, and have justly elicited much admiration.*

Some of the results of these and former surveys of the west coast of Scotland have been published by the Admiralty since our last Anniversary; among others I may mention charts of Lochs Torridon and Shieldag, and of Lochs Carron and Kishorn on the west coast of Ross-shire, both engraved on the scale of three inches to a mile; Loch Tuadh and the isles on four inches; and the sound of Harris on a scale of rather less than two inches to a mile, but sufficiently large for all the requirements of the mariner. Besides these, there is a general chart of the coast from the Mull of Kantyre to Cape Wrath, on the scale of a quarter of an inch to a mile, which for the first time represents with tolerable accuracy the western shore of Scotland with its numerous islands. The intricacy of this coast has hardly its parallel on the globe, unless it be some portions of the west coast of Norway, Tierra del Fuego, and the west coast of Patagonia. It has occupied more than twenty years to survey; and, with the off-shore soundings, will require five years more to complete it. Its cost when finished will not have been less than 250,000*l*.

Ireland.—On the east coast of Ireland Messrs. Hoskyn, Aird, and Yule have surveyed Dundalk bay and harbour, and broken ground at the Strangford narrows. In the course of their work they have sounded over an area of 70 miles; but the chief service rendered by this party of surveyors is the boring of Carlingford Bar, preparatory

* Lieutenants Thomas and Chimmo have made a series of meteorological observations during the past season in the Hebrides, which are very creditable to these officers, and will, no doubt, prove valuable to meteorologists.

to rendering that fine lough a harbour of refuge. It is gratifying to know that the result of their examination proves that there is no obstacle that may not be easily overcome, and that there is a fair probability that within three years we shall see a refuge harbour in this portion of the Irish Sea, where it is so much needed.

In Donegal, on the north coast, Captain Bedford and Lieut. Horner have completed that portion of the shore which was required to fill up the gap in our charts; all that now remains is to carry the soundings off shore to a depth of 100 fathoms. In addition to his usual labours, Captain Bedford, at the request of the Refuge Harbours Commission, prepared a report on the want of lights and buoys on the north-west coast of Ireland, from Galway round to Londonderry, a valuable document, being the result of his 20 years' experience, which is printed in the Appendix to the Report of that Commission.

In Kerry, on the south-west coast, Commander Edye, with Messrs. Macdougall and W. B. Calver, have been employed on the Blasket Isles round from Dingle Bay to the Skerries, in the course of which they have sounded over an area of several square miles. This completes the survey of the shores of Ireland: it only remains to carry the soundings off shore to the depth of 100 fathoms.

In the course of the past year the charts published of the coast of Ireland are Dunmanus Bay in Cork on the scale of 3 inches, Loughs Swilly and Foyle and the river and harbour of Londonderry on the scale of $1\frac{3}{4}$ inches to a mile, the latter showing the new quays, and the admirable lighting and beaconing of the river and lough, which have been carried out by the enterprise of the Harbour Commissioners of Derry, seconded by the skill of their engineers the Messrs. D. and T. Stevenson of Edinburgh.

Mediterranean.—The channel between Malta and Gozo has been re-examined by Captain Spratt, F.R.G.S., and Lieut. Wilkinson, in H.M.S. *Medina*, and a second Report has been written by the former, showing how the Nile continues to bring down its deposits, and how the advance of the delta is checked by the littoral drift from the west; a subject on which I shall dwell in the sequel. Captain Spratt has also presented to the Society a dissertation on the site of Pelusium, which he does not believe to have been at the ruins of Tineh as has been generally supposed, but at some place rather farther inland.

Lieut. Wilkinson, under the direction of Captain Spratt, has made a general chart, showing at one view his surveys of the delta of the

Danube in the Black Sea, to which I referred last year, forming a beautiful drawing, which has been exhibited at one of our evening meetings, and justly elicited warm commendation.

On the coast of Syria Commander Mansell, with his assistants Lieut. Brooker and Mr. Frederick Skead, have surveyed the gulf of Iskanderún, and made plans of the roadsteads of Ayas on the north and Alexandretta on the south. They will now proceed systematically to the southward along the coast by Beïrút, Akkah, and Yaffa, and so join their former survey of the coast of Egypt at El Arish.

South Africa.—In the Cape Colony Mr. Francis Skead has completed the survey of Table Bay, which has been published by the Admiralty. He also accompanied Dr. Livingstone to the mouth of the Zambesi, and has made a sketch survey of the delta of that river, as far up as Expedition Island. It is gratifying to be enabled to report that, thanks to the energy of Rear-Admiral the Hon. Sir Fred. W. Grey, and the ready aid of Mr. Maclear, Astronomer at the Cape, a transit clock and a time signal ball have been erected in Simons Bay, and that henceforward vessels will be able to rate their chronometers in Simons as well as Table Bay, in each of which the time signal ball drops at the instant of one o'clock Cape mean time, to which I shall have occasion to revert a little farther on.

Red Sea.—Captain Pullen, in H.M.S. *Cyclops*, has completed a line of soundings in the Red Sea, to which I referred last year, and it proves that the greatest depth does not exceed 1050 fathoms: he has also carried a line of soundings from Aden to Kurráchi, in which the general depth at 12 miles off shore is about 500 fathoms, and the deepest 2000 fathoms in crossing the entrance to the Persian Gulf. Not improbably at the moment I am speaking, the submarine telegraph cable has been laid down that will unite England viâ Constantinople with Aden.

In Ceylon a new survey of the harbour of Point de Galle, by Mr. J. Power Royston, has been just published by the Admiralty on the scale of 15 inches to a mile; it is, we believe, preparatory to the erection of a breakwater in that much frequented but exposed bay. Mr. Stanton, who has succeeded Mr. Richards in command of the *Saracen*, with his assistant Mr. Reed, is employed in the survey of Banca Strait and its immediate neighbourhood which forms the highway to China, and is still but imperfectly known.

China.—Commander Ward, who has succeeded the late lamented

Captain Bate in command of the *Actæon*, with her tender the *Dove*, Lieut. Bullock, and his staff of surveyors, Messrs. Kerr and Blackney, has greatly improved the chart of the Chu Kiang, or Canton river, and Lieut. Bullock has recently explored the western river for about 150 miles. In the Yang-tse-keang the surveyors accompanied Lord Elgin in his exploratory voyage by Nankin to Han-Kow, and availed themselves of the opportunity to make a good eye sketch of the river for 150 miles as far as the city of Han-Kow, an account of which the Society has received from Captain Sherard Osborn, and on which I shall dilate in the sequel. Captain Ward and his staff have also re-surveyed the river from Wusung to Shanghae, which will shortly be published. In the Gulf of Pechili the Pei-ho has been ascended as far as Tien-sin, and a survey, made by Monsieur E. Ploix, ingénieur-hydrographe of the French navy, has been published by the Admiralty in two sheets, on the scale of about 2½ inches to a mile.

Japan.—Some additions to the United States' Survey of Yedo bay have been made by Captain Sherard Osborn and Commander Ward, and plans of this bay, of Simoda and of Hakodadi, have been published by the Admiralty.

Australia.—Captain Denham, with Lieutenant Hutchison and the officers of H.M.S. *Herald*, have made a partial survey of Shark Bay on the west coast; they have also sounded the approaches to Port Jackson, carried a track through the Coral Sea, correcting the sites of the Cato and other banks, and discovered a dangerous rock at the entrance to Moreton Bay. The plan of Port Jackson, completed last year, has been published, on the scale of 3½ inches to a mile, also the 2nd volume of the Australian Directory, compiled by Commander C. B. Yule, comprising the east coast and Torres Strait, a valuable boon to the mariner. Captain Sir Edward Belcher has re-examined all the longitudes in the Eastern Archipelago, from Madras eastward, and has endeavoured to reconcile the discrepancies which exist, not, however, such as to affect navigation, but far too great for the present state of hydrography in other parts of the globe.

Indian Survey.—The transfer of the government of India from the East India Company to the Crown, and the opening up of a trade to China and Japan, seems to be an occasion calling for a more extended notice than usual of the state of the surveys in the East, which have been made by the officers of the Indian Navy. Whether these surveys will remain under the present direction, or be placed more immediately under the Crown, is unknown to me; but I am

satisfied that I shall render good service by placing on record the present state of the coast survey in the East Indies and China; at the same time expressing our thankfulness as geographers for what the East India Company has already done. It is proposed to extend this brief notice from Suez in the West throughout India, China, and the Asiatic Archipelago, to New Guinea and New Zealand in the East.

The Red Sea, Gulf of Aden, Socotra, and the south-east coast of Arabia, have been sufficiently surveyed for the purposes of navigation by the officers of the Indian Navy, as also the coasts of Beluchistán, Scinde, and Kattiwar, as far south as Cambay. The Gulf of Persia, however, requires some re-examination, which, it is understood, is in progress.

From Cambay southward, along the entire coast of Malabar to Cape Comorin, and thence northward by Madras to Calcutta, the whole of the peninsula of India has been triangulated. The nautical survey of the west coast, and of the east coast between Madras and Santipilly, have also been completed. From the Gulf of Manaar northward to Madras, and from Santipilly to Point Palmyra, is in course of progress by the officers of the Indian Navy. The Sunderbunds, or mouths of the Ganges, up to Calcutta and to Chittagong, have been completely surveyed.

In Ceylon the west coast is also surveyed, but the south and east coasts only very partially, and require early attention, especially in the neighbourhood of the dangerous rocks—the Basses—off the south-east side of the island. The plans of Trincomalee and Point de Galle are passable; that of Colombo is still wanting. The Maldivas, Laccadivas, and Chagos Archipelago, have been carefully surveyed, and published on a large scale by the East India Company. The coast of Chittagong and Aracan, southward to Cape Negrais, has been partially surveyed, but requires further examination. The river up to Aracan, the Negrais up to Persaim, with its outlying dangers to Preparis, and the Rangoon River, have been sufficiently surveyed. The coasts of Martaban and Tenasserim, as far as St. Matthew Island, including the Mergui Archipelago, have been partially surveyed, but require more examination. From Isle St. Matthew southwards to within ten miles of Pulo Penang, the Malacca coast is all but unknown, though a survey is in progress. The same with the Andaman and Nicobar groups, of which we hardly know anything. Keeling Island has been completely surveyed. The eastern shore of the Strait of Malacca as far as Singa-

pore, and that harbour, have been well surveyed, the latter by Mr. J. Richards, R.N. The western shore of the strait has been very loosely examined. The straits of Durian and Rhio have been partially surveyed, but are very incomplete. The same with the straits of Banca, Gaspar, Macclesfield, and Stolze, the Carimata channel, the west coast of Sumatra, and the islands of Banca and Billiton. The strait of Sunda is fairly known, but not completely surveyed. The island of Java, with the outlying islets and the whole of the Java Sea, have been partially examined by the Dutch, but are still very far from being complete. The same with the islands to the eastward; as Baly, Lombok, Sumbawa, Sumba, Flores, and Timor.

The east, south, and west coasts of Borneo, with the exception of a few spots, as Pantai and Bulúngan rivers, Cape Kani-úngan, and Sambar Point, are quite unknown. The north-west coast, from Tanjong Api by Saráwak and Labúan to Balambangan, is sufficiently surveyed. Of the Natunas north group little is known; the south group has been surveyed, and connected with the coast of Borneo. Of the Anambas and Tambelan groups, and of the isles just to the eastward of Singapore strait, we are quite ignorant; with the islands and dangers south-east of Singapore, as Bintang, Battam, Linga, Sinkep, &c., we are better acquainted, although our knowledge of them is still very defective. The east coast of the Malay peninsula from Singapore northwards has been passably surveyed. The Gulf of Siam has been better surveyed by Mr. John Richards, R.N., but some detached portions on the west coast still require examination, and new soundings are wanted all over the gulf.

On the south coast of Cambodia, from Pulo Obi to Cape Padaran, we know nothing. From Cape Padaran northwards, along the coast of Cochin China, has been partially explored, but requires more examination. Turon Bay is surveyed and published. The Gulf of Tong-kin is utterly unknown. The south-east coast of the island of Hainan has been partially explored, but not sufficiently. The rest of the island is unknown.

Pulo Condore, Pulo Sapata, with all the dangerous rocks and shoals in the southern part of the China Sea, across to the coasts of Borneo and Paláwan, require examination more urgently than any portion of these seas. Farther north the group of the Paracels and the Macclesfield Bank have been explored, but require more careful examination. The island of Paláwan has been completely surveyed, and the charts published. A map of Luzon exists, but

no coast-survey, with the exception of the port of Manila, which is complete.

In China Proper the coast from Hainan Island to Macao has been partially surveyed. From Macao to Canton the river is fairly surveyed, but the group of islets to the south-west of Hong-kong, fronting the entrance of the Chu Kiang, requires further examination. From Hong-kong the east coast of China, as far as the entrance of the Yang-tse-keang, has been sufficiently surveyed for the general purposes of navigation, but as it is not a work in detail, vessels must use caution in approaching the different anchorages.

The Pescadores group and the Chusan isles are also surveyed, but of Taï-wan or Formosa the survey is very partial and detached. The Bashí and Balingtang channels, between Formosa and Luzon, have been explored, but are not at all sufficiently known, and especially the meridian distance is wanted between the Babuyan and the Bashí groups.

The Yang-tse-keang has been explored up to Nan-king, but is far from being properly surveyed; and, indeed, the shifting nature of some of the banks renders it very difficult to make a correct chart of it. From Nan-king upwards to Han-Kow is only known from the track of the expedition in November, 1858.

From the Yang-tse-keang northwards by the Hwang-ho, or Yellow River, as far as the Shantung promontory, being the eastern extreme of that province, the coast has not even been explored, if ever seen, by any European navigator. The Gulf of Pechili is a little better known, especially about the mouth of the Pei-ho. That river is also laid down as far up as Tien-sin; thence to Pekin is only known from the embassies of Macartney and Amherst. The Gulf of Leao-tong is almost unknown. So also with the western coast of Korea, except a few detached capes, the position of which has been fairly determined.

The island of Quelpaert and Port Hamilton have been surveyed. The east coast of Korea has been explored by the French and Russians, as also the coast of Manchuria, as far northwards as the mouth of the Amúr. In this extent Victoria Bay, Port Michael-Seymour, Barracouta Harbour, and Castries Bay, are the only spots passably surveyed.

The Gulf of Tartary also has only been explored. Pérouse Strait, between the south end of Saghalien and Yezo, has not been examined. Of Yezo Island in Japan nothing accurate is known, except the south-west extreme, which forms the northern limit of

the Strait of Tsugar. This latter strait, including the north side of Niphon, has been surveyed. Of the rest of Niphon, with Kin-sin and Sikok, we know nothing, except the position of a few points at its western extreme. There are, however, fair surveys of the bays of Naga-saki, Simoda, and Yedo. Of the islets of Fatchin and Tsu-sima in the Strait of Korea, and of Argonaut and Dugelet islets, we know nothing accurate.

The Kuril Islands, Kamchatka, and the Sea of Okhotsk, have been explored by the French and Russians; the harbour of Petropavlovski has been completely surveyed by the English. Proceeding southward from Japan, the Linschoten Islands are very imperfectly known. The Loo-choo group has been better explored, but still is very incomplete. The Meiaco-sima group has been surveyed.

The Philippine Islands, including Luzon, Mindoro, and Mindañao, have been explored by the Spaniards, but are not surveyed; it is understood that a survey, which is much wanted, is in progress. The same may be said of the Celebes Sea, and of the east coast of Borneo, and west coast of Celebes Island, forming the Strait of Macassar, which is also unsurveyed. Of the Island of Celebes little is known except the western part of the Gulf of Boni, which has been surveyed by the Dutch, and Macassar roadstead by the English. Of the Flores Sea, Banda Sea, Arafura Sea, and the group of islands forming the eastern passages to China, although greatly frequented by shipping, no survey exists.

Of the north-western side of Papua or New Guinea nothing accurate is known. On the north side there is a track-survey, and a few points are fixed, otherwise it is unexplored. The same may be said of the group of the Solomon Islands. The south coast of New Guinea, from the Louisiade Islands westward to Torres Strait, has been surveyed by the English; so also has been Torres Strait.

In Australia, the eastern coast from Torres Strait southward to Halifax Bay, in lat. $19\frac{1}{2}^{\circ}$ South, has been well surveyed; the remainder to Bass Strait has been only partially examined, but some of the harbours, as Port Bowen, Port Curtis, Sandy Island Sound, Moreton Bay, Port Macquarie, Newcastle, Port Jackson, and Twofold Bay, have been completely surveyed. The Coral Sea to the eastward of Australia, a very frequented track between Sydney and China, has been partially explored, but urgently requires a more complete examination.

Bass Strait has been partly, but not sufficiently, surveyed. The east, south, and west coasts of Tasmania have never been sur-

veyed, nor even the harbour of Hobarton. From Bass Strait westward to the Gulf of St. Vincent has only been explored. St. Vincent and Spencer Gulfs were partially surveyed by Flinders. From Spencer Gulf to Cape Leeuwin, the coast of the great Australian bight, there is only a track-exploration. King George Sound has been partially surveyed.

From Cape Leeuwin to Swan River is only explored. Swan River has been surveyed; thence to Shark Bay, and round the north-west coast to Port Essington, has been sufficiently surveyed for the purposes of navigation, yet hardly, perhaps, enough to please geographers. The islets and shoals lying between Timor and the north-west coast of Australia require to be examined. Port Essington is completely surveyed. Thence to Cape York, including the Gulf of Carpentaria, the coast has been explored, and portions of it partially surveyed, but all of it requires further examination. It will thus be seen that there is ample employment in these eastern seas not only for three surveying vessels, but for double that number if we wish that hydrography should keep pace with the rapid advance of civilization and population.

America.—Crossing the Pacific Ocean to the north-western shores of America, we learn that Captain George H. Richards, with his staff of zealous assistants, Messrs. Bull, Pinder, Mayne, and Bedwell, has completed an admirable survey of Rosario and Haro Straits, and of the numerous islets that lie between the mainland and Vancouver Island, an extent of about 800 miles of coast line, sounding over an area of about 700 square miles—the largest amount of hydrographic work, we believe, ever accomplished in one season by a party of five surveyors. The general chart of these straits engraved on a scale of ½ an inch to a mile is on the eve of publication at the Admiralty. A sketch survey of the Frazer River, in British Columbia, showing the several gold reefs, by Lieut. Mayne, R.N., and Mr. Begbie, Colonial Judge, on the scale of 1 inch to a mile, has already appeared.

Nova Scotia.—On the east side of the North American continent, Commander Orlebar, with his assistants Commander Hancock and Messrs. Desbrisay, Clifton, and Carey, have surveyed 46 miles of the open coast of Cape Breton Island, from Cape Hinchinbroke to Port Nova, including Louisburg Harbour. Some plans also have been published of harbours on the coast of Nova Scotia, as Ship, Guysboro', and Beaver harbours, each on the scale of about 4 inches to a mile. In Newfoundland advantage was taken of the laying

down the Atlantic submarine cable, to make a plan of Bull Arm, Trinity Bay, by Captain Otter and the officers of the *Porcupine*. In the Bay of Fundy Captain Shortland, with his staff, Messrs. Scott, Pike, Scarnell, and Mourilyan, have surveyed the coast of New Brunswick from St. Martin Head easterly to Wolf River, part of Chignecto Bay, and the Bay of Mines, sounding over an area of 400 square miles.

In the West Indies Mr. Parsons, with his assistants Messrs. Dillon and W. B. Calver, are engaged on the island of Grenada. The 2nd volume of a new edition of the 'West India Pilot,' compiled by Captain E. Barnett, has been published at the Admiralty, and is a great boon to the mariner. After bearing his part in the successful laying down of the Atlantic submarine cable, Commander Dayman on his passage home carried a line of soundings from the Azores to England, showing a depth of 2500 fathoms to within 60 miles of the edge of the 100 fathoms shelf which extends from the Land's End, thus indicating that a more sudden dip in the bed of the ocean exists here than was found to the westward of Valentia, in Ireland.

Variation Chart.—I had occasion to mention last year that a Variation Chart of the world, showing at a glance the curves of equal magnetic variation, was in preparation at the Admiralty by Mr. Fred. T. Evans, R.N., chief of the Compass Department. This chart has since been published; and judging from the testimony to its value borne from all quarters, it has proved even a more accurate and useful document than was anticipated. The whole of the curves are reduced to the epoch of 1858; the chart gives also the annual change of variation which is constantly in progress, and this in places exceeds seven minutes yearly. This may appear a small amount, but when we consider that in the greater part of the charts by which our merchant ships are navigated, the variation has not been corrected for thirty, forty, and even fifty years, the practical sailor will at once see a fearful source of error that may, unsuspected, exist. The error of a quarter of a point of the compass in a run of 500 miles would amount to 25 miles, and this, in navigating a long narrow sea or strait, as the Adriatic or Red Sea, might readily lead into dangers, and this error has doubtless been one of the many causes of shipwreck. By this chart the means of correcting the variation in all charts are now within the reach of every one for a few shillings, and we trust it will be largely circulated. It is gratifying to know that a strong expression of the approbation of

the Lords Commissioners of the Admiralty has been officially communicated to Mr. Evans for the labour and scientific skill he has bestowed upon this beautiful and useful production.

Besides the surveys above enumerated as in progress in different parts of the world, the labours of the Hydrographic Office during the past year have consisted in the publication of upwards of 80 new and corrected charts of various coasts and plans of harbours. It may enable my hearers to form some idea of the activity that prevails in this department if I mention a fact just made known to me—that during this very month of May the large number of 20,000 Admiralty Charts have been printed and the greater part sold to the public. In addition to these works the usual annual lists of lights, of notices to mariners, of tide-tables, have been published; and lastly I may conclude this portion of my Address with an announcement which cannot but deeply interest all geographers, namely, that it has been determined that the Table of Maritime Positions, giving the latitude and longitude of 8000 places on the globe, compiled with great care by our late lamented Member HENRY RAPER, shall be annually corrected and kept on a par with the latest information at the Admiralty, as the best tribute that hydrography can offer to the memory of our deeply regretted friend and medallist.

LAND SURVEYS.

Ordnance Survey.—The reduction of plans on larger scales to the size of maps by means of photography has been brought into efficient public practice by Colonel James, the able Superintendent of the Ordnance Survey Office and Topographical Department, and a report of a committee, appointed by the Secretary of State for War, of which I was the Chairman, has entirely approved of the process.

When it is known that the largest of the British surveys as now sanctioned are on the scale of 25·344 inches to a mile, or the scale of one square inch to one acre, and that the expense of reducing that enormous scale down to six inch and one inch scales by means of any mechanical contrivance such as a pentagraph must be very considerable, the employment of photography to effect this purpose rapidly, accurately, and economically, reflects the highest credit on Colonel James.

A full and detailed account of the progress of the Ordnance Survey of the British Isles, and of the preparation of the plans and maps upon four different scales, will be found in the last Report

presented to the Houses of Parliament. The account of the principal triangulation embodying the scientific results of the survey was published in the beginning of last year, and has been received with satisfaction by the scientific men of all countries.

Geological Survey of Great Britain.—Fully aware that the physical geography of a country can never be perfected until we are acquainted with the structure of the sub-soil, on which the outlines of the land depend, it is my duty to inform geographers of the progress which has been made in this branch of the Government surveys of which I am the director. In fact, the geographer has only to inspect the horizontal sections which we publish on the scale of six inches to a mile, to see how intimate is the connexion between geography and geology. Whilst coloured maps on the one inch scale have been published over a considerable portion of England, Wales, and Ireland, six sheets on a smaller scale have been issued, comprising all Wales and the bordering English counties. Lest any one should suppose that the production of this beautiful and compendious map had been favoured by myself because it includes the "Silurian Region," let me say that it was ordered by my predecessor, Sir Henry De la Beche, on account of the striking physical features of that region, and was far advanced towards completion when I took office.

Seeing the rapid progress which is made in England and Ireland, it is a subject of deep regret to me that two surveyors only are as yet allotted to Scotland. Knowing the extraordinary value of the great coal tract between the Firths of Clyde and Forth on the one hand, and on the other the great interest which geologists attach to the acquirement of true knowledge respecting the broken and mountainous parts of Scotland, it is manifest that the surveying force there ought to be much augmented; the more so as the Ordnance Survey, under the direction of Colonel James, is now issuing rapidly sheets on the six inch scale, relating to nearly the whole of the south of Scotland. The maps on this scale are of the greatest service to the field geologist, who registers upon them all his detailed data previously to a reduction for the one inch or published map. And although the six inch maps will not be published, copies of them will be registered in the public museum of Edinburgh ready to be consulted by all proprietors who seek for accurate details. I apprehend, indeed, that even when the one inch sheet, exhibiting the geological structure of the country around Edinburgh,

is brought out (as will very shortly be the case), the public will be much struck with the value of maps in which every bed of coal is marked with precision; and I therefore trust that in the coming year the number of surveyors in Scotland will be so increased as to place that country on the footing of the English and Irish surveys.

Commencing their labours in the mountainous regions of the west of England and Wales, my coadjutors in England are now extending their works to the south-east; and seeing the great desirableness of completing as soon as possible the survey around the metropolis, I have brought about a concentration of work, which will ensure a speedy settlement of all questions respecting the subterranean drainage, sewerage, and water supply of this densely peopled tract.

Geological Survey of the West Indies.—Whilst the Government of the United States causes geological surveys to be made not only of their long settled territories, but also of tracts beginning only to be peopled, the mother country still proceeds on the old principle of never stirring till her colonists call out for scientific aid. Following the good example of their neighbours of the United States, our North American colonies of Canada appointed their own geologist, Sir William Logan, and every one versed in the sister science knows how well that able man is conducting the survey of that country. After this, the legislatures of India, the Cape of Good Hope, the Australian Colonies, and lastly, of Tasmania, have each asked for and obtained geological surveyors, most of whom had either been brought up in the establishment which I direct, or recommended by my predecessor or self: already geological maps and surveys of large portions of these countries have been constructed.

Two years ago the legislatures of the principal West India islands under British rule, requested the Government to send out geological surveyors, the half of whose expenses were to be borne by the colony explored, the other moiety by the Imperial Government.

The island of Trinidad was the first to be examined, and Mr. G. P. Wall, a distinguished pupil of the Government School of Mines, and Mr. Sawkins, were selected for that purpose. As their survey is completed, and has been placed in my hands for publication, I have no hesitation in saying that it is a work which will be of signal advantage to the inhabitants, and will be much approved by men of science.

Seeing that the only map of the island was very inaccurate, the

geologists were compelled to survey topographically to some extent for themselves before they could prepare the map now in my possession, which is very creditably executed. Though it is out of place here to expatiate upon the succession of the various rocks and fossils of this great island, still the public will be glad to learn that these geologists discovered several beds of coal which, though of tertiary age, has been found to be of good quality and available for steam navigation; and as these strata crop out upon the shore, the discovery is one of considerable importance. The work will be illustrated not only by maps and sections, but also by a multitude of beautiful sketches of the country as prepared by Mr. Sawkins.

Geological Survey of India.—Professor Oldham, the superintendent of this survey, and formerly Local Director of the Geological Survey of Ireland, has lately issued a map of part of Central India, including the districts of Nerbudda and Saugor, which is important in a geographical as well as in a geological point of view; much of it being from original surveys made by the geologists. The memoirs of the survey, of which Part II. of Volume I. has just appeared in England, comprise matters also of importance to geographers. Such for instance is the description of the curiously flat-topped plateaux of the range of the Khasi Hills, forming long swelling grassy plains, marked here and there by small out-standing hillocks which scarcely interfere with the general level. These suggest the action of long continued denuding forces at tolerably fixed levels. Deep and narrow gorges or valleys form another peculiar feature in the Khasi Hills. In these the rivers in the northern portion find their courses to the plains, the level of the stream being 3000 feet below one of the hill stations.

Remarkable evidences are adduced of the power of water in translating huge masses of rock during great floods; and altogether the manner in which Professor Oldham has interspersed the description of physical and dynamical phenomena with his geological data must commend this memoir and the accompanying maps and sections to the attentive consideration of geographers.

Physical Enquiries.

Progress of Meteorology.—Meteorological science, as resting on ascertained facts rather than on theoretical assumptions, has advanced steadily in this country, and also in France and other parts of Europe.

Volumes have also been widely circulated abounding in interesting speculative ideas, and conjectural explanations, which, so far as they contain a great deal of nautical information, have been extremely useful. But I am assured by my distinguished friend Admiral FitzRoy, now at the head of the Meteorological Survey of our country, that many of these works are not to be depended upon, and are not approved so cordially by the critical few as they have been by general readers.

In Europe, the works of Humboldt, Herschel, and Dové, grounded on sound induction, constitute, indeed, a safe basis on which the numerous class of observers may rest their meteorological facts, preparing, reducing, and classifying them, for the combination of master-hands. Thus, many extensive series of good observations, at sea as well as on land, have been made. Much is already garnered up; but the winnowing of the grain from the chaff, and the ultimate adaptation of the results, must be a work of time, labour, and ability.

At the observatories of Greenwich, Kew, and Oxford, photography has been brought to aid in the registration of all atmospherical changes. Self-registering anemometers have been used for some years successfully in England, and at the Cape of Good Hope. Such an instrument is on its way to Australia, and similar valuable machines, showing every variation of wind, recording accurately, and requiring attention only once in twenty-four hours, are already erected at Halifax and Bermuda by Her Majesty's Government.

Arrangements are made by the Board of Trade and by the Admiralty—in correspondence and co-operation with the various authorities around the seaboard of the Northern Atlantic—for collecting simultaneous observations, at least once a-day, all round our nearest ocean, and upon its surface, during one year—beginning this summer. By such an investigation, as devised by Admiral FitzRoy, a complete understanding and consequent explanation of the order, sequence, causes, and consequences of atmospherical changes and conditions over a large section of the world's surface may be gained in less time than, perhaps, by any other mode of operation. The effects of atmospherical phenomena on climate and on all waters, and even on tidal action (including currents affecting the configuration of land by abrasion or deposit)—these and the bearing of such phenomena on geological or ancient conditions of the earth are only appreciated by the comparatively few who have studied them.

The immense absorption or extrication of latent heat, the un-

known amount of electrical action, as well as the chemical and mechanical combinations which occur during changes of weather (among which the presence or absence of ozone is an interesting subject of investigation); the formation and effects of ice, with the characteristics of ocean itself—are all phenomena that have been lately studied by meteorologists.

The number of meteorological observers and their dispersion over the world is now considerable. Besides Russia, Prussia, and Europe generally—India and Australia* have many well fitted stations—while the United States have spread them over a vast portion of the continent of America; a point to which I shall hereafter allude.

In Scotland, the instructive compilations of Mr. A. Keith Johnston have indoctrinated his countrymen with the desire to establish and keep up a well-ordered Meteorological Society, which is worthy of national encouragement. Following out this plan, Dr. Stark has produced a memoir, the result of two years' observations, on 'The Temperature of the Sea around the Coasts of Scotland.'† Whilst we must admit with this author, that the mild climate of Britain is, in great part, due to the prevalence of the south-westerly winds, I find that his opposition to the views of Commander Maury respecting the course and influence of the Gulf Stream is not accepted by some of our leaders in physical science.

Earthquakes and their Study (*or Seismology*).—In a work recently completed on the earthquakes of Switzerland, Dr. Volger has given a chronological account of all recorded earthquakes in that country from the year 562 to 1855. Illustrating his observations by an account of the geological structure of the Valais, he further describes in detail the shock of 1855, and lastly endeavours to explain the relations and causes of earthquake phenomena in general. Collating a quantity of curious data, this author attributes these paroxysms of the earth's surface in great measure to the changes and peculiar combinations of atmospheric and meteorological conditions. He combats the theory adopted by most geologists of a central heat, and also disallows the intimate connexion between volcanos and earthquakes; suggesting the falling of mountain masses into cavities, and the consequent production of shocks accompanied by much development of electricity. Not doubting that the records

* *See* particularly the Third Meteorological Report, with a diagram, of Barometric Pressure (for the years 1857-8), prepared by Mr. R. Brough Smyth, the director of the Meteorological Observatories of Victoria, and presented to both Houses of Parliament.

† Read before the Royal Society of Edinburgh, 3rd January, 1859.

of Dr. Volger are faithful, and that they will afford materials for the elucidation of the phenomena of earthquakes, I must say, as a geologist, that I differ from his views, and adhere to the prevalent belief that the chief cause of all earthquakes is the effort of heat and gas to burst through the cerements composing the crust of the earth. I do so, because I every where trace the most intimate relations between earthquakes and volcanicity, both in those tracts where that force is at present in action, and in those where it has formerly shown signs of emission through fissures in the older rocks. On the other hand, the large regions like Russia in Europe which, as I have elsewhere shown,* have never been affected by eruptive rocks (or in other words where the crust of sedimentary matter has never been broken through in ancient periods), are just those countries in which earthquakes have been and are unknown.

All those great movements of the earth's crust which have been so instrumental in producing and modifying from time to time the geographical features of our planet belong, I conceive, to the same class of phenomena as ordinary earthquakes, and are to be referred to similar causes acting with different degrees of intensity. Every great movement must, in fact, have been attended, towards the boundaries of the regions to which it extended, by those smaller movements, reduced for the most part to *vibrations*, to which the term *earthquake* has been usually restricted. Hence the theory of earthquakes can only be regarded as a subordinate part of any more general theory which may deal with all those movements, great or small, to which the superficial portion of the globe has been subjected, and which constitute, in fact, the basis of geological science. The smaller movements are those alone which man has had actual opportunities of observing, and hence the investigations of the phenomena attending them, and the causes to which they are assignable, have been separated from those of the allied phenomena somewhat more perhaps than some geologists might think desirable, and have been erected into a separate branch of science, under the name of *Seismology*. Dr. Young and Gay Lussac had suggested that earthquake shocks were propagated in a way analogous to the vibrations of sonorous bodies, but no attempt had been made to unite into a whole the mass of heterogeneous and other apparently conflicting facts, and account for them by the application of one consistent theory.

In February, 1846, Mr. Robert Mallet read to the Royal Irish

* *See* 'Russia in Europe and the Ural Mountains,' chapters first and last.

Academy his Memoir on the Dynamics of Earthquakes,* in which his object was to show that all observed earthquake phenomena might be reduced to the direct motions (in accordance with the acknowledged laws of physics and mechanics) of three distinct classes of waves, all produced simultaneously by a single impulse, and originating at a single point, namely:—1st. The earth wave or shock through the elastic crust of the earth: 2nd. The sound waves through the same, or through the sea and through the atmosphere: 3rd. The great sea waves—or fluid wave of translation which rolls in shore after the shock—to which should be added the liquid wave, which he has denominated the "forced sea wave." He showed that the nature and sequence of the phenomena would differ as the centre of impulse was beneath the land or under the sea; and in the subsequent parts of his paper, illustrated by diagrams and maps, he indicated the bearings of his theory upon future research and its important connection with vulcanology and terrestrial physics, and thus laid the foundation for those methods of observation of earthquake phenomena which have since been very widely adopted. He pointed out the necessity for self-registering seismometers, and in the same volume of Transactions describes and figures the first completely self-registering seismometer proposed, whose functions were, by the aid of electro-chronographic arrangements, to determine the direction of motion, the moment of transit, and dimensions of the earth wave or shock. Mr. Mallet's views being founded on the admitted laws of exact science, and also distinguished by their simplicity, received the approbation of many competent judges throughout Europe.†

In 1850, at the request of the British Association, Mr. Mallet drew up a first Report upon the Facts of Earthquakes,‡ in which he discusses all anterior views, and with the guidance of his theory classifies and separates under distinct propositions the facts found scattered in multifarious confusion through earthquake narratives. He concludes by enunciating certain desiderata, amongst which were the formation and discussion of a complete catalogue of earthquakes for all time and all countries, and by submitting to the actual test of experiment the views which he had theoretically announced as to the elastic transit of the earth wave.

Funds were placed at his disposal for the purpose by the British

* Trans. R. I. A., vol. xxi. p. 1.
† *See* Mrs. Somerville's 'Physical Geography,' Humboldt's 'Kosmos,' &c.
‡ Trans. Brit. Assoc. 1850.

Association, and by means of a new instrument (the seismoscope) and the creation of small but real earthquakes at pleasure by mines of gunpowder fired galvanically at the distance of a mile, he was enabled to ascertain the actual relative rate of transit of the earth wave or shock in loose sand, in shattered as well as in solid unbroken granite;* it being thus determined that an earthquake cannot move slower than in sand, nor probably faster in any known rock than in granite. These experiments Mr. Mallet, with the joint aid of the British Association and of the Royal Society, has since extended to some stratified rocks. Mr. Mallet has also condensed his views into the form of instructions for earthquake observation in the Admiralty Manual, and the Article has been translated into French by Mons. Perrey, at the desire of his Government.

The laborious compilation of the vast catalogue, comprising between six and seven thousand earthquake narratives, thus early projected, had been steadily pursued by Mr. Mallet, ably assisted by his eldest son, Dr. John William Mallet, of the University of Alabama, U.S., from 1852 to 1858, and last year the 'British Association Earthquake Catalogue,' by these authors, appeared in print, with the most complete discussion by curves and seismic maps ever made, and giving, so far as human knowledge goes, the facts of seismic distribution in time and in space.† Several deductions of interest and importance have resulted from this extensive labour, the most important of which is probably the now ascertained fact, that mere farther cataloguing is useless as regards the advance of science; since Mr. Mallet considers that no great generalization can be thus elicited. Looking to the true direction in which the efforts of seismologists are to operate, he recommends observation at self-registering seismometrical establishments at suitable localities in certain earthquake regions. The latter portion of his final Report is devoted to the description of the various forms of seismometers proposed by divers authors, and he has figured the preferable forms of seismometric apparatus to be adopted, which have resulted from the labours and experimental investigations of several years. The electro-seismic trigon, as his arrangement may be called, as well as the various simpler and ruder methods of approximate observation pointed out to the traveller in the Admiralty

* Second Report, Trans. Brit. Assoc. 1851.

† Mr. Mallet and his son acknowledge the important lightening of their labours by the previous large and valuable catalogues of Von Hoff, and especially of Professor Perrey of Dijon, to whose collaboration in the seismic field they give the highest praise. (*See* Mém. Acad. Roy. de Belgique, tom. vii., in oct.)

Manual, should be known to every geographer who devotes a portion of his time to observations on terrestrial physics.

Lastly, Mr. Mallet under great privations re-explored, almost immediately after the recent occurrence of the great earthquake, the provinces of the kingdom of Naples, nearly from Bari to Calabria, and has collected many striking particulars, including great topographical changes of the surface, an account of which will be laid before the Royal Society of London, at the desire of which learned body he made his journey, and I look forward with deep interest to the publication of his results.

New Publications, Maps, Surveys, etc.

The 'Manual of Geographical Science' (Parker and Son), the first part of which appeared in 1852, having been completed this year by the addition of a well digested volume, can now be recommended to the public as a most useful and instructive work. The first portion embraced mathematical geography, physical geography, cartography, and geographical terminology. The new volume contains a learned and interesting history of ancient or comparative geography, by the Rev. W. L. Bevan; whilst the last 400 pages of the book, which are written by our indefatigable associate the Rev. C. G. Nicolay, are devoted to the progress of maritime discovery, and a description of the surface of the earth as now known to us. The lucid manner in which this author explains the relations of land and water, as well as all the leading physical outlines and waterpartings of continents, must have a most beneficial influence in impressing upon students the elements and principles of geographical science.

Among the communications to our Society I was much gratified to find the eminent astronomer, Sir John Herschel, coming before us in the last session with a new and ingenious projection of the sphere. The author shows that his projection offers several peculiar advantages for geographical purposes, particularly when the whole, or at least the whole accessible part of the globe, has to be mapped down on one sheet.

The astronomical experiment on the Peak of Teneriffe, which was carried out in 1856, under the sanction of the Admiralty, by Professor C. Piazzi Smyth,* is chiefly of interest to this Society

* Parts of this work were published in the 'Philosophical Transactions;' but the whole work, as now brought out by the Admiralty, 1859, contains three additional

from the observations of the Astronomer Royal of Scotland on the optical, atmospheric, astronomical, and physical phenomena, made at great altitudes on this volcanic mountain. We have particularly to thank him for his topographical descriptions, and for producing a striking relief map taken from a model prepared by Mr. Nasmyth, after determinations of the author, which reminds us of maps of the surface of the moon.

The works produced during the past year by our excellent cartographer, Arrowsmith, are :—1st, A Map of the Provinces of British Columbia and Vancouver Island, with Portions of the United States and Hudson Bay Territories, compiled from original documents, showing also the various Passes across the Rocky Mountains ; 2ndly, a Map, in eight sheets, of the Island of Ceylon, constructed from a base of Triangulations and corresponding Astronomical Observations, during his employment on the staff of the colony, by Major-General John Fraser, late Deputy Quartermaster-General, reconstructed, incorporating a great number of original documents, and connected with the Great Survey of India; 3rdly, a Map of the Eastern Half of Australia, constructed from official and other original documents, adjusted to the Maritime Surveys of Flinders, King, Wickham, Stokes, Blackwood, Stanley, &c. This map, which is on six sheets, will show the route of many Australian travellers.

Mr. Arrowsmith is also about to publish other Maps, including a Map of the World, on two sheets, showing by repetition the connection between England and the Australian Colonies, both by the Cape of Good Hope and Cape Horn.

Having called your attention in days gone by to the improvements made in cartography by Mr. A. Keith Johnston, and to his zealous and successful endeavours to lay before his countrymen, on maps, all the chief data of physical science, I have now the satisfaction of adverting to his last important work—a new General Atlas. Fifteen years having elapsed since he published his National Atlas, the author felt that the time was come for the production of an entirely new work, which should embrace all the recent discoveries and all the territorial changes. In accomplishing this task, Mr. Johnston has succeeded in placing before the public a series of sheets of each region on a very convenient scale, and

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chapters—Geology and General Topography, Botany, and Miscellaneous Observations, including the author's ingenious method of eliminating the angular motions of a ship at sea, to which I alluded last year.

by a judicious selection of names, arranged on a special index accompanying each map, he at once directs the observer to the position of any place through the medium of letters of reference. But that which most pleases the eye and instructs the looker on is the remarkable distinctness which is given to every water-course, lake, canal, or railroad by the use of "light blue ink." By this process the orography and skeleton of each country stand out in clear relief, the coast-lines never confusing the student. In short, this atlas, of which two parts out of ten are now issued, will, I have no doubt, be generally approved, and its sale will, I trust, reward the author for his long and arduous labours.

Nelson's Atlas, of which one portion has been published, is an excellent and carefully executed work, of that class which reflects so much credit on our Scottish geographers, and is an evidence of the great and increasing interest taken by the general public in geography. This atlas gives the distances and measurements in English miles, a mode better adapted for length and area than for angular measurements, and which is to be elucidated by an index which will give the distance of each place from London in English miles. By consulting this index the position of any place on the map can be at once found, whilst its geographical position on the globe is told off in the language of common life. As I am informed that the calculations for the index involved several months of labour, I hope that the efforts of the publisher may be recompensed by a good sale.

I must also call attention to the '*Weekly Dispatch* Atlas,' comprising a series of excellent maps (issued one every week) with that paper. These maps include the English counties, as well as general maps,—some of them on a very large scale (India, for instance, being in 8 sheets). The maps are compiled from the latest authorities, and chiefly by Fellows of this Society, including Mr. Weller, Mr. Lowry, Mr. Dower, &c. The atlas will contain about 250 maps, of which 90 are already published.

Owing to the changes that have taken place since the 'Gazetteer of the World,' by Fullarton and Co. of Edinburgh, was first issued, a new edition of the first volume of that work, bringing up the geographical and statistical information to the present period, is in course of publication. The 'Royal Illustrated Atlas,' by the same publishers, and to which allusion was made in my Address of last year, has been continued, and will, it is said, be completed during the present year.

The 'Imperial Atlas,' by Blackie and Son, the compilers and publishers of the 'Imperial Gazetteer,' is now finished, and consists of 31 parts, containing 78 beautifully engraved sheets, and comprising upwards of 100 useful maps. An index to the work is, I understand, in course of preparation.

CONTINENT OF EUROPE.

Germany.—Among the larger cartographic works published by the establishment of Justus Perthes at Gotha, which are now attracting particular attention, is Mayr's Atlas of the Alpine Countries. Three sheets have appeared, and the remainder will, it is said, be completed this year. It is on the scale of $\frac{1}{450,000}$, consists of nine sheets, and extends from the valley of the Rhone on the west to Vienna on the east, from Strasburg on the north to Nice, Leghorn, and Ancona on the south; thus comprising the seat of the present war. No map of this extensive region has been published on so large a scale. Of the usefulness of this work a proof has recently been given by the fact, that 45,000 copies of the part which refers to the seat of war were, I am told, recently sold in a fortnight.

A condensed edition of Dr. Barth's Travels in two small volumes, commenced in parts, will be finished before the close of the year, and will be a welcome edition to many readers, for whom the five volumes of the first edition are too bulky and tedious.

A large Historical Map of Europe by K. von Spruner, the well-known author of the large Historical Atlas, is nearly ready for publication. It is executed at the instance of the King of Bavaria, consists of nine sheets, and is drawn on the scale of $\frac{1}{4,000,000}$. It is very elaborately printed, and represents in three principal colours the three epochs—of ancient geography, of the middle ages, and of modern time. An Historical Atlas of the Austrian Empire, by the same author, is also nearly ready.

An important work on the glaciers of the Tyrol by the Austrian Major Karl von Sonklar is in preparation, and will soon be published. This officer has made most extensive observations, not only of the theory of glacial development, but more particularly of their connexion with meteorological phenomena in general. His beautiful surveys, plans, and illustrations of the glaciers can scarcely fail to command attention.

I am happy to learn that a work illustrative of the geology of

Bavaria, surveyed and described under the direction of C. W. Gümbel, will be published in the establishment of Justus Perthes, by authority of the Bavarian Government. Another geological work by Von Richshofen, member of the Austrian Imperial "Reichs anstalt," will also soon be published. One volume of 'Travels in Palestine,' made by Dr. Titus Tobler during the year 1857, is, I am told, nearly ready for publication.

Lastly, from what I know of their usefulness, I can well understand that the 'Geographische Mittheilungen' should have been so generally encouraged and approved of, that they are to be greatly extended in the form of extra numbers, the publication of which will commence this summer. Like the fifth part of last year's numbers, which gave a résumé of the geography of South Africa, including the remarkable journeys and discoveries of Livingstone, each of these extra parts will contain one subject only.

In mentioning the works of German writers, I must specially allude to the last travels in Palestine of the late Dr. Roth. This able and well-known traveller, a Professor of Munich, whose hypsometrical measurements in the Wadi Araba were mentioned in my previous Address, died, I lament to say, of fever last summer at Hasbeiya in Anti-Lebanon, after making several tours, the results of which have not yet been published. Thus, in exploring the countries east of the Jordan, he reached (March, 1858) Kerek and Tafileh, remained at both places for some time, and investigated the natural history and meteorology of that little-known region. Subsequently he returned to Jerusalem, and thence went northwards to the upper basin of the Jordan and the range of Anti-Lebanon. Some of the last points visited by him were Mount Hermon, Lake Phiala, Baneas, and Hasbeiya; having previously obtained many valuable scientific results. Among his former labours it will be remembered that he accompanied Schubert and Erdl in 1836 and 1837 to Palestine, as well as Major Harris in his mission to Shoa in 1841-1843. Just as in his preceding tours through the Wadi Araba and other parts of the Holy countries, Dr. Roth bestowed great pains in fixing the altitudes of his route and of the chief points visited, and his observations will be found to be among the most trustworthy hitherto made in Palestine. These altitudes, together with various meteorological observations and the last papers of Dr. Roth, having been put into the hands of Dr. Peter-

mann for publication in the 'Mittheilungen,' that gentleman has obligingly sent me the subjoined list of heights in French feet.*

Russia.—The accomplished Secretary of the Imperial Geographical Society, M. Lamansky, has transmitted to me his clear and well condensed 'Compte Rendu' of the progress of that body, and has this year prepared an Appendix, which the geographical reader will find most instructive and useful, since it enumerates all the works bearing on our subject which have been published in the Empire of Russia.

But besides the important expeditions in operation and the production of works, to some of which I called your attention last year, and others which are mentioned in the last résumé of M. Lamansky, our correspondent has recently made me acquainted with information which I hasten to communicate.

The Geographical Society of St. Petersburg has this year sent forth M. Schmidt, an able geologist of the University of Dörpat, well known to me by his valuable researches among the Silurian and Devonian rocks of the Baltic provinces of Russia, to study the structure of the great basin of the river Amúr and of the island of Sakhalin, and to report upon the geological relation and mineral wealth of this vast region. Following the judicious plan of thoroughly working out the details in every examination of a new country, the Imperial Government, counselled by the Grand Duke Constantine and the Geographical Society, have ordained that this expedition of M. Schmidt shall be employed for three or four years, during which time the explorers will not confine their researches to the banks of the great river, but will push up its affluents, into the large mountain chains from which those streams descend. The great chain of Khin Jhan and the large island of Sakhalin, both highly interesting in a geological point of view, will be specially explored, and, looking to the unquestioned talents of the leader of the expedition, we may hope, with great success.

Another expedition has been sent into the heart of Central Asia to beyond the river Ili and the Lake Balkhash in the Kirghis

* Mount Hermon, 6975 (according to Major Scott's observations, 8798); Hasbeiya, 2354; Baneas, bridge over the Jordan, 1194; Lake Phiala, 3100; Lake Merom, 265 (according to Bertou, 322); Safed, 2619 (according to Symonds, 2604); Tiberias, near the Castle, 523; Mount Tabor, 1754; Nazareth, 1187; Mt. of Olives, 2596; Zion, Christian Cemetery, 2530; Hebron, 2738; Kerek, 3318; Tafileh (Lower), 3363.

steppes, to the confines of Chinese Turkestan. The chief object of this survey, which is conducted by Capt. Jolubeff, is to determine the geographical position of the principal points, so as to lead to the construction of an exact map of those wild countries which so many Russian travellers, including M. Semenoff, have already explored, and whose labours will thus be brought together and registered on accurate maps.

An important expedition to Khorassan has returned from Herat, and the general résumé of its labours, which has been alone as yet made known, is highly satisfactory. This vast region has hitherto been slightly examined only by accurate topographers, and the Russian geographers have therefore been able to make many corrections in the pre-existing maps. Among other errata M. Khanikoff cites in his report, that the town of Tebes of the old maps must change position to the extent of 1° 30′ of long. to the west, and 1° of lat. to the south; whilst numerous corrections are applied to the general configuration and orography of the country as laid down on previous maps. Other data, which have been got together respecting the geology, botany, zoology, ethnography, and historical monuments of this little explored region, give to this expedition to Khorassan the scientific importance of a general survey.

The river Ussuri, one of the affluents of the great Amúr, and which constitutes the boundary between Russia and China, was last year examined by Captain Veniukoff, and for the first time its banks were examined in their whole length. The French missionaries De la Brunnière and Venant had indeed explored this river partially, but, unfortunately, the assassination of M. de la Brunnière was accompanied by the loss of all his papers. Starting from the mouth of the river, M. Veniukoff ascended the chain of mountains from which it flows, and descended to the sea in the Gulf of Vladimir; and the description of his journey, with two maps, which is published in the Journal of the Imperial Geographical Society, which we are about to receive, will no doubt be viewed with deep interest by all true geographers.

The geographical science of the empire is about to receive a great addition in a general admeasurement of the levels of Russia in Europe, on a plan laid before the Government by Professor Otto Struve, of the Imperial Observatory of Pulkowa, and on the basis of preliminary observations carried on by him in the environs of St. Petersburg. This operation will doubtless prove of immense advantage in all industrial and engineering works. Professor

Struve has farther instructed and organized two parties intended to make astronomical observations on the frontiers of Russia and China, and particularly with the view of determining the cartography of the country adjacent to the great internal lake of Issykkul.*

Switzerland.—Our indefatigable correspondent, M. Ziegler, acquaints us, that through the energy of General Dufour, who directs the survey, the great map of Switzerland is tending rapidly to completion, six sheets only remaining to be finished; three of which have been plotted. M. Ziegler has also forwarded to us a map which he has prepared to show the positions of all the Celtic remains found in Switzerland up to last year.

In alluding to the progress of geography in a country of such striking configuration, and in exploring the structure of which I have spent many enjoyable days, I commend to your notice a beautiful work just published, entitled 'The Peaks, Passes, and Glaciers of Switzerland.' This work is the produce of the Alpine Club, an association already numbering more than 100 members (many of them Fellows of our Society and friends of my own), who, instigated by the writings of Agassiz, James Forbes, Studer, and others, have devoted their energies to the special object of exploring and making better known the highest and most inaccessible portions of the Alps.

In the last five years these Alpine volunteers have succeeded in ascending the highest point of Monte Rosa, the Dom, the Great Combin, the Alleleinhorn, the Wetterhorn Proper, and several other peaks never before scaled. The narratives of the adventurous undertakings set forth in this volume contain evidences of perseverance and personal endurance under difficulties which make us rejoice that our enterprising countrymen should

* Among various other geographical operations of which I have just received notice from Mr. Petermann, the following may be mentioned:—Trigonometrical surveys have been made in the last year in the Governments of Kostroma, Voronesk, &c., and on the right bank of the Volga from Saratov to Volsk. Astronomical operations have been carried on in Viatka and Vologda. Travelling over 10,000 versts in five months, the two astronomers employed fixed 38 points in the first, and 37 in the second of these large Governments, which, from personal experience, I can testify are not easily traversed. Topographical surveys are being executed in the Governments of St. Petersburg, Esthonia, Kharkov, &c., including enlarged plans of various towns. Beyond the limits of Russia in Europe a vast region, extending from the country of the Cossacks of the Ural (including the Ust-Urt) to the Bay of Kara Boghas, as well as on the east side of the Aral Sea, has been surveyed. The results of the survey of the boundary-line between Turkey and Persia, executed by a Commission composed of Russian, English, Persian, and Turkish surveyors, are now being laid down in the Dépôt de la Guerre at St. Petersburg, on the scale of 1 : 73,500.—*June*, 1859.

have collected a mass of information of great interest to the lovers of adventure whom I now address.

Knowing the ability with which my friend Mr. John Ball can master any branch of natural history science, I congratulate the Alpine Club on having secured his services as their editor. With such contributors as those whose names appear in this volume, we may feel sure that many other Alpine scenes will be racily and faithfully delineated. One of the most interesting communications in the estimation of a geologist like myself is the comparison by Professor Ramsay of the former and very ancient glaciers of Snowdon in Wales (which come into the category of geological dynamics) with the less ancient glaciers of Switzerland, from the moraines of which the ice has shrunk away within the historic period.

The lively descriptions of the tourists, and the chromo-lithographic sketches of the chief scenes, will attract many a traveller to the Alps; whilst the accompanying little maps will be found clear and useful.

France and other Continental Countries.—As our Library contains the full Report of the Proceedings of the Geographical Society of France, it is unnecessary that I should swell this Address by giving extracts from that useful and meritorious publication; and as I have not this year been favoured with the official Report of the progress of the surveys by land and by sea in France, Spain, or Italy, I am unable to allude to them. It is, however, gratifying to me to learn that the geographers of France have recompensed the brothers Schlagintweit, on whose discoveries I dilated last year, with the gold medal of the French Society.

Asia.

Persia.—We have been indebted to the Hon. C. Murray, H. M. Minister at the Court of Teheran, for communicating to us an interesting account of the ascent of Mount Demavend by Mr. Thomson and Lord Schomburg Kerr, who are attached to his mission. Besides travelling over and describing an extensive portion of the mountainous region between Teheran and the depression which extends to the Caspian Sea, these zealous diplomatists made three ascents of Demavend, and, measuring its altitude by boiling water, came to the conclusion that the summit (which is composed of volcanic and sulphureous materials) was 21,500 feet above the sea. In support of the measurement of our countrymen, I learn by a letter recently

received from M. Otto Struve, of the Imperial Observatory of Pulkowa, that by his deductions, calculated in 1851, from M. Lenne's geodetic observations, made in 1838 (see 'Memoirs of the Imp. Acad. of Science,' 1851), Demavend had the height of 20,085 French feet assigned to it. This independent testimony is of great value; the approach to agreement being the more remarkable, considering the comparatively feeble instruments employed both by the Russian and English parties.

Hence is it certain that Demavend is much loftier than the Ararat of geographers, which lies at the south end of the Caucasus, and has an altitude of 17,112 feet only. But if that name is to be applied to the highest summit in Western Asia, we are assured by Sir Henry Rawlinson that Mount Júdi, overhanging the plain of Assyria, is much higher than Demavend, and is actually considered by the inhabitants to be the mountain on which the Ark of Noah rested. As our eminent medallist Sir Henry is about to proceed to Persia, there to represent our Sovereign, we may feel assured that, with his love of research, he will not quit his post until he has taken steps to clear up these points, and also to make us better acquainted with the geography of the interior of Persia, particularly that portion of the kingdom which lies adjacent to the Caspian Sea.

In the observations I offer on the progress of geography among the Russians, the reader will find that the recent expedition of M. Khanikoff has produced a greater rectification in the positions of some important places.

China, Japan, and New Guinea.—The additions to our acquaintance with the coasts, ports, and interior of the vast Empire of China, which have been made during the last year, are very considerable. By the judicious and decisive measures of Her Majesty's Ambassador, the Earl of Elgin, and the skill and energy of our naval armaments, commanded by that excellent officer Admiral Sir Michael Seymour, combined with those of our allies, the river Peiho has been ascended, the great port of the capital occupied, and a treaty prescribed to the Imperial Court—the first example of equal diplomatic relations between China, Japan, and the commercial nations of Europe and America.

Our zealous and enlightened associate, Captain Sherard Osborn, commanding the *Furious* steam-frigate (in which Lord Elgin sailed), has furnished us with vivid descriptions of the nature of the coast,

soundings, and anchorages between Shangae and the Gulf of Pecheli, as well as with accounts of that gulf and of the river Peiho.* This officer has not only the talent of clearly developing the geographical features of a country, as well as the characteristic habits, trades, and occupations of its inhabitants, but he does this in such lively and attractive language, that the reader of our Proceedings can now precisely picture to his mind's eye how Shangae has risen to its present state of opulence, can fancy himself lying at anchor in the Gulf of Pecheli, sounding the bar of the Peiho, or disembarking among shoals of canoes while pressed upon by curious Chinese, as he wends his way through Tien-sin, the populous and filthy great port of the capital.

But of all the operations which have been carried on in China, no one has proved so truly surprising to the geographer as the recent ascent of the great river Yang-tse-Keang by the Earl of Elgin. On this remarkable occasion we are again in company with Captain Sherard Osborn, who, together with his excellent officers, has given us a detailed chart of the river. We have been also furnished with an admirable description of the operations of this successful voyage by our Associate Mr. L. Oliphant, the Secretary of Lord Elgin—already well known in the literary world; so that from the combination of the talents of these gentlemen, documents relating to the course of the mighty stream have been laid before us which are of the deepest interest to the geographer, the statist, and the merchant.

It may fairly be said that never was an expedition of this nature carried out under such strange and striking circumstances; for never before did a squadron of armed steamers, one of them drawing 16 feet of water, penetrate into the interior of a great continent for between 600 and 700 miles—a distance equal to the length of the Danube in a straight line from its mouths to near Vienna. Again, when we consider that large portions of the banks of the river were occupied by a hostile rebel force, the batteries of which offered resistance at two critical points of the voyage, and that the whole tract was more or less in a state of ruthless civil war, our astonishment increases. Such an achievement it may safely be said would have been impossible in any other age than the one we live in. On referring to the chart of Sherard Osborn and his naval associates, we find that this wonderful voyage to and fro, *i. e.* for a dis-

* *See* the account of the statistics of the port of Shanghae.—Proc. Geogr. Soc., vol. iii., p. 57.

tance of about 1250 miles, was performed in the short space of 46 days, exclusive of 12 days spent off the city of Kew-Keang; and, when we peruse the lively and clear description of Mr. Oliphant, our surprise rises to admiration. It is then that we find what difficulties our gallant seamen encountered and overcame, caused by the extraordinary changes which are continually going on in the banks and bottom of the great river. Seeing that in the year 1844 the river had been already and accurately surveyed, as far as Nankin, by those excellent officers Kellett and Collinson, it might have been expected that up to that point at least, the charts might to some extent be depended on; but, as Oliphant narrates, "24 hours had scarcely elapsed before every ship in the squadron had discovered a new sandbank by feeling it with her bottom. Shoals had been converted into islands, or had disappeared altogether, and the spot formerly avoided as a danger was now discovered to be the deep and safe channel. But this entire transformation was not confined to the bed of the river alone. In some places its banks were similarly affected, former landmarks having disappeared or become so altered as to be no longer distinguishable." Farther up the stream, as the voyagers neared Nankin (and where landmarks have not changed), 6 feet of water only were sounded where Collinson had found 6 fathoms. These remarkable variations, common to all rivers having a long course over alluvial tracts, although not to the same extent, show that if a steady commerce is hereafter to be carried on, the re-surveys of the stream must be frequent.

A few observations on these striking natural phenomena may here be permissible. Descending in two main streams from the Pering mountains, which divide China proper from the unknown regions of Tartary, the Yang-tse-Keang, which is estimated to have a length of 3300 miles, is thus remarkable in being navigable by large ships for upwards of a fifth part of its whole length! Being the largest river in the Old World of geographers, and exceeded only by the Mississippi and the Amazon in the New World, this long body of water is swelled by numerous affluents, chiefly from the north, but also by some on its southern shore. The former, flowing from lofty snow-covered mountains, and consequently rushing forth with great vehemence in the early summer season, necessarily carry down with them vast quantities of sand and detritus, thus explaining how, in its course seawards, the trunk-stream is either rapidly obstructed in one part of its bed, or deepened in another by new and powerful currents. Thus it is that in no part of the civilized world

has man been more stimulated than along large portions of the banks of the Yang-tse-Keang, where the moveable surrounding objects have compelled him to apply his industrial and inventive talents. For, after the floods of the rainy season have retired from the lagoons and temporary shallow lakes which spread out from the great central river of China, wherever its banks are low, the inhabitants flock rapidly to the desiccated soil, cultivate it zealously, and inhabit temporary dwellings until the next approaching inundations drive them into higher grounds.

The accumulations and excavations occasioned by the Yang-tse-Keang are indeed good illustrations of certain geological phenomena. They teach us to be cautious in inferring that much time has necessarily elapsed in forming masses of ancient sediment which have since been converted into stone. For example, the geologist who has drawn his conclusions mainly from countries watered by rivers that rise in low hills, carry with them little detritus, and exercise a small degree of degrading power, might naturally suppose that a cliff of sandstone, of 30 feet in height, composed of layer over layer, must necessarily have occupied many years in its formation; whilst the Yang-tse-Keang, fed by affluents descending from lofty snowy mountains, accomplishes such a deposit or excavates a deep channel in a single season! Hence we see the impossibility of inferring, from physical features alone, that thick accumulations of sediment or the deep denudation of lands have necessarily been periods of great duration, and hence it follows that the evidences obtained of the entombment of different animals in the successive accumulations which under pristine physical conditions have enveloped the globe and thickened its crust, when combined with the signs of their order of superposition, are by far the surest proofs of the vast antiquity of our planet.

Apart from such natural phenomena, the voyage up the Yang-tse-Keang has made known to us many circumstances deeply exciting to the political and mercantile communities; though the sketch of Mr. Oliphant would lead us to modify to some extent the alluring picture of wealth and prosperity of the interior which some writers have drawn. The rebellion has, however, caused a wide-spread desolation, which is feelingly narrated. Opulent cities have been razed to the ground and converted into jungles, where wild animals have occupied the resorts of man.

Independently, indeed, of the rebel devastation, Mr. Oliphant seems to be of opinion that the views formerly entertained of the

teeming population and extreme cultivation of the region watered by the great stream have been exaggerated. He is disposed to think that even prior to rebel invasion the cities never could have equalled in number or extent the accounts which have been current respecting them. Thus, instead of a population of 8,000,000, ascribed to the three cities of which Han-Kow is the chief, he is disposed to reduce the cipher to an eighth part of that number. On this head, however, we have the authority of the great Chinese scholar, Sir John Davis, who, with my lamented friend Sir Henry Ellis, partially ascended the Yang-tse-Keang in 1816, to prove how very abundant and flourishing was the population before the country was cursed with a pestiferous rebellion, which, under the false pretence of Christianity and religion, has enabled a collection of lawless and destructive freebooters to paralyse the industry of a great country. I would indeed fain hope, that the Imperial Government of China may be aided by foreign states in suppressing this noxious and devastating insurrection; for there can be little doubt that the nations interested in establishing a steady commerce with China could, if they willed it, re-establish the Imperial Government in full possession of the country, and thus strengthen the union which has happily at last been effected.

Let us, then, turn with hope to the picture of the internal commerce sketched out by our associate, Mr. Lockhart, who last year placed before us those data on Chinese authority respecting the importance of the great interior port of Han-Kow, which have been entirely confirmed by the exploration of Lord Elgin. We may, indeed, feel certain that when commercial relations are established with that port, to which Mr. Lockhart specially directed attention, smaller vessels will soon pass still farther up the river to new and important stations of intercourse with the natives; whilst daring travellers, no longer experiencing the difficulties which beset them of old, will penetrate towards the very sources of this mighty stream,*

* I learn from Mr. Joseph Edkins, the associate of Mr. W. Lockhart in China, that the Chinese possess written records of all the enormous changes which the great river Yang-tse-Keang as well as other streams have undergone for many ages back. The fertilizing of large tracts by fresh water floods—the barring out of the tides by which the salt water would have sterilized good lands—the regulation of the system of canals and embankments, are explained in works mentioned in the brief but pregnant announcement of Mr. Edkins, which will be read before the Society, and printed in our Proceedings. Some of these works are among the oldest geographical documents. Thus, the Section of the Shooking (Book of History) called Yu-Kung consists of a geographical description of China in the time of the famous Emperor Yu, who, about 2000 years before Christ, restored the country to a condition fit for agriculture after a great local deluge. On his return to China, Mr. Edkins will work out many curious data of the comparative geography of this singular and learned people.

and eventually make us acquainted with that vast interior which separates China from Hindostan. In the mean time let me commend to the perusal of all those who desire to become acquainted with the internal resources of China and its trade a most instructive short pamphlet of my friend Mr. John Crawfurd. That paper, which was given as a popular lecture before the Philosophical and Literary Society of Leeds, is the clearest and best condensed account of the people and productions of this remarkable empire which has fallen under my notice.

Japan.—Although Marco Polo, in the thirteenth century, first brought to Europe the intelligence of the existence of the chain of volcanic islands now known as Japan, this empire—one island of which is as large as Britain—has remained to a great extent unknown to us. Early in the fifteenth century, and for the brief space of ten years, a British factory existed at Firando, but that intercourse was abandoned for more profitable ventures.

To the Dutch, who have contrived, in spite of much opposition, to maintain their commercial intercourse with Japan, we are chiefly indebted for any knowledge we possess of its inhabitants. Kämpfer, indeed, opined that owing to the dangerous access to their shores, and to the prolific nature of the soil, nature seemed to have destined these islands to constitute a secluded world within themselves. Yet, the barriers have now been broken down, and the fertile Japan is opened to the commerce of the West.

As our kinsmen of the United States had the merit of leading the way in obtaining this result, we also may now rejoice that through the sagacious conduct of Lord Elgin, aided by the vigorous naval movement of Sherard Osborn, Britain has obtained that full share in the commercial advantages which are likely to flow from the new treaty.

In the treaty concluded by Lord Elgin at Yedo, or, as it is usually written by us, Jeddo, several of the restrictions enforced upon the Dutch are not applied. Hitherto, the intercourse of Europeans with Japan being confined exclusively to the small Dutch factory at the extreme point of the empire, has exercised no influence whatever upon the mass of the population. They have been as effectually secluded from the rest of the world as if the great island of Desima did not exist, nor have the products and manufactures of the West penetrated as yet into the cities and villages of Dai Nipon. Doubtless, it may require time to create wants in a population hitherto so independent of the rest of the world, but the

acquisitive and imitative instinct of the native of Japan is so remarkable that he will rapidly discover the merits of Western arts and manufactures, and apply them to his own uses. Already, as Mr. Laurence Oliphant informs me, the Japanese is a sufficiently experienced navigator and scientific engineer to dispense with the assistance of foreigners in steaming from Nagasaki to Yedo—a voyage which usually occupies a week. Again, as the same informant tells me, one of the most enlightened princes has laid down an electric telegraph between his palace and the chief cities of his province, whilst a diving-bell and Nasmyth's hammer are in full operation, under Dutch supervision, in the harbour of Nagasaki. There is, therefore, no reason to doubt that these people will be less ready to adopt our manufactures than our scientific inventions. With six ports open to the unrestricted transmission of imports into the interior, our home products will, in all probability, penetrate into every corner of the empire. In the winter, the furs and cloaks padded with cotton will be replaced by woollens, a production unknown in Japan, where sheep have not yet been introduced. Again, sugar, one of the few articles for which they depend largely on China, though now a luxury, may easily be rendered a necessary of life; for it can be far more cheaply furnished by our merchants from such countries as Java, Siam, and Bengal than from densely-peopled China, which itself receives supplies from some of these countries.

Situated in a temperate latitude, and with an industrious, ingenious, and docile population, which is probably not overestimated at 40,000,000, Japan is marked by productions not very dissimilar from those of the south of Europe. One of the most remarkable of these is insect wax, a cargo of which has already reached this country and proved a most profitable investment. Camphor, silk, and tea of a superior quality are produced in great quantities, as also hemp, flax, and tobacco. In their manufactures of iron, copper, glass, wood lacquering, China paper, steel, &c., the Japanese have attained such great perfection that the Western manufacturers may even gain some useful hints from them. Without, however, entering into farther details, or venturing upon an oversanguine estimate of the capabilities of this new field for the energy and enterprise of Europe, we may augur well from this fact, that between thirty and forty millions of such customers have been added to our list. Nor while we appreciate the advantages of this new market are we unmindful of the benefits to geographical inquiry which are likely to result

from this most interesting field of exploration. We know at present but little of the topographical configuration of the country beyond the meagre accounts we have received from the Dutch. The Japanese themselves have, indeed, graphically illustrated some of the most striking features of the natural scenery and customs of their country, and in a manner which shows no small proficiency in art. Ere long the singular scenes around the great volcano of Fusi jama will doubtless be visited by our travellers, as Lord Elgin's treaty secures for the British Consul-General and all gentlemen connected with him the right to visit every part of the empire.

Let us hope, however, that the intercourse of other nations with this peculiarly ceremonious race—in which woman occupies a higher station than in any other Asiatic country; where the habits of the people are neat, clean, and orderly; where the laws are short and clear, and where professional lawyers are unknown—may not bring upon these hitherto secluded lands those curses of demoralization which too often attend upon the influx of a higher civilization.

Indian Archipelago.—The additions to our knowledge of the Indian Archipelago for the year are confined to two papers, supplied by Mr. Alfred R. Wallace and Mr. John Yeats. These relate to New Guinea, after Borneo the greatest island in the world, and, at the same time, the least known. Both papers furnish the largest and most authentic contributions to our knowledge of this tropical, forest-clad land, little less than double the extent of Britain, and inhabited by austral negroes in a social condition incomparably lower than that of any of the negro tribes of Eastern or Western Africa; but, rude as it is, destined, I have no doubt, in time to rise to importance in relation to the adjacent Australian continent, where wool, gold, and British enterprise are rapidly creating a mighty empire.

Mr. Wallace, who last year furnished us with an authentic and valuable description of the neighbouring and curious group of the Arru Islands, was, as he himself truly observes, the sole European inhabitant, and we may safely add, the sole civilised being, of New Guinea for three months. The researches of this skilful naturalist were necessarily confined to a small portion of the island, Doree, which lies at the western extremity of the great bay which indents its northern coast. Mr. Wallace's paper supplies us with by far the best account of the geology and geography of the place he

visited, while other Societies have properly received his contributions to botany and zoology.

The paper for which we are indebted to Mr. Yeats is a translation from the Dutch of Dr. Salomon Müller, the learned and judicious naturalist of one of the expeditions which the Dutch Government sent out for the exploration of New Guinea in the years 1826, 1828, and 1835. It describes a considerable portion of the south-western coast of this hitherto unknown country, and is itself a small portion of the great work on the people, languages, natural history, and resources of the Dutch possessions in India, composed and published under the auspices of the Netherland Government. Should the enlightened recommendation of Sir William Denison, alluded to under the heading of Australia, and backed as it has been by the Council of this Society, meet with the approbation of our own Government, we may hope to see the worthy example of the Dutch Government followed on a still larger scale.

In speaking of the Indian Archipelago, it may not be out of place to mention that by a recent and practical examination of the coal-fields of Borneo, those of the British island of Labuan have been found to be incomparably the best as to quality, extent, and facility of working. Our capitalists have not been slow to take advantage of this, and are about to work the mines. It would be superfluous to dwell on the vast advantages of a cheap supply of coal in our present enlarged intercourse with Australia, China, Japan, Siam, and the islands of the Archipelago.

Mr. H. Wise, a gentleman long familiar with the question of Indian navigation, has furnished the Society with an ingenious Memorandum (accompanied by a map) on the means of shortening the route from the Western world to China and Japan by cutting a ship canal through the narrow isthmus which divides the Gulfs of Bengal and Siam. Communications on the subject have also been received from Sir Robert H. Schomburgk, our Consul in Siam. The subject is not, however, ripe for discussion, and all that I need observe upon it at present is, that it is one which comes eminently within the province of the Geographical Society, and is well entitled to our best consideration.

Admiring and respecting as I do our eminent Medallist Sir James Brooke, whose skill, perseverance, and courage laid the foundation of an important settlement in the Eastern Archipelago, I cannot close this brief reference to that region without expressing my gratification that at a period when the health of this dis-

tinguished man has been materially affected, he should have met with that generous sympathy and support of a large body of his enlightened countrymen, which will, I trust, act as the best restorative of a frame which has been overworked in the great endeavour with which his name will ever be associated.

Africa.

Discoveries of Burton and Speke.—The last discoveries in the interior of the eastern side of this great continent have already been adverted to in the adjudication of our Founder's Gold Medal to Captain Burton.

In the few words I addressed to that distinguished explorer in presenting to him that Medal, a brief but pregnant allusion was made to the labours and researches of his associate Captain Speke; and in now expatiating on the results of their remarkable and successful explorations, the chief of the expedition, who is already well known by his bold peregrinations and publications, will, I am sure, be happy that I should offer in the annexed note * a slight sketch of the antecedents as well as of the special duties executed by his companion.

Returning to Europe from Aden, both Captains Burton and Speke sought and obtained employment in the Turkish contingent of the allied armies operating in the Crimea. Thrown out of their military career by the peace, they returned to the east coast of Africa, with the view of exploring the country from the coast of Zanzibar as far inland as might enable them to ascertain the real geography of the interior in that latitude.

* Quitting England at the age of seventeen as an officer of the Indian army, Captain Speke was engaged in four general actions under Sir Colin Campbell. Peace being established in the Punjaub, he obtained leave on several occasions to indulge his natural taste for field sports, and the collection of specimens of the animals of Tibet, the Himàlyas, and Upper India. In those remote and snowy mountains he made himself a geographer, and with a simple compass and watch plotted out tracks for the benefit of future explorers. In 1854, obtaining three years' furlough, he started with a large outfit at his own expense to explore Central Africa, and collect its fauna. Arrived at Aden, General Outram permitted Lieut. Speke to be embodied in the expedition under Captain Burton, destined to explore the Somali country from Berbera. Whilst this expedition was waiting to proceed with the usual annual caravan to Ugadin, Lieut. Speke, with his chief's permission, entered the Somali country as far as Ras Kori, and crossed the coast range into the interior plateau ground. In the space of six months he constructed a sketch plan of those tracts, and made large collections of their flora and fauna. After his return to Aden, he again started alone for the Somali coast at Karam, purchased camels, and proceeded to Berbera, the rendezvous of Burton's party. When the British officers had there established themselves, their camp, as is recorded in your Journal, was attacked by the Somali, who, seizing all the stores, killed Captain Stroyan, wounded Captains Burton and Herne, and wounded and captured Speke. But escaping, as he says, miraculously, he rejoined Burton and the survivors, and returned to Aden.

Aided by the late Colonel Hamerton, our meritorious Consul at Zanzibar, and by Seyd Majid, the second son of the Imaum of Muscat, now the Prince of Zanzibar, the travellers made an experimental journey from that place on the coast to Fuga in the mountain country of Usambara. In their last and great expedition they again proceeded from Zanzibar. Their party consisted of twelve Beloochees furnished by the kindness of the Sultan, some negroes who had been slaves, and asses for the transport of goods and for riding. Passing over the delta and low hilly country called M'rima, they entered the mountainous coast range at about 120 miles from the coast. This range, which rises to a maximum altitude of 6,000 feet, with a width of about 90 miles, is chiefly composed of sandstone and crystalline rocks, the true character of which will be ascertained when Captain Burton's specimens arrive.

Descending from the coast range to the great interior plateau land, at a lower level, and travelling over some poor lands, they reached a rich country in which knolls or bosses of granite and basalt rise up like rocks in an ocean. This country is exclusively peopled by negroes, none of whom are Mahomedans, as are the Somalis and trading Arabs of the coast.

Like the Negroes described by Livingstone, they have no special religion, trusting solely to good and evil spirits. Such of them as have sultans are on the whole peaceable, fire-arms being rare among them. Their country produces cotton, tobacco, maize, sweet potatoes, a great variety of pulses, manioc, yams, plantains, and melons: they manufacture iron, cotton fabrics, have abundance of cows and goats, and live in comparative comfort.

From Kazé, in Unyanyembé, a spot where the Arab traders have established a sort of mart, and where articles from the coast are bartered for ivory and slaves, the travellers moved westerly until they reached the long inland mass of water trending from S. to N., which has been styled Uniamesi and Ujiji, but the real name of which is Tanganyika.

This lake was found to be 1,800 feet only above the sea, or about half the average height of the plateau land west of the coast range. It has a length of about 300 and a breadth of from 30 to 40 miles.

This great internal mass of water was determined to be an insulated depression into which streams flow on all sides. It was crossed by Speke in the centre, and navigated conjointly with Burton to near its northern end, where it is subtended by mountains which were estimated to have a height of from 6,000 to 7,000 feet

within the range of the eye.* Its waters are perfectly fresh and peculiarly agreeable to drink, and it abounds in delicious fish, whilst its banks are grazed by red oxen of large size, some of them having stupendously long horns. Oxen are indeed common over nearly all the region examined.

A singular phenomenon of blindness affected for some time both the travellers. Whilst exposed in the arid, hilly coast range, and also in the plateau land, to a fierce and glaring sun, their sight was unaffected; but on descending into the verdant, well watered, and rich lacustrine expanse of Tanganyika their sight was dimmed, and gradually they became almost blind—their recovery being slow and imperfect. It was this calamity alone which diminished the number of astronomical observations made by Captain Speke, who lost no opportunity of fixing the latitude and longitude of numerous positions.

When returned to their chief central station in Unyanyembé, Speke, thriving upon hard field work, left his invalid companion in order to reach the great lake Nyanza, the position of which had been pointed out to him by the Arabs, who asserted that it was much longer and larger than Tanganyika, from which it is separated by about 200 miles. In this journey Captain Speke, accompanied by his faithful Beloochees, passed through the district where the chief iron works of the country are carried on; the native blacksmiths smelting the ore with charcoal.

The great lake Nyanza was found to occupy the position assigned to it by the Arabs, and the E. longitude being very nearly that of Kazé, viz., 32° 47′,† its southern end was fixed at 2° 30′ S. lat. Ascending a hill and looking northwards, the enterprising

* Since this Address was delivered, the British Museum has acquired a curious, large, old Portuguese MS. map of the world, on the Mercator's projection, made by Antonio Sances, in 1623, which shows how much general knowledge of the interior of Africa was possessed at that period by the Portuguese. On this vellum map, the author distinctly places one large body of water in the centre of Africa, and in the parallel of Zanzibar. Although all the details are inaccurate, and he makes the Congo flow out of this lake to the West, and another river (representing probably the Zambesi), which is called R. de St. Yurzes, from the same to the S.E., still the general notion of great internal waters is there put forth.

Chevalier Pertz has recently discovered in an old MS. in the Royal Library at Berlin that, even in the year 1291, two Genoese navigators, Teodosio Doria and Ugolino Vivaldi, sailed for a certain distance down the West Coast of Africa. Their ships were called *Sant' Antonio* and *Allegranza*, and the last-mentioned name has, indeed, remained attached to the most northern of the Canary Islands. It has been erroneously stated in some journals that these Genoese navigators sailed round the Cape of Good Hope.—*June* 20, 1859.

† Lunar observations were made at this station.

traveller could discern nothing beyond the islands termed Ukerewe, but a vast interior sheet of water, which, according to those Arabs, whose information had hitherto proved correct, extended northwards for upwards of 300 miles. Captain Speke, who estimates the breadth of this internal sea at 90 miles near its southern end, further ascertained that it is fed not only by streams flowing from the mountains which separate it from Lake Tanganyika, but also by other streams, many of which, meandering in the lower plateau to the west of the lake, constitute, like the internal rivers described by Livingstone, a watery network which when supersaturated by the rains burst and overflow the country.

Seeing that this vast sheet of water extends due northwards, ascertaining by his thermometer that it was nearly 4,000 feet above the sea, and knowing that its meridian was nearly that of the main course of the White Nile, Captain Speke naturally concludes that his Nyanza may be the chief source of that mighty stream on the origin of which speculation has been so rife. This view seems to coincide with the theoretical speculation laid before this Society by myself in preceding years, and is in accordance with the data worked out by Livingstone, of a great interior watery plateau subtended on its flanks by higher lands, and from which interior plateau the waters escape to the sea by favouring depressions.

The physical configuration of the land to the east of the great Nyanza Lake is indeed strongly in favour of this view. On that side, and at a distance of about 200 miles from its banks, the eastern coast range of Africa rises from 6000 feet in the latitude of Zanzibar (where it was passed by our travellers) into a lofty range or cluster, of which Kilimanjaro forms the southern and Kenia a northern peak.

If the assertion of Rebmann and Krapf be accepted, that perpetual snow lies on those mountains, though the able critical essay of Cooley* had induced me to suppose that these missionaries might have been somewhat misled, the summits of these mountains must have an altitude of upwards of 18,000 feet. At all events it is granted that they are the highest points of this coast range. Now, whilst streams descending from the western flank of Kenia (Kilimanjaro is too far to the south) may probably be feeders of the great Nyanza Lake, which occupies a long lateral north and south depression in the

* *See* Cooley's 'Inner Africa Laid Open,' p. 126.

plateau on the west, we know from its meridian as now fixed, that the direction of this fresh-water sea points directly to Garbo, the spot in latitude 3° north reached by M. Ulivi, as related by Brun-Rollet, a Sardinian, who had established a trading post at Belenia in latitude 4° 50′ north, on the White Nile in 1851. The north and south direction of the Nyanza, which Speke believes to reach from south latitude 2½° to 3° 30′ north latitude, brings us in fact beyond the Garbo of Ulivi and Brun-Rollet.*

The variations which occur in the height of the waters at different seasons, in the interior plateau-country surrounding the great lake, were strikingly described to Captain Speke by the Arabs, when they assured him that at one season of the year the water lilies were so abundant as to enable the traveller to pass over a wide river by treading on their broad and thick floating leaves, showing how flat the country must be, and how sluggish are the streams.

Let us hope that when re-invigorated by a year's rest, the undaunted Speke may receive every encouragement to proceed from Zanzibar to his old station, and thence carry out to demonstration the view which he now maintains, that the Lake Nyanza is the main source of the Nile. Considering the vast difficulties which beset the traveller who attempts to penetrate southwards by ascending the Nile, it seems to be preferable that the effort should be made from Zanzibar, where Captain Speke is sure of being heartily supported by the Sultan, and whence, taking men on whom he could rely, he can certainly calculate on reaching the Lake Nyanza in good plight, for that zone of Africa which he has passed through is now ascertained to be occupied by a much more tranquil people than those of the countries north and south of it.

On former occasions I contended that the periodical overflow of the waters from the internal fresh-water lakes was explicable by the fact, that at certain periods of the year, differing of course in different latitudes, the rain-fall of several months would at last so supersaturate the interior plateau-lands and lakes as to produce periodical annual discharges. That the lofty mountains of the coast-range, of which Kenia is the chief peak, may throw off certain feeders of the White Nile, just as the mountains of Abyssinia feed the Blue Nile, must probably be the case; but whilst it may be admitted that little snow may occupy the peaks or summits of

* M. Jomard has analysed and compared the discoveries of M. Brun-Rollet, who gives some information derived from De Angelis, who resided at Belenia in 1851, which is worthy of attention.

Kilimanjaro and Kenia, I am of opinion with the learned Cooley * that the elevation and mass of these mountains are not such as would sustain a vast range of snow and ice, the melting of which would account for the annual rise of the Nile. Even if it be assumed that this is really a snowy chain, the exact periodical rise of the Nile could never be caused by a periodical melting of its snows, since the power of the sun under the Equator is so nearly equable throughout the year, that it must operate in filling the streams which descend from the mountains with pretty much the same amount of water at all seasons. The great phenomenon of the periodic rise of the Nile is, it seems to me, much more satisfactorily explained by the annual overflow of a vast interior watery plateau, which, is, thanks to Captain Speke, ascertained to have an altitude much more than adequate to carry the stream down to Khartum, where the Nile is believed to flow at a height of less than 1500 feet above the sea; and as the river below that point passes through an arid country, and is fed by no lateral streams, it is to the southern, central, and well-watered regions that we must look for the periodic supply.

On consulting Captain Speke respecting the rainy season of that part of the interior of Africa which lies between Ujiji and Unyanyembé, I find that in about east longitude 30° and south latitude 5° the rains commence on the 15th November and end on the 15th May, during which period of six months they fall almost continuously. Farther northward, where the Lake Nyanza lies, the rainy season, in the common order of events, would commence, he supposes, somewhat later, and probably at a time which will account for the periodical rise of the Nile at Cairo on the 18th June. In support of this view, Captain Speke states that the river Malagarazi, which drains the surplus waters from the south-east slope of the mountains between the Lakes Nyanza and Tanganyika, when first crossed by the expedition, was within its banks, but on the 5th June it had quite overflowed them and constituted a stream 100 yards broad, running westwards into the depressed lake of Tanganyika. Now, as according to the Arabs, and other intelligent

* This acute scholar has shown his power as a comparative geographer by a close analysis of the *quæstio vexata* respecting the Nile of the ancients, and shows that the true Nile of Ptolemy was the Blue Nile, which descends from the mountains of Abyssinia. He also shows that the great lakes of the Nile of Ptolemy are at the Equator—a view now confirmed by the researches of Speke. As to Kilimanjaro, he says it is "an insulated mountain in a sea-like plain, and on a fifth scale of the magnitude required for maintaining perpetual snow near the Equator." *See* also his work 'Inner Africa Laid Open,' in which he explains the existence of a great sea or lake in the interior of Eastern Africa.

men with whom he conversed, the whole region to the northward of the mountain in question, *i. e.* beneath and to the north of the Equator, is an extensive marshy plateau, intersected by some large and innumerable smaller streams, all feeders of Lake Nyanza, we have only to suppose that at the *close* of the rainy season the great discharge occurs, and we then have in these data strong grounds for believing, that the theory which I ventured to propound to this Society as the best explanation of the overflow of the Zambesi of Livingstone, as well as of the Congo and other African rivers, will also be found to be applicable to the Nile.

In concluding this notice of the labours destined to clear up the problem of the real sources of the Nile, I must express my thanks to Mr. Macqueen for his efforts to collate all the data concerning the ascents of the White Nile from the expedition sent by Mahomed Ali in 1839 to that of Don Angelis, which Brun-Rollet accompanied in 1851, and when the party reached 3° 50′ north latitude, 31° east longitude. Adding to information obtained from natives and Arabs, and citing Lucan and other ancient authors to the same effect, Mr. Macqueen contends that a lofty mountain to the south-east of the cataracts of Garbo, the last station of Brun-Rollet and his companions, which must be Kenia, is the chief feeder of the White Nile, and that the river Tubesi, spoken of by the African King of Bari, is really the Tumbiri heard of by Dr. Krapf.

Now, even if this view be sustained, it seems to me to be quite compatible with the fresh knowledge obtained by Captain Speke, and his inference, that the Nyanza is the chief feeder of the White Nile. For the southern extremity of this great inland lake is but $2\frac{1}{2}°$ south of the Equator, whilst its western shore is probably not more than 150 miles from the lofty mountain of Kenia. Hence, seeing that Nyanza is about 4000 feet only above the sea, and that the eastern mountains, under the Equator, are much higher, there is every probability that this vast sheet of water may be fed from the east by streams flowing from Kenia, as it is ascertained to be supplied from the south-west and west by other rivers flowing from the mountains, which separate this high sheet of water from the depressed Lake Tanganyika.*

If then it should eventually be proved, that the Lake Nyanza

* Mr. Edw. Heneage informs me that Botero, in his 'Relationi Universali' (Venice, 1640), says that the eastern Nile flows out of a lake 220 miles long, situated under the Equator; and he places the sources of the western branch of that river about S. lat. 9°, close to the sources of the Zaire or Congo, and what may also be intended for the origin of the Zambesi.

contributes its annual surplus waters to the White Nile, so may it then be fairly considered as the main source of the great river; the more so when we see that its southern end is farther to the south, or more remote from the embouchure, than any other portion of the Nilotic water-parting.* On the other hand, the high mountains which flank the great stream on the east, and probably supply it with some of its waters, may by other geographers be rather viewed as the main and original source. These are the only remaining portions of the great problem which have to be worked out—a problem which it has been the desideratum of all ages to unravel, and one which, according to Lucan, made Julius Cæsar exclaim, that to gain this knowledge he would even abandon the civil war †—a problem which Nero sent his centurions to determine, and which, by the last discovery of Captain Speke, seems certainly now to approach nearly to a satisfactory solution.

Before we descend to the mouth of the Nile, and consider the nature of its delta, I must say that our excellent Swiss correspondent, M. Ziegler, has communicated to us some very interesting further details respecting the people who inhabit the northern declivities of the mountains of Abyssinia, as transmitted by his countryman, M. Werner Munzinger. The historical sketch of the affairs which have taken place of late years in Abyssinia, and particularly in the region bordering on the land of the Bogos, is accompanied by a map and dialects of that curious people. African scholars, as well as geographers, will anxiously look to the publication of the manuscripts of M. Munzinger: his map extends from 15° to 17° north latitude, and east longitude 33° to 38° east of Paris.

Delta of the Nile. Suez Canal.—Whilst Captain Speke was determining the position of the great lake which may prove to be the main source of the Nile, the distinguished Surveyor of the Mediterranean, Captain Spratt, was working out the interesting problem of the effect of the prevailing wave influence on the deposits discharged at the mouth of the greatest of the African streams, and

* Although both White Nile and Blue Nile are fed by many affluents, the remarkable physical feature of the great stream below their junction is that in a course of 1200 miles it is not increased by the addition of any lateral waters. On this feature, as well as on the parallelism of its course to the great N. and S. depression of the Red Sea, on the fertilizing powers of its waters, and on the periodicity of its flood, the reader will do well to consult the article "Mediterranean Sea," Edinburgh Review, vol. cvi., which is from the pen of our accomplished associate Sir Henry Holland.

† "Spes sit mihi certa videndi
Niliacos fontes bellum civile relinquam."—LUCAN, *Book* 10.
(As quoted by Mr. Macqueen.)

his results have just been published by Her Majesty's Government. Examining the sea shore and sea bottom at different depths along the whole coast of Egypt, and distinguishing the real composition of the detritus brought down by the river from other adjacent deposits, he distinctly shows, that the wave stroke from the west, influenced by the prevailing north-westerly winds, has for ages been impeding the transport of any Nile deposits either to the west, or into the depths of the Mediterranean on the north, but has constantly driven them to the east.

Through this unvarying natural process, Alexandria, which is on the west of the Nile mouth, has been kept free from silt, whilst the deltoid accumulations of the river have in the historic era successively choked up and ruined the harbours of Rosetta and Damietta, and have formed a broader zone in the bay of Pelusium than on any part of the coast. Again, he shows that the prevailing north-westerly wind has produced precisely the same effect upon those dunes and blown sands on the coast lands which, destroying habitations and fertile fields, fill up depressions; all these dunes being derived from those sands which have originally been carried out by the Nile from the interior of Africa, then thrown up on the shore, and afterwards transported eastwards by the prevailing winds.

With the establishment of such data, the result of many soundings at sea and much close observation on land, illustrated in three maps and two plates of sections, Captain Spratt contends, in the spirit of a fair inductive reasoner, that the proposal of M. Lesseps to form a large ship canal in the low countries between Suez and the Bay of Pelusium is wholly unwarranted.—1st. Because that bay of the Mediterranean, into which the canal is to open, is so continuously and regularly silting up, that no amount of dredging could contend against a great local law of nature, and hence that no permanent port could be formed there. 2ndly. That the blown sands drifted from the west would be constantly filling up the canal. 3rdly. That the very incoherent condition of the ground in which the canal has to be cut (being nothing more than the Nilotic sands accumulated in former days) would not sustain a steady body of water, and that all attempts to clear out its unceasing infillings of matter would be impracticable.

In this powerfully-argued paper, Captain Spratt quotes the authority of the French savant, M. Lepiré, who accompanied the First Consul to Egypt in 1800, as a sanction to his conclusions.

With an extended and accurate acquaintance as a maritime surveyor of the deltas which the Danube and various rivers throw out

into the Mediterranean, Captain Spratt proves, that the arguments used by M. Lesseps, as drawn from other localities in favour of his project, are, in fact, directly hostile to it. Thus, the Malamocco entrance to Venice is to the windward side of the river Po, and therefore freed from its deltoid deposits, just as Alexandria is exempted from those of the Nile. Again, in the Black Sea the deltoid accumulations of the mouth of the Danube are chiefly to the leeward of its mouth, whilst in both these cases powerful currents tend to keep open channels which do not exist in the sluggish water of the bay of Pelusium.

In corroboration of his statements, numerous specimens of sand and mud, brought up by the dredgings of Captain Spratt, are deposited in the Museum of Practical Geology; and his pregnant words which follow may well be commended to the attentive consideration of the French Government and nation, before they get further involved in carrying out the project of a great ship canal:—

"In a gigantic engineering project, involving such an enormous outlay for its construction as well as its annual maintenance, as these facts suggest, it is necessary that the commercial interests invited to speculate in it should thoroughly understand it, so as to form an opinion whether millions of money will not be fruitlessly lost in the depths of the sea, as I must believe will be the case. The experience of the past in the difficulties of engineering against similar hydraulic and physical conditions elsewhere should not be forgotten, and to none are such facts as are here stated of more value and of more real importance than to M. Lesseps and the International Commission. At least, such is the humble opinion of one whose only object is to arrive at the truth of nature's laws, and to suggest to others the consideration of those truths, before blindly engineering against them, and thence to be certain of the cost and results before undertaking a work that will have to contend against so vast an amount of physical difficulties in perpetuity."

These conclusions of Captain Spratt are entirely in unison with the observations of my gallant friend Commander Pim, communicated to our Society at one of our recent meetings, as resulting from a visit to Egypt, which he made when he was the companion of our associate, Mr. Robert Stephenson. That eminent civil engineer has for some time, indeed, arrived at a similar opinion, and has put forth other arguments which seem to me to be as unanswerable as those of Captain Spratt.

The Niger Expedition.—The unfortunate shipwreck of the *Pleiad* on the rocks near Rabba, and the check given to the expedition under

Dr. W. B. Baikie, which left England early in 1857, were alluded to in my last year's Address. I now learn from Mr. D. T. May, R.N., who has returned to England, that less than twenty miles above Rabba the River Niger, or Quorra, divides into several rocky, intricate channels. Consul Beecroft in the *Ethiope*, in 1845, safely navigated the most available of these passages; but the voyagers of 1857 were not so fortunate, and the steamer was totally lost on the rocks. Most of the property was, however, saved, and the neighbouring bank became the head-quarters of the expedition for a whole year. The rocks forming the banks of the river where the shipwreck took place are composed of highly-inclined strata of hard sandstone. All the specimens of this rock which I have examined, whether brought home by Mr. May or sent by the Admiralty, belong to the same light-coloured, hard, sub-crystalline, pinkish sandstone, with very fine flakes of white mica; the successive layers (which are much foliated) being strikingly covered by thin elongated crystals of black tourmaline.* The rock has altogether the appearance of having undergone considerable metamorphosis, and much elevation and disturbance. Geodes of pure white quartz, with large micaceous coatings, also occur. As soon as the party had become somewhat settled, it was determined to make a direct overland communication by Yóruba with Lagos, and Mr. May offering himself for this service, accomplished it satisfactorily, as explained in a notice laid before the Society. In the mean time Lieut. Glover made journeys up the river, visiting Wawa and Busa, and definitely ascertained the impracticability of navigating the river for a few miles beyond the spot of the encampment, a waterfall at Waru being an impassable barrier even for canoes in any season.

Mr. May having waited on the sea-coast, expecting another steamer from England, at last returned to the encampment through Yóruba, and then set out on a more extended journey, with a view to exploring the country, and of establishing postal communication in a line from Lagos to the confluence. Having first travelled to Hadan (the road between Lagos and Hadan being well known and used), he passed eastward, and journeyed for many weeks through the previously unvisited districts of Ife, Ijesha, Igbouma, Yagha, &c., being warmly received, and observing everywhere that the people were quiet, orderly, and industrious; though

* I reiterate the expression of my deep regret (*see* vol. xxvii. President's Address, p. clxvi.), that no member of this expedition is versed in geology or mineralogy.

these good qualities are here and there broken in upon by marauding or slave-catching armies, sent into the Yóruban country by powerful neighbours. The details of this journey were communicated to the Foreign Office in January last, and will, I presume, soon reach the Society.

Approaching to within fifty or sixty miles of the confluences of the Quorra and Chadda Rivers, Mr. May was compelled to alter his route, and proceed northwards, visiting the ruined famous town Ladi, crossing the Quorra at Shaw, and journeying thence on the north side of the river through Núpe to Rabba.

Lieutenant Glover had during this time also visited the coast by Mr. May's first route, and was now there waiting to pilot up the river the steamer which was at last coming to the relief of the party. Dr. Baikie and the other members of the expedition had been chiefly employed during the year in cultivating a good understanding with their neighbours, reducing their language, &c., whilst the energies of Mr. Barton were amply occupied on the botany of this part of Africa. In October, 1858, just a twelvemonth after the settlement of the expedition at the spot in question, the *Sunbeam* steamer arrived, the whole party were then embarked, and proceeded down the river to Fernando Po, there to recruit the health of the officers and men, and make arrangements for farther exploration. During the twelvemonth's residence in Núpe the most friendly relations were maintained with the king, his brother, and chiefs, and the natives generally; supplies being often received overland from Lagos.

At Fernando Po (November, 1858), a re-organisation having taken place, and the preparations being completed, the party again set out, now in the steamer *Rainbow*, built and sent for the purpose, and endeavoured to re-ascend the river. But it was then found that this vessel, which draws four feet of water, could not ascend the Niger even in the month of January; the waters subsiding until June, when they increase. In consequence, the party was obliged again to return to the sea, and since have set out upon the land-journey from Lagos to Rabba (upon the route opened up by Mr. May), whence it is purposed to proceed with an expedition the friendly objects of which must by this time have made a due impression on the native chiefs, and from which we may anticipate the gain of much knowledge when all the acquisitions of Dr. Baikie and his associates are unfolded.

Livingstone or Zambesi Expedition. — With the exception of the

accounts we received last autumn of the arrival of the great South African explorer in the Zambesi, of his ascent of the river in the little *Ma-Robert* to a great distance above Tete, of his again meeting with his old friends the Makololo, and his subsequent descent of the stream—data with which the public are already well acquainted—we have no news respecting the ulterior progress of this important expedition. If no new geographical discovery should be speedily communicated, let us recollect that the main object of Livingstone, who is now one of Her Majesty's Consuls, is to establish entrepôts for trade and commerce high up the river; and, as a prelude to such arrangements, it was most cheering to us all to learn that his stanch friends, the Makololo, had persevered in waiting for his return in a tract distant from their native land. The charts and maps of the river-banks, executed by my young geological pupil Mr. Thornton, are very creditable performances. Mr. Baines, the artist, has laid before us a clear statement of the difficulties overcome in navigating the river, through rocks and shoals, with little depth of water, and the skill of Livingstone himself has been put to the test in acting, as he terms it, the part of "skipper" in the absence of Commander Bedingfeld. Whatever may be the other products derived from this region of Africa, there is a fair probability that its splendid hard trees of vast dimensions may afford fine supplies for ship building; and there are persons—including Mr. Lyons M'Leod, lately our Consul at Mozambique—who, looking to the general luxuriance of the vegetation, are of opinion that the territory on the Zambesi may be made a corn-exporting country.

The Seychelles.—In his 'Notes on the Seychelles,' we learn from Mr. Lyons M'Leod that these islands, twenty-nine in number, form an archipelago, which is the most considerable of the dependencies of the island of Mauritius. Extending from 3° 33′ to 5° 35′ south latitude, and from 55° 15′ to 56° 10′ east longitude, they lie at a distance of 915 miles from Mauritius, 566 from Madagascar, and 1470 miles from the continent of India. First discovered by Vasco di Gama during his second voyage to India in 1502, they were explored, in 1742, by Captain Lazare Picault, who took possession of them in the name of the King of France, since which date they have been called by their present name, after the then French Marine Minister. Mahé, the principal island, is about 17 miles long and 4 miles broad: it attains an elevation of 2000 feet in height, and may be seen at a distance of 12 to 15 leagues. The chief mass consists of hard granitic rock, the soil varied and pro-

ductive, watered with numerous rivulets, and being well wooded, the scenery is very picturesque.

On the east side of the island the magnificent bay or road-stead, Port Victoria, about 4 miles deep and 3½ miles wide, could contain from 300 to 400 vessels, while in the harbour five or six sail of the line might be safely moored, with sufficient room for smaller vessels.

Hurricanes and gales of wind are never known there. From 1817 to 1827 a flourishing and lucrative cotton trade was carried on at the Seychelles; though the plant, which is of fine quality, has not yet been placed in competition with *sea-island* quality of Georgia, in the United States.

The sugar-cane grows luxuriantly, and no tobacco is superior to that raised at the Seychelles. Timber, for shipbuilding, furniture, and all domestic purposes, is to be found in abundance. The sperm whale is fished near the Seychelles, and turtle abound. The working population, however, is scant, and during the last year two-thirds of the cloves which are produced by the remains of the spice gardens were left on the ground for want of labour to save them.

"This love of the ocean," says Mr. M'Leod, "might be turned to advantage by encouraging maritime pursuits and commercial relations between these islands, Madagascar, and the whole of the east seaboard of Africa." Specimens of cotton, woods for building purposes, orchilla weed, the COCO-DE-MER (found only on these islands), and specimens of the woods may be seen at the rooms of our Society, all brought home by the author of that Memoir from which I have extracted the preceding matter.

The same zealous officer wrote to me in 1857 from Mozambique, advocating the establishment of steam-postal communication between Aden, Natal, and the Cape of Good Hope. From England *viâ* Aden letters are delivered at Mauritius in 29 days. By the same route, *i. e.* by Aden, a letter might reach Natal in 25 days, and the Cape of Good Hope in 30 days, the steamer calling by the way at Zanzibar and Mozambique. Already it appears that endeavours are making at the Cape to carry out partially the suggestion of Mr. M'Leod by advertisements for tenders to carry on a monthly steam communication between the Cape and Mozambique, and between the former place and Natal steam vessels have plied once a fortnight for more than two years.

So rapid is the demand for advancement in these parts that the

inhabitants of Natal and Mauritius contemplate the establishment of a telegraphic cable between these settlements.

Cotton.—In concluding the observations on Africa and the adjacent countries, I may not inappositely introduce a short notice of the countries from which we may expect to import cotton. The supply of cotton for our own manufactures is a subject which, in the course of the present year, has been frequently discussed at the meetings of the Society; and when I state that the yearly value of raw cotton consumed by our manufactures in 1857 was no less than 26,000,000*l.*, while the value of the fabrics which we exported, to say nothing of our own immense domestic consumption, amounted fully to 46,000,000*l.*, it is obvious that the importance of the question cannot easily be over-rated.

Besides British India, various other localities, including large tracts of Africa, have been pointed out as suited to the growth of cotton. In fact this plant has such a wide geographical extension, reaching to 35° north and south of the Equator, that it will thrive wherever it is not liable to be cut off by frost. It may be successfully cultivated for exportation wherever the soil is of adequate fertility, wherever the government is strong enough for the protection of life and property, wherever the country is not so crowded with inhabitants as to be itself the best market for its own produce (such being the case in China and the valley of the Ganges)—in short, wherever there exists a cheap transport to a foreign market, and, in so far as the finer qualities are concerned, wherever an adequate share of skill in culture and preparation prevails.

The southern States of the American Union are the parts of the world that have hitherto been found to possess in an eminent degree all the necessary qualifications now enumerated, and hence they are still the chief places from which we derive our finer varieties of the material. They do, in fact, yield 70 parts in 100 of the value of our whole consumption of cotton. Some parts only of our Indian dominions possess a few of the enumerated advantages, and they furnish us with about one-fourth in quantity and one-fifth in value of all that we consume; for the quality in this case, let it be observed, is the poorest of any that is found in our markets, and this simply from the absence of European care, which has never been exercised in the growth, curing, or inland transport of Indian cotton.

Many parts of Africa are, in so far as regards soil and climate, also obviously well adapted to the growth of cotton, which, if not an

indigenous plant, has at all events been long acclimated. The Cotton-Supply Association, formed at Manchester, has not only been made up of those persons who look to a future increase of produce, but has been liberally supported by many philanthropists, who hope that the cultivation of the plant by the natives of Africa may produce a salutary change in putting an end to the slave-trade. One of the active supporters of this institution is Miss Burdett Coutts—a lady eminently distinguished by the kind, judicious, and practical application of her wealth. Among other efforts, this Association has caused a map on a large scale to be published, pointing out with much sagacity in colours the localities which appear, from fertility and means of transport, to be most eligible for the growth of cotton. Already a small supply of fair cotton has been brought to England from the Western Coast of Africa; and it is also asserted that the plant flourishes in abundance in the Fiji Islands.

Although it is not unlikely that Africa may hereafter supply our manufactures with a much larger amount of cotton than at present, the probability is that in such a country other articles better suited to the rude condition of the people will be preferred to it. We have a remarkable instance of this in the supply of the strong and useful oil which we import, the produce of a palm, Elais Guiniensis, a native of the Western Coast, and which, although the trade is of barely forty years' standing, we imported in 1857, as Mr. John Crawfurd informs me, to the extraordinary value of more than 1,800,000*l*. The same country is, without a doubt, well calculated to produce other oil-yielding vegetables like those we have been of late years receiving from India, such as linseed, rape, mustard, and sesame; all of them plants easily raised when compared with cotton. Already there has been imported from the Western Coast of Africa a still more valuable oil, which goes under the name of shea butter. This is the produce of one of the plants of the natural order Sapotaceæ, as is also the vegetable tallow which we have recently imported from the Malay Islands. The vegetable wax of Japan, of which, as already mentioned, a cargo has been imported within the last three weeks from that empire, is the produce of the Rhus succedaneum. I may add, that the voyagers up the Yang-tse-Keang have brought with them specimens of a more valuable article than any of these, insect-wax, the product of an insect which feeds and forms its nidus on a species of ash, *Fraxinus Hanburii*. This was obtained at the mart of Han-Kow, where it

abounds, and is largely used in the manufacture of candles. It will be curious and instructive if we should find that as animal oils become scarce and dear in the progress of society, their place can be supplied from remote and opposite quarters of the world by oils derived from vegetables.

America.

British North America.—The important results of the exploring expedition under Captain J. Palliser, as communicated by the Colonial Office, and as dwelt upon in awarding the Founder's Gold Medal to that officer, have necessarily given great satisfaction to us, proceeding as they do from men who were especially recommended for this public service to Her Majesty's Government by our Society as well as by the Royal Society.

When Captain Palliser first proposed to make this exploration, one of the main points of interest to geographers was a survey of that part of the Rocky Mountains to the north of the United States boundary which separates the great tracts now named British Columbia from the eastern mass of British North America. Her Majesty's Government deemed it, however, of paramount importance that, in the first instance, the nature of the ground between Lakes Superior and Winnipeg should be accurately surveyed, in order to set at rest all questions of colonization as dependent on the possibility of making practicable routes of communication. For example, whether the Canadas might be brought into profitable communication with the Red River Settlement. The remoter or more western explorations were destined to develop the true nature of the great Prairie region, as watered by the North and South Saskatchewan rivers and their affluents. Collaterally, it was resolved, if possible—and mainly at the instance of this Society—to determine the elevation of the Rocky Mountains in those parallels of latitude, and to point out the passes in them by which communication might be opened out between the vast country occupied by the Hudson Bay Company and the great British seaboard on the Pacific.

In the award of the Patron's Medal to Captain Palliser, allusions have been made to some of the principal results obtained by the researches of the expedition under his orders. But I should not do justice to the leader and his associates, nor to my own feelings, were I not to add a few words of explanation and comment. The first year's labours were necessarily of more importance to the Govern-

ment than they could be to geographers and naturalists. The great object was to determine the capability of establishing an intercourse between the rocky region of Lakes Superior and Winnipeg on the east and the rich prairie countries on the west; and though astronomical, physical, and magnetical observations of considerable importance were made—these countries being to a great extent known before, and their outlines being monotonous—that portion of the survey created but slight interest among us.

Not so when the Rocky Mountains, to which we had specially directed attention, came to be surveyed.* On proceeding from Fort Carlton, Palliser showed his good sense in approaching these mountains from the rich Buffalo prairies midway between the North and South Saskatchewan. An experienced buffalo-hunter himself, he knew that if his men were not well supplied, by no efforts, however well directed, could they succeed. Accordingly, having established a good base, and having secured abundant provisions at Slaughter Creek, he divided his force into three parties. Leading one of these himself across the Kananaski Pass, and returning by the Kutanie Pass in north latitude 49½°, and directing Captain Blakiston to explore the still more southerly or Boundary Pass, he sent Dr. Hector to traverse the chain by the Vermilion Pass, and to explore, as a geologist and naturalist, the much loftier mountains into which the chain rises in its trend to the N.N.W. This division of his forces well merited, therefore, the expressions used in the award which has been sanctioned by the Council.

The marked success of the survey accomplished by my young friend Dr. Hector has been peculiarly gratifying to me, inasmuch as I had answered for the capacity he would exhibit in applying his scientific knowledge. Thus, in addition to the determination of latitude, longitude, and the altitude of the mountains and two of their passes, Dr. Hector presents us with a sketch of the physical and geological structure of the chain, with its axis of slaty subcrystalline rocks, overlaid by limestones of Devonian and carboniferous age, and flanked on the eastern face by carboniferous sandstone, representing, probably, our own coal-fields, the whole followed by those cretaceous and tertiary deposits which constitute the subsoil of the vast and rich prairies watered by the North and South Saskatchewan and their affluents. His observations on the erratic or drift phenomena are also curious and valuable.

* Dr. Hector had, by directions of his chief, made a successful foray in dog-sledges to the eastern edge of the Rocky Mountains during the winter, in which he procured men and horses.

Prevented by his instructions from descending into the valleys of the Columbia, and there to ascertain practicable routes to the far West, which he will look out for during the present summer, Dr. Hector, though so severely injured by the kick of a horse as to be incapacitated from moving for some days, contrived so to travel northwards as to round the base of the loftiest mountains of the chain before he returned to his winter-quarters in October, after an absence of eighteen weeks from his chief, but laden with valuable geographical and geological knowledge.

In this survey he had the merit of showing that the Vermilion Pass —which is less than 5000 feet high, and therefore 1000 feet lower than any other known pass of the Rocky Mountains—had another decided advantage over them, inasmuch as its western slope, from the summit level of the horse-path, is so little steep that its explorer has no doubt that even a road for carts may be there established. The descents westward, or into the drainage of the Columbia, in the other passes are exceedingly steep; and according to Captain Blakiston, the Kutanie Pass can only have a railroad made along it by the formation of tunnels of several miles in length, and by encountering the difficulty of the steep western gradient of 194 feet per mile.

Another singular natural feature of comparison is, that whilst the Vermilion Pass is less than 5000 feet above the sea, the adjacent mountains on the north rise to near 16,000 feet, showing the great depth of the gorge. On the other hand, in the range beyond the British boundary, to the south, and where no peak (not even that of Frémont) exceeds 13,000 feet, the passes range from 6000 to 7000 feet high.*

* In anticipation of what may hereafter be published in the 'Journal of the Royal Geographical Society,' the reader is referred to the papers presented to Parliament in April, relative to the "Exploration by Captain Palliser of that portion of British North America which lies between the northern branch of the River Saskatchewan and the frontier of the United States, and between the Red River and Rocky Mountains." These printed documents are accompanied by a map, executed by Arrowsmith, from the surveys of the Palliser expedition, together with despatches of the leader and officers under his command, and tables giving the calculations of latitude and longitude by which the positions of places were fixed. An additional paper and map on the southern part of the Rocky Mountains near the American boundary, as prepared by Captain Blakiston, who had quitted the expedition, has very recently been sent to the Society, with the notice from the Secretary of the Colonies that it was not to be looked upon as an official communication until sanctioned by Captain Palliser. These last-mentioned documents, which seem to me to be also ably prepared, have not yet been laid before the Society. The public will soon possess an excellent map by Arrowsmith, in which all the new discoveries are inserted. This map is entitled 'The Provinces of British Columbia, Vancouver Island, with portions of the United States and Hudson Bay Territories.'

I was recently informed by my friend the Right Hon. Edward Ellice that the geographical position of these passes was laid down many years ago upon a MS. map, at the instance of the

Whether one of the heights called Mounts Brown * and Hooker by Mr. Douglas, in honour of our eminent botanical contemporaries, be still higher than the Mount Murchison of Palliser and Hector, it is certain that the chain diminishes rapidly in its trend from this lofty cluster to the north. We know, indeed, that Mackenzie, the first great explorer of those regions, passed through the range in north latitude 56°, at a comparatively lower level. Again, we further know that in proceeding northwards these mountains dwindle into insignificance before they reach the Arctic Ocean.

It will be recollected that seven years ago Captain M. H. Synge of the Royal Engineers, who had been quartered in the Canadas and had made excursions into the adjacent western territories, being deeply imbued with the importance of the original observations of Mackenzie, and attracted by his glowing description, made a warm appeal in favour of the establishment of a line of communication between the Atlantic and Pacific, by passing from Lake Athabasca and the Peace River, thence traversing the Rocky Mountains on the parallel followed by Mackenzie. But that scheme must now, I apprehend, give way before the shorter passages across the mountains in a more southern parallel, and which will, it is hoped, bring a rich prairie country on the east into intercourse with our newly-discovered gold region on the west, as well as with Vancouver Island, the natural resources of which were brought before us by Colonel W. C. Grant.†

Hudson Bay Company, by Mr. David Thompson. I have further learnt from Mr. Arrowsmith, with whom he corresponded, that Mr. Thompson explored the vast regions of the Hudson Bay Company in all directions during twenty-eight years, and projected the construction of a general map of the whole country between Hudson Bay and Lake Superior on the east, and the Pacific on the west! It is indeed much to be regretted that geographers in general were wholly ignorant of such labours and their results. It appears that the last six years of Mr. Thompson's labours were spent on the west side of the Rocky Mountains; it being important to note that his MS. maps were all made from actual survey, corrected by numerous astronomical observations. The largest affluent of the Frazer River in British Columbia, "the Thompson," justly bears the name of this great but little-known geographical explorer; and I therefore trust that there is no foundation for a report which has been spread, that it is proposed to substitute some other appellation for the name of this meritorious man. Beginning his astronomical observations in 1792, Mr. David Thompson was in 1817 appointed the Astronomer of the North American Boundary Commission, and was upwards of eighty years of age when he died in Canada. In the words of Mr. Arrowsmith, "he has left no one behind him who is possessed of a tenth part of his acquaintance with the territories of the Hudson Bay Company, whose directors were duly sensible of his great merits." Whatever may be the fate of that remarkable corporation, we must all admit that it has not only maintained British rights over wide tracts of North America, but has also, in addition to Thompson, produced some of the best geographical explorers of snow-clad Arctic countries, including our medallist Rae; whilst its dealings with the various fur-hunting tribes of Indians have been so equitable as to have maintained the attachment of these poor people, who under such influence have been preserved, instead of falling before the white man as in other parts of America.

* Mount Brown is said to be 16,000 feet high.

† *See* Journal of the Royal Geographical Society, vol. xxvii.

During the animated discussion which took place among us in the year 1851, Mr. Asa Whitney, of the United States, in proposing his gigantic plan of an inter-oceanic railway, candidly told us that the best line of intercourse between the two oceans would be found within the British territories, and the Palliser expedition has already gone far to demonstrate the truth and value of his suggestion.

With a knowledge of the data acquired by the Palliser expedition, men of ardent minds already contemplate the formation of a railroad, or, if not, of a practicable route, which, traversing British possessions only, shall connect the Atlantic and Pacific Oceans. But when we reflect that the length of this line is above 2000 English miles, and that the greater part of the route on the east will have to traverse wild and unpeopled regions, we cannot rush to hasty conclusions as to the practicability of such an enterprise. Neither ought we to deride a plan which may be ultimately called for when British Columbia and Vancouver Island shall have risen into that importance which they must attain as British colonies. For, it is now ascertained, that the tract lying between the North and South Saskatchewan on the east is one of great fertility, where no intense cold prevails, and that, once through the Rocky Mountains, the traveller enters a country of cedars and rich vegetation, in which even wheat may be grown at heights exceeding 2000 feet above the sea. In the mean time we need, at all events, have no hesitation in assuming that the electric telegraph will, ere long, be at work across British North America.

Believing it to be of the deepest geographical importance, that men who have so distinguished themselves as Palliser and his associates, should not, through a misplaced economy, be held to their original instructions, and be forced to return homewards by retracing their steps from Fort Edmonton, over the previously beaten tracts of North America and the United States, I have had great pleasure in supporting the request of the gallant leader of this expedition and of his associate Dr. Hector, that they might be allowed to wend their way home next summer by again traversing the passes in the Rocky Mountains, and thence to explore the great intervening tracts of British Columbia, including the auriferous region of Frazer River. I am happy to say that Sir Edward B. Lytton readily complied with this request, and that the Palliser expedition is thus about to establish fresh claims upon our approbation.

British Columbia.—Of the vast region to which our Sovereign re-

cently attached the name of British Columbia, geographers have as yet but a scant and very imperfect account. Its first great explorer was my honoured countryman Mackenzie, who, traversing the Rocky Mountains, and reaching the sea after incredible labour, left us an excellent record of his exploits. Since that time agents of the Hudson Bay Company, including its Governor, Sir G. Simpson, have passed through this region; Mr. D. Thompson having partially surveyed it.

In our own volumes we find first, a slight sketch of the Columbia River, or notes made by Dr. Gardner at Vancouver Island and Fort William in the year 1835; then a few observations by Dr. Scouler on the indigenous tribes of the country, distinguishing the fish-eating and well-fed race of the coast from the hunters of the interior. In later years Mr. Douglas, one of the able men brought up by the Hudson Bay Company, and who has recently been appointed Governor of British Columbia, gave us the first sketch of the east side of the island discovered by Vancouver, and also of the Straits of Juan de Fuca; and Colonel Grant described that island much more in detail, giving also an account of its natural history and geological structure.* Then, again, the bold exploring botanist, the late D. Douglas, who fell a victim to his zeal, visited parts of the Rocky Mountains, collecting many fine plants, including the noble *Douglasia* pine, and assigning, as before said, the names of his eminent friends Brown and Hooker to the highest parts of that chain.

With the exception, however, of the description of Mackenzie,† we still remained very ignorant of the greater part of the region now known as British Columbia, and probably would have so remained many years longer, but for the accidental discovery of gold in the bed and on the banks of the Frazer River. So many diggers and speculators soon rushed to the tract, that it became necessary to raise the whole country into the rank of a colony, by separating it altogether from the influence of the Hudson Bay Company.

The printed papers communicated to Parliament in the last year, being accompanied by a map of the gold region, give us a fresh insight into the progress which has already been made in establishing this new colony. In these documents we are pleased to find,

* Whilst this Address is going through the press, a geological description of a part of Vancouver Island by Mr. Bauermann has been transmitted to me. It now appears that the *coal* before spoken of, like that of New Zealand, is of *tertiary age*.

† Avoch, the property and birthplace of Sir Alexander Mackenzie, who was knighted for his grand explorations in North America, like my own birthplace, Taradale, is in the Black Isle of Ross-shire.

that whilst such clear and statesmanlike instructions have been forwarded by the Secretary for the Colonies, for the guidance of Governor Douglas, the latter has admirably fulfilled his duties in the management of a set of wild and untrammelled gold-diggers, chiefly wanderers from California, from whose lawless deeds and outrages he has taken the best measures to protect the poor Indians.

A despatch to the Colonial Secretary from the Governor's Secretary of the Colony, Mr. F. W. Chesson,* after particularizing the character and habits of the Indians, eloquently and manfully points out the necessity of establishing a thorough British protection of these natives, and some reasonable adjustment of their claims, if the peace of the colony is to be maintained. "The present case (Mr. F. W. Chesson observes) resembles no common instance of white men encroaching on the lands or rights of aborigines for hunting or settlement. It more than realizes the fabulous feuds of Gryphons and Arimaspians, and no ordinary measures can be expected to overcome the difficulty which duty and interest require to be removed, if British Columbia is to become an honourable or advantageous portion of the British dominions." Advocating the adoption of a treaty between the British authorities and the chiefs and their people as legal, just, and pacific as that made by William Penn with the Indians of the eastern sea-bord of America, he rightly adds, that "Nothing short of realizing lawful payment of that which it may be necessary to acquire, and the proper administration of laws framed in a spirit of justice and equality, can really be of service."

Whilst the civil government is thus acting, it will, doubtless, be largely supported in its beneficent scope by the co-operation and aid of the mild influence of religious instruction. In addition to the efforts of the Society for the Propagation of the Gospel, it is, indeed, most gratifying to know that the benevolent Miss Burdett Coutts, who annually distributes aid with boundless liberality in fostering numberless charities and the spread of true religion, has furnished the means for the endowment of the bishopric of British Columbia; so that, thanks to the munificence of this good Englishwoman, the poor native Indians will find an instructor and protector in Bishop Hale.

Judging from the information already sent home, the gold region of the new colony presents a broad and general resemblance to that of California. Thus, as in the latter the ore has not yet been found

* Parliamentary Papers relating to British Columbia, p. 59.

in the coast-range which bounds the Pacific, but sets on at Fort Yale on the River Frazer, in long. 121½°—extending northwards from 50° to beyond 51° North lat., the gold detritus has been found to ramify largely to the E. and N.E., along the various affluents of the Frazer; the Anderson, Thompson,* and various smaller streams, being found charged with golden débris. Specimens of gold from different parts of the region having been recently presented to the Museum of Practical Geology by Sir Edward Bulwer Lytton, I am led to infer that the original sites or quartz reefs in the slaty rocks, whence all this detrital matter has doubtless been derived, are ridges which lie in the N.N.W. prolongation of the auriferous ridges of California, and are separated from the Rocky Mountains on the east, and from the coast-ridges of the Pacific on the west. At present it is impossible to conjecture, with any approach to accuracy, what may be the probable length of this auriferous region; but there is every reason to think that it may extend far to the N.N.W.; so that the Emperor of Russia may possibly possess in his distant North American dominions a Dorado as well as in his own Ural Mountains. Again, even restricting our inquiry to the auriferous tract of British Columbia, we as yet know little or nothing of its breadth. It has been, indeed, said that gold has been detected on the eastern shore of the great Okanagan Lake, in E. long. 119°, a statement which seems by no means improbable, seeing that the precious metal has been found as far eastward in the United States as Fort Colville on the Columbia.

This brief allusion to the want of knowledge respecting the eastern extension of the gold fields of British Columbia may lead us to hope that Dr. Hector, the geologist and naturalist, who is even now, we hope, about to traverse these tracts, will bring us home accounts which will, to a great extent, dispel our ignorance. He will, at all events, offer to us for the first time a true account of the lithological character of the Rocky Mountains, as distinguished from the auriferous chains to their West; and when his reports are combined with those of Mr. Bauermann, the geologist of the Boundary Survey conducted by Colonel Hawkins, and these are co-ordinated with the data obtained by Palliser in more northern parallels, we shall, indeed, possess a valuable instalment of contributions towards a better

* The Duke of Newcastle, now Colonial Secretary, has just deposited in the Museum of Practical Geology a nugget from the head waters of the Thompson River, weighing nearly 8 oz.—*July* 12, 1859.

acquaintance with a vast country which is, doubtlessly, destined to play a most important part in the annals of British history.*

Arctic Researches.—It will be remembered that Captain M'Clintock failed to accomplish the middle passage across Baffin Bay in the season of 1857. The *Fox*, therefore, was forced to pass the winter in the pack; afterwards drifting with it helplessly to the south until set free in April of last year. No evil consequences beyond the vexatious loss of an entire year were experienced, the efficiency of the expedition being unimpaired, and after a short stay in the ports of Greenland, where supplies of fresh meat, &c., were obtained, as also from several vessels of the whaling fleet, Captain M'Clintock has gallantly made a successful passage across the middle ice, and entered Pond Bay on the 29th of July. Our latest intelligence is dated from this inlet, whither he had gone for the purpose of investigating some very remarkable reports, which for the last few years have been perseveringly made by the natives to the whaling ships frequenting this quarter.

The statements made by the Esquimaux with respect to fugitive parties of white men in distress, point unequivocally to portions of the crew of the *Erebus* and *Terror*, and their conjecture is corroborated by the fact, that the sledges of these tribes are found to be constructed of oak and mahogany belonging to British ships, and by the existence of other articles in their possession, which could have been derived only from such a source. When last seen, the *Fox* was steering into the very centre of the area from which these reports proceeded, and to which Captain M'Clintock attached the utmost importance. Having cleared up this important point, it was his intention to proceed to Beechey Island to examine into the state of provisions there deposited, and then to make his way southerly towards the bight of the Back or Great Fish River, where it is earnestly hoped the object of his voyage will be attained.

Although it would be premature to express any immediate anxiety respecting the safety of this isolated vessel, commanded as she is by an officer of so much ability and experience, with so many depôts of provision to fall back upon in the event of any casualty occurring previous to her reaching the American continent, yet it cannot be denied that if the close of the present year should have brought us no intelligence, there will be grave cause for solicitude and for

* An instructive map of the region lying immediately to the south of British Columbia, and extending southwards to California Proper, and which has been occupied and settled by the American Government, has been recently published by Mr. Trutch.

regret that the adventurous and skilful M'Clintock should have been left without that support from the west which I have invariably advocated.

Even now we must deplore that the representations made to Her Majesty's Government to induce them to cooperate in this national undertaking by sending or by aiding to send a second vessel to meet the *Fox* through the route of Behring Strait, which was proved by Collinson to be so sure and safe for ships of any size, have not been attended to, and that the *Fox*, equipped and maintained as she is almost entirely at the expense of Lady Franklin, should have been permitted to go forth unaided on her holy errand. This consideration receives additional force from the fact that an Arctic vessel, especially presented by the United States Government, remains unemployed in our own waters; and when, in addition to the primary object of following up the traces of our missing countrymen, she could have been employed in making those magnetical observations on the north coast of the American continent, which the President and Council of the Royal Society have pointed out as being of great importance. Upon this subject it remains only to be remarked, that when Captain M'Clintock sailed from Aberdeen on the 30th of June, 1857, there was still a well-founded hope that the Government would make this concession in the interests of humanity and science, since there was ample time for the fitting out of a second ship before the month of December following, the season of departure for Behring Strait. In anticipation of such assistance, the far-sighted and experienced commander of the *Fox* communicated to Captain Maguire, whose knowledge of the western route rendered him peculiarly fitted to receive such confidence, the views he entertained as to the manner in which two ships, thus converging to the same specified field of search, might act in concert for the common object. It is painful to reflect upon what must be the feeling of disappointment of Captain M'Clintock, when, on reaching near to his goal, he finds none of those preconcerted marks or signals indicative of the approaching succour and cooperation of which he may stand in need!

While the spirit of Arctic enterprise seems almost to have departed from among us, our kindred nation on the opposite side of the Atlantic, entering upon it in the first instance with the kind feeling of succouring our missing countrymen, appear inclined to pursue a path from which so much honour has redounded, and we have received notices of their intention to equip from that country another expedition, having for its object the further examination of Smith

Sound. The settlement of that great physical question, the open Polar Sea, so desired by all geographers, will add a new lustre to the country that sent forth Dr. Kane. Those recent advices have also informed us that Mr. R. Kennicott, of Chicago, has started on a journey overland to the Arctic Ocean. He purposes to proceed to Fort Garry, on the Red River, and thence, with the agents of the Hudson Bay Company, to the valley of the Saskatchewan, the Athabasca, and the Peace Rivers, to the Great Slave Lake. Arriving at the Mackenzie River in the spring of 1860, the summer of that year he will devote to the exploration of the shores of the Arctic Ocean, returning home the following year. It is, therefore, not at all improbable that Captain M'Clintock, should God prosper him, may be welcomed to the shores of British America by a citizen of the United States!*

Progress of Geography in the United States.—At our last Anniversary we justly awarded one of our Gold Medals to Professor Bache, for his highly important coast surveys; and I have now to advert to some other works of our kinsmen of the West that have come under my notice, and which reflect high credit upon them.

The large quarto publications which illustrate the tracks best suited for a railway between the Mississippi and the Pacific have now advanced to the eighth volume. This volume is occupied by a clear and able description, by Mr. Spencer F. Baird, of all the mammals, birds, reptiles, and fishes of those regions, preceded by a lucid introduction, the whole comprising 756 pages of letter-press and 40 plates. This publication and the volumes which preceded it have completely carried out the object of the American statesmen, who directed that their railroad surveys of unknown regions should be illustrated in so complete a manner.

In alluding to this Report, I must repeat what I have said on former occasions, in respect to analogous publications, that the

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* The last journals of Captain Fitzjames, the associate of Sir John Franklin, as addressed to Mrs. Coningham, which have just been printed by that lady's husband, Mr. William Coningham, M.P., are deeply interesting. The picture sketched by this gallant officer, of the perfect happiness and good order of the crews under the influence of their beloved commander, revives all our grief for the loss of such noble fellows. There is one expression (p. 8) which, had it been made known when the searching expeditions were sent out in quest of Franklin, might have saved some unnecessary orders of the Admiralty, and much fruitless speculation on the part of geographers, including myself, in favour of tentative efforts being made to the *north* of Beechey Island. "At dinner to-day (Captain Fitzjames writes) Sir John gave us a pleasant account of *his expectation of being able to get through the ice on the coast of America, and his disbelief in the idea that there is open sea to the northward.*" *See* also Sir John Richardson's able comments, article 'Polar Regions,' new edition 'Encyclopædia Britannica.'

Government of the United States has set an example which might certainly be imitated by the mother country. In treating of Australia, I have directed your attention to a proposal of the enlightened Governor of New South Wales, who has endeavoured to rouse the British Government to a sense of the importance of pursuing a similar conduct in our vast colonies.

In the first volume of this remarkable series of 'Explorations and Surveys for a Railroad Route from the Mississippi to the Pacific,' the reader will be much struck with the introductory State paper by Mr. Jefferson Davis, then Secretary of War, and addressed to the Speaker of the House of Representatives. The explorers are therein directed to observe and note all those objects and phenomena which have an immediate or remote bearing on the railway, or which might seem to develop the resources, peculiarities, and climate of the country. They were, in fact, ordered to determine all geographical positions, to lay down the topography of the lands, to observe the meteorology, including data for barometric profiles, and two of the party were to determine the direction and intensity of the magnetic force. Other individuals were ordered to make geological surveys and to collect all the plants and animals of the country, as well as to obtain the statistics of the tribes of aborigines. Now that these directions have been well and efficiently worked out by zealous and able men, let us render all honour to the nation which contributes such a great amount of fresh knowledge to the world of science.

Another of these very important documents recently issued by the American Government is the Report on the United States and Mexican Boundary Survey, by Major Emory and his assistants, whose descriptions of the natural appearances of the country are vivid, and its features pictorially delineated; the fossil remains having been collected and partially described by Mr. Parry. Besides many woodcuts representing various landscapes, the work is further embellished by a profusion of lithographic views, as well as by tinted and coloured sketches of the inhabitants. The geological description of the country was prepared by Mr. Arthur Schott, and specimens of the fossil remains having been brought to New York, have been described in this volume by the celebrated palæontologist Mr. James Hall. The accompanying map, embracing all the region included between the British boundary on the north and 23° north latitude on the south, and between 84° and 126° east longitude, is a great addition to our previous cartography.

In alluding to other works connected with the geography of America, I am glad to have the high authority of my friend Admiral FitzRoy for saying, that one of the most valuable meteorological works which has yet been produced is Lorin Blodget's 'Climatology of the United States.' This large octavo volume, amply illustrated with the best class of maps, is well written, and treats the subject in a masterly and comprehensive manner; the author having strictly followed Humboldt, and largely referred to Dové. In estimating such works as this, and the still more extensive Reports of Espy, we are reminded that they proceed from a country where one language, one system of measurement, one postal arrangement, and one government, coextend over a vast portion of the continent of America.*

If I were now presiding over my brother geologists, I might dilate upon the very important work recently published by Professor Henry Rogers on the 'Geology of Pennsylvania;' for truly the two thick quarto volumes replete with numerous illustrations which have been prepared by this geologist are to be viewed as masterpieces of correct delineation of the structure of his native country. Independently of the intrinsic value of these details to the geologist, miner, and proprietor, the maps and sections have in themselves a most important bearing on physical geography. In tracing the boundaries of the different geological formations, Professor Rogers has shown the intimate connexion between the complicated geological folds or replication and the geographical outlines of the land, and with an ability which proves him to be as good

* Since this Address was read, I have had the satisfaction to receive from our associate, Commander Maury, the second volume of the eighth edition of his 'Explanations and Sailing Directions to accompany his Wind and Current Charts.' This invaluable work, which has justly acquired a world-wide reputation, is another of the striking proofs of the wisdom of the Government of the United States in their encouragement of science.

More recently our medallist, Professor Bache, has obligingly sent to me a list of all the principal American geographical explorations and publications since 1857. In addition to no less than thirty-nine such works, most of them executed by direction of the Government (and of which a list will be given in a subsequent number of the 'Proceedings'), Professor Bache informs me that the following four expeditions are either starting or are already in the field:—Exploration of the San Juan and Colorado Rivers, and of a route from New Mexico to Utah Territory, commanded by Captain John Macomb, Topographical Engineers U. S. A., under the Office of Explorations, War Department.—Exploration of the head Tributaries of the Yellow-stone and Missouri Rivers, and the region in which their sources lie, commanded by Captain W. F. Raynolds, Topographical Engineers U. S. A., under the Office of Explorations, War Department.—Construction of a Military Road from Fort Benton on the Missouri to Fort Walla Walla on the Columbia, commanded by Lieut. John Mullan, U. S. A., under the Office of Explorations, War Department.—Exploration of a route for a Railroad on a new line, across the Great Basin, by Captain J. H. Simpson, Topographical Engineers U. S. A., Utah Expedition, Brigadier-General Albert Johnston, U. S. A., commanding, under the War Department.

a physical geographer as he is an eminent geologist. Liberal as the State of Pennsylvania has been in contributing to the payment of the cost of this elaborate work, I happen to know that in addition to years of labour, the author has spent some of his private means in bringing it out; and I therefore sincerely hope, for the honour of science, that these volumes may meet with such a sale as will indemnify the writer, who has shown that he can combine such a profusion of details with broad and ingenious philosophical views.

Many are the subjects connected with our science on which, in honour of the United States, I might expatiate. Even whilst I write, the newspapers of Boston announce the proposal to erect a vast Conservatory of Art and Science. Now, whether this idea be carried out in the public gardens of that city, or, as my illustrious friend Professor Agassiz wishes, in the precincts of the adjacent University of Cambridge, with which the names of Everett, Prescott, and other eminent men are associated, a subscription for that noble object, as furnished by thousands of citizens, is the best proof which can be afforded of an enlightened patriotism.*

Central America.—Every year brings us some new information regarding those portions of Central America which seem to offer the best lines for opening a direct communication, either by railroads or canals, between the Atlantic and Pacific Oceans.

The proposed railroad through Honduras has led to surveys across that territory, of very great interest in their actual as well as anticipated results. They will be invaluable to our mapmakers for the new data which they add to our geographical knowledge of a country never before so carefully explored. I have on previous occasions adverted to the mass of valuable information on Central America collected and published by Mr. Squier, the intelligent promoter of the Honduras Interoceanic Railway, which he has since followed up by further details, amongst others a corrected account of the great lake of Yojoa, which has recently been printed in the Proceedings of our Society.

M. Belly, who has obtained from the Governments of Nicaragua and Costa Rica the exclusive privilege and right to open an interoceanic communication, by water, through the territories of those

* The great work of Agassiz, to the completion of which that eminent naturalist is devoting his life, and which has been subscribed for in the various States of America to the amount of 60,000*l.* sterling, is an additional proof of the encouragement of science in the United States.

states, has presented to me a copy of the map and sections of his proposed line, which have been laid before the Society. No one can doubt the great interest attached to such an undertaking; it remains, however, to be seen whether it is possible to raise the funds necessary for the completion of so gigantic an enterprise.

South America.—In my Address of 1857 I noticed the preliminary account, all that had then appeared, of Lieutenant Page's 'Exploration and Survey of the Rio de la Plata and its Tributaries,' the full Report of which has now been published at the expense of the Government of the United States.

It forms an important contribution to the geography of South America, and may be well classed with the works of his brother-officers, Herndon, Gibbon, and Gilliss, whose travels were also undertaken under the liberal auspices and at the cost of the Government of the United States. The number of positions which have been for the first time determined and brought together by these officers will leave our mapmakers but little excuse for not correcting in the maps of South America the positions of many towns and places of importance, the true sites of which were never before, perhaps, fixed by observation.

The uninterrupted ascent of the Parana by an American steamer through 13 degrees of latitude as high as 19 degrees, fully corroborates the belief, founded on the old Spanish accounts, that the higher waters of this mighty river are navigable for vessels of quite as large a burthen as are requisite for carrying on a commercial intercourse with the rich provinces of Matto Grosso and Cuyaba, in the very heart of the continent. The observations, however, of Lieutenant Page (like those made in the case of the Yang-tse-Keang in China) show how little reliance is to be placed, even from year to year, on the most careful surveys and soundings of a great river liable to such alterations from periodical floodings. He says —"On comparing the charts of Captain Sullivan, made in 1847, with his own surveys made in 1853 and 1854, it appeared not only that the channels but the appearance of the river was in some places materially changed; islands have been enlarged, others reduced in size, some have disappeared altogether, and their positions as marked upon his chart are now, in some instances, the channel of the river." The track of the *Waterwitch*, at the lower pass of St. Juan (in lat. 30° 36′), passes directly over the position of an island marked on Sullivan's charts. This, as Lieutenant Page observes, proves nothing wrong in his surveys, but it is an interesting fact, showing

the remarkable physical changes constantly produced by the action of the currents. The historical portion of Lieutenant Page's book has been drawn up apparently from the best authorities; the work of one of our former Vice-Presidents, Sir Woodbine Parish, having been amongst others very freely used.

I take this opportunity of recording with satisfaction that we have received a translation of Sir Woodbine Parish's work into Spanish, which has been published at Buenos Ayres, containing some later statistics and additional information respecting the interior provinces of La Plata, and collected by order of the local governments. This translation will add to the value of the work as the best book of reference on those countries.

West Indies.

Phosphatic Rocks of the Anguilla Islands.—A curious and important discovery has been made in the Anguilla Islands, which lie to the north of St. Kitts. The captain of an American trader being becalmed off a rock called "Sombrero," which lies between the British possessions of the Anguillas on the east and Anegada on the west, took away certain specimens of the rock, apparently a bone-breccia. On analysis, these proved to be richly impregnated with phosphate of lime, and a cargo subsequently imported was sold at New York at from 3*l.* 10*s.* to 6*l.* 10*s.* per ton, to renovate the worn out soils of Virginia.

Seeing that 30,000 tons of material removed from a little rock in the wide ocean, which no one had cared to claim, had realized 100,000*l.* in the New York market, the inhabitants of the Anguillas were led to believe that some of the detached rocks or "keys," which lie to the north of the chief island, and at no great distance from Sombrero, might be of the same composition as that rock. They accordingly induced the Governor of St. Kitts, Mr.* Hercules Robinson, to transmit specimens for analysis to London. These specimens having been sent to me by my eminent friend Sir William Hooker have been analysed in the laboratory of the School of Mines, and have been found to contain a notable quantity of phosphate of lime. Hence, when they are properly surveyed and opened out, there is every reason to hope, that these rocky islets will afford a supply of renovating material which may render the

* Now Sir Hercules Robinson.—*June* 30, 1859.

British farmer, to a great extent, independent of the guano of Peru.*

AUSTRALIA, TASMANIA, AND NEW ZEALAND.

Journey from Moreton Bay to South Australia.—The recent accessions to our knowledge respecting the interior of Australia have been large. Our medallist, Mr. Augustus Gregory, has performed a most remarkable inland journey from Moreton Bay, in which, though unsuccessful in discovering any relics of Leichhardt and his party (the first object of the expedition), he was enabled to define the nature of the interior of the continent from N.E. to S.W., and to reach Adelaide in South Australia. Taking a north-westerly course to the W.N.W. and N.W., he at first found abundance of green grass, though he fears that in seasons of drought few of the water-holes even at a moderate distance from the colony of Moreton Bay, recently named "Queen's-land," are permanent. Tabular sandstone ridges, basaltic peaks, or finely-timbered valleys succeed; but on passing from the River Nare to the N.N.W., it was found that the drought had been of such long continuance, that the whole of the vegetable surface had been swept away by the wind, leaving the country an absolute desert; a few widely-scattered tufts of grass being the only food discoverable for the support of the horses. When on the route to the N.W., which it is known that Leichhardt had intended to follow, Gregory found that high floods had obliterated all tracks of previous explorers, and that the very districts described by Mitchell as covered by a rich vegetation were parched and barren clays! In lat. 24° 55′, long. 146° 6′, a tree was, however, discovered, on which the letter L was cut, indicating very probably that Leichhardt had encamped there.

Continuing the search towards the north-west, Gregory then encountered tremendously heavy rains, and was entangled among numerous and deep channels and boggy gullies, from which the party was only extricated by extraordinary exertions. Such are the frightful vicissitudes abounding in this low region of alternate flood and drought which separates the fertile hilly country of the east coast from the great interior saline desert. In this region they met with occasional small parties of natives, who, as usual, were shy and

* The richest of the specimens is from the rock or key called the Little Scrub. I have sent an account of these keys and a detailed analysis of the specimens, as prepared in the Government School of Mines, to the Royal Agricultural Society for publication in their volume, and have there expressed a hope that a geological surveyor may be sent to the Anguillas to define the extent and relations of these phosphatic rocks.

treacherous, but easily intimidated. Despite of all impediments and much privation, the adventurers pushed on up Thompson River, through a desolate and arid, red-coloured, sandy country, until they reached lat. 23° 47′, when the total cessation of water and grass put an end to all efforts to penetrate farther to the north-west. Compelled most unwillingly to abandon the principal object of their travels by continuing to follow the route probably taken by Leichhardt, Gregory and his companions then turned to the south-west, and ascertained the nature of the country between his remote position and Kennedy's farthest explorations, proceeding through more southern latitudes to reach the settled country of South Australia. The vicissitudes and privations experienced in this route to the south-east are succinctly related, and the outlines of ground, whether stony desert, plains with low ridges of red drift-sand, or sandstone table-lands, are well defined. Advancing by Cooper Creek, and that branch of it named by Sturt, Strzelecki Creek, the travellers finally reached Adelaide.

Respecting the fate of Leichhardt, Mr. A. Gregory thinks it probable that the adventurous traveller, advancing from the Victoria, was lured on to the north-west by favouring thunder-showers, until, on the cessation of the rains, he was arrested in the parched and waterless tract, and, unable to advance or retreat, he perished in the wilderness.* Gregory also informs us, that west of the meridian of 147° E. long. most of the country is unfit for occupation, until the boundary of the colony of South Australia, or 141° E. long., is reached in more southern parallels.

Our medallist is, indeed, well borne out in saying that the results of his expedition are most important with reference to the physical geography of Australia; for when combined with the researches of Sturt, they seem to demonstrate that, whether as examined from the north-east or south, a very large portion indeed of the interior is a worthless saline desert, very little above the level of the sea.

Explorations westward and north-westward from South Australia.—Whilst the last journey of Augustus Gregory has served to confirm the view established by the researches of Sturt, that a vast interior and sterile low region lies to the north of South Australia, and extends to the higher lands which form the western limits of New South Wales on the east, and to the elevations south of Cambridge Gulf on the north, the surveys set on foot at Adelaide

* My friend the Rev. W. C. Clarke has written able notices in the 'Sydney Morning Herald,' in which he differs in opinion from Mr. A. Gregory as to the track followed by Leichhardt.

have demonstrated that a vast tract of well-watered and fertile lands exists to the north-west of that colony.

The efforts of Mr. Herschel Babbage, to which I last year directed your attention, were for some time unsuccessful, owing to the intensely saline condition of the country through which he had to pass, and the difficulty of transporting the apparatus he had ingeniously contrived for the conversion of salt water into fresh. As soon, however, as the heavy teams and drays were dispensed with, and that, joined by Mr. C. Gregory, riding and pack-horses were substituted, this explorer showed how capable he was of defining with precision a considerable portion of new country in which fresh water was reached. Fixing with accuracy the latitude and longitude of several points, he proved the existence of dry land between the masses of water which had been previously united upon our maps under the name of Lake Torrens, while he defined their outlines, distinguishing the northernmost of them by the name of Lake Gregory.

Various other documents and sketch-maps relating to South Australia, which have been forwarded to the Society by Her Majesty's Colonial Secretary, demonstrate what vigorous exertions have been made by other explorers. Thus, Major Warburton defined large tracts of country north of the Gawler Ranges, *i. e.*, between Streaky Bay on the south-west, and the saline country occupied by Lake Gairdner and its adjacent lagoons. The larger part of this country seems to be incapable of supporting colonists, from the want of fresh water, and its prevalent saline character. This active officer also shows that, in many parts, the saline condition of the surface of the country is due to the existence of saliferous rocks beneath, being in this respect analogous to the saline steppes of Russia. Police trooper Geharty, in a separate tour, proved the extension of lands equally sterile with those explored by Major Warburton, which was to be expected, as the tract lies contiguous to the sterile coast-range of Eyre. To the east of Lakes Torrens and Gregory the explorations of Mr. Samuel Parry and Corporal Burt are worthy of notice; the former having determined several points of latitude and longitude, and having given us information respecting the nature of the rocks which occupy the region intermediate between Lake Torrens and Angepena, near the settled parts of the colony.

In the mean time, whilst Mr. Babbage was occupied with his earlier difficulties, and other explorers were determining the real

condition of the saline tracts lying between 32° 30′ and 31° of latitude, an unaided colonist, Mr. M'Dougall Stuart, a former companion of Sturt, passed rapidly beyond all these saline tracts and discovered a large, well-watered, and more elevated region to the north-west. As soon as he ascertained the existence of a permanent supply of fresh water at Andamoka, in south latitude 30½°, and had thus secured a retreat, he dashed on to the north and north-west, and soon fell in with numerous gum-creeks, containing streams which flowed from hills ranging from south-east to north-west, and further ascertained that large portions of this region were well grassed and admirably adapted for settlement!

The Governor of South Australia, Sir R. G. Macdonnell, states that the extent of this newly discovered available land amounts to from 1200 to 1800 square miles, and has rightly named the principal waterparting, Stuart Range. His Excellency then adds that the House of Assembly of South Australia had presented an address to him, requesting that the necessary steps should be taken for granting Mr. Stuart a fourteen years' lease of 1500 square miles of the new country.

When we look to the fact, that this explorer had, in the first instance, to get through the southern saline desert between the sea and those interior lands—that he was accompanied by one white man, Foster, and a black man only, and that his compass and watch were his only instruments, we cannot too highly applaud his success, and the Council of this Society has, therefore, well judged in awarding to him a gold watch in honour of such highly valuable discoveries.

Not only did Mr. M'Dougall Stuart define the northern portion of this new and fertile region, but before he returned by a most daring and perilous route to the coast on a meridian far to the west of his line of advance, he also ascertained the southern limit of all the available land.

Nothing which I have read of in Australian travel more strikingly displays the bold and undaunted spirit of adventure, than when Mr. Stuart had reached the southern limit of the fresh-watered country, and ascended a hill near Mount Espy to look southward over the country between him and the sea, he descried nothing but a vast saline desert through which (his provisions being almost exhausted) he must pass. Nothing daunted by that dismal prospect, or the great privations he would have to suffer, he regained the seashore, and travelling along it, once more found

himself on the threshold of colonization. From the 7th of August, when he entered on this desert country, he and his companion Foster had to suffer from hunger and thirst during a fortnight before they reached the settlement of Mr. Gibson, in Streaky Bay. There, both the explorers nearly died, in consequence of the sudden change from a state of want to good diet. Recovering, however, they reached the regularly settled districts of the colony, and were hailed with acclamation in Adelaide.

Now, had the brave M'Dougall Stuart perished like Leichhardt in this last dreadful march to the sea-bord, all notion of a well-watered, rich interior country on the north-west might have been for ages unknown, and his success being ignored, his fate would have checked all further enterprise in that direction.

Whilst it is pleasing to reflect on this happy result, it is also well to know, that the newly discovered fertile lands may be approached from the settled and central portions of the colony without touching upon any part of the sterile saline coast-tract. For, as above said, it has been ascertained that the Lake Torrens of earlier days is divided into at least two bodies of water, and that the mass of land dividing them, which has since been traversed, may serve as the line of route to Stuart Range.

Through the researches of the Government surveyor, Mr. Samuel Parry, and of Corporal Burt, as well as by a return journey of Major Warburton, it has also been ascertained that practicable routes exist from Angepena, on the north-west of the settled country of Adelaide, to the region of Lake Torrens, by which (there being a sufficiency of water-holes) a communication may, it is hoped, be maintained between the settled districts and the new country.

At the same time this discovery of the local waterparting of Stuart Range must not be supposed to clash with the clear determinations of Sturt, that the great mass of the continent directly to the north of Victoria and South Australia is a vast saline depression. In fact the fresh waters descend from the Stuart Range on the north-east into that great sterile depression, and are there absorbed or evaporated. As far, therefore, as our present knowledge goes, we learn that the hilly grounds of Stuart Range, extending from south-east to north-west, constitute a zone of no great width, which pours off its waters both to the north-east and south-west into lower and saline deserts.

Navigation of the Murray, Murrumbidgee, &c.—Whilst such have been the discoveries of travellers overland, an object of paramount im-

portance to Australia has been accomplished by water. The opening of the river Murray to navigation was first accomplished by Captain Francis Cadell, in 1853, as narrated by that enterprising seaman in a letter published in volume xxv. of our Journal. Steadily persevering, with augmented resources and additional steamers, the same individual and other parties have been recently plying on this river from its mouth, near Adelaide, in South Australia, to Albury, a distance of nearly 1800 miles. The channel of the Wakool has also been tested for 50 miles, and Captain Cadell has passed up the Murrumbidgee in a steamboat for 800 miles! Thus, a region in which six years ago no internal traffic existed, has been opened out to water carriage over a distance of 2650 miles, it being estimated that 1150 miles more may eventually be accomplished in the rivers Wakool, Edward, and Darling. The Murray and Murrumbidgee are now ascertained to be navigable from May to the end of December in every year, and for the whole twelve months in those years when more than the average amount of snow and rain falls in the Alpine country in which they take their rise. The Darling, not having its sources in mountains of such altitude, cannot be similarly reckoned upon, though probably it might also be rendered navigable in ordinary seasons if the drift timber, which at present encumbers it, were removed. Referring my readers to the clear and searching Report of a Committee on the navigation of the Murray and its affluents, printed by order of the Legislative Assembly of New South Wales (29th Oct., 1858), as signed by its chairman, that good explorer, Mr. George Macleay, and brought to my notice by my friend Mr. Stuart Donaldson, also one of the Committee,* it is enough for me to cull from that able document the astounding fact, that twenty towns, some of them of considerable size, such as Albury, Deniliquin, Gundagai, Tumut, and Wagga-Wagga, have been called into existence, and that seven more are about to be proclaimed. Already, 71,000 acres of land in this vicinity have been sold; and if, by Artesian borings, fresh water should be obtained in the vast salt-bush countries yet unoccupied, prodigious additional quantities of sheep and cattle may be supported in the adjacent regions.

Descending from the lofty Australian Alps of Strzelecki (Mount Kosciusko), the Murray traverses tracts, some of which, as well as portions of the basin of the Murrumbidgee, have been ascertained by

* Recently Minister of Finance of that colony.

my friend the Rev. J. M. Clarke to be highly auriferous, and in other respects also metalliferous. One of these gold tracts, Adelong, has indeed already been reached within 16 miles by one of the steamers. When we consider that this internal water carriage is already very serviceable for a vast distance to the colony of South Australia, in which the Murray debouches; that higher up the same stream is contiguous to the rich gold-bearing and rapidly rising tracts of the northern parts of Victoria; and that, out of the 1800 miles now proved to be navigable, 1300 lie within the territory of New South Wales, we must rejoice in the reflection that British industry and science have brought into activity a line of intercourse and traffic which must for ever unite in mutual interest the three largest of our Australian colonies.

Again requesting you to consult the well-considered and effective Report of the Committee, appointed by the Legislative Assembly of New South Wales, for the large and statesmanlike views which it embodies, I also specially commend to your notice the clear descriptions given in it by various colonists of the physical condition of the interior, the peculiarities and changes of the rivers, and the very ingenious and effective method employed by Captain Cadell of clearing away those masses of drift timber which formerly impeded navigation. Considerable additional expenditure will, indeed, be required to complete this grand operation of extracting the "snags;" but, looking to the spirit with which the Murray has been cleared for 700 miles, there can be little doubt of the ultimate result, and that in a few years, to use the words of the Committee, "the cheap transmission of the comforts and conveniences heretofore unattainable will give a fixed and civilized character to the society of vast pastoral districts, which has up to the present time been comparatively rude and nomadic."

New Zealand.—Among the good results of the scientific voyage round the world of the Austrian frigate *Novara*, under the command of Commodore Willenstorf, we have now before us a report of Dr. Hochstetter, the geologist of the party, on the coal of New Zealand. Although this coal is of tertiary age, as seen in the districts of Papakura and Drury, in the province of Auckland, it is stated to be abundant, and of such good quality as to be of great importance both for steam navigation and manufacturing purposes.*

As all the geological details will be laid before the Imperial and

* *See* 'New Zealand Gazette,' January 1859, for the Report of Dr. Hochstetter communicated by the Governor, Thomas Gore Browne, and transmitted to the Royal Geographical Society by Sir E. B. Lytton.

Royal Geological Institute of Austria by my accomplished friend Dr. Hochstetter as soon as the men of science reach their native land, I rejoiced when I heard that the Emperor Louis Napoleon had given orders that the vessel freighted with such large collections and so much knowledge should not be interfered with by any French cruisers on her way home. I formerly spoke of my anticipations of the successful issue of this scientific voyage, and having recommended these Austrian explorers to the goodwill of Sir W. Denison, the Governor-General of East Australia, it was most satisfactory to learn that his Excellency had been enabled to assist them materially; whilst on their part they have well repaid the kindness shown to them by giving us the first reliable sketch which has been sent home of the true nature of the coal formations of New Zealand.

Tasmania.—Hitherto we have not yet been made sufficiently acquainted with the physical geography and natural history of this large colony. In former years, my valued friend the late Sir John Franklin, when Governor, strove hard to set on foot various scientific inquiries, and of late years the Tasmanian Society has published some good memoirs on various scientific subjects. Recently, however, the Local Government having resolved to have the whole island correctly surveyed by a competent geologist, Her Majesty's Secretary of the Colonies applied to me to recommend a proper person, and Mr. Charles Gould, formerly a distinguished student of the Government School of Mines, has, in consequence, been appointed geological surveyor of this important and little explored region. Whether we look to the correct delineation of the coal deposits which are already known to exist there, to the discovery of gold, or to the general advancement of science, I feel certain that the researches of Mr. C. Gould (son of the eminent ornithologist) will prove of signal value to the colony, and be well appreciated in the mother country.

General Observations on the Australian Colonies.—A project for the establishment of a system of observation in various branches of natural history sciences throughout the British Colonies, and of publishing the same, has been transmitted by the enlightened Governor-General of New South Wales to Her Majesty's Secretary for the Colonies, who has submitted the plan to the consideration of the Council of this Society.*

* The project has been also submitted to the President and Council of the Royal Society, who, as well as the Council of the Royal Geographical Society and myself, have reported favourably upon the scheme.—*July* 1, 1859.

Being much impressed with the value of the publications on the structure and natural history of the several states of North America, and particularly by a work in 22 volumes on the State of Chile, of which 16 are devoted to the zoology and botany of that country (the portion on geology being still in progress), Sir William Denison has suggested that works on a similar plan, descriptive of the natural history of the British colonial empire, should be set on foot.

Agreeing with Sir W. Denison that such an undertaking is well worthy of the nation whose offshoots have taken root so extensively, I trust that due encouragement will be given to the proposal, and that it may not be checked by the difficulties which at first sight present themselves in bringing it into an effective working state. Sir William feels certain that the different colonies, if called upon, would gladly contribute largely to the work, whilst he looks to the Imperial Government to take upon itself the task of arranging and publishing these contributions upon one uniform system.

The practicability of realizing some such plan as this for our Australian colonies, is illustrated in part by the mode of publication proposed of the geological survey of Trinidad and other West India Islands, to which I have alluded. Works like these, the cost of which is to be divided between the colony and the mother country, must tend to unite by closer bonds all parts of our empire. The practical difficulties will lie first in the selection of persons competent to execute the task, and, next, to organise such a home staff as may efficiently carry the publications through the press.

In reference to Australia, it may indeed be said that parts of the scheme of Sir W. Denison are already advanced. Thus, it is certain that there are few animals or plants of New South Wales which are not known to the eminent naturalists Mr. W. Macleay, and Dr. John Bennett, who reside at Sydney; whilst the geology of large tracts has been accurately laid down since those days when Strzelecki first opened out to us its structure, by Clarke, Jukes, Stuchbury, and others.

Again, from Victoria, now under the enlightened auspices of Sir H. Barkly, we are constantly receiving proofs of the zeal and ability with which Mr. A. Selwyn is describing and laying down accurately upon maps the geological features of that rich auriferous

region; whilst Dr. Mueller, on whose shoulders as an Australian botanist has fallen the mantle of Robert Brown, is continually issuing new works on the plants of the continent, whether those which he collected in tropical or northern Australia, when he was the companion of Gregory, or those of Victoria.

These, then, are excellent materials, ready to be used in the publication of the Opus Magnum of our colonial empire which is projected by Sir W. Denison. Let us hope, therefore, that the Old Country may willingly respond to this demand for knowledge made by her children in the colonies. Let us follow the admirable example in this respect set to us by our kinsmen in the United States as well as by our fellow countrymen in Canada, where the publications on geography and geology have already demonstrated how much can be done by the hearty goodwill of the several states of the American Union and by one great colony of the British empire.

Before, however, I quit the consideration of Australia and the adjacent lands, let me remind you of the endeavour which I made as early as the year 1844 (see Address, vol. xiv. p. xcvii) to rouse the attention of the public to the necessity of keeping up the establishment we then possessed at Port Essington, whether as a port of refuge for our merchantmen in peace, or as a roadstead during war, in which a fleet could assemble, to protect the northern and eastern coasts of this vast continent. In the absence of such, it was clear that an enemy might sweep the eastern archipelago on the one side, or attack the slightly protected colony of New South Wales on the other.

In the mean time, although we have long ago abandoned the solitary station of Port Essington on the north coast of Australia—contrary to the entreaty of that excellent naval officer the late Sir Gordon Bremer and his associates now living, Captains Stokes and Drury, as well as in the face of a protest on the part of this Society—not only has no substitute for it been obtained by occupying Cape York or any other station, but we seem to have been heedless of the efforts made in the interim by the French to establish other ports in these seas, and to fill them with a naval force. Thus, whilst the picture of New Caledonia, as discovered by Captain Cook, still hangs in the rooms of the First Lord of our Admiralty, that great island has been taken possession of by the French, and is now their "Nouvelle Calédonie." Now, if our allies (and may

they long continue such) were merely occupying these islands for purposes of trade and commerce, little notice might be taken of the event; but when it is known that they possess in those seas and bays a much larger force of ships of war than Britain, the prospect is, I am bound to say, unsatisfactory as regards the long undefended coast-line of Eastern and Southern Australia.

In vain has your old President insisted on this point for many years, in virtue of the advice of naval officers of experience in those seas, on whose opinion he could rely; but he trusts that a sufficient naval protection of Australia—no less than of the British isles—will now seriously occupy the attention of the Government, the Parliament, and the country.

Conclusion.

Entreating your pardon, Gentlemen, for the many imperfections in the preceding sketch of the progress of geographical science during the past year, I will now conclude with a few general remarks connected with the immediate interests of the body over which I have the honour to preside.

Our twenty-eighth volume, edited by Dr. Shaw, shortly to be issued, contains memoirs of high interest, which will fully sustain the reputation we had acquired; and our Proceedings, containing records of the conversations which followed the reading of the various memoirs, have in the mean time put our absent and travelling associates in possession of the zest with which our affairs are carried on.

Whilst a true "*esprit du corps*" has animated us on all occasions, never did it shine forth in a manner so congenial to my feelings as when the mass of the Society rose to bid farewell to my dear friend Livingstone, and at a few days' notice filled to repletion the largest festive hall of this metropolis to wish all success to the undaunted traveller who was about to reexplore the interior of South Africa.

So steadily have our numbers augmented, that although the Society seemed to have reached its climax last year, when I spoke of its having rapidly increased from 600 to nearly 1100 members, I have now the happiness to know that it actually possesses 1200 members, a number far exceeding that of any other scientific body in London.

Looking to the composition of this body, I rejoice to observe that it is made up of men of so influential and yet of such very different classes and walks in life as to ensure a long continuation

of prosperity. In addition to the efforts of geographers, including eminent astronomers and physical philosophers, as well as ardent explorers of distant lands, this Association also flourishes through the good will and hearty support of statesmen, members of both Houses of Parliament, officers of the army and navy, residents in our colonies, and the merchant-traders of this great metropolis. All these, as well as many proprietors and professional gentlemen, take a deep interest in our progress, because they see and feel that in the diffusion of fresh knowledge, and in grappling with questions of physical geography, natural history, and the productions of distant countries, we are continually advancing the material interests of the nation.

It is for such reasons that the Secretaries of the Foreign and Colonial Departments, as well as the Board of Admiralty, never fail to supply us with materials which sustain the interest and character of our evening meetings.

Considering that a larger number of votaries attend these assemblies than those of any other scientific Society, the only drawback which seems to weigh upon us at the present moment is the difficulty of obtaining a meeting-room capacious enough to receive our great numbers. For the last two years the Council of the Royal Society and the Senate of the University of London have kindly permitted us to hold our meetings in the great hall at Burlington House; but if that room and all the beautiful adjacent buildings are to be removed in order to give place to colossal edifices, in which the cultivators of art and science are to have their meeting-places, galleries, and museums, let us confidently hope that a Society so useful and so popular as our own will receive some share of the patronage of the Government.

Let my associates be assured that their President has been quite awake on a subject so important to their interests. Ample care has been taken that the Council should not lose a moment in memorializing the Government and in strongly urging our just claims; but up to the present time no assurance has been obtained that we shall be provided with apartments on the site of Burlington House, and thus be affiliated, as I ardently wished, with the Royal, Chemical, Linnean, and Geological Societies.*

* In issuing this Address I have the satisfaction to announce that the President and Council of the Royal Society have, on my application, consented to continue to the Royal Geographical Society the use of the Great Hall in Burlington House for the meetings of the ensuing Session.—*July* 15.

I must here express my sincere satisfaction, that one of the results to which I have looked with deep interest for many years has been attained since I last addressed you. We have obtained a Royal Charter, which secures to us all those claims upon the State to which our works had already well entitled us; and, as we are now placed in precisely the same public condition as any of the older scientific Societies of the metropolis, it enables me with truth to take leave of my dear friends, as the really good "Fellows of the Royal Geographical Society." The use of my name as your President in this Royal Charter will indeed be to me a source of pleasing reflection through life, whilst it will acquaint those who follow us that I have been bound up with your rise and progress.

Lastly, as the moment has now arrived when, in accordance with our rules, it is my duty to bid you farewell in the capacity of President, let me assure you that I should do so with infinite pain, if the act were to be accompanied by any severance of those ties of reciprocal esteem and affection which I am proud to say have united us in close relationship during many years. Believe me, that in whatever post I may be placed, my heart is too firmly fixed in the prosperity of this Society not to strain every nerve to aid its advancement. I shall, indeed, ever look back with the truest satisfaction to the happy days I have passed among you, and shall never cease to be grateful for the warm support you have invariably afforded me when occupying this chair; thus securing that unanimity and cordiality with which we have all pulled together.

As our meetings are now so numerously attended, and partake so essentially of a popular character, I deem it most fortunate that at this stage of our progress we have been enabled to secure the services of the Earl of Ripon, the son of our first President, who, inheriting the engaging manners and enlightened purposes of his parent, has already shown, both in the Senate and amid large bodies of his countrymen, that he possesses all the qualities which will enable him to maintain our Society in harmonious action. At the same time I also feel confident, that with his attainments and liberal views, he will essentially promote the higher objects of our science.

In handing over to his care the interests of a body so dear to me, you must permit me to say, that as every Roman citizen who had more than once served as Consul was assured that a notice of this

honour would be inscribed upon his monument, so do I hope, that those who survive me will not fail to have engraved on my tombstone the record of which I may well be proud—that by the goodwill of my associates I served for twenty-seven years as a Member of their Council, and was during seven of those years the President of the Royal Geographical Society.