ADDRESS

TO

THE ROYAL GEOGRAPHICAL SOCIETY.

Delivered at the Anniversary Meeting on the 27th May, 1867.

By Sir Roderick Impey Murchison, Bart., K.C.B.,

PRESIDENT.

Gentlemen,

I meet you with the satisfactory announcement that great as was the number of our members at the last anniversary, it has since then considerably increased, and now amounts to 2120 Fellows.

I have also the satisfaction of reminding you that, thanks to the zealous and efficient services of our Assistant Secretary, Mr. Bates, the well-filled volume of the year has been, like the last, for some time in your hands.

The general observations on the progress of Geography which I shall lay before you in the following Address will, as usual, be preceded by brief notices of those of our deceased associates who have taken any part in geographical researches or publications, as well as by a review of the Admiralty Surveys prepared by Capt. Richards, the Hydrographer.

OBITUARY.

In justice to an eminent geographer who has been taken from us, I begin the sad record (much less heavy, however, than that of last year), with a notice of the career of

Sir George Everest.—This distinguished Indian surveyor and geographer was the son of Tristram Everest, Esq., of Gwernvale, Brecon, and was born on the 4th July, 1790. He began his scientific education at Marlow and completed it at Woolwich, where he passed a brilliant examination, and was declared fit for a commission at an earlier age than the limit fixed by the regula-

tions. Sailing for Bengal as an artillery cadet in 1806, the first important service in which he was engaged was in executing a reconnaissance survey of the Island of Java, for which duty he was selected by the famous Sir Stamford Raffles, during the occupation of the island by the British from 1814 to 1816. During this period Everest gained the friendship of our honoured associate Mr. John Crawfurd, who, happily, is still amongst us, after a distinguished career in the East, particularly in connexion with the Malay Archipelago.

On his return to Bengal, Everest was employed by the Government in various engineering works, particularly in the establishment of a telegraph system between Calcutta and Benares. It was not long, however, before he entered upon a service of more immediate connexion with Geographical science; for in 1818 he was appointed chief assistant to Colonel Lambton, the founder of the Great Trigonometrical Survey of India. It will not be considered out of place here, if I mention that this colossal undertaking owes its origin to the late Duke of Wellington, who recommended it and gave it his cordial support, selecting Colonel Lambton to carry it out. How much an accurate survey was needed was shown by the earlier results of the operations, an error of 40 miles being detected in the breadth of the peninsula as previously laid down.

Captain Everest was first employed in the triangulation of the eastern part of the Nizam's dominions, where the unhealthy climate and close application to his duties so affected his health that he was ordered to the Cape of Good Hope to recruit. He did not, however, remain idle, for he employed his leisure in investigating the circumstances appertaining to the Abbé de la Caillé's arc, and his researches formed the subject of a paper, published in the first volume of the 'Transactions of the Astronomical Society.'

On the death of Colonel Lambton, in 1823, Captain Everest succeeded to the vacant post of Superintendent of the great Survey. He applied himself with such unremitting ardour to the extension of the great arc series of measurements, that his health again gave way, and he was obliged to seek rest and change for a time in England.

In 1830 he returned to India, provided, by the liberality of the Court of Directors, with an equipment of geodetical instruments and apparatus for the continuance of the survey, in the construction of which the most skilful makers had been employed. He had made himself acquainted during his visit with the English Ordnance

Survey system, and with every modern improvement in geodetical matters that had taken place in Europe. Thus provided, and in the prime of life, Colonel Everest returned to his great task. In addition to the duties of Superintendent of the Trigonometrical Survey, he had now to perform those of Surveyor-General of India, to which office he had been appointed by the Court of Directors; a union of offices which vastly increased his labours.

Between the years 1832 and 1841 the measurements of the great arc were carried on, and in December of the latter year closed by the completion of the Beder base-line, a work accomplished by his chief assistant, Captain (now Sir Andrew Scott) Waugh. The whole Indian arc from Cape Comorin to the Himalayas was thus completed. These elaborate operations were fully detailed in Colonel Everest's work on the 'Measurement of two Sections of the Meridional Arc of India,' published in two quarto volumes in 1847; a work which gained for its author a high reputation.

In summing up the labours of Sir George Everest I cannot do better than quote the expressive words used when the Asiatic Society of Bengal nominated him an Honorary Member. "Of the many works executed under Colonel Everest's direction, the most important, and that by which he will be best known to posterity, is the northern portion of the great Meridional Arc of India, $11\frac{1}{2}^{\circ}$ in length. No geodetic measure in any part of the world surpasses, or perhaps equals, in accuracy this splendid achievement. By the light it throws on researches into the figure and dimensions of the earth, it forms one of the most valuable contributions to that branch of science which we possess, whilst, at the same time, it constitutes a foundation for the geography of Northern India, the integrity of which must for ever stand unquestioned. Colonel Everest reduced the whole system of the Great Trigonometrical Survey of India to order, and established the fixed basis on which the geography of India now rests."

After Sir George Everest's departure from India in December, 1843, and retirement from the service, his successor, Sir Andrew Scott Waugh, took an opportunity of paying a well-deserved compliment to his former commanding officer, by naming after him the highest mountain measured in the Himalayas—namely, Mount Everest, whose height is 29,002 feet.

At the conclusion of his active career in India, and on settling in England, it was quite natural that all scientific Societies should have wished to do honour to such a man. He therefore naturally became

a Fellow of the Royal Society, an active supporter of the Royal Institution, but especially was he appreciated by Geographers, inasmuch as he was for many years one of our most honoured associates in the Council of this Society, and one of the most distinguished scientific Geographers who ever held the office of Vice-President.

Professor Henry ROGERS was a distinguished Geologist of the United States, who for the last years of his life became quite naturalised among us, and was indeed Professor of Natural History in the University of Glasgow at the time of his death.

His chief work, entitled 'The Geology of Pennsylvania, with a General View of the Geology of the United States,' in 3 vols. 4to., was illustrated by so well-defined a map of the whole region of the United States, that even in this Society his name must be ever mentioned with respect.

Besides the delineation of the boundaries of all the principal geological formations in the States, his sections are most ably drawn in showing how the strata of the Apalachian chain have been folded over and over, and how the whole have been violently affected, and in many cases reversed in their order, particularly in contact with igneous and metamorphic rocks of the eastern seaboard.

The Rev. George Cecil RENOUARD, Rector of Swanscombe, near Rochester, who died on the 15th February last, in his eighty-seventh year, was one of the oldest Fellows of our Society, and during ten years (1836 to 1846) acted most efficiently and zealously as Foreign Secretary. In early life, after leaving Cambridge, he fulfilled the duties of Chaplain to the British Embassy at Constantinople; and, after an interval in England, went back to Turkey as Chaplain to the Factor at Smyrna, which appointment he held to 1814. On returning to Cambridge, he was elected Professor of Arabic in that University. His acquaintance with the geography and languages of the East rendered him a most leading and useful member of the Asiatic and Geographical as also of the Syro-Egyptian and Numismatic Societies.

In regard to his incessant labours to correct and improve all the publications in our volumes which related to Comparative Geography, or to Asiatic and African subjects, I can bear full testimony that this good and learned man laboured successfully for others in the advancement of knowledge, without looking for praise or endeavouring to gain any reputation for himself. As an editor his per-

spicuity was invaluable, as shown by all the papers on classical or critical Geography which passed through his hands.

His kindly manners and true modesty endeared him to every one of the Council with whom he acted, and when he spoke on any moot point, he was as logical in his deductions as he was accurate in his facts.

An excellent parish priest, he united the utmost purity of life with a simple and guileless nature, chastened by a feeling of reverence as deep as it was real; for, disliking metaphysics, he always maintained that Faith has its own high region whither Reason cannot follow it.

Sir STUART DONALDSON, who died on the 11th of January, 1867, was brought up to commercial pursuits, his brother the late Dr. Donaldson, Head Master of the School at Bury St. Edmunds, having been one of the most accomplished scholars of our day. At an early age he went to Mexico, where he remained some years, and acquired a knowledge of the Spanish language, which he spoke with fluency. About the year 1830 he went to Australia, and was engaged at Sydney as a merchant for many years.

On the establishment of Representative Institutions in the colony he became a Member of the Legislature, in which, being a ready and successful speaker, he took a prominent place. When responsible Government was set up in the Australian Colonies (1856) he became Colonial Treasurer, and on his return to England, in 1859, he received the honour of knighthood. Among his good deeds he is to be remembered as one of the original Members of the Senate of the University of Sydney, in the foundation and conduct of which he took, as I am informed by Sir Charles Nicholson, a very important part, as well as in other colonial establishments.

When he came among us here, we who knew him became soon attached to him, for his warm, cheerful, and genial manner; whilst at our convivial parties his fluency and energy as a speaker will be always remembered. In short, both in Australia and at home, this open-hearted, generous man has left many friends to deplore his loss in the prime of life, and when he was striving to obtain a seat in the British Parliament.

It is not within my province to endeavour to do justice to the various claims which many other deceased Fellows have unquestionably had to public recognition, irrespective of geographical science and researches. A mere enumeration, however, of the names of

those who have been taken from us, many of whom were of high reputation in other spheres, will indicate how well the Royal Geographical Society is supported by men of all classes in the British dominions. In this melancholy list are the following:—The Marquis of Camden, K.G., D.C.L., one of our original members; the second Marquis of Lansdowne, son of our much lamented Founder; Lord Northbrook, well known as Sir Francis Baring, M.P., who, when First Lord of the Admiralty, was a good supporter of Arctic exploration and Lady Franklin's efforts; Mr. T. Alcock, formerly M.P.; Mr. Joseph Beldam; Mr. Charles Bathoe; Captain John Chapman, R.A.; Mr. Daniel Clark; Mr. John Dobie, R.N.; Mr. George Dollond; Mr. Peter Dickson; Sir Alexander P. Gordon-Cumming, Bart., of Altyre; Mr. J. Gilchrist; Mr. Charles Pascoe Grenfell, many years M.P.; Mr. Robert Carr Glynn; Major J. F. Napier Hewett; Mr. Jacob Herbert; the Rev. C. Hudson, the ardent Alpine explorer, who lost his life on the Matterhorn; Mr. F. S. Homfray; Mr. R. Hanbury, M.P.; Captain Clement Johnson; Commander Jones-Byrom, R.N.; General Sir Harry Jones, G.C.B., a highly-distinguished officer of Engineers, and lately Governor of the Royal Military College; Mr. C. H. C. Plowden; Mr. Thomas Phinn, Q.C., formerly M.P., and latterly Judge-Advocate of the Fleet, and Councillor of the Board of Admiralty; Major Patrick Stewart, distinguished for his engineering services under Lord Clyde in the Indian war, and also in the laying down of the great telegraphic line through Persia to Hindostan; Mr. J. F. Pike Scrivener; Mr. H. S. Dazley Smith; the Rev. W. Brownrigg Smith, M.A.; Mr. John Stewart; Mr. Alexander Trotter, the brother of the lamented explorer of the Niger; Mr. John Taylor; Mr. Thomas Vardon; Mr. C. Willich; and the Right Hon. John Wynne.

Admiralty Surveys.*—The Admiralty Surveys both at home and abroad have been carried out during the past year with energy and success, and the results compare favourably with those of any preceding year. The following sketch will convey an idea as to how the force has been distributed, and the amount of work which has been accomplished.

Coasts of the United Kingdom.—Captain E. J. Bedford, with his three assistants in the *Lightning*, have been employed in the Bristol Channel. They have completed a new Survey of Cardiff Roads and

* By the Hydrographer, Captain G. H. Richards, R.N.

its approaches on a scale of four inches to the nautical mile, and have done much towards correcting the Chart of the upper portion of the Channel in the vicinity of the Welch Grounds, where great changes had been found to have taken place since the Surveys of 1847-9. This work is still in progress.

Staff-Commander E. K. Calver, with his two assistants in the *Porcupine*, has been employed in making a minute examination of the eastern coasts of the United Kingdom, with a view to correcting the charts and revising the Sailing Directions to meet the constant changes which are occurring on these shores. Five hundred and thirty miles of coast between Cape Wrath, the north-westernmost point of Scotland, and the River Humber, have been so examined, and the entrances of the rivers Tay, Blyth, Tees, and Humber, where very considerable changes were found to have taken place, have been entirely re-surveyed. During the progress of this work a dangerous sunken ledge off Tarbet Ness—the promontory which separates the Dornoch Firth from the Bay of Cromarty—has been discovered and placed on the charts.

Channel Islands.—Staff-Commander John Richards, with one assistant, has completed the coast-line of the Island of Jersey, and has constructed on a large scale a plan of St. Helier's Bay, to enable the island authorities to improve and extend their present limited harbour accommodation.

The exceptionally rocky nature of the shores of the Channel Islands, the many off-lying dangers, the strength of the tides, and the general intricacy of the navigation, render the progress of this important survey necessarily slow, and much remains to be done before we can supply a complete and satisfactory chart of the whole group with their approaches. Surveys of most of the islands, however, are already separately published.

Portsmouth.—A small party with a steam launch has been employed on the Bar, Spithead, and its neighbourhood, during the past year. The deepening of the entrance by artificial means, and the numerous works in progress, have rendered it necessary that a constant watch should be kept to detect the least changes which may possibly take place. Commander Brooker, in conjunction with Mr. Hall, Master R.N., which latter officer succeeded in August last to the charge of the survey, has made a minute examination of the Bar on a scale of 60 inches to the mile; and it is satisfactory to find that the extra depth of between 6 and 7 feet water, which was obtained by dredging two years since, is fully maintained.

Foreign Surveys. — *Mediterranean.* — The *Hydra*, under Captain Shortland, has been employed during the past season in making a new survey of the Malta Channel, which has involved a minute triangulation of the south and east coasts of Sicily, the accurate determination of the various shoals, with elaborate soundings. This work is still in progress, and it is hoped will be completed during the present year.

China Sea.—This Survey which is under the charge of Mr. J. W. Reed, Master R.N., in the *Rifleman*, extends from the Equator to the parallel of Hong-Kong, including the various passages southward and eastward of Singapore, together with the main and Palawan routes. The whole region is encumbered with innumerable reefs and shoals, and although very much has been done towards determining their true positions, by the many eminent Surveyors who have been for years employed by the Admiralty on this service, no less important to all maritime nations than to Great Britain, much still remains to be completed before we can consider the routes to China free from danger.

Mr. Reed and his officers have been profitably employed during the past year in examining the reefs and shoals in the main route. They have surveyed the St. Esprit Shoal, between the Paracels and Hong-Kong, the Fiery Cross or Investigator Reef off the North-west Coast of Borneo, and determined the true positions, or expunged from the Chart those of many other hitherto doubtful dangers.

North China and Japan.—It was stated in our last Annual Report that the *Swallow*, employed for four years on this Survey, was on her way to England, and was to be relieved by another vessel. The *Sylvia*, under Commander Brooker, has since left England on this duty. The Survey comprises a very extensive field of new, or, at any rate, little known ground, towards which trade is now rapidly advancing.

The labours of the Surveyor have always been, and always must be, the precursor of Commerce; and Japan, Formosa, the Korea—the islands of the Eastern Archipelago—will long afford scope for his energy and talent. The vast Empire of Japan, indeed, has the outline of its shores fairly represented on our Charts upon the authority of its own ingenious geographers, and its principal ports to which we are at present admitted have been surveyed by ourselves; but there is still a void which the annual record of disasters too clearly confirms, and which, if ancient custom is adhered to, it will

remain for us to fill up. As to the Korea, it is at present almost a sealed book.

The *Serpent*, a ship of war under the orders of the Commander-in-Chief in China, commanded by an able surveying officer, Commander Bullock, performs also the duties of an auxiliary surveying vessel when necessary, or the exigencies of the service will admit; and many valuable contributions to the hydrography of the China Seas have been received from Commander Bullock, more especially connected with the coasts of Japan.

Straits of Magellan.—It was also stated in our last report that in withdrawing the second vessel from the Mediterranean Survey now approaching completion, it was the intention of the Admiralty—considering the importance of this Strait as a line of steam communication between the Atlantic and Pacific Oceans, and the comparatively little that was known of those extensive channels leading northwards into the Gulf of Peñas from its western entrance—to undertake a thorough examination of this region. The *Nassau*, commanded by Captain Mayne, sailed accordingly from England on this service in the fall of the past year, and, from our latest information, had commenced her work under favourable circumstances and with the cheerful co-operation of the Chilian Government.

West Indies.—This Survey, which is carried on by hired vessels and boats, has been in abeyance during the last year, owing to the officers who had been many years employed on it having returned to England. It has, however, been resumed under its former commanding officer Mr. Parsons, Master R.N., who, with two assistants, now commence the Surveys of Barbadoes and Montserrat.

Bermuda.—A small surveying party under Mr. Langdon, Master R.N., has been for some time engaged in sounding the various channels between the reefs of this group, the increased draught of water of our ships rendering diving operations occasionally necessary to remove coral patches.

The *Gannet*, a ship of war on the West India Station, commanded by an experienced surveying officer, Commander Chimmo, is also engaged in surveying operations, when other duties will permit. Commander Chimmo has, during the past season, completed the survey of the Gulf of Paria and other portions of the Island of Trinidad, and made large plans of the entrance known as the "Serpent's Mouth," and the anchorage of San Fernando.

The *Gannet*, and gunboat *Minstrel*, under Commander Chimmo,

assisted by Mr. Scarnell, Master R.N., have completed the soundings of the Bay of Fundy, and thus brought to a close the survey of Nova Scotia.

Newfoundland.—This survey, under Mr. J. H. Kerr, Master R.N., and carried on in a hired vessel, has made steady progress during the last year. Mr. Kerr and his assistants also rendered essential service to the expedition which laid the Atlantic cable of 1866, by buoying the course of the cable, and by piloting and assisting with their local knowledge the squadron which assembled in Trinity Bay on that occasion.

British Columbia.—Mr. Pender, Master R.N., in charge of this survey, with two assistants, has been employed during the past year, with a hired vessel, in surveying the intricate and hitherto little known channels between the north end of Vancouver Island and the northern boundary of the British possessions, in 54° 40′ N. lat., and has made good progress with this work; he has also surveyed the bar and harbour at the eastern entrance of the Skiddegate Channel in Queen Charlotte Island, as well as made plans of several useful anchorages, not before known, on the shore of the mainland. The bar at the entrance of the Fraser River has also been re-surveyed, in consequence of material changes which had occurred in the depth and direction of the channel.

Cape of Good Hope.—The survey of the shores of this Colony has rapidly advanced towards completion under Staff-Commander Stanton, during the past year; and, with the assistance of H.M.S. *Rapid*, Commander Stubbs, afforded him by Commodore Caldwell, the soundings between Storm River and Cape Reciffe have been satisfactorily completed.

Colonial Surveys.—*Victoria.*—Captain Cox having retired from the charge of this survey, after a long and useful service of more than thirty years in the surveying branch of the profession, has been succeeded by Commander Wilkinson, who, with his assistants during the past year, has made considerable progress in the survey of the exposed outer coast of this part of Australia—having completed from Port Phillip westward to within a league of Cape Otway. The Government of Victoria have wisely placed the Colonial steamer *Victoria* at Commander Wilkinson's disposal for this duty during the last few months, the advantage of which over the former system of working in a small sailing-vessel is apparent in the increased progress of the survey; and should it be found practicable to continue this advantage to the surveying officers, we may expect at no distant

time to have the whole seaboard of this colony completely and satisfactorily surveyed.

New South Wales.—Captain Sidney, in charge of this survey, has, with his two assistants, made very good progress during the past year. The coast between Sydney and Port Stephens, a distance of 86 miles, has been very carefully examined and charted. A re-survey of the harbour of Newcastle, rendered necessary by the changes in the banks and channels, has also been made, and the harbour of Port Stephens has likewise been completed.

Queensland.—The progress of the regular survey of the coasts of this colony has been somewhat interrupted, owing to changes among the officers; Staff-Commander Jeffery has retired from the charge of the survey, and his assistant been transferred to another colony. Mr. Bedwell, Master R.N., has succeeded to the charge, and without any assistant has completed 60 miles of the shores of Moreton Bay, and sounded over 180 square miles of ground.

Any loss of time, however, which has been sustained through the causes above named has been more than compensated for by the energy and ability of Commander Nares, of the *Salamander*, who, while employed on special service between Brisbane and the new settlement of Somerset at Cape York, has lost no opportunity of adding to our hydrographical knowledge of those parts of the Eastern coast of Australia which had only been partially examined before; and since our last report Commander Nares has surveyed the eastern coast of Hinchinbroke Island, the Palm Island Group, and Cleveland Bay.

The examination of the southern and eastern shores of the Gulf of Carpentaria by the *Salamander* was postponed during the last season, from press of other duties; but it has probably been carried out ere this.

South Australia.—The little vessel employed on the survey of the coast of South Australia had, as stated in our last year's report, been transferred for a very considerable time, at the request of the Colonial Government, to the north and north-western coasts of Australia in connection with the formation of new settlements. Latterly Mr. Howard, Master R.N., who was in charge, together with his assistant, Mr. Guy, have been able to add considerably to our knowledge of these shores, and have charted the coast between Cape Croker, the north-east point of Coburg Peninsula and Cape Stewart, a distance of 250 miles. All this coast has been fairly sounded and several new dangers accurately determined and laid down, as well as detailed

plans made of Mountnorris Bay and the Liverpool River. The vessel has now returned to Adelaide, and Commander Hutchison, having resumed the charge of the survey, has commenced his work on the eastern side of Spencer Gulf, 70 miles of the coast of which, southward of Cape Elizabeth, including a plan of Port Victoria, have been already completed.

Summary.—During the year 1866 sixty-eight new charts have been engraved and published, noteworthy among which is that showing the Agulhas Bank and the coast of the Cape of Good Hope from Hondeklip Bay to Port Natal. Upwards of 1050 original plates have been added to and corrected, and 168,900 charts printed.

Sailing Directions for the approaches to the China Sea and Singapore, by the Straits of Sunda, Banka, Gaspar, Carimata, Rhio, Varella, Durian, and Singapore, as well as the annual light books, tide tables, and azimuth tables, have been published.

Continental Publications.—Independently of the Societies established in many of the capitals of Europe for the promotion of Geographical Science, the chief source of information has been, as in former years, Perthes' 'Geographische Mittheilungen,' so ably conducted by our Honorary Associate, Dr. A. Petermann. Although the past year appears not to have been remarkable for any great discoveries in our science, many memoirs of considerable interest have been published in this important serial. Amongst those more especially deserving of mention is an article entitled 'Das Nordlichste Land der Erde' (1867, Part v.), which contains a *resumé* of the geographical and cartographical results of all the North Polar Expeditions in the neighbourhood of Baffin's Bay from 1616 to the last journey of our Medallist, Dr. Hayes, in 1861. The paper is illustrated by an excellent comparative map, which gives a clear view of the successive additions to our knowledge of this portion of the Arctic regions. A memoir by the well-known Siberian explorer and naturalist M. Radde, is also well worthy of especial mention, describing the chief results of his travels and botanical researches in the Caucasus in the year 1865. This, together with a memoir by Otto Finsch, 'On the Geographical Distribution of Parrots' ('Mittheilungen,' 1867, Part i.), illustrated by a map, coloured to show the ranges of the genera and families, furnish striking examples of the close connection of botanical and zoological distribution with our favourite science. Other papers worthy of attention are, Payer's 'Investigation of the Ortler Alps;' Colonel E. von Sydow's

View of European Cartography in 1865 and 1866; an article by the learned Editor, advocating warmly the establishment of a German Society for the promotion of geographical expeditions; and, lastly, 'Altitude measurements of the Rocky Mountains in Colorado Territory,' in which it is shown that Pike's Peak and other culminating points are exceeded in height by peaks in the Sierra Nevada range of California, as measured by the Geological Survey of that State.

Grundemann's Missionary Atlas.—A special Atlas devoted to the illustration of the Geography of Protestant Missions, and compiled by Dr. Grundemann, is now in course of publication, in German and English editions. The first parts, containing maps of several districts on the West Coast of Africa, have already appeared, and the work seems likely to prove very useful to all those who are interested in the progress of missions in little-known parts of the world, especially as the maps contain much detail and are in a convenient and portable form.

Africa.—*Dr. Livingstone.* — During the last few months our thoughts have been directed, with painful interest, to the last enterprise of our eminent associate, Livingstone. For reasons which I have explained at our evening meetings, and also through the public press, I have never admitted that there existed any valid proof whatever of the death of that great traveller. And now that Arab traders have arrived from a spot close to the reported scene of the murder, long after the event was said to have taken place, and brought to the Sultan of Zanzibar the intelligence that he had passed safely into the friendly Babisa country to the westward, and that a report has arrived at Zanzibar that a white man had reached the Lake Tanganyika, we have fresh grounds for hoping that he may now be pursuing his journey in the interior. In truth, we have recently obtained good evidence of the mendacity of the man Moosa, on whose statement alone the death was reported—it being known that he has given one version of it to the Consul and Dr. Kirk at Zanzibar, and also to the British resident at Johanna, and an entirely different one to the Sepoy examined, on his return to Bombay, by Colonel Rigby. We have, therefore, the strongest grounds for disbelieving the story altogether, and for hoping that our great traveller has passed safely through the intermediate country and reached the Lake Tanganyika, the great object of his mission.

Already Livingstone, by crossing the northern end of his own

Lake Nyassa, has determined one important point in respect to the watershed of South Africa, for he has proved, according to Dr. Kirk, that this great sheet of water here terminates, and is not connected with the more northerly Lake Tanganyika. If he has been spared, as we all hope, he has before him as grand a career as was ever laid out before an African explorer, it being now probable that Tanganyika, a fresh-water sea which must have an outlet, is connected on the north with the Albert Nyanza of Baker and others belong to the Nile system. For although Burton and Speke estimated the height of Lake Tanganyika to be little more than 1800 feet above the sea—the Albert, or lower lake being, according to Baker, 2720 feet—many persons, mistrusting the results obtained by the use of a bad thermometer, still think it probable that the Tanganyika may communicate through a gorge in the mountains at its northern end with the Albert Nyanza of Baker; for both these waters lie in the same meridian.

Pursuing this subject, our associate Mr. Findlay, after a comparison of the altitude observations of Burton and Speke, on the first East African expedition, those of Speke and Grant on the second, and of Baker on his great journey to the Albert Nyanza, has prepared a memoir in which he endeavours to prove that these various altitudes are not inconsistent with Tanganyika being the furthermost lake of the Nile system, with an exit into Albert Nyanza. This important argumentative memoir will be read to us at our first meeting after the Anniversary.

For myself, I give no opinion on a question which, like many others respecting African geography, can really be decided by positive survey only. Let us, then, trust that Livingstone has been enabled to solve this singularly interesting problem.

In the mean time, not believing in the death of Livingstone on the sole testimony of one of his cowardly baggage-bearers who fled, and who has already given different versions of the catastrophe, I am sure the Society and the public will approve of the course I recommended, and in which I was cordially supported by the Council, and, to their great credit, by Her Majesty's Government, namely, to send out a boat expedition to the head of Lake Nyassa, and thus ascertain the truth. If by this exhaustive search we ascertain that, sceptical as we are, the noble fellow did fall at that spot where the Johanna man said he was killed, why then, alas! at our next anniversary, it will be the sad duty of your President, in mourning for his loss, to dwell upon the wondrous

achievements of his life. If, on the contrary, we should learn from our own envoys, and not merely from Arab traders, that he has passed on into the interior (and this we shall ascertain in six or seven months), why then, trusting to the skill and indomitable pluck of Livingstone, we may feel assured that, among friendly Negro tribes, who know that he is their steadfast friend, he may still realize one of the grandest geographical triumphs of our era, the connexion of the great Tanganyika with the waters of the Nile system.

But even here I would have my countrymen who are accustomed to obtain rapid intelligence of distant travellers not to despair if they should be a year or more without any news of our undaunted friend. For, if he be alive, they must recollect that he has with him a small band only of faithful negroes, no one of whom could be spared to traverse the wide regions between Lake Tanganyika and the coast. Until he himself reappears—and how long was he unheard of in his first great traverse of Southern Africa!—we have, therefore, little chance of knowing the true result of his mission. But if, as I fervently pray, he should return to us, with what open arms will the country receive him! and how rejoiced will your President be, if he lives, to preside over as grand a Livingstone festival as he did when this noble and lion-hearted traveller was about to depart on his second great expedition.

The party which I have announced as about to proceed to Eastern Africa, to procure accurate information concerning Livingstone, will be commanded by Mr. E. D. Young, who did excellent service in the former Zambesi expedition, in the management of the *Lady Nyassa* river-boat. With him will be associated Mr. Henry Faulkner, a young volunteer of great promise, and two acclimatised men, one a mechanic and the other a seaman. The expedition, I am happy to say, is warmly supported by Her Majesty's Government, and the building of the boat is rapidly progressing under the orders of the Board of Admiralty. The boat will be a sailing one, made of steel, and built in pieces, no one of which will weigh more than 50 lbs., so that the portage of the whole by natives past the cataracts of the Shiré will be much facilitated. The Government have arranged for the transport of the party to the Cape, with the boat and stores, by the African mail-steamer on the 9th of next month.*

* To the credit of the Union Steam Packet Company the boat has been taken out free of charge. Whilst these pages are passing through the press, I learn that the party sailed from Plymouth on the 11th instant.—*June* 12, 1867.

Arrived there, one of our cruisers will take them to the Luabo mouth of the Zambesi, where the boat will be put together, and the party—having engaged a crew of negroes—will be left to pursue their noble and adventurous errand, by the Zambesi and the Shiré, to the head of the Lake Nyassa. On account of the heavy seas which prevail on the western or leeward side of that lake, the expedition will keep close to its eastward shore, hitherto unexplored, and it is expected it will reach Kampunda, at the northern extremity, by the end of October, and there ascertain whether our great traveller has perished as reported, or has passed forward in safety through Cazembe to the Lake Tanganyika.

Senegal.—In former Addresses I have had occasion to record the great services rendered to Geography by the enlightened Governor of the French possessions on the Senegal, Colonel Faidherbe, who has greatly extended our knowledge of the country along the banks of that river. The most advanced post of the French is Medine, near the cataracts of Felou, 600 miles from the mouth, up to which point the river is navigable, during the rainy months, for vessels drawing 12 feet of water. With a view to ascertaining the political condition of the countries beyond the eastern frontier, as also to fix accurately the geographical positions of places between the Upper Senegal and the Niger, an expedition was sent out by Colonel Faidherbe, in 1863, to traverse the distance between Medine and the important town of Segou, which had been visited by our own renowned traveller Mungo Park, sixty years previously. The mission was most ably and successfully carried out by Lieutenant E. Mage and Dr. Quintin of the French navy. Countries recently desolated by semi-religious wars carried on by Mussulman chiefs were traversed with great danger, and the positions of the route carefully laid down; the road taken being a *détour* to the north, after crossing the Senegal, by Diangounté, to Yamina, on the Niger, and thence by canoe to Segou. By this journey Lieutenant Mage has filled up a void in all maps of the region of the Upper Senegal, and corrected the positions of many places as previously laid down by Mungo Park and others; but the accuracy of our English traveller in the most important points is cheerfully acknowledged by his accomplished French successor, especially, for instance, in the position of Yamina, which Mungo Park fixed at 13° 15′, and Lieutenant Mage found to be 13° 17′ N. lat. The expedition returned to the mouth of the Senegal in June, 1866, and the

French Geographical Society in the present year has rewarded the courageous leader with one of its gold medals.

Asia.—Whilst, with the exception of the probable settlement of the north end of Lake Nyassa by the last journey of Livingstone, little has been added in the past year to our stock of knowledge respecting Africa, much information has in the same period been elicited regarding the geography of Central Asia, particularly as respects the physical features of those vast northern portions of it which have been explored by the Russians, and the positions of places and mountain ranges laid down by our own surveyors to the north of British India.

At the head of the labours which have elucidated the comparative geography of this quarter of the globe, I place the two remarkable volumes produced by our distinguished associate Colonel Henry Yule, C.B., entitled 'Cathay and the Way Thither,' published by our active auxiliaries the members of the Hakluyt Society, and of whose productions our Secretary Mr. Clements Markham is the perspicuous editor. Although the student of the former condition of China and the surrounding regions has ever dwelt with profit and delight on the descriptions of the great traveller Marco Polo, as first brought under the notice of modern English readers by Marsden, and as since rendered so popular by the excellent work of M. Pauthier, it was left for Colonel Yule vastly to extend our acquaintance with the amount of information possessed by our ancestors in the mediæval centuries which succeeded to the epoch when the great Venetian lived. By gathering together in one collection various records of other travellers in the East, commencing with those of the quaint and original Friar Odoric of Pordenone, in the fourteenth century, Colonel Yule has not only satisfied the cravings of scholars, but has at the same time gratified geographers by the preparation of a most instructive map of Asia, such as it was when explored by those earlier travellers, and when it was ruled over by the different branches of the family of Chinghiz Khan.

The contrast between the statistical and political condition of Asia, particularly its central portion, in those days when mercantile men traversed it freely from Azof or from Tabriz to India and China, and the present time, when there exists so small an amount of land intercourse with Europe, is truly astonishing. In those days, and even as late as the sixteenth century, Samarkand, a city renowned as a

seat of Mohammedan learning, was frequented by embassies, including one from the King of Spain. Even our own Queen Elizabeth was so anxious in the first year of her reign to open out an intercourse by way of the Caspian with Persia and India, that she addressed a letter to "the Great Sophi, Emperor of the Medes and Parthians." It was then (1558) that Jenkinson, our English traveller, made the journey from Astrachan to Bokhara, passing by Urghendj.

Now, with the exception of Russia, whose mission in 1841 has been noticed in previous addresses, no European power has had any sort of intercourse with the truculent Emir of Bokhara, to whom much of this fine region is, alas! subjected. It has since been left to stray travellers, one of the last of whom is the enterprising Hungarian Vámbéry, to explain to the civilized world the real state of this region, once so important, and now so fallen through tyranny and misgovernment. No one can have read that author's sketch of the condition of the natives in either of the Khannats of Khiva or Bokhara without rejoicing that Russia has, through the energy of her Government, at last brought these barbarians to respect the frontiers of an empire which has established a safe line of communication between its own territories and those of China.

One of the most important statistical results of modern geographical research, and the employment of natural means to a great end, is the bringing into real use, for the first time in history, the River Jaxartes of the ancients (now called the Syr Daria), and navigating it with steamers from its mouth on the Sea of Aral for many hundred miles into Turkistan and Kokand. By this great feat, and by the erection of forts, Russia has established an entirely new and well-protected route between Europe and China, far to the north of that followed by travellers and merchants in the middle ages, which was from the south end of the Caspian.

England, holding as she does so high a maritime position among the nations, may reflect with satisfaction on her great eastern traffic with India and China, carried on by her own great road, the ocean; and, far from envying the recent opening out of this land and river route through Central Asia, she may be well pleased that her Northern allies should have a beneficial commercial traffic by caravans with those fertile regions of north-western China, with which, in fact, we never have had any intercourse, but with whom the Russians have traded for ages, though always until now with more or less impediment, due to the forays of the intermediate wild people, and particularly the Kokandians. The two great empires

of Russia and China seem, in fact, to be destined by nature to interchange commodities by land and river communications through Central Asia; and so long as the line of such commerce between them is separated, as it now is, from British India and its dependencies by mountainous, sterile, and snowy regions, impassable by modern armies, there never can be the smallest ground of jealousy on the part of Britain.

On this head I was much gratified, at our very last meeting, in listening to the able memoir of Captain Sherard Osborn on the actual state of Chinese Tartary, an enormous region that has become, through the relaxation of the Chinese hold, "no man's land," and in hearing from the eloquent author, as well as from the commentators on his Memoir, that, instead of any apprehension being entertained regarding the late Russian advances, it was generally felt that it would be greatly to the advantage of the natives, as well as to British power in India, that the influence of a civilized Christian nation should be extended eastward over a region now becoming desolate through misgovernment and lawlessness.*

These considerations lead me naturally to say a few words upon the geographical operations of our medallist Admiral Boutakoff, which have mainly led to the establishment of the new Russian line of eastern traffic, and which have justly obtained for him a high reputation. The first of these enterprises might almost be called the geographical discovery of the Aral Sea. For, although this great mass of salt water had been known to Arabian geographers during several centuries under the name of the Sea of Khwarezm, though its shores had been visited by travellers, one of whom was the accomplished Russian geographer George von Meyendorf, who described the mouths of the Syr Daria or Jaxartes, at its north-eastern extremity, and another, General Berg,† who led a Russian expedition along its western banks in the winter of 1825-6, no ship had ever sailed upon this inland sea. The first vessel launched upon it was constructed at Orenburg in 1848, and transported in pieces across the desert, and in it Boutakoff, after two years of navigation,

* The reader who wishes to become acquainted with the physical features and boundaries of the districts of Chinese Tartary, so well expounded by Capt. Sherard Osborn, and of which he prepared a large map, must consult Keith Johnston's Library Map of Asia, published by Mr. Stanford, in the preparation of which Mr. Trelawney Saunders took a leading part.

† See the first published notice of the remarkable expedition of General Berg in 1825, in the work of myself and coadjutors, 'Russia and the Ural Mountains,' vol. i. p. 310. General Berg is now Count de Berg, and the Emperor's representative in Russian Poland.

defined the real shape of the coast, established the depths of the sea, and was the discoverer of the large island in it, the wild antelopes of which came to stare with astonishment, yet without fear, at their first invaders.

Fifteen years have elapsed since I communicated the first important paper of Boutakoff to this Society, and it was spoken of with all the praise it merited in my Anniversary Address of the year 1853.* The successful exploration of the Jaxartes, and the discovery of its fitness for steam navigation, which was the next exploit of Boutakoff, led to the establishment of the great central route to China already mentioned, and Russia naturally availed herself of the commercial advantages thus presented in these natural features near the boundaries of her Asiatic possessions.

The question now arises, whether, by these enterprises, the honour does not truly belong to Russia of having, for the first time in history, defined the course of the Syr Daria and its exit into the Sea of Aral? The classical writers were, as I shall presently show, ignorant of the true geography of this region, particularly of its northern part, and an attentive consideration of its geological structure and physical outlines has led me, followed by the inquiries I have made among comparative geographers who have well studied the subject, to believe that their silence with respect to the Aral Sea is no proof that it has not existed during the whole of the historical era.

Holding this opinion, I necessarily differ from my friend Sir H. Rawlinson, who, in observations recently delivered from the chair of this Society † made a very ingenious statement, and gave it as his opinion that there was sufficient evidence to show that in early times, say from 600 years before the Christian era to 500 or 600 years after it, both the river Oxus and Jaxartes flowed into the Caspian, the Aral being non-existent. That afterwards, and up to the year 1300, they fell into the Aral, and that for the next two hundred years (1300 to 1500) they came back into the Caspian, subsequently flowing gradually back into the Aral and forming the Sea as we now know it.

Although I know that my colleague will admit that my geological data must have some weight, I have to claim his indulgence for venturing to question the views of so eminent a scholar respect-

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* 'Journal,' vol. xxiii., President's Address, p. lxxxvi.
† See 'Proceedings,' 11th March, 1867.

ing the changes of physical features in this region that may have happened in the days of history. Supported, however, as I am by the opinions of men on whose knowledge I place great reliance, I must say that I cannot regard the Persian manuscript, which was presented to Sir Henry by a clever chief of Herat, to be a document of sufficient value to override the conclusions at which I have arrived on many independent grounds.

Concerning the ancient course of the Oxus, I see no reason to differ from the Persian writer and Sir Henry. But when it is stated that in the year A.D. 1417 the Jaxartes had deviated from its former course, and instead of flowing into the Caspian (as the ancients had it), joined the Oxus, and thus, the two rivers occupying one and the same bed, came into that sea, I must withhold my assent. This is a novel and striking statement, and before we attach credence to it we must have some physical evidence to sustain it. In my state of scepticism regarding the value of this Persian manuscript, now for the first time produced, that which strikes me *à priori* as a sign of its invalidity, is, that when this region was open to knowledge through the long-enduring reign of the civilised and literary Arabians (say from the 7th to the 13th century), the Aral was known and laid down as a distinct water-basin under the name of Sea of Khwarezm. On the other hand, when after that period knowledge became dim and local, and civilisation was at its lowest ebb, then it was that the Aral disappeared. My conclusion from this coincidence of the supposed emptying of the Aral, with the absence of records respecting it, would be that the sea had existed during all that time, but that there were then no geographers to record the fact.

In treating this subject, let us first consider the separation of the Aral from the Caspian as originally dependent on geological changes of the surface, and then proceed to estimate the value we are to attach to the writings of the classical authorities in reference to a region so very imperfectly known to them. As a geologist who has studied this Aralo-Caspian question *in situ* I beg to place on record in our Geographical volumes my view of the prehistoric physical outlines of a region which, with the exception of the obliteration of one mouth of the Oxus, has, I venture to think, undergone no essential change during the human period.

According to all good authorities, including Humboldt, there existed in the latest tertiary, or what some call quaternary times, a vast depression on the surface of the globe, extending over 8,000

square marine leagues, in which a great inland sea was accumulated, and which, in a work on Russia, my associates and myself first mapped out under Humboldt's name of Aralo-Caspian.* In that sea there lived an abundance of molluscous and other animals, all of species having a local and limited range, and all strikingly distinguished from the more numerous animals of oceanic seas. Now, owing to the upheaval of large portions of the bottom of that old inland sea, its animal contents formed, in a fossil state, the Steppe limestone, as seen at different levels over an enormous area. Owing to these prehistoric movements of the crust of the earth, these fossil remains are seen to occupy the strata on the banks of the lake of Aral, as well as on the shores of the Caspian Sea. They also occur at various places and at different heights in the adjacent Steppes, extending westward to the country of the Don Cossacks to the north of the Sea of Azof, where I have myself examined them. There is therefore no doubt that, in prehistoric times, the Aral and the Caspian, and also portions of a much wider region, now raised above them, were occupied by one vast internal and depressed sea, large portions of which have been desiccated. By these movements of elevation that part of the former great sea which became the Aral was elevated to about 117 ft. above the former western part, or present Caspian, and the seas thus insulated were separated through the same movements by the elevated plateau now called Ust-Urt.

This was the physical condition of the region long before tradition or history. Humboldt has well remarked that the great Aralo-Caspian depression had a similar origin to the much deeper cavity in the earth's surface occupied by the Dead Sea, though the one is only 83 feet and the other nearly 1300 feet beneath the Ocean. Now, if we endeavour to account theoretically for the low present level of the old Aralo-Caspian Sea by evaporation only, we are met by the facts that large portions of its former bottom have been raised to different altitudes in the surrounding region, and that the levels of the Sea of Aral and the Caspian are also different, and are separated by the great plateau of Ust-Urt. As it is impossible to explain the existence of the much deeper cavity of the Dead Sea except by a greater sinking of the earth's crust, so is such a phenomenon precisely what geologists would expect to see realized

* See 'Russia in Europe and the Ural Mountains,' vol. i. pp. 303-314, and particularly observe the map and section, p. 311, from the Sea of Azof across the Caspian and the Ust-Urt to the Sea of Aral.

as a natural and compensating result of the corresponding upheaval of the adjacent lofty mountains of Asia.

This being the conclusion at which geologists have arrived, let us see if it be interfered with by any reliable historical records. As to the knowledge possessed by Alexander, or his cotemporaries, it really does not touch the question of the relative courses of the Oxus and Jaxartes towards their mouths. For Alexander crossed the Oxus at about 400 miles above its mouth, and the most western point at which the great conqueror reached the Jaxartes was Cyropolis, where he passed it to defeat the Scythians; and that spot is about equidistant from the Aral Sea. Consequently, neither Alexander nor his generals could know anything of the real course of either river for great distances above their mouths. Scholars and comparative geographers doubt, indeed, if any weight can be attached to the unanimous statement of the Greeks, that both the Oxus and Jaxartes flowed into the Caspian, by mouths some 300 miles apart,* when they see how equally unanimous were the writers who came between Herodotus and Ptolemy in believing the Caspian to be but a gulf of the Northern Ocean! Again, we see how persistently the followers of Alexander confounded the Jaxartes itself with the Tanais, and fancied that they had doubled back upon the rear of Europe.

"The expedition of Alexander," says Humboldt, "far from extending or rectifying the geography of the Caspian Sea, confounded the Tanais with the Jaxartes, and the Caucasus with the Paropamisus or Hindu Kush." † Again, "It is through a singular combination of circumstances that the great Macedonian expedition, which in other respects extended the geographical horizon of the Western nations, became fatal to the geography of the Caspian Sea." ‡ Further on, he says, "Some traces of the Sea of Aral, described as a great basin to the east of the Ural or Jaik River, are indeed found in Menander, the Byzantine historiographer; but it is only with the series of Arabian geographers, at the head of whom, in the tenth century, we must place El-Istachry, that we first obtain a certain knowledge of the topography of these countries." §

The truth is, that, when it was thus loosely said, that both the Oxus and Jaxartes flowed into the Caspian, we must make due allowance for the ignorance of the ancients of the northern portion

* 2400 stadia according to Eratosthenes, and 80 parasangs according to Patroclus, both quoted by Strabo.

† 'Asie Centrale,' vol. ii. p. 14. ‡ Ibid., p. 153. § Ibid., p. 156.

of this vast region, particularly of the course of the Jaxartes, which no one of them had fully explored, and at the mouth of which none of them had arrived.

If, indeed, we rely on the sagacious Rennell, he, in his great work on the 'Geographical System of Herodotus,' may be said to have established this point, for, in speaking of the old geographers, he says, "they understood the *Aral to be included in the Caspian*, since they knew but of one expanse of water in that quarter; for the Cyrus and Araxes, Oxus and Jaxartes, were all supposed to fall into the same sea." This he contrasts with the accurate subsequent knowledge of the Arabian geographers. And truly so, for this was the regular progress of observation, and a great advance over the ignorance of the classical writers respecting these hyperborean tracts. In those times the regions inhabited by the Massagetæ and the King of Kharasmia (the present Khiva) were barbarous countries, never explored by geographers; and, consequently, the classical authorities could only have obtained the little knowledge they possessed from native hearsay.

In his able essay on the 'Life of Alexander the Great,' Williams distinctly lays down, in his map of that period, the seas of the Aral and Caspian as distinct bodies of water. The same separation is given by Rennell, in his map of the twenty satrapies of Darius Hystaspes; and, whilst in it he indicates the Oxus flowing into the Caspian, and the Jaxartes into the Aral, he shows completely how the two seas were separated by what he terms the high plateau of Samob, the Ust-Urt of the present day.

Again, Thirlwall, in his 'History of Greece,' plainly leads us to believe that the Greeks could have known nothing of the region of the Sea of Aral and the mouth of the Jaxartes, except what they derived from the reports of the King of Kharasmia, who came from a distance in the north to visit Alexander. In short, there is no historical evidence whatever to oppose the view, that the outline and structure of the Aralo-Caspian region, as now seen, was determined, as I have said, long anterior to the historical era.

On the point of the prehistoric separation of the Aral from the Caspian, I entirely concur with Humboldt. "If we ascend," he says, "to the primitive condition of the vast Mediterranean concavity, I should be led to believe that, notwithstanding the diminution of surface which the Caspian and Aral basins may have undergone in the historical times, from Hecatæus and Herodotus down to the tenth century of our era—*i. e.* to the days of

the Arab geographers El-Istachry and Ebn Haukal—the event of the separation of the Aral and Caspian remounts to a geological epoch, which, like the separation of the Euxine and the Caspian, or the opening out of the Dardanelles and the Straits of Gibraltar, are all ante-historical, or far beyond any human tradition." *

In sustaining this view it is to be remarked that, whilst the Aral Sea trends from north to south, the Syr Daria and its embranchment the Kuvan Daria, which flow into it from the east, have had courses at right angles to that sea itself; thus favouring the geological view that the great movement which produced the plateau of the Ust-Urt, separated the Sea of Aral from the Caspian, and left the chasm occupied by the Aral, was also accompanied (as is usual in such elevations) by transverse flanking openings in the mainland, on the east, along which those rivers flowed. In this view the parallelism of the Syr Daria to that of the Kuvan Daria, about 50 miles south of it, is remarkable.

If the Jaxartes ever flowed to the south-west, as suggested by Sir H. Rawlinson, it must have joined the Oxus long before the united streams fell into the Caspian, which is very distant from the nearest point of the valley of the Oxus. But if such an union of the great streams ever existed in so southern a latitude, it must have been perfectly well known to the ancients, and they have made no allusion to it. On the contrary, they believed and have stated, that the rivers fell independently into the Caspian, and by different courses, separated from each other by a wide interval.

Whilst I think that, probably, the many-mouthed Oxus always sent a large portion of its waters into the Aral, I also quite believe that one of the branches debouched formerly into the Caspian, as explained by Humboldt, and as proved indeed by the old English traveller Jenkinson, to whom he refers. It will also be presently seen that the distinguished Asiatic geographer Semenof would explain the desiccation of the former or Caspian branch of the Oxus in another manner. The stoppage of that watercourse (formerly an usual line of traffic) may also be accounted for by a local elevation of land in that latitude; for it is not remote from the scene of igneous eruptions that produced volcanic mountains, as the greater and lesser Balkan, near the ancient desiccated mouth of the Oxus. Such a change of level may, indeed, have been caused by the same subterranean

* Humboldt, 'Asie Centrale,' vol. ii. p. 146.

forces which, in this latitude, evolve, at the present day, the fires of Baku, and have recently thrown up volcanic mud-islands near the southern end of the Caspian. The elevating effect of these forces would deflect the Caspian branch of the Oxus and cause its waters to unite with the branches which flowed northwards into the Aral Sea.

The great distinction between the views taken by Sir Henry Rawlinson and myself is, that whilst I believe the main outlines of the Aralo-Caspian region were determined by movements of the earth in quaternary or later tertiary times, he refers the great changes which he believes to have been made in the courses of the Oxus and Jaxartes to no very distant historical dates; thus referring the emptying and refilling of the deep hollow in which the Aral Sea lies to comparatively modern times.

He offers, indeed, one argument, which, if sustained, would at once dispose of my view. In support of the opinion that the Aral Sea was non-existent in the thirteenth and fourteenth centuries, he states that in those days travellers from Europe to Asia passed over dry lands since occupied by that sea. If this were substantiated, the belief I have adopted that the separation of the Aral from the Caspian, and the upheaval of the broad intervening plateau of the Ust-Urt, would be at once removed from a prehistoric period to the days of Henry III. and the two first Edwards of English history.

Now, surely, if so great a terrestrial change of surface as this had happened in the thirteenth or fourteenth centuries, the rumour of it would have been bruited throughout Europe and Asia. Unwilling, however, to rest upon any notions of my own, I have consulted that admirable comparative geographer, Colonel Yule, as to the routes taken by the mediæval travellers of that date; and he having favoured me with much information respecting the whole of this subject, I extract from his letter the appended long note.* By reference to it the reader will see that no foundation for such an assertion is to be traced in the narratives of these old travellers. For even when the starting point of their journey eastward lay upon the Volga, their line of march is traced either quite to the south of the Aral through the lands of modern Khiva, or more to the north of that sea, and probably beyond sight even of its shores.

* After alluding to the little weight to be attached to the statements of the Greeks, tracing the imperfect accounts of Herodotus and his followers, and rejecting the Oxiana Palus of Ptolemy, which had been made "to do duty," as he says, for the Aral on many respectable maps, Colonel Yule proceeds to say:—

"We are on surer ground in the narrative of the Embassy of Zemarchus to the Khan of

In considering what changes have or may have occurred within the historic period, and quite independent of all former or geo-

the Turks about the year 570. The remains of the historian Menander, which relate this mission, are unfortunately but fragments, and do not say how Zemarchus got from Byzantium to Central Asia. But on his return route, which lay to the north of the Caspian, we are told that before reaching the rivers *Ich* and *Daich* (apparently the modern Emba and Ural) [1] he passed for twelve days along the sandy margin of a certain *great and wide lagoon*. This looks very like the Aral; nor probably will Sir Henry Rawlinson deny its existence at that date. But I quote the allusion to show that even the Greeks, once they got actually to the site of the Aral, did recognise its existence.

"We now get to a period regarding which there is no controversy. A long *catena* of geographical works, as Sir Henry Rawlinson tells us, represents the two great rivers as falling into the Sea of Khwarezm, *i. e.* the Aral. But is it the case that this chain of testimony ceases with the year 1300? Among those quoted by Humboldt even are some of later date, such as Abulfeda and the Persian Hamdallah. It is the case, no doubt, that those Eastern geographers often copy what has been said by their predecessors centuries before; but a passage which Humboldt quotes from Hamdalla, a writer of the 14th century, appears to be original. It speaks of the Sea of Khwarezm (or Aral) as having a compass of 100 parasangs, and separated from the Caspian by a tract of 100 parasangs in width. It contains also the remarkable statement that only a *part* of the water of the Oxus then flowed into the said sea, which was fed also by the River of Ferghana (the Jaxartes) and others.

"Two centuries later, when the first English traveller [2] reaches those regions, he finds the Aral in existence, though his account of it is but hazy; and when Russian geography springs up at the end of the 16th century, we find that it already knows the Aral well as the Blue Sea.[3]

"Knowing then, as we do, how many indications point to the existence in those regions in recent geological times of a great inland sea, and finding a tolerable chain of evidence as to the Aral itself—either positive or implicit—down to the days of modern geography, I feel it difficult to believe, on the authority of the Persian MS., that this great sea, nearly 600 miles in circuit, with precipitous sides and attaining a depth of 37 fathoms, did, for a number of years, entirely cease to exist, and then again became as we see it and as old Arab geographers had described it. I by no means desire to dispute that there may have been a material contraction of its area at the time when a considerable part, if not the main stream, of the Oxus flowed into the Caspian; but this is a different thing from its entire disappearance and desiccation.

"There is one argument on this subject urged by Sir Henry Rawlinson which I think a review of the facts in detail will scarcely bear out. He refers to that period during the 13th and 14th centuries when the vast extent of the Mongol domination threw open Asia, which for a succession of years was penetrated by envoys, missionaries, and adventurers, several of whose narratives have come down to us, and when a regular course of trade was established, regarding which we have many particulars.[4] The route usually followed by those travellers, Sir Henry says, lay exactly across the site of the Sea of Aral; yet not one of them mentions it. If this were so indeed, it would be vain to maintain the *improbability* of what would be so clearly established as a fact.

"But let us glance at the routes followed by these travellers successively from the first of them in the middle of the 13th century. This was Friar John of Plano Carpini, sent on a mission from the Pope to the Great Khan in 1245-47. Friar John, though he

[1] "Perhaps, however, the *Ural* and *Ik*, so carrying the route north of Orenburg."

[2] "Jenkinson."

[3] "See in Levchine's 'Description des Hordes et des Steppes des Khirghiz Kazaks,' in his dissertation on the Jaxartes, p. 462, a quotation from a Russian geographical work of the time named."

[4] "Surely there is a *lapsus*, when Sir Henry Rawlinson speaks of these merchants as returning with the *tea* and silk of China; or, if he has grounds for including the former, it would be most interesting that they should be produced. In 'Cathay,' I have indicated the mention of tea by Ramusio's Persian friend Hajji Mahomed, as the first known to me in any European book."

logical changes, I necessarily attach great weight to the opinion I have recently obtained through my friend General Helmersen from

writes in the main like a man of sense and reading, is not a good geographer. He makes the Dnieper, the Don, the Wolga, and the Jaic all fall into the *Great Sea*, the '*Mare Magnum*, which has its issue by St. George's Channel at Constantinople;' and rides for many days along the shores of the Caspian, apparently under the impression that it is but a part of the Euxine.[1] We might ask, in passing, if there were no Friar Johns among the ancients capable of the more venial error of confounding the Sea of Aral with the Caspian? Be this as it may, there is no reason for carrying the route of Carpini's party over the bed of the Aral. After crossing the Jaic, it lay for many days through the land of the *Cangitæ*, or Kankhlis, in which they found few people, but very many and large salt-marshes and lagoons, which they took to be the *Paludes Mœotides* of the ancients, and which probably were those which still exist to the north and north-east of the Aral.[2] They then enter the land of the *Bisermini*, or Mussulmans, and come upon the cities and cultivated lands of northern Turkestan.

"Friar William de Rubruquis, eight years later, is more correct in his notions of geography. He clearly discriminates the Caspian from the Euxine, and gives a fair account of it. He gives also the general orientation of his route, running due east from the Wolga for 45 days and then turning southward, and so continuing for eight days till he reached *Kenchak*, a city known to have been in the valley of the river Talas. If you protract this route as well as the data will admit, you will find that it entirely clears the Aral.[3]

"Another traveller, who visited the Court of Mongolia in the same year with Rubruquis, was King Hethum or Hayton, of Little Armenia. He, too, after visiting Batu Khan upon the Wolga, rides eastward across the Jaic; but, as he passes the Irtish also, his route must have lain far to the north of the Aral. On his return he passed by Samarkand and Bokhara into Persia.

"Marco Polo himself never mentions the Aral, indeed; but neither does he mention the Jaxartes, and seems never to have been nearer either than at Kashgar. In the preliminary chapters of his book, in which he speaks of the journey made by his father and uncle from the Wolga to Bokhara, he unfortunately gives no particulars of their route,[4] excepting that they went south from Bolghar to Ukak (near Saratov) before striking east.[5]

"Probably, however, it was the same as that laid down in the next century from the information of the merchants who had travelled it, by the Florentine factor Balducci Pegolotti, about 1330-1340. This route, followed by mercantile travellers bound for China, ran from Sarai, on the Wolga, to Saracanco, or Saraichik, on the Jaic, and thence in camel-waggons to URGHANJ, the capital of Khwarezm, which stood on a branch of the Oxus, about 60 miles south of the present embouchure of that river in the Aral Sea. From Urghanj the travellers were in the habit of proceeding to OTRAR, a few miles north of the Jaxartes, and not far from the modern town of Turkestan, and so forward to Almalik, near the Ili, the capital of the Khanate of Chagatai. They thus travelled distinctly *round* and not across the bed of the Aral. We are told, indeed, that if they had no merchandise to dispose of at Urghanj, they might save from 5 to 10 days by going direct from Saraichik to Otrar. If we lay down this direct route with geometrical and literal directness, it will indeed pass through the extreme north of the Sea of Aral. But even direct railway lines are not so straight as that; and there can be little doubt that Pegolotti's direct line was much the same as that followed by Carpini and Rubruquis in the preceding century.

"The same route that Pegolotti recommends—viz., that from Sarai to Saraichik, and

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[1] "See in D'Avezac's edition, p. 743."

[2] "See the narrative of Carpini's companion, Benedict the Pole, in D'Avezac, p. 777."

[3] "For a detailed examination of Friar William's route see 'Cathay and the Way Thither,' p. ccxi. *seqq*."

[4] "The *Tigeri*, or Tigris River, which Polo mentions as crossed by the party, was supposed by Marsden and his successors to be the Jaxartes; but Pauthier has clearly shown it to be the Wolga. (See his 'Polo,' p. 8; also 'Cathay,' p. 234.)"

[5] Timur, invading Kipchak and Russia, went so far north as to cross the Tobol before crossing the Jaic.

M. P. Semenof, the President of the Physico-Geographical section of the Russian Geographical Society, who has distinguished himself by his researches in the Thian Shan chain of Central Asia. Whilst he rejects, like myself, the hypothesis of the great Aral depression having been emptied and refilled in the historical period, he refers the desiccation of the Asiatic rivers and the diminution of lakes to the decrease of glaciers in the high mountains, as well as to great evaporation. By these causes he thinks that at one period the Aral Sea may have been diminished, though he is firmly of opinion that such a deep depression could not have been emptied and refilled. In reference, however, to the former Caspian branch of the Oxus, in the existence of which he believes, he supposes that many streams, now dry or nearly so, formerly

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thence to Urghanj and Almalik—was followed by Friar Pascal, of Vittoria, in 1337,[1] and (as far as Urghanj) by Ibn Batuta, a few years earlier, in travelling from Sarai to Bokhara.

"It was probably also the route followed by John de' Marignolli, on his journey towards Peking, in 1339-42; but, unfortunately, he says nothing whatever of his route between the two Mongol capitals of Sarai and Almalik.

"We have named all the travellers, as far as I am aware, that have left any record of their journeys in those regions during the period to which Sir Henry referred. None of them, we must acknowledge, say anything of the Aral Sea; but we see also that it cannot be maintained that they gave the practical disproof of its existence which would be afforded by their travelling dryshod across its bed! and the travellers' narratives were the bases of the maps to which Sir Henry has referred. The Catalan map does not, indeed, contain the Sea of Aral; but neither does it contain any hint of the Jaxartes. The great map of Fra Mauro, though it contains no Aral, represents the river Amu (or Oxus) as flowing into the Lake Issik-kul, which is, perhaps, an adumbration of some knowledge of its discharge into another sea than the Caspian. The traditions of geographers are hard to correct. I do not know what map first shows the Aral under anything like its proper conditions. Many years after the date of the Russian geography to which we have alluded as so clearly indicating the Aral under the name of the Blue Sea, we find John Blaeu, in his great atlas (1663), representing the Jaxartes as flowing into the Caspian, and a duplicate of the same river, under the name of *Sur*, flowing by Tashkend into the 'Lake of Kathay,' with a difference of 30 degrees of longitude between the two! Even Petis de la Croix, in the maps (sometimes singularly happy) which illustrate his translation of the History of Timur, has no indication of the Aral.

"There is, indeed, one mediæval map which at first sight seems to bear strong testimony to the existence of the Aral Sea in the beginning of the 14th century. I mean that curious one executed by the old Venetian Marino Sanudo, and submitted by him to the Pope and King of France, about 1325, with his grand scheme for the destruction of the Mohammedan power. This map exhibits very clearly a *Mare Yrcanum, Caspis* or *de Sara*, in the proper position of the Caspian. It is connected by a river with another sea, further east, marked *Mare Caspium*, and full of islands, which is in a startling degree suggestive of the Aral. Further still to the east, towards *Sera*, appears a third and smaller sea, without a name, into which the *Gyon* flows (*i. e.* Jihun or Oxus). I dare not, however, lay much stress on this map, which contains almost nothing else to corroborate a claim to exacter information. The multiplied seas *may* have sprung only out of some misunderstanding of the classical geographers."[2]

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[1] "'Cathay,' p. 232."

[2] "The map is engraved in 'Bongarsius, Gesta Dei per Francos,' vol. ii. There is a *quasi* facsimile of it in the second volume of Vincent; but in this latter the third sea is scarcely to be recognised."

augmented the volume of the Oxus, thus enabling it to supply a branch to the Caspian by the Gulf of Karabogas, and that to the failure of this supply we may attribute the drying up of the branch, without involving any great physical change of outline of the land. In this case the Aral Sea, occupying a separate cavity not communicating with the larger depression, would, as he thinks, become shallower, and to a great extent obscured by reeds, so as to have remained unknown to travellers for 500 years before and 500 years after Christ. M. Semenof suggests that in those days when the South-western branch of the Oxus existed, travellers proceeding northwards and meeting with little but reeds and marshes, might very well suppose that the Aral was merely an extension of the great Bay of Karabogas of the Caspian Sea. In illustration of this view he informs me that the inhabitants around the lakes Ala Kul and Sassyk-Kul have at this day no precise conception of their separation, and term them both Ala Kul simply, because they are unacquainted with the marshy and inaccessible isthmus between them. In Central Asia, too, the River Tchu, through its desiccation, has lost its former communication with the Lake Issyk-Kul, just as in the Aralo-Caspian region the Sary-su River has failed to reach the Syr Daria; and this last river, having lost its northern affluents, could no longer contribute (if ever it did) by any of its branches to the Oxus, and has found an easier embouchure in the Aral. How easily these changes of direction are effected in the course of rivers in flat and sandy countries, is well known to many Russian geographers who have explored Central Asia.

Thus, the Oxus, deprived of many of its former affluents, ceased to be able to throw any portion of its waters into the Caspian, and took the straight course into the Aral. This natural operation, as Semenof observes, may have also been accomplished within the historical period, and so, since its South-western or Caspian branch dried up, the Oxus, by throwing all, instead of a part, of its waters into the Aral, has given to that sea a better-marked place in human knowledge than it had in the fourteenth and fifteenth centuries.

Before I quit the subject of the now desiccated former branch of the Oxus, I may state, on the authority of my correspondent, General Helmersen, that recently a memoir was presented to the Imperial Geographical Society of St. Petersburg, suggesting that men of science should be sent to the spot to examine into the evidences of that ancient bed of the river, and also to test, by soundings along the shore of the Caspian, if any remains of the

old delta of that stream could be detected. But the project, as well as the continuation of the survey and soundings of the southern edges of the Caspian, have both been suspended, I believe from motives of economy. The latter important work was under the able direction of Captains Ivanchnizow and Oulsky, who had already proceeded so far that in less than three years they would have completed the survey of the whole of that vast interior sea; and it is indeed much to be regretted that a work of such great geographical interest should have been thus set aside.

In conclusion, my belief is:—1. That the Caspian and Aral have existed as separate seas before and during all the historic period. 2. That the main course of the Rivers Jaxartes and Oxus, as also of the sites of the Caspian and Aral seas, were determined in a prehistoric period. 3. That at one time the Oxus emptied itself both into the Caspian and the Aral, and that the Caspian branch-stream was sent back to the course of the other portion of the stream, either by the local rise of some lands between Khiva and the Caspian, or by desiccation and a want of sufficient power of water. And, lastly, that the Jaxartes never was deflected from its natural east to west course, to pass southwards, and so reach the Caspian by the southern end of the great elevation of the Ust-Urt, after a very long course at right angles to its present direction, to say nothing of its having in that case necessarily united with the Oxus by the way—a fact, of which, as already stated, all history is silent.

If old authors believed, without personal observation, that the Jaxartes, as well as the Oxus, fell independently into what they called the Caspian, we may easily account for such a notion, at a time when the true meridian of barbarous places lying to the north of any line of intercourse between Greece or Rome and Asia was wholly undetermined. May we not rationally infer that the ancient geographers believed that the Jaxartes, as well as the Oxus, flowed into the Caspian, simply, as suggested by Rennell, from having heard that the Jaxartes terminated in one great sea, and that they naturally believed that the Aral was then simply the north-eastern portion of those large inland waters of which they had heard, but of which they knew nothing accurately.

In truth, when we know that the geography of the Greeks, and even of the Romans, was worthless, in regard to any lands beyond the parallel of the mouth of the Oxus, we necessarily recur to the works of the earliest Arabian geographers, in which the Sea of Khwarezm was first exhibited as a separate sea. As such it also appears in

the maps of Rennell, of Williams, of Yule, and, in short, of all the best authorities, representing that which I believe to have been the true physical condition of the region during all historical time, and which I maintain dated from an ante-historical period.

In estimating the present or future relative importance of the Oxus and Jaxartes as lines of commercial traffic with China and India, I have no hesitation in saying that the latter river holds the first place. By reference to the memoir of Lieut. Wood, in the tenth volume of our 'Journal', describing the sources of the Oxus, and still better by inspecting the map of the Bolor Mountains and Upper Sources of the Oxus, which has just appeared in our present volume (vol. 36), I agree with the able Russian geographer Veniukof, who, after alluding to the wild barbarian races which occupy the high tableland of Pamir and the adjacent mountains, adds this significant passage: "When we, moreover, remember that this basin of the sources of the Oxus is closed in on the north, east, and south by mountains from 15,000 to 18,000 feet high, and across which the roads for pack-animals are few and difficult to traverse, we must arrive at the conclusion, that all idea of converting this region into a rich entrepôt for a trade with India and China must be abandoned." *

Before I quit the subject of the investigation of Central Asia, let me ask those of my countrymen who read German with facility, to peruse the great work of Ritter, the 'Erdkunde von Asien:' and they will at once learn how to value the vast amount of modern discovery which is due to our Russian cotemporaries.

On former occasions I have naturally adverted to several of these remarkable researches; but I regret that, in my last two Addresses, I have omitted to notice, as I now do with special approbation, the memoir of M. Semenof, published in our Thirty-fifth Volume, on 'Djungaria and the Celestial Mountains.' As the only man of modern times who has explored a considerable portion of the Thian-Shan or Celestial Range, M. Semenof must be placed among the most distinguished of the famous band of Russian explorers—not simply for having determined many geographical positions, the forms of the land and their altitudes, but also for his careful examination of the mineral character of the rocks which constitute the loftiest masses of those regions. In so doing, he has set aside one of the few errors which the illustrious Humboldt fell into in his grand generalizations, when he was led to believe that the Thian-Shan—

* 'Journal,' vol. xxxvi. p. 263.

the great axial range of Central Asia—must be essentially one of volcanic eruption.

Influenced, doubtless, by his successful description of the Andes of South America, and the rise to their summits of active volcanoes, the great traveller was very naturally disposed to apply the same inference to the lofty chains of Central Asia; the more so as all the imperfect data he could collect seemed to indicate the existence of rocks of that class.

But as soon as the Thian-Shan was examined by the only man of science in our age who has visited it, he found nothing but sedimentary strata; and as this important rectification is due to M. Semenof alone, we must not only accord to him all due praise as a Geographer, but it is specially my duty as a Geologist to thank him for making this great observation.

In fact, the grand movements of upheaval, which determined the form of many of the loftiest mountains, whether in Central Asia or in the great northern barrier of India, the Himalayas, were caused by former expansions from the interior, doubtless due to central heat, which raised up sea-bottoms, often altering them into crystallised rocks, and elevating them to enormous altitudes, without exhibiting any true igneous rocks.

Having already twice alluded to the recent discoveries in Asia by the Russians, and we having endeavoured to do honour to them by the award of our Founder's Medal to one of the most distinguished Russian explorers, it is now my pleasing duty to advert to others of their recent labours in that quarter of the globe.

On former occasions I have dwelt upon the explorations of Eastern Siberia and the affluents of the grand River Amur and the mountains to the north. Let us now turn to Central Asia proper, and see what good documents have been furnished by the different men of science who have explored those regions. I gather from the bulletins of the Imperial Geographical Society that the communications of MM. Semenof, Severtzof, Poltarazky, Abramof, Bakkof, Goloubef, and Printz, explain the physical conformation of tracts and the natural riches of regions never before reached in modern times.

Of most of these hitherto unknown and wild tracts the Russian explorers have prepared or are preparing maps. To facilitate journeys from Siberia to Pekin, Dr. Brettschneider, the physician to the Russian mission in China, has laid down upon a map all the different known roads across Mongolia, of which that which

is called the post road is 1760 versts long, between Kiachta and Pekin, with 68 relays. If the telegraph, which one of our countrymen, Mr. Gordon, who had travelled across this desert, sought to realize, be established, the journey across the desert of Gobi will soon be thought nothing of.

As to Bokhara, of which Englishmen have only painful recollections, on account of the murder of our distinguished officers, Conolly and Stoddart, we now know that two Russians, MM. Gloukovsky and Tatarinof, who were for seven months captives there, have added much knowledge to that acquired by their accomplished countrymen Khanikoff and Lehmann in 1842.

Those of our associates who may now visit St. Petersburg may see pictorial views of Khodjend, Tashkend, and all the places taken from the Kokandians in the recent advance of the Russians along the Syr Daria, and now forming parts of the great new province of Turkestan. I learn also, in reference to this region, so recently opened out to the civilized world, that M. Struve, the son of the great Russian astronomer, has prepared a map of the whole province of Turkestan, on a scale of 40 versts to the inch.

Deeply interested as we must all be in this grand opening out to geographers of a vast unknown country, my first request to my eminent friend Admiral Count Lütke must be, that as President of the Imperial Geographical Society and also of the Imperial Academy, he will procure for our Society copies of the maps which, to their great credit, the Russian geographers have prepared.

Northern Frontiers of British India.—At our last anniversary it was my duty to dwell upon the great accession to geographical knowledge obtained by the survey of Captain Montgomerie in the mountainous region north of Cashmir and the Himalayas Proper. I have now to remind you of the highly interesting journey made by Mr. W. H. Johnson, from Leh, in Ladakh, to Ilchi, in Chinese Turkestan, a city which had not been reached in this century by any European since the days of Marco Polo and the Mediæval travellers, except by Adolf Schlagintweit, who was killed. This town lies further northward than any point reached by his brothers when they traversed the Kuen Lun.

The clear and eloquent manner in which this great feat on the part of an Indian engineer, brought up under Sir Andrew Waugh, was laid before the Society by Sir Henry Rawlinson, renders all comment on my part superfluous. For he not only delineated the

achievement of that traveller, but put you completely into possession of all the historical data relating to this vast and little-known region, the routes used in old times for traffic, and pointed out to you how it happened that Ilchi, once a great mart on the highway between Russia and China, had been left aside on account of the more favourable route by Yarkand. Although I have always discouraged discussions on the political interests of our own country in reference to those of other nations, I entirely agree with the observation which fell from Sir Henry Rawlinson, that both the Russians and ourselves might trade advantageously with that great intermediate region, and that at the chief cities of each, consuls of either nation might live together in perfect amity.

When that state of things shall have arrived, our geographers would no longer be wanderers, stealthily seeking to acquire knowledge, but would be associated with Russian topographers in defining the physical features of wide tracts, which, though useful to both countries for trade, are far too vast to be objects of settlement for either.

The mineral products of this region are, no doubt, as numerous and important as Sir Henry Rawlinson described them to be, particularly in gold and jade, and the opening up of a fresh trade might be highly beneficial to ourselves and to Russia, now that the Chinese domination has been entirely set aside.

Tibet.—The survey of Lake Pangkong in Tibet, by that intelligent and active explorer, Captain Godwin Austen, is another fact of marked interest in the delineation of tracts lying to the north of the frontiers of British India. Passing from Leh over the Chang La Pass, 17,470 feet above the sea, this traveller, like Dr. Thomson in other adjacent tracts, encountered the most enormous accumulation of débris which had been swept down from the Snowy Mountains, occasionally barring up the streams. He followed the great lake to within a short distance of Noh, a Tibetan town of the province of Rudok. Although the Lake Pangkong has now an altitude of 13,931 feet above the sea-level, Captain Austen showed, judging from traces of remains of shells at considerable altitudes, that its waters must once have stood at a much higher level. At that remote period the waters were fresh and the country covered with rich vegetation; but now the waters of the lake are much too salt to nourish any molluscous animals, and its banks are entirely destitute of vegetation.

Site for a New Indian Capital.—At one of our evening meetings in

January a valuable paper by the Honourable George Campbell, a Judge of the newly-instituted Supreme Court of Judicature for the Bengal Provinces, was read and discussed. The subject was an enquiry into the most suitable site for a new capital for our Indian empire, there being a pretty general agreement in the condemnation of the present metropolis. Had it been possible to foresee the present extent of our dominion, it is almost certain that Calcutta would not have been our choice. It is situated at a corner of our dominion, all the most valuable portions of it lying north, south, and west of it, sometimes at distances of 1000 or 1500 miles. It lies in the delta of a great river, almost on the Tropic. The result of this locality is that the climate is unsuited to the constitutions of the denizens of a cold and temperate region, one-third part of the year only being congenial, while the remainder is divided between great heat and drought and great heat and moisture. In such a climate Europeans cannot labour out-of-doors without imminent peril to health, and the consequence is that most Englishmen, from the Governor-General downwards, abandon Calcutta, if they can, for two-thirds of the year. Still, as the port of the mighty Ganges, Calcutta is truly a metropolis. Although at first a village, it was the seat of our commercial factory; and Bengal, to which it belongs, was our first profitable acquisition—that acquisition, indeed, which, in the sequel, enabled us to make and maintain future territories.

The desirable points to be held in view in the selection of a second capital for India are, that the locality should be central, that the climate should be so temperate that the ruling class should be able to labour effectively without detriment to health, and that the locality should be secure from the dangers of foreign and domestic aggression. There are, no doubt, other qualities which it would be convenient to combine with these, but which are probably nowhere attainable. It would, for example, be desirable that the capital should be situated in a fertile and productive territory, capable of sustaining a large population, but such a position could only be found in the low and hot valleys of the great rivers. It would perhaps be desirable that the seat of government should, at the same time, be a great commercial emporium; but this advantage cannot be combined with the more indispensable requisite of a temperate climate, since all the possible commercial emporia of India are tropical, and on the sea-level. It would be desirable that the Government of India should have the benefit of a public opinion at its

seat; but this does not seem to be indispensable, for with the rapid communication which exists in our times, and which has been extended even to India, the public opinion of great provincial towns may be as effective as that of any capital.

Even centrality of position has, by the discoveries of steam navigation, the railway, and the telegraph, become of far less importance than it once was. The same discoveries have contributed to diminish greatly the risks of domestic insurrection, and as to danger from a foreign enemy, our substantial protection is not local, but rests on England, and the pre-eminence of England's navy.

The author of the paper points out the neighbourhood of a town called Nassick as the most suitable site for a new capital of India. Nassick is an inconsiderable Mahratta town, and a famous place of Hindoo pilgrimage. It has a fertile territory, is but 120 miles from Bombay, and on the line of one of the great railways; but then it is two degrees within the Tropic, and but 2000 feet above the sea-level, so that its summer heat cannot but be very considerable. Nassick did not receive the general approval of the able and expeperienced Indian officers * who discussed the question at our meeting. Some of the speakers expressed a favourable opinion of the Neilgherry Hills, a mountain range which covers an area of 600 square miles, and already the seat of several *sanataria*, and which contains several extensive plateaux, which rise from 5000 to 7000 feet above the sea-level, with a reduction of temperature corresponding to these altitudes, and not unlike the climate of an English summer, although lying between the 10th and 11th degrees of latitude.

Delta of the Indus.—In the course of the session, a paper of eminent ability on the Physical Geography of the Lower Indus, was read by Colonel Tremenheere. It gave rise to a spirited discussion on a disputed question of engineering; but as engineering is not a special branch of geography, we, according to our usual practice, offered no opinion of our own. Exclusive of all theory, however, the subject of Colonel Tremenheere's communication, which includes in a direct line to the sea, 330 miles of the lower course of the Indus, and, incidentally, the harbour of Kurrachee, the only navigable entrance to the Indus, is of unquestionable importance.

The Indus, with its harbour, Kurrachee, I may observe, is to Western India what the Ganges and Calcutta are to Eastern India.

* For the various opinions expressed by Sir Henry Rawlinson, Sir Charles Trevelyan, Sir Robert Montgomerie, Sir Erskine Perry, and others, *see* 'Proceedings,' vol. xi. p. 74.

No doubt the Indus and its affluents, passing as they do through a comparatively sterile and under-peopled region, are of far less value to agriculture than the Ganges with its affluents, which water the most extensive, fertile, and populous parts of India; yet it has its special advantages. For vessels of burden its navigable course is more extensive; it is our natural frontier at the only quarter from which our Indian dominion can be assailed, while it is the great highway to the possible points of attack. The port of Kurrachee has even some advantages over that of Calcutta. The navigable difficulties incurred in reaching it from the open sea extend only about 10 miles, while in the case of Calcutta they extend over 150. Kurrachee has, besides, the advantage of being from 2000 to 3000 miles nearer to England—the true source of our Indian wealth and power—than Calcutta. Kurrachee was, like Calcutta, a small village when we took possession of it only 24 years ago. It is now a considerable, well-built town, and its importance as a commercial emporium may be judged by the following simple fact. Its joint export and import trade in 1844 was of the value of 122,160*l.*, and on the average of the four years ending with 1866, it amounted to 5,500,000*l.*

Independent of the political and commercial advantages of the Indus, with its harbour, it is not to be forgotten that Kurrachee is the only port existing on the western side of India, with the exception of the fine one of Bombay. India, meaning by this the proper country of the Hindus, is, for a great, populous, and wealthy region, singularly deficient in good harbours. On its eastern side it has not one until we arrive at the head of the Bay of Bengal, where we find Calcutta, made tolerably safe, only by dint of great skill and heavy cost. It is worth notice, in a geographical sense, that the opposite coast of the same gulf forms, in this respect, a singular contrast, for here we have no fewer than four good and safe harbours, Negrais, Rangoon, Martaban, and Mergui, the three first being also the embouchures of navigable rivers. If we include Penang, which is on the same coast, we have five harbours, while large and populous Hindustan has but three.

Kurdistan.—In the mountainous region immediately to the north of the plains of Mesopotamia, and around the sources of the Tigris and Euphrates, our Consul at Diarbekr, Mr. I. E. Taylor, has been doing good work of late years in advancing geographical and archæological knowledge. In a former session of our Society, Mr. Taylor communicated to us the results of his researches during the

years 1861-3, when he explored the eastern head of the Tigris, verifying the description of Strabo, and discovering near it a record of an invasion of the country by one of the Assyrian monarchs. Returning, in 1865, to the scene of his labours, after a short visit to England, this persevering explorer has continued his researches in the direction of the Kara Su River, or Lycus of the ancients. He has lately sent us a brief preliminary account of this last journey, stating that he has traced this river to its sources and discovered the site of Pompey's Nicopolis. A more detailed account of these explorations, together with a map of his routes over districts never before visited by a European in modern times, is promised by Mr. Taylor, and will doubtless form the subject of discussion at one of our evening meetings early in the next session.

Egypt.—*The Great Pyramid.*—Among recent publications, I must not omit to notice Professor Piazzi Smyth's 'Life and Work at the Great Pyramid.' If our Government of late years has seemed too often chargeable with indifference to the promotion of scientific research in foreign regions, and even in its own dominions, there are still private Englishmen ready to devote their time and means to such researches. And as it is to the labours and munificence of one Englishman (Colonel Howard Vyse) that Europe owes all the most important discoveries regarding the general structure of the Great Pyramid, so now to the indefatigable work of another we owe the most minute and scientifically accurate measurement of its details that has ever been executed.

Before his visit to Egypt, Professor Smyth had become an enthusiastic advocate of the late John Taylor's theory of the Pyramid as a great metrologic record; and it was his desire to test and develope this theory by more accurate measurements that carried him to Egypt. His stay there has enabled him to produce a book of great interest, both in the narrative of his operations and in their results; and its connexion throughout with metrology, in the most comprehensive sense of the word, renders it a fit work for the consideration of the Geographical Society. Some of the measurements were performed under remarkable advantages, for Professor Smyth had the good fortune to see the whole four of the corner-sockets of the Great Pyramid, as originally excavated in the living rock, uncovered simultaneously for the first time on record. Yet the important measurement between those fiducial points was sorely obstructed by the masses of rubbish that

surround the pyramid, the removal of which is too costly for private means. Professor Smyth shows clearly that the Great Pyramid is not merely the greatest of a class, but stands *alone* in its proportions and constructive arrangements. He shows that though its entrance passages were so carefully sealed, the details of their elaborate structure clearly point to the anticipation of future disclosure, whilst marks indicating the way to such disclosure have even been discovered by Professor Smyth in the masonry of the first descending passage. He has gone far towards establishing beyond doubt the fact—which many still reject—that the pyramid was originally cased with smooth Mokattam limestone (not granite, as some have stated). His measurements demonstrate that the pyramid is (or rather has been) a true symmetrical figure on a square base, the orientation of the sides of which deviates from the truth not more than 5 minutes at most, whilst their *mutual* deviation does not exceed 35 seconds. They prove that the altitude of the pyramid is to the perimeter of its base in the ratio of the radius to the circumference of a circle; that the number of cubits in the length of the base symbolises to a fraction the length of the solar year; that the cubical capacity of the lower course of the King's chamber is just 50 times the interior content of the granite coffer which stands within it; whilst the exterior capacity of the coffer is just double its interior contents. These are only a very few samples of the results of the measurements in which Professor Smyth conceives that he finds the records of a metrologic system of the most scientific kind; of a standard of length based on the length of the earth's semi-axis of rotation; of standards of weight and capacity based on the earth's mean density and on the preceding standard of length; of time standards in the length of the year and the record of the Sabbatic week; nay of a standard of thermometrical and a scale of angular measurement. Some of Professor Smyth's concluding speculations and deductions are, doubtless, a little eccentric, and the least questionable of his results are astounding. But whatever may be thought of the more startling parts of the book, as a whole it is the record of a great undertaking scientifically executed, and it will doubtless produce much discussion among antiquaries and astronomers as well as geographers.

SOUTH AMERICA.—In my Address for last year I fully discussed, with the valuable aid of Sir Woodbine Parish, the geographical

questions which were solved by the exploration of the river Purûs by Mr. Chandless. That most accurate observer ascertained beyond a doubt that the main branch of the great stream, which he ascended nearly to its source, did not extend to the mountain ranges of Peru. We have since received a full account of the second voyage of Mr. Chandless up the Purûs, and of his exploration of its principal affluent the Aquiry, which he undertook in the season of 1865-6. He found no difficulty in navigating the Aquiry for the first 300 miles, even at the lowest stage of water, and considered it to be perfectly navigable for steamers up to the parallel of 11° s. Higher up it became wider and shallower, and his canoe was finally stopped by a network of stranded timber. After navigation became impossible, Mr. Chandless attempted to reach some river belonging to the Madre de Dios system, flowing from the Andes. He forced his way for a considerable distance through almost impenetrable forest, but, at the end of a week, was obliged to return for want of provisions.

While Mr. Chandless was thus, by an exhaustive process solving, in the negative, the question whether the streams flowing from the Cordilleras of Cuzco and Caravaya formed the river Purûs, our Peruvian Honorary Corresponding Member, Don Antonio Raimondy, was furnishing us with information as to their true course. It appears, from our correspondent's narrative, that the enterprising Peruvian explorer Don Faustino Maldonado constructed a canoe in February, 1861, and embarked on the Madre de Dios with seven companions. He was drowned in passing a rapid, but his surviving comrades continued the voyage, entered the great river Madeira, and eventually reached Manaos on the Amazon, at the mouth of the Rio Negro. As the Beni is the only large river which flows into the Madeira on its left bank, it would appear that the rivers Madre de Dios and Ynambari, flowing from the Cordilleras of Cuzco and Caravaya, and which were so long supposed to be the sources of the Purûs, are in reality tributaries of the Beni. Señor Raimondy's own valuable labours have comprised a careful examination of two tributaries of the Ynambari, in the province of Caravaya; but it is his intention to continue the exploration of this interesting and very important region in future years.

It is with great satisfaction that I have to announce the departure, by the last Brazilian Mail Steamer, of that most indefatigable and accurate scientific explorer, Mr. Chandless, to the scene of his former labours and triumphs. It is his intention, on this occasion, to

ascend the rivers Madeira and Beni, and thus at length to reach those streams flowing down the forest-clad slopes of the glorious Eastern Andes, which he had previously sought in vain at the head-waters of the Purûs and Aquiry. We shall look with much interest to the results of our Medallist's further explorations.

While on the subject of South America, I may mention that the attention of the present energetic and enlightened ruler of Peru, Colonel Don Mariano Ignacio Prado, has been turned to the opening up of the great fluvial highways between the Peruvian provinces in the Andes and the main stream of the Amazons, chiefly by way of the Pachitea, a river which our Lieutenant (now Admiral) Smyth endeavoured to reach in his courageous exploration of the year 1834. Three steamers were employed last year in exploring the Ucayali and Pachitea, and succeeded in reaching Mayro, 325 miles from Lima, on the 1st January, 1867; thus proving the Amazons to be navigable for 3623 miles, from its mouth to the eastern slopes of the Andes near Lima. The hitherto almost unknown River Javarí has also been lately explored, to the extent of about 1000 miles, by a joint Peruvian and Brazilian boundary commission. This laudable activity, while developing the resources of these countries, cannot fail to extend geographical knowledge.

AUSTRALASIA.—In my last Address I recorded the progress of the Expedition in search of Leichhardt, which had been organised by a Committee of Ladies at Melbourne, incited by our learned and enthusiastic associate, Dr. F. Mueller, and which had been munificently supported by grants from the Colonial Legislatures, besides donations from the Queen and our own Society. Since then the able leader of the expedition, Mr. Duncan McIntyre, much to the grief of the promoters, has fallen a victim to a malignant fever now prevalent along the banks of the streams which flow into the Gulf of Carpentaria.* Before this unfortunate event occurred, Mr. McIntyre had made good progress in searching for traces of the long-lost party, along the banks of the Albert, Gilliot, and Leichhardt rivers; questioning the natives and examining all the reports of white people living amongst the tribes. His journey across the continent, however, from the

* I am informed by Sir George Bowen, Governor of Queensland, in a letter dated 16th December, 1866, that the last accounts report an improvement of the public health in these districts.

River Darling to Burketown, on the Albert, has added but little to our geographical knowledge, the party having followed very nearly on the tracks of the former explorers, McKinlay and Landsborough. The death of Mr. McIntyre occurred on the 4th of June last; and I have lately learnt that Mr. W. F. Sloman, who succeeded to the command, has since also died. In this state of affairs, with the Expedition left to itself on the opposite side of the continent, the Ladies' Committee have entrusted its further management to Mr. Campbell, the uncle of the late leader, who has contracted to continue the search for the remainder of the two years originally contemplated, and has appointed Mr. W. F. Barnett as leader. By the last accounts from the Gulf of Carpentaria, dated December 21st, the party had resumed the search, and had obtained a valuable coadjutor in Dr. White; the camels were reported as in fine condition, and well suited for Australian travel.

In other parts of Australia the acquisitions to our geographical knowledge have been limited to local explorations in search of lands suitable for pasture or settlement. This has been especially the case with the colony of Western Australia, which has of late years added much to our information respecting the northern portions of its territory. Mr. R. J. Sholl has explored the neighbourhood of the Glenelg River and Camden Harbour, but without hopeful results as regards its capabilities for immediate settlement; and on his report the Provincial Government has abandoned the attempt to colonise the district. The settlement of the northern territory of South Australia has also proved a failure, and is now abandoned,—the survey of the neighbouring coasts and rivers undertaken by the Colony, with a view to discover suitable lands for colonisation, having borne no fruit. On the other hand, the progress of settlement in the tropical portions of Queensland, on the eastern coast, and at the head of the Gulf of Carpentaria, steadily continues. Another new township, named Carnarvon, has been formed in the Gulf, on Sweers' Island, to the north of the mouth of Albert River, where the harbour, named by Captain Flinders "Investigator Roads," is the only good one at the head of the Gulf. This is probably destined to become the principal seaport in this part of Australia, and the emporium for the settlements on the banks of rivers running into the Gulf. Upon the general subject of the advance of colonization in Queensland I entered into some detail in my last Address, and need not now recur to it, beyond calling your

attention to the able descriptive paper of Mr John Jardine,* which gives so much information regarding the neighbourhood of our new settlement of Somerset, at Cape York.

New Zealand.—Since the publication of the valuable papers of Dr. Haast and Dr. Hector, on the glaciers and passes of the Canterbury and Otago Provinces, in the Middle Island, New Zealand, in the 34th volume of our Journal, the exploration of the rugged and almost impassable mountain-range which forms the backbone of the island, has been continued by the former of these gentlemen. Owing to the discovery of gold on the western coast at Hokitika, the Provincial Government of Canterbury were anxious to discover some nearer route over the mountains than the circuitous one by the Hurunui and Teramakau or Harper's Pass; and several parties were sent out to find, if possible, other passes. From this resulted the discovery of Arthur's Pass (3038 feet) near the head-water of the Waimakariri, by Messrs. Arthur and George Dobson, and the north Rakaia Pass (4645 feet) by Messrs. Browning and Griffiths, which latter reduced the distance between the east and west coasts by about eleven miles. On Dr. Haast devolved the duty of examining these different passes, and preparing a series of altitude sections by barometrical observations, to serve as a guide to the Government in choosing the best route. The task was accomplished in the latter part of the year 1865; Dr. Haast traversing the various passes, and, on his return to Christchurch, drawing up a series of admirable diagrams in illustration of the subject, copies of which, together with a descriptive paper, he has forwarded to me for presentation to our Society. The north Rakaia Pass was found by Dr. Haast to be deeply covered with snow in the early summer, and he states that the routes by Arthur and Harper passes (although considerably longer) will always be preferred by travellers, as they are seldom obstructed by snow, and are not subject to avalanches.

CONCLUSION.—In concluding this, the thirteenth, Address which I have delivered to you, I must now assure you that the Council ought to have selected some one younger than myself to occupy your chair. For in truth, my numerous avocations press so heavily upon me, that, with the heartiest desire to serve you, I am too well aware of my inability to efficiently perform all I could wish.

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* *See* 'Journal,' vol. xxxvi. p. 76.

Permit me, however, to explain, that if this Address is not as complete as it ought to be, my chief apology is that, as our anniversary approached, I was in the throes of bringing out a new edition of the chief work of my life, 'Siluria.' But whilst Geology has been the pusuit on which I have established whatever little reputation I possess as a labourer in the fields of Science, I know that you will believe me when I say that I have so loved Geography that I have through life considered these two great branches of knowledge to be inseparably connected. At all events, during my term of office as your President, I have ever striven to the utmost of my power to preserve the efficiency and augment the influence of the Royal Geographical Society.

If, then, you should be pleased to adopt the recommendation of the Council, and re-elect me, I promise you that, if I be spared, I will put forth what energy remains in me to carry out your wishes during the ensuing year. But really, when that term shall have expired, I trust you will place at your head a younger chief; and whoever he may be, I am sure when he has been but a year in office he will declare, as I have ever done, that the Fellows of this Society are men of whose support he may well be proud, and over whom it is a true honour to preside.