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THE SCOTTISH GEOGRAPHICAL MAGAZINE.

ANNIVERSARY ADDRESS: THE HISTORICAL ASPECTS OF INDIAN GEOGRAPHY.

BY SIR WILLIAM WILSON HUNTER, K.C.S.I., C.I.E., LL.D., ETC.

(At a Meeting of the Society, Edinburgh, November 6, 1888.)

MY LORDS, LADIES, AND GENTLEMEN,—

I thank you for your kind welcome, and it is with a very sincere pleasure that I appear before you this evening, in response to the invitation of the Royal Scottish Geographical Society. For the Council of this Society, in selecting India as the subject of its Anniversary Address, has chosen a field of geographical research rich in results to science, and of vital importance to our nation. It will be my duty to rapidly unroll before you the long series of labours by which that far-off land of prodigy and fable has been brought within the realm of verified knowledge. But the record is not merely a panorama of scientific achievement; it is a picture-writing from the remote ages of the great struggle between man and nature which forms the permanent discipline of our race.

Many influences have of late combined to bring India closer to us. The Jubilee procession of last year, when our beloved Queen went to offer thanks to the Almighty for His goodness to herself and her people during her long and glorious reign, attended by her splendid escort of European and Indian princes, made the nation realise, as it had never realised before, that Her Majesty is not only the august sovereign of Britain, but also a great Asiatic Empress. That procession, unique in the world's history, and magnificent beyond the most gorgeous triumph of imperial Rome, awakened a nobler and a broader sense of nationality in three hundred millions of subjects, from the hearths of our Scottish Highlands to the homesteads of Hindustan. Conspicuous above all, and cheered loudly beyond the rest, rode a commanding presence in white

uniform, that spotless royal knight in spotless raiment, whom on earth we shall never see again. And I think that we Scotsmen, to whom our Sovereign Lady has so especially endeared herself by her Scottish home life, may be permitted in a special manner to participate in her great home sorrow. I feel at any rate that this Society, which gratefully remembers the distinction accorded to it by Her Majesty in commemoration of her jubilee, would not desire its anniversary to pass without expressing its deep and loyal sympathy. For it is not alone the beloved husband of our Queen's beloved daughter; and the most powerful Emperor of Europe, the illustrious head of an honoured and a kindred nation, whose loss we deplore. It is also the enlightened patron of science, the munificent yet delicate helper of men of learning, the friend of all faithful and honest workers throughout the world. We bow our heads in the presence of this great international calamity. But God in His own time makes clear His own design. And then it will be found that Germany and Britain have a new and dearer bond in their common reverence for that noble pattern of Christian fortitude and manly endurance, and in their mutual memories of the knightly and imperial and most loving soul that has passed away.

In India the earth and skies are more terrible things than we feel them to be in the temperate zone. Mountains, rivers, deserts, wind, rain, and dew, there control with an irresistible compulsion the destinies of man. The configuration of the mighty triangle, nearly equal to all Continental Europe, less Russia, which juts southward from mid-Asia into the tropical sea, marks it out as a vast isolated field on which the agencies of earth, air, and ocean might wage their warfare on a Titanic scale. It is as if the Almighty had set apart a region of this planet in which the forces of nature might run to and fro undisturbed and do His bidding. We still behold the rivers rending the rocks, carrying down thousands of millions of tons every year from the distant mountains, and causing the dry earth to rise out of the waters. The ancient secrets of land-making are laid bare; the drama of Genesis is acted before our eyes; and we may stand by and witness, as in a stupendous miracle-play, the third morning of the Mosaic creation.

The vastness and the isolation of India, walled out by the Himalayas from the rest of the world, and projected nearly two thousand miles into the ocean, enable the elemental forces to carry on their work with but slight interruptions from local and variable causes. A majestic order is there revealed in all things. Earth and ocean act and react on each other with a regularity of meteorological results here unknown. The solar heat, and the evaporation of the surrounding tropical expanse of water, produce an almost unvarying procession of phenomena each year. Nor is this imposing uniformity confined to the annual revolutions of heat, wind, and rain. It seems also to disclose itself in more recondite cycles spread over longer periods, which are only now coming within the range of continuous research.

The overwhelming forces of nature have in India at all times pressed heavily on the imagination and the lot of man. They profoundly influenced

his ideas about God. They gave form to his mythology. They shaped his history. They regulate with a minute and imperious discipline his social institutions and his daily life. It will presently be my duty to point out the reservations under which such inferences with regard to the influence of nature upon man must be received. The danger of confounding coincidence with causation can scarcely be eliminated from them. But subject to this caveat, it may be safely said that as the stupendous scale of nature in India and its uncontrollable forces seem to have modified religious conceptions, so also they appear to have powerfully reacted on the social and industrial economy. Man in India found himself too weak to stand alone against nature. The chances against the individual are heavy, and at the same time the general conditions are highly favourable to the increase of the race. Isolation has always there been felt to involve serious risks. The gregarious instinct in man accordingly received a very full development in India, and it still exhibits a remarkable vitality. The ancient human groups have there offered a firm resistance to the centrifugal and isolating tendencies. The undivided family maintains much of its old coherence in the midst of a complex system of individual rights. The caste binds together the family groups, and the separate trades or handicrafts into strongly organised guilds (or semi-religious, semi-industrial corporations) of remote ethnical origin, but with a very practical modern basis of reciprocal obligation, reciprocal supervision, and reciprocal help. The social institutions of India which disclose the most characteristic vitality, are those which most effectively discharge the functions of mutual assurance societies. Taken as a whole, they do the work of a poor-law for a dense population, subject to all the calamities of the tropics.

This appears clearly among the agricultural masses, who are most obviously at the mercy of nature. Until our own time, the village commune was the one stable unit of rural organisation in India which raised its head above every succeeding inundation of conquest. And the village commune involved many sorts and degrees of mutual insurance, from a joint responsibility for keeping up the continuous embankments against the river, or for maintaining the common reservoir or irrigation-lake, to a joint liability for the revenue or even a joint distribution of the crops. As the cultivator finds himself better secured against the vicissitudes of the seasons by the scientific appliances of British rule, he grows more self-reliant. When he knows that he can protect his own fields by Government irrigation, or supplement a local failure of crops by grain bought at cheap rates by State railways from other provinces, he insensibly becomes less anxious about his individual risks. It is no longer so necessary for him to spread those risks over a joint village group. One of the strongest solvents of corporate village rights in India has been found to be canal water. But the most characteristic of the rural institutions of India are still those which act as a mutual assurance against the calamities of nature and the mischances of life.

Not less masterful has been the influence of the Physical Geography of India upon its political history. The configuration of the country

gave a uniform direction during ages to the invasions of India, and set precise limits to each successive empire. The dynastic problem in India for hundreds of years preceding our rule was how to weld together the north and the south, in spite of the geographical obstacles. The Mughal sovereigns staked their empire upon the solution of this problem. They staked, and they lost. The fate of previous dynasties had shown that Northern India alone could not permanently withstand the influx of fresh invading races from the hardy breeding-grounds of Central Asia. A consolidated India under a vigorous rule might be able to do so. This was the dream of the Mughal dynasty. The last of its great emperors wrecked his armies and his revenues in a fifty years' struggle against the barriers which nature had set up between the north and the south. Out of the magnificent fragments of his empire, the British nation has built up a united India. But it is only in these last days that modern man, with the aid of the railway, the steamship, and the telegraph, is in India emerging victorious from the long struggle with nature. The dream of the Mughal emperors has become the reality of British rule.

In starting at the outset with a summary of the human aspects of Indian Geography, I have not thought it needful to vindicate before your learned Society this method of treatment. For one of the irresistible conclusions of recent research is that if geography is to keep its place as a progressive science, it must deal not alone with the physical configuration of the earth, but also with the relations of physical configuration to the phenomena of life. This view, after being carefully worked out in Germany, has now been accepted in Britain. The successful labours of the Royal Scottish Geographical Society in this direction, its public lectures, its exhibition of geographical appliances, its examinations and prizes, form parts of a well-organised scheme for encouraging the study of scientific geography in Scottish schools. The University Extension Scheme has recently included a course in Physiography by Dr. Mill, and the Heriot-Watt College in Edinburgh has instituted a class for Commercial Geography. How very practical and, at the same time, how strictly scientific the study of the new geography may be rendered in capable hands may be judged from the admirable work by a distinguished member of the Council of this Society, Dr. George Smith. Dr. Smith's volume is the first systematic geography of British India, a model of careful research and of able exposition, which has done more than any other book to render the physical facts of our great Eastern dependency intelligible to the British nation. A more general statement of the aims and methods of the new science of geography is given in the brilliant yet deeply philosophical article recently written by Mr. Scott Keltie. The learned dissertation of Sir George Birdwood on "The Maratha Plough" shows what can be done by the application of scientific geography to local history in India.

During the past year, also, the study has been recognised for the first time by the two great English Universities; and the President of the Royal Geographical Society, in his inaugural course of lectures at Cambridge, clearly explained the character of the teaching which that

Society has aided with its funds to establish. The new teaching does not exclude our former conceptions of geographical research. Scientific geography must still, and at all times, be built upon the sound basis of geodetic and topographical work. But it is not the old geography of our school days—the dry bones of terrestrial mensuration and the nomenclature of the earth's surface—that the English Universities have now undertaken to teach. It is, to use the name given to it by General Strachey, Applied Geography, or broadly speaking, the relations of terrestrial configuration to terrestrial life. On this wide subject, Mr. Mackinder, the newly-appointed Reader in Geography at Oxford, delivered forty-three lectures during the past year. He has successfully claimed a recognition for the study alike in the School of Natural Science and in the School of Modern History. In one course of lectures he treats of geography from its scientific aspects; in another concurrent course he deals with it in its relations to history. During last term he delivered a series of most valuable lectures on "The Influence of Physical Features on Man's Movements and Settlements" to audiences such as seldom come together in Oxford professorial halls. The heads of the historical school at Oxford have actively entered the field. Professor Freeman announces a course of lectures on "The Historical Geography of Europe"; and Mr. Sidney Owen, the learned historian, to whom India already owes so much, continues to treat Indian history on the basis of Indian geography.

The doctrine of the dependence of life on geographical conditions has been systematically elaborated in connection with plants and the lower animals. But the supreme problem of the action of geographical environment on man is beset with greater difficulties. For while plants and the lower animals can do little to modify their physical surroundings, man can do much. He gradually advances from an animal-like dependence upon his environment into a long struggle with nature—a struggle in which millions of his species are destroyed, but from which the most effective races derive an invaluable training and stores of accumulated knowledge. In the final stage it is difficult to pronounce as to whether man, with the aid of science, more profoundly modifies his environment or is more controlled by it. The problem is no longer one of the direct action of geographical conditions upon life, but of the complex interaction between man and his physical surroundings. When the problem is carried still further, from man as a biological structure to man as a historical development, new sources of error arise. At each extension of the doctrine of the dependence of life on external conditions into the domain of civilised humanity, it becomes less susceptible of verification. The chain of sequence weakens as it lengthens out, until it may in rash hands degenerate into a mere *post hoc ergo propter hoc*.

In speculations such as we are now entering on—speculations which cannot be brought to the touchstone of direct experiment—a wise diffidence should govern our speech and control our conclusions. We can see that in India the majestic scale of nature and the overwhelming energy of its forces have gradually influenced man's conceptions about God. We can see that geographical and climatic conditions have

tended to a full development of social and rural institutions of a certain type, and have given to that type a marked degree of vitality. But we cannot yet say, and we shall probably never be able to state, in what precise degree the physical conditions have contributed to the historical result. The great equation of the interaction between man and nature cannot be determined by any formula of algebra. The finest instruments available for the research still leave its process one of qualitative and not of quantitative analysis. Especially is this the case in regard to the political aspects of Indian geography. We can see that certain river valleys have in the long-run determined the line of march of Indian mankind; that certain chains of mountains have in the long-run set limits to successive Indian empires. But on scrutinising the individual episodes of Indian history, we find that in every case purely human and even personal influences have intervened to determine the result. The march of the races has been deflected from the natural route, and turned to the right hand or to the left by causes quite independent of the geographical conditions. Armies have halted and the tide of empire has been turned back, not because a river or a mountain range could not be crossed, but because, as it seemed, at the very moment when the natural obstacle would be overcome, an emperor dreamed a dream, or a rebellious son broke out into revolt in a distant province. All that we can establish is that the constant factor of geographical configuration has, in certain definite directions, slowly, steadily, and powerfully controlled the course of Indian history.

The first essential for the study of the historical movements of mankind in India is, therefore, a knowledge, at once comprehensive and exact, of Indian geography. That knowledge has, during the past eighty-eight years, been supplied by a series of operations conducted by the Government, with a magnitude of resource and with a continuity of effort which have no parallel in the annals of research. The trigonometrical mensuration of the Indian continent as a whole, its topographical delineation province by province, a geological survey of its land structure, a marine survey of its coasts and ocean approaches, astronomical observations, and a strongly organised meteorological department have accumulated invaluable materials for the scientific geographer. Nor have the investigations stopped short at the phenomena of inert matter. The plant-life of India, and certain divisions of its animal-life, have been comprehensively studied; the archæological survey has revealed the progress of man in the past: the statistical survey exhibits the population district by district, and systematically records the conditions, physical, moral, and economical, of human life in the present. While Germany has been elaborating with admirable industry the principles of Applied Geography, England may claim to have stored up in India materials on an unrivalled scale for the practical structure of the science, from the initial stage of geodetic mensuration to the final problem of the influence of terrestrial environment upon man.

I propose, before indicating some of the main results from this vast totality of effort, to explain the principal classes of the materials now available for the historical geography of India. The first class is derived

from philological research. That research divides itself into two branches in India: the study of Indo-Aryan languages, for which we are largely, although—thanks to Bengal civilians—not altogether indebted to German scholars; and the study of the non-Aryan Indian dialects, of which Bishop Caldwell's Dravidian Grammar forms the monumental work. The early literature of India comes next, particularly the Veda and the Epic Poems. These are now for the most part available to the student in English renderings, many of which we owe to native Indian translators. From the fifth century B.C., to about 200 A.D., we have the notices of India by the Greek travellers and geographers, including the surviving abridgment of Ktesias, the fragments of the ambassador Megasthenes, the *Indika* and *Anabasis* of Arrian, the geography of India as given by Strabo and Ptolemy, and the *Periplus* of the Erythræan Sea. Herodotus knew nothing of India beyond the Indus. An excellent collection of these Greek notices of India has been edited in English by a member of the Council of this Society, Mr. J. W. M'Crinde. Coins and inscriptions supplement them, and bring down the materials, with an interval of obscurity, to the fourth century A.D. The Chinese pilgrims to the Buddhist holy places in India, take up the thread of the story in 399 A.D., and supply valuable, although intermittent data, down to the year 645. The itineraries of these venerable travellers, after careful study by French and German scholars, have been systematised by General Cunningham in his *Geography of Ancient India*, and re-examined, with the aid of the latest lights, by the Rev. Samuel Beal. The mediæval writings of Hinduism, the Puranas, and *Acta Sanctorum* of the great Hindu sects, continue the chain of evidence onwards from the eighth century A.D., until the uprising of the modern vernacular literature of India.

Meanwhile the Muhammadan geographers and historians have come upon the scene. Their almost continuous flow of narrative from the ninth century to the nineteenth, has been rendered available to the English student by Sir Henry Elliot's eight volumes, and in many isolated translations and monographs. From the thirteenth century onwards, European voyagers also make their appearance in India; from the Venetian noble and the Catholic friar to the Portuguese and Dutch admirals, and the captains of British East Indiamen. This period of early European discovery finds perhaps its three most characteristic expressions in Marco Polo, the *Lusiad*, and Purchas' *Pilgrims*, including the Embassy of Sir Thomas Roe. The long series of materials thus summarised, beginning with philological inductions and the Vedic hymns, and coming down to the log-books of the East India Company and Bishop of Heber's Journey, cover a period of between three and four thousand years. They enable the English student to obtain a more or less continuous record of man and his environment in India from perhaps nineteen centuries before Christ, to the nineteenth century of our era.

But this vast store of observation represents only what may be called the pre-scientific materials for Indian geography. With the first year of the present century commenced those great series of operations conducted by our Government, on which our present knowledge of India rests. The trigonometrical survey of India practically dates from 1800, and

owed its organisation on an adequate scale to the two illustrious brethren who were then conquering and governing India, and who are known in English history as the Marquess of Wellesley and the Duke of Wellington. Starting from the measurement of an arc of the meridian, the complete triangulation of the Indian continent has been steadily carried out at 3472 stations in spite of malarious forests, tropical swamps, and Himalayan snows. The achievements of daring, and of patient suffering, and of indomitable endurance in the records of the Trigonometrical Survey of India, form some of the most glorious unpublished annals of our British race. While the geodetic measurement of India, as a whole, was thus being accomplished, the Topographical Survey, based upon the trigonometrical triangulation, was filling in the details for each province. Isolated surveyors, among whom Major Rennell in Bengal and Colonel Colin Mackenzie in Southern India hold the foremost place, had been at work since 1762 ; but the Topographical and Revenue Surveys, on a systematic plan, may also be said to date from the first years of the present century. The trigonometrical and topographical operations of the past eighty-eight years have raised Indian geography into a science. Fourteen centuries ago, the Sanskrit sage, Aryabhata, had affirmed the diurnal revolution of the earth on its axis, explained the true cause of solar and lunar eclipses, and is said to have computed its circumference at the marvellously accurate approximation of 25,080 miles. This was a splendid triumph for Brahman astronomy a thousand years before Copernicus ; and Observatories erected, or even conducted, by Indian princes had carried on excellent work before the British established their Indian headquarters of astronomical observation at Madras. The early European voyagers, also, had constructed maps of India and of its ocean approaches before the admirable marine surveys by the old Indian navy. But while acknowledging the historical interest of these pre-existing materials, the fact remains that the scientific geography of India has been created by the British Government and by British officers during the present century.

The accurate basis thus afforded has been used to systematise various cognate departments of knowledge. In 1818 a geologist was regularly attached to the trigonometrical staff, and his office has grown into the great Geological Survey, to which India is deeply indebted for the development of her mineral resources. The physical geography of India was investigated by a series of able workers, conspicuous among whom were the indefatigable brothers, Henry and Richard Strachey. General Richard Strachey has now had the enviable task of giving effect, as President of the Royal Geographical Society, to his ideas regarding the true scope and functions of the science, ideas perhaps formed during his pioneer searches among the Western Himalayas and Siwaliks forty years ago. The botanical geography of India received its first impulse from the *Hortus Malabaricus*, undertaken under the auspices of the Dutch Governor of Malabar, Van Rheede, in the seventeenth century. But the true father of Indian botany was our brother Scotsman, Dr. Roxburgh, who lies buried in this city. His magnificent volumes of the *Flora Indica* were published from 1820 to 1832. His successor, Nathaniel Wallich, was a

Dane, taken captive by the English at Serampur, but promoted from his prison to the highest botanical appointment in the gift of the Indian Government. Under Dr. Wallich's enthusiastic administration, the Calcutta Gardens soon became the richest horticultural establishment in the tropics, and in many respects the first in the world. Besides travelling and collecting for it, himself, in Nepal, Burma, and the Straits, he employed collectors in all parts of India. The treasures thus obtained were distributed with lavish munificence to the public and private gardens throughout Great Britain, its Colonies, and Europe, whilst he at the same time enriched the Garden at Calcutta by the contributions which were received in return. By the same means he amassed a Herbarium of Indian plants amounting to upwards of 8000 species, named and numbered duplicates of which were distributed to the principal museums of Europe. For extent, novelty, and interest, this great Herbarium has never been equalled. Amongst his many contributions to scientific botany, Dr. Wallich's *Plantæ Asiaticæ Variores*, a superb work in three folio volumes, will always be regarded as a monument of his great botanical knowledge, energy, and ability. Other distinguished botanists succeeded Dr. Wallich, down to the admirable labours of Dr. King. It was, however, reserved for the illustrious son of a distinguished Scottish professor, to complete the work which Dr. Roxburgh began. Sir Joseph Hooker's long labours for India include every branch of botanical research, from his personal collections in the Himalayas forty years ago to his plotting out the Indian continent, with Ceylon, into eighteen botanical provinces, and his great Flora of British India, which will form one of the most enduring monuments of British science. The zoology of India has not yet been systematised by so encyclopædic a genius. But important divisions of the animal kingdom in India have been carefully investigated. A noble and venerable worker, Brian Houghton Hodgson, still remains among us, who combined with a master's grasp alike the botany, the zoology, and the ethnology of Himalayan India. Dr. Blanford's *Fauna of British India* will treat with a magnificent completeness of the Indian Vertebrates. The study of plant life and animal life is now receiving new and invaluable data from the Meteorological Department. India presents an unrivalled area for thermometric and barometric observation; an almost isolated meteorological field of vast size and of comparatively simple conditions.

The interval from plant life and animal life to human life is a wide one; and it has been successfully bridged by the Government surveys in India. Man and his works in the past have been systematically explored by a brilliant succession of archæologists, among whom five Scotsmen stand in the foremost rank. Colebrooke, Colonel Colin Mackenzie, and Buchanan Hamilton, in the beginning of the century; General Sir Alexander Cunningham, a son of our Dumfriesshire poet, and Dr. Burgess of Edinburgh, in our own days—these are the workers to whom India is conspicuously indebted for the exploration of her ancient memorials. The investigations of Colin Mackenzie in Southern India and of Buchanan Hamilton in Bengal form two magnificent series of manuscript folios in the India Office Library. The more extended labours of General

Cunningham, and Dr. Burgess's invaluable researches in the Western Presidency, are printed in the records of the Archæological Survey of India. Together with the works of Colebrooke, Horace Hayman Wilson, Rajendra Lala Mitra, Bhau Daji, and others too numerous to name, they supply accessible and abundant materials for the study of Indian historical man.

This great reservoir of research has contributed invaluable materials to the latest of the Indian Government Surveys—the Statistical Survey of India. The Statistical Survey, after eighteen years of continuous effort, has digested and published a complete account of the country and its people in 128 volumes. Each of the 240 districts of India, as then constituted, is dealt with separately, from materials collected on the spot. The Survey preserves a unity of plan sufficient for the purposes of comparative statistics, without sacrificing local individuality. This long labour, like the Archæological Survey, has also been conducted under the direction of a Scotsman. The physical geography of each district, or territorial unit, its administrative history, its meteorological and climatic conditions, its natural products, mineral, vegetable, and animal, its methods of cultivation, its population and races, their ethnical divisions, their civil status, their rate of increase, their industries, arts, manufactures, commerce, and trade, are systematically set forth in a vast aggregate of sixty thousand printed pages. The Statistical Survey thus endeavours to sum up the practical human aspects of the many series of operations which the British Government has conducted since 1800, with a view to obtaining an accurate knowledge of India. Its dependence upon these operations, and the debt which it owes to them, may be judged from a single fact. During the progress of the Statistical Survey the position of the Madras Observatory, on which all Indian longitudes are based, was determined afresh by the exact methods of electro-telegraphy. It became necessary, therefore, to carefully consider whether the whole longitudes in the Statistical Survey, exceeding ten thousand in number, should be altered accordingly; or whether, as a further minute change seemed not improbable, the case should be met by a general intimation that all longitudes in the Statistical Survey require a constant correction of minus $2\frac{1}{2}$ minutes. As the Archæological and Geological Surveys complete their work, and as the meteorological observations furnish materials for new inductions, additions and improvements will, I hope, be made in a future edition of the district Statistical Accounts. Meanwhile their sixty thousand pages have been condensed and made available to the public in the fourteen volumes of the Imperial Gazetteer of India.

I think that every British man may look back with a sense of national exultation to what their countrymen in India have accomplished on behalf of human knowledge during the past eighty years. It is impossible to overrate the political benefits which British Rule has during this period conferred on the Indian races: and even those natives of India who are most desirous for a popular development of our Indian system of government are most forward in acknowledging its claims on their loyalty and gratitude. But while we know that we have ruled righteously, our national habit of self-depreciation sometimes leads us to underrate what may be termed the intellectual and scientific aspects of our Indian Government.

The summary which I have given of the actual work done by our countrymen in India during the present century forms an unanswerable protest against such despondency. If the evidence of an independent expert is preserved, let me quote the words in which the great German organ for the criticism of foreign literature sums up its verdict on the Statistical Survey :—"The Englishman who dips, as we have done, into this deep reservoir will be filled with a new and nobler pride in the empire which his nation has created and maintained as their own in the East. Not warlike fame, nor imposing majesty, nor wealth, nor the national power which guarantees the British sovereignty in India, make upon him the strongest impression. It is rather a feeling of the earnest and responsible duty which fate has imposed upon his nation to free India from anarchy and misrule—to make it the England of Asia, and the centre of a new civilisation for the continent from which issued the earliest stream of enlightenment to enrich the world."

I shall now summarise a few of the inductions which may with safety be drawn from this great magazine of research. India was marked out from primæval times as a continent which the races of mankind were destined to reach by three definite routes. The sea-coasts of Lower Bengal, and the comparatively easy approach through its eastern hill-ranges, gave an easy access from the south-east. The evidence proves that in a prehistoric period successive migrations entered India by these routes, and brought with them dialects which, after infinite processes of mutation and decay, still establish their relationship with the human families to which the nations of Eastern Asia, from Burma to China, belong. This advancing tide of races from the south-east was encountered at a very early period by an inflow of population through the mountain passes of the north-west. The huge wall of the Himalayas along the north of India seems to have allowed of little influx from Central Asia. The population of India, like the rivers of India, could only find entrance into the peninsula by skirting round the Himalayas, at the extreme east or the extreme west of that mighty mountain barrier. The tide of non-Aryan mankind flowing up the Gangetic valley from the south-east was eventually encountered by the inundation of Aryan mankind entering the Gangetic valley from the north-west. A process of enslavement or of incorporation took place under Aryan supremacy, but vast masses of the defeated non-Aryans were pushed out of the Gangetic basin into the hills which surround it, and especially into the mountains and table-lands of Central India on the south. But even down to our own century, the south-eastern non-Aryan races kept constantly pushing in from the coast and eastern border of Lower Bengal. The Muhammadans had for a time to fix their military capital of Lower Bengal at Dacca, in the unhealthy eastern delta, to repress these movements. Our first maps of that country delineate large tracts bare of inhabitants, with the words written across them, "depopulated by the Maghs." It was not till the British, in 1824-26, broke the power of Burma, and annexed the eastern province of Assam and the coast of Arakan, that invasions from the south-east ceased out of Indian history.

The third great approach to India was by the sea. The difficulties attending ancient navigation rendered this route an almost inaccessible one for military purposes till about a thousand years ago. From the time of the Roman Empire merchant ships had reached India from the Persian Gulf and Red Sea. But it was not till the religion of Muhammad gave its momentous impulse to the peoples of Arabia, that invasions in force commenced by the sea. From the eighth to the eighteenth centuries of our era, however, such invasions become a historical factor of increasing importance. They led to the formation and to the maintenance of Muhammadan states and kingdoms in Western and South-Western India, which played a decisive rôle in the destinies of the whole Indian continent. But for this Muhammadan element in Southern India, the pirate Musalman strongholds on the coast and the strong Musalman monarchies inland, it seems probable that a Hindu race, the Marathas, would at this moment be dividing the sovereignty of the peninsula with the British. During the eighteenth and nineteenth centuries the sea became the great highway for the conquest of India. The two ancient land routes of invasion from the north-west and the south-east are now definitely closed.

The geographical configuration of India had not only defined the three methods by which it should be reached; it had also rigidly prescribed the distribution of the masses of mankind who flowed in. India was marked out by nature for four distinct seats of ancient empire, and for four ancient lands of refuge. The delta and rich lower valleys of the Ganges, like the delta and rich lower valleys of the Nile, seem to have been appointed as a nursery for the human race. Nor can there be any reasonable doubt that Lower Bengal would have become a centre of non-Aryan civilisation, which might have greatly modified our conceptions of the intellectual possibilities of Turanian mankind, if that province had been allowed to work out its own development. But the increasing pressure of the Aryan races from the north interrupted the process. The climatic conditions of Lower Bengal, although favourable to the growth of wealth and the increase of the species, are unfavourable to the physical development of the individual man. When, therefore, wave after wave of hardier tribes poured through the north-western passes from the highlands of Central Asia, and pushed their predecessors down the Gangetic valley, the non-Aryans from the south-east succumbed in the impact of the races.

For, meanwhile, a second great seat of civilisation had established itself in the north. The upper valleys of the Ganges and its affluents, together with the river margins of the Punjab, were marked out not less distinctly than Bengal as a scene for the early progress of mankind. The soil, although less perennially recuperative, was abundantly rich for the wants of a not too dense population. Any inferiority in fertility was compensated by a climate more favourable to robust physical development. From the traditional Indian point of view, the subjugation of the non-Aryan races of the south-east by the Aryan races from the north-west, was final and complete. From the point of view of literary and philosophical culture, the north was also triumphant. The Aryans of the north-west appear as having given their religion, their philosophy, their

poetry to all India. But modern critical research proves that the result was really a coalition rather than a conquest. There are indications that the great Buddhist religion, which dominated India for nearly a thousand years, was the product of the eastern kingdoms of the Gangetic basins rather than the north-western, and that it was profoundly influenced in its political history and its organisation by the non-Aryan races. It is certain that mediæval Hinduism, which succeeded Buddhism, and that the modern Hinduism of our own day, derive their practical structure not less from non-Aryan than from Aryan conceptions and rites.

The third region of India marked out by nature as a seat of early civilisation was the delta of the Indus, and the country around the mouths of the two great rivers, the Tapti and the Narbada, which debouch into the Gulf of Cambay. Geographical configuration had, however, set narrower limits to the primitive progress of mankind in these tracts. The sandy plains of the Indus, and the mountainous background which rises at no great distance inland from the mouths of the Tapti and Narbada, were prohibitive of the vast movements of races to which the broad fertile basin of the Ganges gave free scope. Liability to sea-invasion from Arabia or the Persian Gulf, and to devastations from the pirate strongholds down the Indian coast, contributed, with the silting up of the Gulf of Cambay, to restrict the area of these western maritime seats of Indian civilisation. After figuring prominently during ten centuries, from Alexander the Great's progress through Sind (325 B.C.), to the Buddhist pilgrim's account of the court and kingdom of Valabhi (630-640 A.D.), the kingdoms of the northern Bombay coast were eventually absorbed by the great Muhammadan empire which had its centre in the upper valleys of the Ganges.

The fourth seat of ancient Indian civilisation was marked out with even greater precision. The lofty mountain ranges which run down the south-western coast render it impossible for the drainage of the inner hills and table-lands to find an exit on that side. A narrow fertile strip borders the ocean, but is walled out from the rest of India by the Western Ghâts, or, literally, colossal "landing-stairs" from the sea. The rain which falls upon the peaks overhanging the Bombay sea-board has to search out for itself a course of many hundreds of tortuous miles, till it reaches the Bay of Bengal. In this way, the three great rivers of the Madras Presidency, namely, the Godavari, the Kistna, and the Kaveri rise in the mountain wall which arrests the monsoon rains on the Bombay coast, and they traverse the whole breadth of the central table-land to the eastern shores of India. A series of powerful ancient kingdoms thus arose in the well-watered and comparatively open regions of South-Eastern India, with outliers as far north as the delta of the Mahanadi. They were succeeded from the fourteenth century of our era onwards by a shifting congeries of Muhammadan States, from which the five great Musalman kingdoms in the south stand out pre-eminent. The battle of Talikot in 1565 finally transferred the sovereignty of Southern India from the Hindus to the Muhammadans. But the Muhammadan dynasties of the south were influenced by direct maritime intercourse with the Persian Gulf, and in the end differed pro-

foundly in their political views and religious beliefs from the Musalmans who had entered India by the north-western passes, and founded the great empire of Delhi. To an orthodox Suni emperor of the north, like Aurungzeb, a Shia dynasty in the south was almost as hatefully heretical as were the Hindu infidels themselves. Political expediency combined with religious differences to render the conquest of the Muhammadan kingdoms of the south a necessity for the Muhammadan empire of the north. After a struggle prolonged over more than a century, at the very moment when victory seemed within the grasp of the Delhi sovereign, the geographical barriers fixed by nature between the north and the south decided the fate of Hindustan. The Muhammadan dynasties alike of the north and the south were broken in the conflict, and the Hindu Marathas rushed forth from their mountains, and became for a time the masters of India.

I have mentioned that India was marked out by its physical configuration not only for four separate seats of early empire, but also for four refuge-lands for the defeated races. As successive waves of invaders poured in during three thousand years from the north-west, the early inhabitants were gradually pushed aside to right and left out of the Gangetic basin. Some of them sought shelter in the lower ranges of the Himalayas on the north. Others found new homes amid the mountains and valleys and table-lands of Central India, and there worked out a tribal political organisation of their own. The deserts and oases of Rajputana afforded at a later period a refuge-land to the chivalrous Hindu tribes who disdained to yield to the Muhammadan invader. In Southern India a hardy breed of men grew up among the ranges and highlands which rise from the Bombay coast. This indigent peasantry, bred in the discipline of a scanty soil and a severe husbandry, disclosed in the sixteenth century a capacity for consolidation under military chiefs, and of docile guidance by astute Brahmans imported from the fertile maritime strip which lay between their highlands and the sea. Thus consolidated, they became the Maratha race. The Mughal emperors, in their attempt to conquer the south, had not only to overcome the barriers of desert, and forest, and mountain, but also the indomitable Hindu highlanders. The failure of the Muhammadans in this attempt formed the turning-point of India's history.

At that turning-point my narrative comes to a close. For the history of India during the subsequent period—the period of British rule—ceases to be the history of how the geographical conditions controlled the movements of man. It becomes the record of that series of splendid efforts by which the British rulers, aided by modern science, have overcome the obstacles of nature. Of the three routes of invasion into India, the two land routes from the south-east and north-west have been closed by British rule. The third, or ocean highway, is commanded by British fleets. Even if Russia, or any other power, were now to force an entrance through the north-western passes, she would find on the Indian side of the defiles, not alone the troops of the Bengal provinces, but the array of a politically united India. I believe that she would also encounter another, and in India an altogether new breakwater against

foreign aggression—the loyalty of the Indian races, conciliated and contented under the British sway. For the old barriers set up by nature between the northern and the southern kingdoms of India have been thrown down. North and south have been bound together by the masterful appliances of British rule; by the railway, the steamship, the telegraph, but above all by a strong central government which has the wisdom not to strain too severely the forces of centralisation.

Yet the geographical conditions of ancient India have bequeathed to us the problem which forms the vital Indian question of the close of this century. Will there ever be a united India? German statesmen and German poets down to the past twenty years, were wont to laugh at, or despair of, the idea of a united Germany. One of the greatest of them asserted that there was no such country as Germany, and no such nation as the German nation. There were, he said, a number of separate countries and peoples, divided by their past history, by their present interests, and by their religious views of the future life, who covered a geographical area erroneously called Germany. Now we hear exactly the same things said about India at the present day. The ancient barriers imposed by geographical conditions have left a legacy of disunion to the races and provinces of India. Some able men will tell you that there is no India. They are the men who look to the past. Other able men speak, perhaps too confidently, of a united Indian nation. They are the men who look to the future. The facts and the duties of the present lie between these views. And I esteem myself fortunate, my Lord, in having had an opportunity this evening of explaining the causes which have disunited India in the past, under the presidency of a statesman who has laboured so nobly for the union of all the British dependencies in the future. I for one do not look forward to an India which will be a single State. But I do look forward to an India firmly knit together into a great Empire. For I see an India in which the ancient barriers, that nature had set up against unity, have been thrown down. I see an India in which ample scope is given in each province for the local management of local affairs, yet in which the revenues and the armies of all provinces are available for the political needs and the military defence of the united Indian empire. Above all, I see an India in which the long-divided races are at this moment awakening to the first impulses of a common national life—impulses which have sprung, not from a common resistance to oppression, but from a true sense of united interests under a righteous government, and of united loyalty to a wise and beloved sovereign. Seeing these things in the present—things that were never before seen in India—and knowing how British rule has solved the hard problems of a divided India in the past, I look forward, not without anxiety, but certainly without fear, to the United India of the future.

Before the Address,—

The Right Honourable the EARL OF ROSEBURY, President of the Society, said:—

“LADIES AND GENTLEMEN,—It now falls to my pleasing duty, as President

of this Society, to open its Annual Session ; and I think that in performing this duty I may fairly congratulate the Society on the success it has achieved. We have a large working membership, and we give more to our members than, I take it, any other Society of the kind. When you come to consider how great a step that represents, how great a ratio of progress—when we consider the position of Edinburgh to London or to other great metropolitan cities that have Societies of this kind—I think we have reason to congratulate ourselves. After all, the mere formation of a Geographical Society in this part of the world—in Scotland—is a great sign of intellectual progress. A hundred years ago, when Edinburgh was famous for intellect and for brilliancy—famous, perhaps, among all the cities of Europe, such a Society as this would have been only an intellectual name. But now we have extended our sympathies, and though I do not think that Scotland is less brilliant than it was then, yet it is probably less concentrated, and its intellectual focus is not directed merely on Scotland, or the three kingdoms, or on Europe, but spreads itself all over the world at large. Well, I think we have some proof of our enlargement in the history of our own Society. It seems to me only yesterday—only a month or two ago—since I presided in Glasgow at the meeting of our Society, where we were privileged to hear Mr. Stanley—whose slow and painful progress we are at this moment watching with so much vivid interest. I think that is a proof, if any proof were needed, that our sympathies have got larger, that we demand more varied subjects for our intellectual observation, and that a Geographical Society for Scotland is not now a luxury, but almost an intellectual necessity. Well, ladies and gentlemen, if that be so, I am not sure that the prospect for the geographer is altogether a brilliant one. Think how little there is for geography in the sense of the word as we understood it thirty years ago—think how little there is now in the world for geography to explore. There is absolutely no field at all for the human imagination except in the centre of Africa or Tibet. All the rest is more or less explored. Even Africa seems likely to become as familiar to us as a county in Scotland. As to Tibet—we have hopes of Tibet. Those who love the mysterious can always lay their account with Tibet. A climate which preserves libraries for centuries, in which no literary work is ever lost, and where no human being, except perhaps one Hungarian in a century, is ever allowed to penetrate—that is the region which offers some field for the imagination. Now, I am not sure if Sir William Hunter this evening will take us, as the Indian Empire has taken us, to the immediate proximity of Tibet, but he is, as I understand, going to discourse to us on the historical geography of our Indian Empire. That is not a subject on which all of us are qualified to discourse, and I suspect that we all come here to listen to him rather as learners than as critics. But it does suggest this consideration, how far that system of historical geography is likely to extend. Historical geography is, after all, the history of empires ; and the history of our Indian Empire is one so extraordinary, so marvellous, sprung from origins so indirect, that we may be inclined to speculate, ourselves, where the historical geography of our Indian Empire may lead us. After all, ladies and gentlemen, our destinies come to us very much in germs—in germs that we do not observe ourselves. The facts that are likely to make or to mar our future are very often absolutely unperceived at the time. And when we remember that it is about three hundred years ago since three Englishmen, almost by chance, landed on the coast of India, and were brutally ill-treated there—and that was perhaps our first acquaintance with our Indian Empire—and when we remember that in three centuries that empire has grown to what it is—has grown to so prodigious a responsibility, that statesmen of the time of

Elizabeth might well have paused to undertake it if they had ever realised what they were about to inaugurate—when we consider that, I say, we may feel the deepest interest in our historical geography, and some perplexity as to the historical geography of our future. Ladies and Gentlemen, that is all I have to say to you on that point, and I have only now to introduce Sir William Hunter to you. I do not know that the word “introduce” is a very felicitous one, because Sir William Hunter is well known to Edinburgh already. It is his rare fortune that, in an early age for statesmen and for public men, he has been the most prolific *littérateur*, perhaps, of his generation. I do not suppose that perhaps anybody except Dumas the novelist, or Rubens the painter, has ever produced as much as Sir William Hunter at the same age. And we have this further pride that, if I am not mistaken—but he is at hand to correct me—if I am not mistaken, these prodigious works of his, the *Imperial Gazetteer* and *Statistical Survey of India*, were carried on in part in this very city of Edinburgh. If we left no proof to the world—no other record of our existence in India—than these works, we should leave something very considerable behind us. And it is as the author of the *Imperial Gazetteer*, as a man who has done almost more work in his time than any other person whom you can lay your hands upon, that I have the greatest pleasure in introducing Sir William Hunter to this audience.

After the Address,—

Professor BUTCHER, Member of Council, moved a vote of thanks to Sir William Hunter for his Address. He said they had had an exposition from Sir William Hunter that was both popular and scientific in the very highest sense. He thought that all of them, as they listened to the Address, must have wished they had had Sir William Hunter with them in childhood to instruct them in the science of geography. It must also have occurred to them that they had good reason to be proud of being citizens of the British Empire. If they left India to-morrow they should leave behind them a monument of peaceful and beneficent sway.

Sir WILLIAM HUNTER bowed in acknowledgement of the motion.

Mr. VARY CAMPBELL, Advocate, moved a vote of thanks to Lord Rosebery for presiding. He regretted to say that Lord Rosebery was obliged to leave them immediately, as he understood, for that geographic division of Great Britain which was called England, but he was sure they would join with him in conveying to him the one sentiment that he would like to express to him—namely, that they were all proud of him.

The EARL OF ROSEBERY, in reply, said—Ladies and Gentlemen, I am sure I do not deserve your thanks for anything that I have done this evening. I have not been the chairman—I have only been the first pupil here to-night. We have all been pupils, and, I think, delighted pupils. As Professor Butcher has said, I think some of us must have travelled back with regret to the scenes of our childhood, when geography was rather an arid expression to us than any real vivid study. I believe there is even a better method of studying geography, if we had the opportunity, than listening to Sir William Hunter, pleasant as that is—I mean by realising geography by travel. I have been privileged to travel over a great part of the continent—for it is a continent—which he has so eloquently laid before us to-day. There was one expression of Sir William Hunter which drew me back to those travels. He said that the conquests of India had been rather coalitions than conquests. Well, my knowledge of the country of India is infinitesimal as compared to his, but I cannot help remembering

some incidents of those events which make us feel that those coalitions must have been somewhat unpleasant in their nature. Lord Beaconsfield once said that England did not love coalitions, and I am sure that there is no coalition that England would love less than a coalition of the kind described by Sir William Hunter on the frontiers of India. I had the privilege of travelling along the North-West Frontier, and of course it is impertinent for a civilian to speak about such matters, but it did seem as if by great outlay and by consummate skill we had made that frontier so impregnable that we need not dread coalition or conquest. And, ladies and gentlemen, I believe that there is a second barrier not less important than the mountain barrier which we have fortified in the north-west. I believe it lies in the contented populations of India. I am not quite sure that I understood what Sir William Hunter's view was of those populations. He said that the view at the present lay something between the former view and the future view of the nationalities of India. Well, I take it that even now India is populated by nations and creeds so diverse, so different, with limits so sharply fixed, that we cannot in any possible future, in any limited future, look forward to their becoming a homogeneous population. But we can at least effect this—to keep the scales of justice equally between those nationalities and those faiths throughout that mighty continent, which by that accident which after all is only the finger of Providence in history has been intrusted to our charge—to administer that great inheritance impartially, and to raise before any possible invader a second frontier of a contented and intelligent people.

The proceedings then concluded.

IRRIGATION, NATURAL AND ARTIFICIAL, IN SAMARKAND AND BOKHARA.

BY VICTOR DINGELSTEDT.

Hon. Corr. Mem., Royal Scottish Geographical Society.

PUBLIC attention is largely directed just now to the vast and fertile regions of Central Asia. The Russians are endeavouring to reclaim for civilization those ancient historical countries which once were renowned in many branches of useful activity, and which, notwithstanding centuries of decline and many adventitious circumstances, still present a hopeful disposition. The prospect of these praiseworthy efforts to recall into new life the effete Oriental civilization will largely depend, in Central Asia, upon the solution of the physical questions regarding the distribution or *régime* of water-courses. The steppes and valleys in these rainless regions can be made habitable and productive only by the means of sweet water available in abundance, either through natural or artificial *media*. The art of irrigation and drainage thus assumes a position of the most vital importance. The most fertile and best situated part of Central Asia must be doomed to misery and stagnation, as long as there is no canal, which can bring in water for irrigation and drain off the surplus. The first part of the question—that of bringing in the necessary water—is generally easier of solution than the second,—that of leading it off,—