

their periodic time, and is expressed by the equation $a = \frac{gT}{2\pi}$. This, then, may be called the *terminal velocity* of a wave of a given period. It follows that if a wave is raised through the disturbance produced by a solid body, that wave will at first travel with a speed depending on the virtual depth of the original disturbance; but as it advances to a greater and greater distance from the disturbing body, the velocity of advance will gradually approximate to the terminal velocity corresponding to the periodic time, and the virtual depth will continually adjust itself to the changing velocity, and approximate gradually to the equivalent pendulum corresponding to the periodic time. Such is the cause of the forward curvature of the ridges of the obliquely diverging waves which follow a ship*.

May 14, 1868.

Lieut.-General SABINE, President, in the Chair.

The Right Hon. the Earl of Rosse was admitted into the Society.

The following communications were read:—

- I. "Scientific Exploration of Central Australia." By Dr. G. NEUMAYER. Communicated by the President. Received April 20, 1868.

If we look on a map of the Australian continent published ten years ago, we are struck by the immense expanse of land then unexplored; we perceive at a glance that the south-eastern sea-board only of this great continent had then been examined with any degree of accuracy, and that very little was known to us respecting the character of its shores on the west and north-west. In two quarters only had the zeal and daring of the explorer succeeded in forcing a path towards the central portions of this vast territory, Sturt having penetrated as far as 24° South and 138° East, and Gregory as far as 21° South and 128° East. The nature of the country traversed by these two eminent explorers was such as to countenance the supposition, that the interior of Australia was little better than one vast desert, offering almost insurmountable obstacles to exploration. The idea, originally advanced by Oxley, that the greater part of the interior was occupied by vast inland lakes, was then abandoned; and the theory just mentioned took its place. In such a state of utter uncertainty as to the nature of the interior of a vast continent, it is but natural that various theories should be started; and no doubt they will, in the end, help to keep up the spirit for rigorous examination and exploration, yet care must be taken that they do not, by the unfavourable nature of their suppositions, tend to discourage enterprise. From such a danger we had a narrow escape

* This is explained in greater detail in a paper read to the Institution of Naval Architects on the 4th of April 1868.

during the years following A. C. Gregory's exploration of the interior, and his expedition in search of Dr. Leichhardt, as at that time it was generally believed that the arid plains and stony deserts met with in the east and south, and the sandy desert in the north-west, were but the outskirts of a desert country unparalleled on our globe.

Fortunately, however, for the progress of civilization and geographical knowledge, this unfavourable opinion as to the nature of the interior was not universally entertained. Many men, well versed in terrestrial physics, especially with reference to the Australian continent, could not, from reasons based upon meteorological observations made in the south-east, concur in the prevailing belief. They urged the possibility of tracts of fine country interspersing the so-called desert, and the necessity, in any case, of clearing up the mystery still surrounding this important geographical question; and in this view they were strongly supported by the improbability (generally speaking) of the existence of a desert country of such enormous extent and such a description in any part of the earth's surface. It would be useless to enter now upon the arguments for and against the various opinions set forth during that period of uncertainty, except that they might in some instances serve to put us on our guard against advancing or accepting bold conjectures which may be put forward at any future time, and more particularly in the special case we have to deal with in this paper. Suffice it to say, that the spirit of enterprise and the desire of increasing our geographical knowledge triumphed at last. The year 1860 gave a fresh impulse to Australian exploration, and will for ever be memorable as having inaugurated a new era in this respect. In the end of that year and the beginning of 1861, Burke and Wills crossed the continent with comparative ease. It was now said by many of the adherents of the old desert doctrine, that Burke had merely hit upon a narrow strip of good country, which carried him across; had he but deviated to the one side or the other of his path he must have failed in his attempt. But when M'Dougal Stuart three times crossed and recrossed the continent in other parts, and the last time from shore to shore—when M'Kinlay made his way from South Australia, by way of the Gulf of Carpentaria, to the coast of Queensland, driving before him a flock of sheep—when Walker and Landsborough had accomplished their journeys through the imaginary desert country—the old opinion could no longer be maintained, and the desert theory fell utterly into discredit, at least as far as the eastern part of the continent is concerned. Since that time this once so much dreaded task has been several times successfully accomplished, so that we are now enabled to give a pretty accurate description of the features of the country forming the scene of these glorious achievements; and as it will doubtless prove of material assistance to the complete understanding of the following exposition and plan, I may here be permitted to give in a few words an outline of the main character of the ground to the north of the parallel of latitude 26°, between the coast-ranges of Queensland and Stuart's route through the

centre, which embraces nearly the whole of the country discovered and examined since 1860.

From the records of the various explorers, it would appear that the line which divides the waters flowing to the coast, and those flowing to the interior, runs from $19\frac{1}{2}^{\circ}$ S. on Stuart's track to 19° S. latitude on Landsborough's south-west expedition, in 138° east longitude. According to Mr. M'Intyre's apparently reliable observations, this line would then pass through 22° S. in $141\frac{1}{2}^{\circ}$ E., whilst M'Kinlay places in the same locality the watershed between the Middleton and Müller rivers, in a latitude but slightly differing from that just named; and in Walker's Diary we find it passing through $21\frac{1}{2}^{\circ}$ S. and 145° E., where I find the highest elevation recorded by the latter explorer on his expedition in search of Burke and Wills. Mr. A. C. Gregory's exploration places the continuation of this line of watershed through the north-west in 13° S. and 130° E., whilst in the east it meets the main watershed between the Belyando and Thomson on the one side, and the Burdekin and Flinders on the other, in about 21° S. and $145\frac{1}{2}^{\circ}$ E. (See accompanying map.) The sweep of this line leads across a sandstone tableland of considerable elevation—in parts even as high, if we may rely on the data hitherto collected respecting it, as 1900 or 2000 feet. On its coast side this tableland inclines somewhat abruptly, whilst towards the interior it slopes more gently, thus affording a ready explanation of the marked difference existing between its river-systems, those flowing in the former direction passing through well-defined valleys, while those in the latter direction run generally in shallow beds, and are consequently subject to excessive evaporation and inundation according to the season of the year. The general incline of the country from longitude 145° to Stuart's track in about 135° is towards south-west, until reaching near the latter its lowest point, as we feel justified in concluding from the great number of hot springs on the route Stuart pursued when crossing the continent. This immense tract of land abounds in creeks and ill-defined water-courses. In many cases the dividing or separating ridges of sandstone are (probably from the effects of floods and weather) broken up, and cover the surface, which then presents a desert-like appearance, only here and there covered with a scanty vegetation, consisting mostly of *Spinifex* (*Triodia irritans*). Very frequently, however, these ridges have succeeded in resisting the destroying effects, and we then meet with valleys of good soil, covered with fine grass and gum forest; which state of things, happily for the future of the Australian continent, seems to predominate, as we learn from the reports of explorers who passed through fine country after having once entered the tropic. These water-courses of the interior basin drain partly towards the Barcoo River (Cooper's Creek), partly towards the south, splitting up into innumerable little creeks and rills without any definite direction. As an example of the latter kind may be mentioned the Burke Creek, which at times causes immense inundations in the tract of country near 25° S. and 140° E., as we learn from the reports of

Burke, Wills, Howitt, M'Kinlay, and Gregory. To the south of this region the at one time so much dreaded "Stony Desert" seems to extend in the manner indicated on our map; and it certainly bears every appearance as if this region of sandstone was principally caused by the effects of the inundations and floods already referred to. For whereas it is very easy to trace this peculiar phenomenon to the south, it is hardly possible to define it exactly towards the north, which fact accords well with the explanation of its true origin just suggested. The careful researches of Mr. B. Hassenstein* have tended to throw new light upon this subject, and reduce the Stony Desert to its proper limits. We know now that the arid plains described by some explorers, which others had found well grassed and covered with an even luxuriant vegetation, are the receptacles of the waters flowing from the north, and form the boundary of the Stony Desert; we know moreover that extensive tracts of fine country are interspersed with strips of "stony desert" of a very limited extent. Such is the nature of the whole country, as far as we know it, from the meridian of 145° to Burke's track. Of the country between the latter's course and that of Stuart very little is known; but it is not unreasonable to suppose that it will prove to be mostly of the same description as that already well known to us, as it forms only the lower part of the interior basin above described, the very bottom of which we have been made tolerably well acquainted with by Stuart's exploration, which bears out that supposition. Further to the west, in the unknown country between Stuart's track and the west coast, the same sandstone tableland probably rises again to the high ranges which have been observed by the various explorers who have penetrated into the interior from the west, attaining in some parts an elevation of from three to four thousand feet above the ocean. Therefore it is not at all unlikely that we shall find in the western half of the central basin in the main the same state of things which we have found to exist in the east, with but such slight modifications as may be determined by the configuration and lay of the country in connexion with the prevailing system of winds and contingent meteorological phenomena.

In order to complete the general description of this portion of the Australian continent, we must call to mind the effect a tropical and subtropical sun must naturally exert upon a territory constituted as this interior tableland. During the time the sun is north of the equator, in the winter months of the southern hemisphere, the prevailing winds are from south-east all over the northern continent, with little and only occasional rain; but on the sun's approach, during October and November, the monsoon shifts to north-west, and brings on the rainy season, gradually advancing from south to north in the middle of December and January. At the end of this season, in February and March, and about the time preceding the shifting back to south-east of the monsoon in April, the heavy falls of rain and the soaked state of the soil cause those immense floods which are

* Petermann, *Mittheilungen*, 1867, p. 80.

recorded in the Journals of the various explorers; and it is during this period that in the territory south of the Burke Creek and north of the Stony Desert, as we have already explained, great ravages are caused by inundation. Further to the south the meteorological phenomena of the northern portion of the continent pass gradually over to those prevailing in the south, namely that of two alternating currents of air, with winter rains and a short rainy season in September and October.

Great as have been the recent achievements with regard to the geographical knowledge of the continent, comparatively little has been done by any one of the exploring expeditions towards the advancement of science. Information calculated to throw light on the elevation of the interior or on its geological character flows very scantily from the journals kept by the explorers; and even the astronomical determinations of localities must, at least as far as longitude is concerned, be received with caution, as the means at their disposal, the comparatively small practice of most of the observers in determinations of this kind, and the very methods employed, would hardly admit of anything like a close approximation to the truth. Indeed we may safely assert that it would have been scarcely compatible with the general pioneering object of parties in the field since 1860 to have devoted more attention to matters of science, strictly speaking, than was sufficient to carry them through the difficulties they had to encounter. Perhaps it may not be considered out of place if I express here my deep regret, on this very ground, for the untimely death of my young friend, W. J. Wills, the astronomer of Burke's expedition; for, had he but survived his first feat, there can be but little doubt that his zeal for the advancement of science, and the knowledge he had obtained during the time he was on the staff of the Observatory over which I then presided, would have enabled him to take the first place as a scientific explorer, whereas we can now only admire him for his courageous and enterprising spirit as a pioneer. This hope, however, is at an end; and up to the present time absolutely nothing has been done towards the scientific examination of the vast interior of Australia—an examination of such immense importance for the advancement of almost every branch of physical science, and for the development of the natural resources of this great country. It is with regard to this matter that I venture to address this Society, with the view of soliciting its important assistance in starting an expedition, having for its object the exploring of the western half of Australia, and the scientific survey of the route across the entire continent.

When the celebrated Australian explorer, Dr. Leichhardt, started on the expedition which was to be his last, he did so with the intention of crossing the continent from east to west, for the purpose of discovering the extent of Sturt's desert, and the character of the western and north-western coasts, and of observing the gradual change in vegetable and animal life from one side of the continent to the other*. It is now exactly twenty years

* History of Discovery and Exploration of Australia, by the Rev. J. E. T. Woods, vol. ii. p. 518.

since this grand idea was conceived and attempted to be carried out. The last news of Dr. Leichhardt is dated April the 3rd, 1848. Subsequent to this date nothing has been heard of him; and deep mystery still surrounds his fate, notwithstanding the many efforts which have since been made, originally to rescue the explorer and his party, and subsequently, when all hope of again seeing any of them alive was abandoned, to ascertain the manner in which they perished, and the locality where it occurred. No doubt, to many it may have appeared premature on the part of Dr. Leichhardt to have entered upon such an undertaking at a time when so little was known of the nature of the interior as to make it utterly impossible to lay down a route across the continent on any other ground than that of mere conjecture. Circumstances, however, have since that time changed considerably; at least one half of the continent has since been explored in such a way as to make us acquainted with the natural resources an explorer may expect to meet with and turn to account, whilst even from the western coast numerous expeditions have tended to diminish the risk with which such an undertaking would be invested. And in directing the attention of this Society to Dr. Leichhardt's idea, with the view of seeing it carried out, I do so with the conviction that now the proper time has arrived for taking in hand an enterprise of such importance for the future of the Australian colonies, and especially for the advancement of science, and thereby manifesting alike our appreciation of the various interests at stake, and of the noble mind who risked all he had in their furtherance. In the execution of such a work, its scope may now be materially extended. Instead of a rough survey on a single line from north-east to south-west, with an apparatus which allowed of but a limited attention being paid to strictly scientific matters, it is now proposed to form a base-line for the various branches of science through the interior of a vast continent. That such a work can now no longer be regarded as impracticable or premature, and that its successful completion cannot be otherwise than replete with the greatest interest, I hope to be able to show in the course of this paper.

After these introductory remarks, I shall proceed to detail the plan which I propose to follow in carrying out the exploration of the western half of the continent, and the scientific survey of the line of route to be followed in traversing the interior from the east shores of Queensland to Western Australia.

It is proposed that the expedition be organized in Queensland, probably on the Burdekin, near Port Denison, in 20° south latitude. From a point in 20° South and about 148° East it will strike out for a point in $24\frac{1}{2}^{\circ}$ South on Stuart's track. So far the interior has to some extent been explored already, and it can be predicted with some degree of certainty, with what difficulties and with what facilities the expedition will probably meet*. From this point, which I designate on the accompanying map by the letter B, the original starting-point being A, to the south-western

* The greater part of the country between the east coast and Burke's track will probably have been taken up for squatting purposes in a very few years.

extremity of the continent, nothing is known; and in choosing a practicable route, we must be guided entirely by surmises as to the nature of the country, based upon the supposition that we shall most probably have to deal with a state of things in the west very similar to that already known to exist in the east. I shall, in the first place, however, lay down the entire course, and then enter upon my reasons for having done so. From point B I propose keeping nearly on the same parallel as far as point C, in longitude $125\frac{2}{3}^{\circ}$ East; from thence proceeding on the same meridian to a point in 27° South, and thence to a point D in $116\frac{1}{4}^{\circ}$ East and $31\frac{1}{2}^{\circ}$ South. Near the latter point, on our route to Perth in Western Australia, we shall strike the Swan River. The entire distance on that route is about 2649 miles, of which 1080 comprise the distance from A to B, and the remainder that from B to C and D, an allowance of 20 per cent. being made for curvature, which percentage must always be understood when reference to distance occurs in the course of this paper.

As a close examination of the country traversed is the primary object of the expedition, it is proposed to accomplish it in thirteen stages, so that fourteen separate depots will have to be established during its progress, each depot being intended to be retained only for such a time as will be requisite for the survey and exploration of the surrounding country, and for the formation and transport to the next. From A to B the number of depots will be six, so that the average distance between two consecutive depots will be 216 miles, while from B to C and C to D there will be eight depots, with an average distance of 200 miles. On the map these depots are marked; but it is evident that it is next to impossible to assign them their proper positions with any degree of accuracy, as these will depend so much upon circumstances at present almost entirely unknown to us. It is only for the line from A to B that we are enabled to fix with any certainty the positions of such depots, as we are already acquainted with some localities the nature of which will probably recommend them for such a purpose. Thus we should propose fixing depot No. 2 on the meridian of 145° and near Walker's track, depot No. 3 on the Middleton River of M'Kinlay, depot No. 4 near the "fine open plains" of Burke and Wills, and depot No. 6 on Stuart's track somewhere between the Fincke and Hugh rivers; in each of which cases the country is described as well grassed and provided with permanent water. For depot No. 6, and depots 7 to 12, we have no data whereby to guide us, until we again approach the regions already explored from the west. As it is proposed from these various depots to strike out in different directions, they will have also to be selected with a view to enable these minor expeditions to yield the greatest possible amount of information with respect to the largest possible tracts of country.

With reference to the time required for accomplishing the whole expedition in a manner commensurate with the scientific objects of the undertaking, it may be said, that it is proposed to devote three years and six months to it, of which fifteen months are taken up by the examination of

the country between A and B, and twenty-seven months for the exploration and scientific survey of that part of the route within the entirely unknown region between points B and D. Now let us examine what prospects of success this would allow for the performance of the task proposed. The distance from the Burdekin to Stuart's track may easily be travelled through, at the moderate rate of ten miles a day, in 108 days, or three months and a half, allowing a time of stay in each of the several depots of nearly two months (1·9). For the route through the western country, the time has been increased at a rate proportionate to the increased risk incurred and the care to be bestowed upon the explorations within its regions. The time requisite to travel over the line from B to D would be about five months and a half, which would allow of a period of stay in each of the depots of 2·4 months; counting, however, depot No. 6 twice, as it is proposed, for reasons presently to be explained, to prolong the stay at that point beyond the time generally allowed to the other depots. From this exposition, it is evident that ample opportunities are offered for an exact study of the ground travelled over with reference to the various branches of science to be included in the scope of the entire work. This will become still more apparent on the further unfolding of the details of the organization of the expedition. Dr. Leichhardt intended to travel over nearly the same distance in about two years and a half, and that too without having also, as regards the eastern portion of the Continent, any information whatever to guide him in his route; and it was probably to some extent owing to the insufficiency of time allowed by him for the carrying through of such an extensive undertaking, and the consequent deficiency of provisions and outfit, that he failed in its accomplishment. The extent, moreover, of the scientific labours proposed to be undertaken on this occasion is something widely different from what explorers twenty years ago could attempt, and is such as would of itself alone justify an increase of time by twelve months.

I shall now have to enumerate a few of the reasons prompting me in proposing the route I have laid down in the preceding pages. From what I have already said respecting the character of the tropical and subtropical interior of Australia, it appears that the line of route from the Burdekin to the Fincke of Stuart passes, as far as known, through practicable country, well watered and grassed, abounding in game of all kinds, and likewise well peopled with aboriginals. We are on this route likely to meet with the most practicable country in the interior we propose to explore and examine, and shall probably shun entirely the so-called desert country, subject to destructive inundations. There is much likelihood that the unknown regions in the west bear in many respects a great resemblance to the eastern half; and I therefore feel inclined to believe that on the same parallel of latitude (23° S.) we shall meet with no greater obstacles to progress than we are likely to encounter in the east. The explorations of Mr. Gregory in the same latitude and in longitude 117° seem to corroborate this opinion, as the country appeared to him from that point towards the east to bear

for many miles a promising appearance. Observations made in other parts of the north-west *littorale* of Australia confirm this view, and some of the rivers have been supposed to take their origin in high granite and trap ranges three hundred miles from the coast. They would in this case be only four hundred miles from our point C, towards which the high western tableland, of which these ranges are probably the watershed, inclines until again reaching the lowest part near Stuart's hot springs and the lake district forming the receptacle of the drainage from the Barcoo River. The course proposed passes very nearly through the centre of the unknown interior, and offers therefore, as an inspection of the map will show, an opportunity for exploring these unknown regions, and most likely also for tracing the limits of Mr. Gregory's sandy deserts in the north-west. With reference to the south-west extremity, I accept for the greater part the suppositions thrown out by the Rev. J. E. T. Woods respecting its nature, first ably set forth in a letter addressed to the 'Melbourne Argus' some years ago, and again repeated in his excellent work on Australian exploration (vol. ii. p. 511), from which we quote the following passage. Mr. Woods says,—“If the western end of the tableland be on an average two thousand feet high, there must be a drainage to the interior nearly equal to that which causes so many rivers on the west coast. The watershed has never yet been crossed from the west side; but one cannot help remarking that wherever it has been crossed elsewhere good land has been found. It is no evidence against the existence of a river that none are found on the south coast, especially in the Australian Bight, where it would be most likely to appear. Many places in the interior have an extensive drainage, which never reaches the sea. The Barcoo drains into Lake Eyre, which is the receptacle of many other streams. A stream from the west coast might empty itself into Lake Gairdner*. There must at any rate be some important drainage in connexion with that large sheet of water.” It is scarcely needful to add anything to the reasons here set forth for the necessity of the existence of a large drainage area in the south-western extremity of the continent; but it may perhaps be not out of place to recall to mind here that the Barcoo River (Cooper's Creek) drains a territory of nearly nine degrees of longitude and seven degrees of latitude before emptying itself into Lakes Eyre and Gregory, forming, after its bifurcation near the locality where the final scenes of the Burke and Wills tragedy were enacted, an immense river delta, far exceeding any of the well-known deltas in the world†. If we now place a drainage system, in dimensions similar to that just spoken of, to the west of Lakes Eyre and Gairdner, it would in all probability be intersected by the course proposed through the western interior. An expedition, after having once struck such a river-system, would of course have to follow up the discovery; and would, in its further course towards south-west, have mainly to be

* I rather feel inclined to believe that the receptacle spoken of is formed by some lakes to the north of the Australian Bight, yet undiscovered.

† According to the recent exploration of Major Warburton.

guided by the watercourses, without however losing sight of its primary object. It is not unlikely that, by the time the proposed expedition would reach the country north of the Australian Bight, expeditions from Western Australia, and even from the recently opened harbour on the south coast (Eucla), will have thrown new light upon this subject, thereby considerably facilitating this portion of the undertaking.

It has already been mentioned that at point B on Stuart's track it is proposed to make a longer stay than in any of the other depots. The principal reason for so doing is to afford the expedition at that stage an opportunity of communicating with the settled portion of South Australia, previous to entering on the unknown territory to the south-west. A small party may be detached from the main body for the purpose of travelling to the nearest point of settlement, on which occasion collections and documents may be sent to Adelaide or Melbourne, as well as any information received which may be of importance for the progress of the expedition, and chiefly such respecting the progress of exploration in Australia, having an immediate bearing on the problem at issue. Such an expedition may also present an opportunity of exchanging or making up our complement of men and horses, replenishing stores, &c. That this does not present any serious difficulty in execution we know from Stuart's expeditions, who on an average travelled the distance from the Fincke to Mount Margaret* (Mr. Jarvis's station) in twenty-four days. It is therefore fair to suppose that within ten weeks this party could proceed to the first settlements and return, after having accomplished its objects.

In the preceding part of this paper I have laid down the track I propose following, and have, I believe, succeeded in explaining the reasons which guided me in doing so. I have avoided, however, all matters of detail as to the branch expeditions, which are intended to be undertaken on both sides of the main route, as such expeditions must to a great extent depend on the nature of the country to be explored, on which point our knowledge is still very scanty. I shall now in a few words give an outline of the scientific objects of the expedition, and then proceed with some details respecting its organization and probable expense.

An expedition passing through the centre of such a vast continent, travelling through 32 degrees of longitude and 12 degrees of latitude, cannot be otherwise considered than as productive of the most material advantages to the cause of science generally, provided the plan of its working be such as accords with the present state of scientific inquiry, and the conduct of the whole be entrusted to competent hands. It is frequently supposed that, in expeditions of this nature, it is expedient to confine the scientific researches and observations within the narrowest limits. Indeed, a rigorous scientific inquiry is frequently thought incompatible with geographical discovery. This is a grievous mistake, and has invariably proved to be such whenever an expedition has taken the field, in the organization of which

* Probably the stations are now still further advanced towards the north.

proper attention had been paid to the objects it had to serve. There is no doubt that the many unemployed hours, even of those of the party generally and more exclusively engaged upon exploration matters, may, for the benefit of the well-being of the whole expedition, well be turned to account in assisting scientific inquiry. On such principles the scientific plan of operations of the proposed expedition, as detailed hereafter, has been framed. It includes the following branches :—

1. *Astronomical Science and Surveying*.—In addition to such operations as are absolutely necessary for the mapping of the country, it is proposed to organize a system of observations of the moon, with a view to assist longitudinal determination. Such more accurate determinations of the geographical position may be carried out at the various depots above spoken of.

2. *Terrestrial Physics and Meteorology*.—Systematic registration of meteorological phenomena and terrestrial magnetism is likewise to be carried out at the depots, particularly with a view to assist barometrical measurements of elevations and magnetic observations in the field.

If it should prove at all practicable, it would likewise be advisable to include in the general plan of working observations on the length of the pendulum vibrating seconds.

3. *Geology, Palæontology, and Mineralogy*.—A geological sketch-map of the whole route across the continent is to be made, and palæontological specimens are to be collected. Special attention has to be paid to the mineral resources of the country travelled over.

4. *Botany*.—Observations on the physiology and geographical distribution of plants are to be included, and collections made.

5. *Zoology and Comparative Anatomy, including Ethnology*.—This branch is likewise to be attended to with a view to assist physiological studies, and to examine into the applicability of Darwin's Theory on the Fauna of Australia, ancient and modern. Collections are to be made.

Character and language of the aborigines in the various parts of the continent are to be studied.

6. *Sketching and Photography*.—These arts will be employed more particularly for the purpose of representing the character of the various tracts of country passed through, but will have likewise to assist the various branches of science in the complete execution of their parts.

I refrain from entering into particulars respecting the general scheme of scientific work to be adhered to in the course of the expedition ; the more so as it is intended that the authorities in the various scientific branches, both in England and in the colonies of Australia, should be consulted on this matter, and their cooperation and advice solicited. It is especially by the aid of the scientific men and institutions in Australia, and their extensive labours in the various branches of science, that I am led to hope for a great success in the scientific part of the work of the expedition, as these labours form an excellent base whereon to build and start from. Thus much, however, I may state, that it is to be made a rule that nothing be

included in the plan of immediate investigation while in the field which may well be deferred without prejudicing the general objects of the expedition. This rule is to hold good for all scientific branches, and will also be made a guiding principle with reference to the reduction and discussion of observations, the examining of natural-history objects, and the collecting of specimens.

At the present time, when mystery still surrounds the fate of Dr. Leichhardt, I should consider myself open to just reproach were I to lay out the plan and scope of an expedition through the interior of Australia without calling attention to this subject, and including it among the duties of such an expedition to aid in clearing up that mystery. As remarked at the outset of this paper, twenty years have now elapsed since the utter disappearance of that great explorer, and there is now indeed scarcely any likelihood of rescuing any of his party alive. But the hope of even ascertaining the fate of that brave body of men should never be abandoned until the object be attained, though there can be no doubt that the chances of our doing so grow smaller from year to year, every fresh inundation or conflagration of large tracts of forest diminishing them considerably. The scientific survey entailed upon such an expedition as that proposed offers great facilities also for the promotion of a search after traces of the missing explorers. In addition to which I consider it of extreme importance for such a purpose that the search should be instituted in the direction in which the missing expedition intended to move, the more so as all efforts to cut Leichhardt's probable route at right angles have hitherto proved ineffectual. When we consider that the eastern portion of the Australian continent has been so frequently crossed and recrossed during the last six years without any material information having been gained as to Leichhardt's fate, we feel almost disposed to believe that he shaped his course from Upper Victoria and the Alice River, in a direction somewhat similar to that taken by Mr. Gregory on his expedition in search of him, particularly as such an opinion is supported by such an authority on Australian exploration as Mr. J. E. T. Woods in his recent work. According to his opinion the explorer was compelled to follow the Barcoo, and may have perished in the country to the west of Lake Eyre and Stuart's track. But we must not forget that such a course to the south-west would, with this indefatigable explorer, have been equivalent to giving up his original plans respecting the exploration—plans which, as far as we are acquainted with them through the Rev. Mr. Clarke of Sydney, and others intimately connected with him, would have carried him to the west, and even to the north of west. This opinion was also entertained by Mr. A. Gregory, who thought "that Leichhardt had left the Barcoo at its junction with the Alice, and, favoured by thunderstorms, penetrated the level desert country to the north-west, where, being unable to return, they may have perished for want of water." (Expedition in Search of Dr. Leichhardt, 1857-58, page 8.) Such may be the case, but it may also be that they succeeded in forcing their way through the country referred to by Gregory, and there-

fore the country between Stuart's and Burke's track must be well examined with a view to find traces of the party. Although it may at first sight appear difficult to conceive that Stuart could have passed six times through the country which Leichhardt most probably crossed on his way to the west without observing any trail or mark of the latter's course, nevertheless there is no improbability in such being the case; and unremitting zeal should be displayed throughout the whole expedition in endeavouring to lift the veil from off this sad tragedy. Should the expedition fail in finding the remains of the party in the east, they will have to search for them in the west and south-west extremity of the continent.

An expedition through the vast interior of Australia, with such an extended scheme of operations and so many important matters to attend to, should be organized on such a base as to give full guarantees for being able to accomplish its main objects, as well as to protect itself against attacks of the aborigines and the destructive effects of unforeseen misfortunes. It is therefore proposed that the expedition should number twenty-five men. The following is the plan showing how the exploring expedition proper is to be composed:—

Leader, assistant leader, storekeeper and overseer, saddler and tent-maker, blacksmith and wheelwright, twelve stockmen, and three aborigines. To these are to be added the following scientific men of the party:—1. Geologist and mineralogist; 2. Botanist and chief medical officer; 3. Zoologist, palæontologist, and medical assistant; 4. Artist, photographer, and custos of collections; 5. Assistant for physical science and observer.

With reference to the organization of the party, so as to ensure a satisfactory cooperation of all concerned, it is proposed to adhere to the following principles:—

1. The scientific members of the expedition, with the exception of the leader and the assistant leader, do not form part of the exploring party proper, but are under the leader's supervision, and may be employed as may appear to him desirable for the advancement of the objects of the expedition.

2. The exploring party proper consists of the leader as first officer, the assistant leader second officer, and the overseer third officer, two artisans, twelve stockmen, and three aborigines.

3. The exploring party proper is to be divided into three bodies of men:—

a. Depot party.—Storekeeper and overseer, saddler and tent-maker, three men, and an aboriginal. To this party the assistant observer is to be attached.

b. Field Party I.—Leader, blacksmith, four men, and an aboriginal. To this party any of the scientific men may be attached as best answering the purpose, care being, however, taken that one of the medical men be included among them.

c. Field Party II.—Assistant leader, five men, and an aboriginal.

To this party &c. as above.

4. The depot party remains in the depots which will successively be formed in the course of the expedition. It will chiefly be employed in keeping everything in repair and good order, in preparing provisions, and propagating useful plants. The sick and convalescent are likewise to be received into it. Systematic registration of meteorological and magnetical phenomena is to be carried on by it under the immediate superintendence of the assistant observer.

5. The field parties will be employed in such a manner that one will be examining the neighbourhood of the depot, say thirty miles round, while the other will undertake the larger excursions on both sides of the main route. In case of a removal of the depot in the direction of the main route, all parties will have to cooperate. It is proposed, moreover, to employ the field telegraph, as well for the promotion of the scientific objects as for the more satisfactory cooperation of the whole party engaged. The perfection to which ballooning has been brought by the zeal and energy of Mr. Glaisher makes it not unlikely that it may be employed with advantage in this expedition for the facilitation of the exploring and mapping of tracts of country otherwise barely accessible.

For means of transport it is proposed to employ fifty horses and eight or ten camels, which latter animals have now been acclimatized in the colonies, and show a special fitness and adaptation for Australian exploring work.

We may now add a few words as to the probable amount of expenditure an expedition of this kind would involve, referring, however, for particulars to the appendix.

The following is an abstract of the probable expense:—

1. Expenses previous to the organization of the expedition	£880	0	0
2. Outfit of the expedition, exclusive of provisions.	2,980	0	0
3. Salaries, wages, and contingencies for three years and six months	17,675	0	0
Total expenditure.	£21,535	0	0

This estimate has been framed without regard to any expenses in connexion with the publication of the results of the expedition. The sum may, at first sight, appear somewhat large; but when we come to take into consideration the objects which the expedition professes to advance—when we remember that, for the first time in the history of Australian exploration, the various governments are to unite in support of a uniform and well-planned scheme of exploration—when we consider that this sum is to be distributed over a period of three years and a half—we cannot fail to perceive the moderate amount of the sum proposed to be expended.

It is proposed that the expenditure for this great scheme of exploration of the vast interior of Australia, and the scientific researches contingent

upon it, shall be borne by the mother country in conjunction with the various Australian colonies. So soon, therefore, as an arrangement to that effect may have been arrived at, trustees should be appointed, residing in the colonies, who would act as a Committee of administration, such Committee to consist of not more than five members. All funds would be placed at their disposal, and all money transactions in connexion with the expedition would be made under their supervision and subject to their approval.

The objects of the expedition having been attained, and the time arrived when the same is to be broken up, the residue of the stock and stores—horses, camels, equipment, instruments, provisions, &c.—would be handed over to the Committee of Trustees, to be disposed of as they might think fit.

All observations, journals, maps, natural-history collections, drawings, and photographs, without exception, would likewise be handed over to the Committee of Trustees on the completion of the expedition, in order that the same may be turned to account in furtherance of the interests of science, and of the various countries that have taken a part in this great undertaking. Members of the expedition would not be permitted to make private collections, and none of the results would be made public, unless by special authority of the Committee of Trustees.

Such are the objects and leading principles of an expedition which I hope to be able in person to carry out; and I trust it will not be deemed presumptuous on my part if I add a few words in support of my claims to be entrusted with the conduct of so noble an enterprise. I have been connected with Australia, with brief interruptions, ever since the year 1852, and the greater part of that long interval of time has been employed by me in studying the physical character of that great continent. In 1858 I succeeded in establishing an Observatory at Melbourne for the advancement of our knowledge of terrestrial physics, and my labours and publications on the observations made up to the time of my resignation and retirement from that institution in 1863, will in a very short time come to a conclusion. The magnetical and other observations collected during my travels through Victoria, part of New South Wales, and of South Australia, comprising an area of nine degrees of longitude and six degrees of latitude, are now in course of publication on behalf of the colony of Victoria. As soon as this is accomplished, I purpose again to devote my energies to further inquiries respecting the physical geography of Australia, but on this occasion likewise as an explorer. In this determination I am prompted by no other motives than the advancement of science, and my attachment towards a rising country—an attachment not unnatural, after a connexion extending over a period of so many years.

It is on these grounds that I solicit the powerful support of this Society in this great national undertaking, which, I am persuaded, will, if successfully carried out, conduce equally to the advancement of the interests of science and to the material welfare of Australia. Men may differ as to the

mode of proceeding in its execution ; but none, I presume, will venture to deny its importance, especially with regard to the development of the natural resources of that immense area, in the interests of civilization—none, I feel sure, will oppose it as being premature or inopportune. It would be presumptuous on my part were I to urge the importance of the opening up of the western interior for the successful settlement of Western and North-Western Australia, which at some future time, and under certain contingencies that might arise, would have a most important bearing on the security of the British possessions in India. For I am well aware that men, regarded as authorities in colonial policy, have long ago brought this subject under the consideration of the Government. Nor need I speak of the enlightened spirit in which the various Governments in Australia have ever shown themselves ready to assist the cause of exploration and scientific research. The many and valuable contributions that science, in nearly every one of its branches, has received from the colonies cannot fail to assure us of their assistance and cooperation in a systematic and scientific exploration of the unknown interior round which they are clustered. I feel confident there needs but an impulse from England, and the sanction of its highest scientific authorities, to secure for the undertaking a ready assent and strenuous support on the part of the people and the Governments of Australia.

APPENDIX.

A.—Annual Expenditure of the Expedition.

a. Salaries and wages for the members of the expedition proper.

1. Leader, annually.....	£450	0	0
Assistant leader, annually.....	350	0	0
Storekeeper and overseer, annually	200	0	0
Saddler, tent-maker, &c., monthly £12	144	0	0
Blacksmith, wheelwright, monthly £12.....	144	0	0
	<hr/>		
	£1288	0	0

2. Twelve stockmen at £8 a month	£1152	0	0
Three aboriginals at £4 a month	144	0	0
	<hr/>		
	£1296	0	0

b. Salaries for the scientific men.

Geologist, mineralogist, annually	£300	0	0
Botanist and medical officer	300	0	0
Zoologist, palæontologist, medical assistant	300	0	0
Artist and photographer.....	300	0	0
Assistant observer for physical science	200	0	0
	<hr/>		
	£1400	0	0

TOTAL SALARIES AND WAGES.

<i>a.</i> 1	£1288	0	0
<i>a.</i> 2	1296	0	0
<i>b.</i>	1400	0	0
	<hr/>		
	£3984	0	0
	<hr/>		
<i>c.</i> Expenditure for provisions, tobacco, &c.	£866	0	0
And for wear and tear and repairs.	200	0	0
	<hr/>		
	£1066	0	0
	<hr/>		
Total of the annual expenditure.	{ £3984 0 0		
	{ 1066 0 0		
	<hr/>		
	£5050	0	0
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Total for three years and a half	£17675	0	0
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B.—*Expenditure of the Expedition for Instruments, Outfit, exclusive of Provisions.*

1. Instruments—Astronomical	£200	0	0
Physical and meteorological	250	0	0
Physiological and botanical	80	0	0
Surgical medicine-chest	60	0	0
Geological	40	0	0
Photographical	50	0	0
Packing and transport to Australia	60	0	0
	<hr/>		
	£740	0	0
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2. Tools and implements, including rifles, revolvers, ammunition, rockets, blue lights, horseshoes, &c.	£400	0	0
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3. Tents, a boat, and a small iron vehicle	£300	0	0
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4. Saddlery, including thirty riding saddles and pack saddles, water bags, &c.	£440	0	0
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5. Live stock; fifty horses at £20 each.	£1000	0	0
Some sheep.	100	0	0
	<hr/>		
	£1100	0	0
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TOTAL OUTFIT.

1	£740	0	0
2	400	0	0
3	300	0	0
4	440	0	0
5	1100	0	0
		<hr/>		
		£2980	0	0

C.—*Expenditure during and prior to the Organization of the Expedition.*

Expenses in Europe.....	£100	0	0
Passage money for the officers to Australia.....	380	0	0
Probable expenditure prior to the organization	400	0	0
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Total	£880	0	0

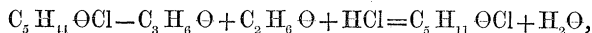
GRAND TOTAL EXPENDITURE.

A	£17,675	0	0
B	2,980	0	0
C	880	0	0
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£21,535 0 0			

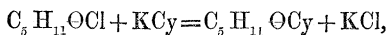
II. "On some New Derivatives of Acetone." By MAXWELL SIMPSON, M.D., F.R.S. Received April 18, 1868.

The compounds which form the subject of the present paper came accidentally under my notice whilst I was engaged in an unsuccessful attempt to form leucic acid by a new synthesis.

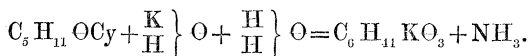
By saturating a mixture of acetone and absolute alcohol with dry hydrochloric acid gas, I had hoped to form a body having the composition



and that this, when treated successively with cyanide of potassium and caustic potash, would have yielded the desired acid according to the following equations:—



and



By saturating the above mixture with hydrochloric acid, I obtained, it is true, a large quantity of a chlorinated oil; but I could not ascertain whether it was the compound I expected or not, as I found it impossible to render

