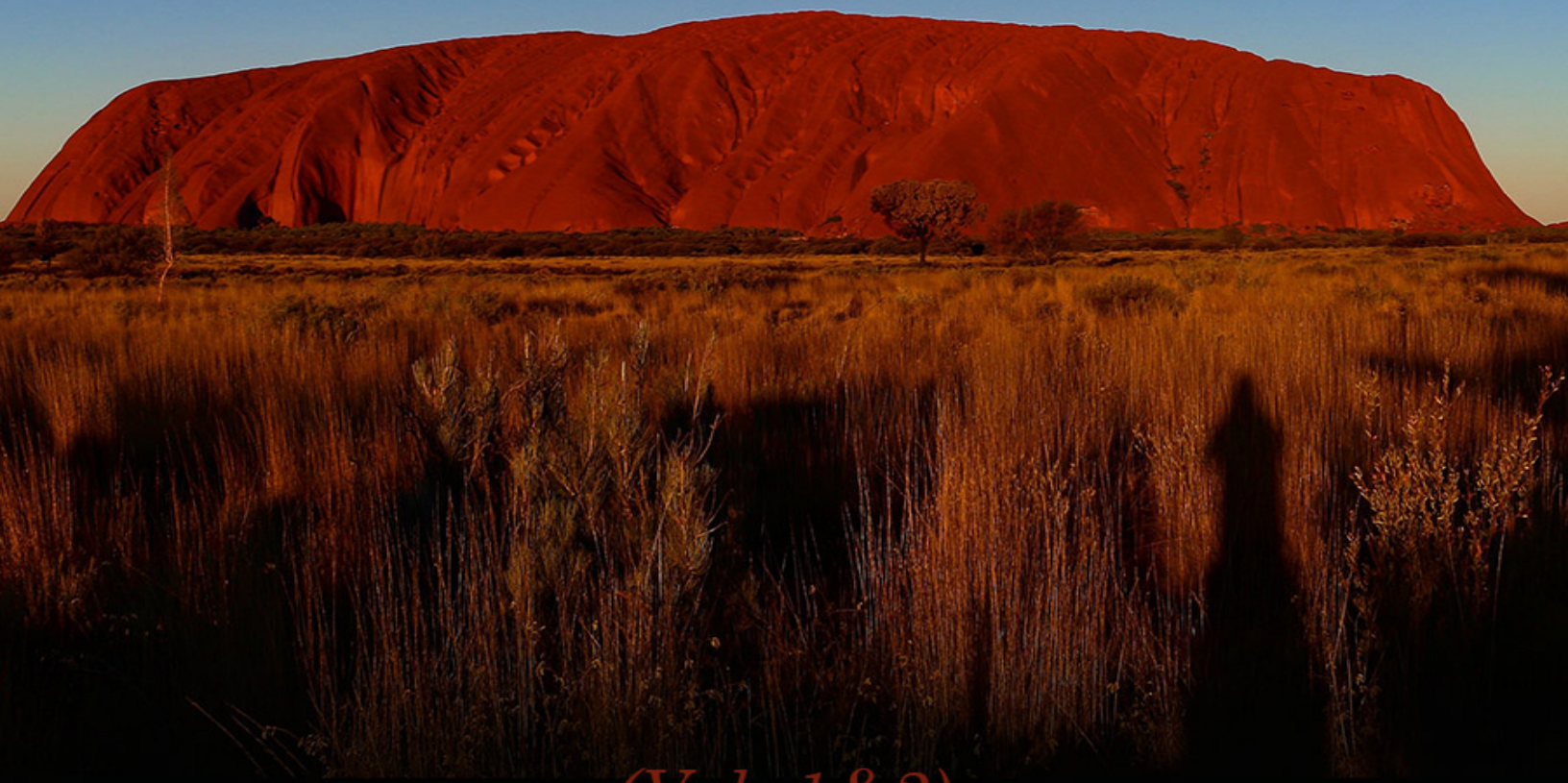
John Lort Stokes

Discoveries in Australia



(Vol. 1&2)

John Lort Stokes

Discoveries in Australia
(Vol. 1&2)

With an Account of the Coasts and Rivers Explored and Surveyed During the Voyage of H. M. S. Beagle

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Volume 1

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APPENDIX 5. DESCRIPTIONS OF SOME NEW OR IMPERFECTLY CHARACTERIZED LEPIDOPTERA FROM AUSTRALIA. BY EDWARD DOUBLEDAY, F.L.S. ASSISTANT IN THE ZOOLOGICAL DEPARTMENT OF THE BRITISH MUSEUM.

INTRODUCTION.

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I cannot allow these volumes to go before the public, without expressing my thanks to the following gentlemen for assistance, afforded to me in the course of the composition of this work: To Captain Beaufort, R.N., F.R.S., Hydrographer to the Admiralty, for his kindness in furnishing me with some of the accompanying charts; to Sir John Richardson, F.R.S; J.E. Gray, Esquire, F.R.S.; E. Doubleday, Esquire, F.L.S., and A. White, Esquire, M.E.S., for their valuable contributions on Natural History, to be found in the Appendix; to J. Gould, Esquire, F.R.S., for a list of birds collected during the voyage of the Beagle; to Lieutenants Gore and Fitzmaurice, for many of the sketches which illustrate the work; and to B. Bynoe, Esquire, F.R.C.S., for several interesting papers which will be found dispersed in the following pages.

Captain Owen Stanley, R.N., F.R.S., also merits my warmest thanks, for the important addition to the work of his visits to the Islands in the Arafura Sea.

I have to explain, that when the name Australasia is used in the following pages, it is intended to include Tasmania (Van Diemen's Land) and all the islands in the vicinity of the Australian continent.

All bearings and courses, unless it is specified to the contrary, are magnetic, according to the variation during the period of the Beagle's voyage.

The longitudes are generally given from meridians in Australia, as I much question whether any portion of the continent is accurately determined with reference to Greenwich. Sydney, Port Essington, and Swan River, have been the meridians selected; and the respective positions of those places, within a minute of the truth, I consider to be as follows:

Swan River (Scott's Jetty, Fremantle) 115 degrees 47 minutes East.

Port Essington (Government house) 132 degrees 13 minutes East.

Sydney (Fort Macquarie) 151 degrees 16 minutes East.

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CHAPTER 1.1. INTRODUCTION.

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For more than half a century, the connection between Great Britain and her Australian possessions has been one of growing interest; and men of the highest eminence have foreseen and foretold the ultimate importance of that vast continent, over which, within the memory of living man, the roving savage held precarious though unquestioned empire.

Of the Australian shores, the North-western was the least known, and became, towards the close of the year 1836, a subject of much geographical speculation. Former navigators were almost unanimous in believing that the deep bays known to indent a large portion of this coast, received the waters of extensive rivers, the discovery of which would not only open a route to the interior, but afford

facilities for colonizing a part of Australia, so near our East Indian territories, as to render its occupation an object of evident importance.

His Majesty's Government therefore determined to send out an expedition to explore and survey such portions of the Australian coasts as were wholly or in part unknown to Captains Flinders and King.

H.M. SLOOP BEAGLE.

For this service H.M. Sloop Beagle was commissioned at Woolwich, in the second week of February 1837 by Commander Wickham, who had already twice accompanied her in her wanderings over the least known and most boisterous waters of the globe; first, in her sister ship of discovery, the Adventure, Captain King, and afterwards as first lieutenant of the sloop now entrusted to his command. Under Captain Wickham some of the most important objects of the voyage were achieved, but in consequence of his retirement in March 1841, owing to ill health, the command of the Beagle was entrusted to the author of the following pages; and as, by a singular combination of circumstances, no less than three long and hazardous voyages of discovery have been successfully completed in this vessel, some account of her here may not be wholly uninteresting. The reader will be surprised to learn that she belongs to that much-abused class, the 10-gun brigs--COFFINS, as they are not infrequently designated in the service; notwithstanding which, she has proved herself, under every possible variety of trial, in all kinds of weather, an excellent sea boat. She was built at Woolwich in 1819, and her first exploit was the

novel and unprecedented one of passing through old London bridge (the first rigged man-of-war that had ever floated so high upon the waters of the Thames) in order to salute at the coronation of King George the Fourth.

VOYAGES OF THE BEAGLE.

Towards the close of the year 1825 she was first commissioned by Commander Pringle Stokes,* as second officer of the expedition which sailed from Plymouth on the 22nd of May, 1826, under the command of Captain Phillip Parker King; an account of which voyage, published by Captain R. Fitzroy, who ultimately succeeded to the vacancy occasioned by the lamented death of Captain Stokes, and who subsequently commanded the Beagle during her second solitary, but most interesting expedition--has added to the well-earned reputation of the seaman, the more enduring laurels which literature and science can alone supply.

(*Footnote. Not related to the author.)

DEATH OF CAPTAIN STOKES.

Though painful recollections surround the subject, it would be hardly possible to offer an account of the earlier history of the Beagle, and yet make no allusion to the fate of her first commander, in whom the service lost, upon the testimony of one well qualified to judge, "an active, intelligent, and most energetic officer:" and well has it been remarked by the same high authority, "that those who have been exposed to one of such trials as his, upon an unknown lee shore, during the worst description of weather, will

understand and appreciate some of those feelings which wrought too powerfully upon his excitable mind." The constant and pressing cares connected with his responsible commanded--the hardships and the dangers to which his crew were of necessity exposed during the survey of Tierra del Fuego--and in some degree the awful gloom which rests forever on that storm-swept coast--finally destroyed the equilibrium of a mind distracted with anxiety and shattered by disease.

Perhaps no circumstance could prove more strongly the peculiar difficulties connected with a service of this nature, nor could any more clearly testify that in this melancholy instance every thought of self-preservation was absorbed by a zeal to promote the objects of the expedition, which neither danger, disappointment, anxiety, nor disease could render less earnest, or less vigilant, even to the last!

The two vessels returned to England in October, 1830, when the Adventure was paid off at Woolwich, and the Beagle at Plymouth; she was recommissioned by Captain Fitzroy--to whose delightful narrative allusion has been already made--on the 4th July, 1831,* and continued under his command till her return to Woolwich in November, 1836; where, after undergoing some slight repairs, she was a third time put in commission for the purposes of discovery, under Commander Wickham, her former first lieutenant; and shortly afterwards commenced that third voyage, of the toils and successes of which, as an humble contribution to the stores of geographical knowledge, I have attempted in the following pages to convey as faithful and complete an account as the circumstances under which the materials

have been prepared will allow. Nor will the subject less interest myself, when I call to mind, that for eighteen years the Beagle has been to me a home upon the wave--that my first cruise as a Middy was made in her; that serving in her alone I have passed through every grade in my profession to the rank I have now the honour to hold--that in her I have known the excitements of imminent danger, and the delights of long anticipated success; and that with her perils and her name are connected those recollections of early and familiar friendship, to which even memory herself fails to do full justice!

(*Footnote. The Beagle was stripped to her timbers, and rebuilt under this able officer's own inspection: and among other improvements, she had the lightning conductors of the well-known Snow Harris, Esquire, F.R.S. fitted to her masts; a circumstance to which she has more than once been indebted for her safety.)

ADMIRALTY INSTRUCTIONS.

The following instructions were received by Captain Wickham, previous to our departure from Woolwich, and under them I subsequently acted.

BY THE COMMISSIONERS FOR EXECUTING THE OFFICE OF LORD HIGH ADMIRAL OF THE UNITED KINGDOM OF GREAT BRITAIN AND IRELAND, ETC.

Whereas his Majesty's surveying vessel, Beagle, under your command, has been fitted out for the purpose of exploring certain parts of the north-west coast of New Holland, and of surveying the best channels in the straits of Bass and Torres, you are hereby required and directed, as

soon as she shall be in all respects ready, to repair to Plymouth Sound, in order to obtain a chronometric departure from the west end of the breakwater, and then to proceed, with all convenient expedition, to Santa Cruz, in Tenerife.

In the voyage there, you are to endeavour to pass over the reputed site of the Eight Stones, within the limits pointed out by our Hydrographer; but keeping a strict lookout for any appearance of discoloured water, and getting a few deep casts of the lead.

At Tenerife you are to remain three days, for the purpose of rating the chronometers, when you are to make the best of your way to Bahia, in order to replenish your water, and from thence to Simon's Bay, at the Cape of Good Hope; where, having without loss of time obtained the necessary refreshments, you will proceed direct to Swan River; but as the severe gales which are sometimes felt at that settlement may not have entirely ceased, you will approach that coast with due caution.

At Swan River, you are to land Lieutenants Grey and Lushington, as well as to refit and water with all convenient despatch; and you are then to proceed immediately to the north-west coast of New Holland, making the coast in the vicinity of Dampier Land. The leading objects of your examination there will be, the extent of the two deep inlets connected with Roebuck Bay and Cygnet Bay, where the strength and elevation of the tides have led to the supposition that Dampier Land is an island, and that the above openings unite in the mouth of a river, or that they branch off from a wide and deep gulf. Moderate and regular

soundings extend far out from Cape Villaret: you will, therefore, in the first instance, make that headland; and, keeping along the southern shore of Roebuck Bay, penetrate at once as far as the Beagle and her boats can find sufficient depth of water; but you must, however, take care not too precipitately to commit His Majesty's ship among these rapid tides, nor to entangle her among the numerous rocks with which all this part of the coast seems to abound; but by a cautious advance of your boats, for the double purpose of feeling your way, and at the same time of surveying, you will establish her in a judicious series of stations, equally beneficial to the progress of the survey, and to the support of your detached people.

Prince Regent River appears to have been fully examined by Captain King up to its freshwater rapids, but as the adjacent ridges of rocky land which were seen on both sides of Collier Bay, were only laid down from their distant appearance, it is probable that they will resolve themselves into a collection of islands in the rear of Dampier Land; and it is possible that they may form avenues to some wide expanse of water, or to the mouth of some large river, the discovery of which would be highly interesting.

As this question, whether there are or are not any rivers of magnitude on the western coast is one of the principal objects of the expedition, you will leave no likely opening unexplored, nor desist from its examination till fully satisfied; but as no estimate can be formed of the time required for its solution, so no period can be here assigned at which you shall abandon it in order to obtain refreshments; when that necessity is felt, it must be left to

your own judgment, whether to have recourse to the town Balli, in the strait of Allas, or to the Dutch settlement of Coepang, or even to the Arrou Islands, which have been described as places well adapted for that purpose; but on these points you will take pains to acquire all the information which can be obtained from the residents at Swan River.

Another circumstance which prevents any precise instructions being given to you on this head, is the uncertainty that prevails here respecting the weather which you may at that period find in those latitudes, and which it is possible may be such as if not altogether to prevent the execution of these orders, may at least cause them to be ineffectually performed, or perhaps lead to a waste of time, which might be better employed on other parts of the coast. If such should eventually be the case, it would be prudent not to attempt this intricate part of the coast during the prevalence of the north-west monsoon, but to employ it in completing the examination of Shark Bay and of Exmouth Gulf, as well as of other unexplored intervals of coast up to the 122nd degree of longitude; or, with a view to the proximity of one of the above-mentioned places of refreshment, it might, perhaps, be advisable, if compelled to quit the vicinity of Dampier Land, to devote that part of the season to a more careful investigation of the low shores of the gulf of Carpentaria, where it has been surmised, though very loosely, that rivers of some capacity will be found.

The above objects having been accomplished (in whatever order you may find suitable to the service) you will return to the southern settlements for refreshments; and

then proceed, during the summer months of fine weather and long days, to Bass Strait, in which so many fatal accidents have recently occurred, and of which you are to make a correct and effectual survey.

But previous to your undertaking that survey, as it has been represented to us that it would be very desirable for the perfection of the Tidal theory, that an accurate register of the times and heights of high and low-water should be kept for some time in Bass Strait, you will (if practicable) establish a party for that purpose on King Island, and you are to cause the above particulars of the Tides there to be unintermittently and minutely observed, and registered in the blank forms which will be supplied to you by our Hydrographer. If, however, circumstances should render this measure unadvisable at that island, you will either choose some less objectionable station, where the average tide in the Strait may be fairly registered; or, if you can employ no permanent party on this service, you will be the more exact in ascertaining the above particulars at every one of your stations; and in all parts of this Strait you will carefully note the set and strength of the stream at the intermediate hours between high and low-water, and also the time at which the stream turns in the offing.

The survey of Bass Strait should include, first, a verification of the two shores by which it is formed; secondly, such a systematic representation of the depth and quality of the bottom as will ensure to any vessel, which chooses to sound by night or day, a correct knowledge of her position; and, thirdly, a careful examination of the passages on either side of King Island, as well as through

the chains of rocks and islands which stretch across from Wilson's Promontory to Cape Portland. This survey will, of course, comprehend the approach to Port Dalrymple, but the interior details of that extensive harbour may be left to the officers employed by the Lieutenant-Governor of Van Diemen's Land, provided you can ascertain that it is his intention to employ them there within any reasonable time.

The number of vessels which are now in the habit of passing through Bass Strait, and the doubts which have recently been expressed, not only of the just position of the dangers it is known to contain, but of the existence of others, show the necessity of this survey being executed with that care and fidelity which will give confidence to all future navigators; and may, therefore, be more extensive in its limits, and occupy a larger portion of your time than is at present contemplated. You must exercise your own judgment as to the fittest period at which you should either repair to Sydney to refit, or adjourn to Port Dalrymple to receive occasional supplies. Whenever this branch of the service shall be completed, you are forthwith by a safe conveyance to transmit a copy of it to our Secretary, that no time may be lost in publishing it for the general benefit.

At Sydney you will find the stores which we have ordered to be deposited there for your use, and having carefully rated your chronometers, and taken a fresh departure from the Observatory near that port, and having re-equipped His Majesty's ship, and fully completed her provisions, you will proceed by the inner route to Torres Strait, where the most arduous of your duties are yet to be performed. The numerous reefs which block up that Strait; the difficulty of

entering its intricate channels; the discordant result of the many partial surveys which have from time to time been made there, and the rapidly increasing commerce of which it has become the thoroughfare, call for a full and satisfactory examination of the whole space between Cape York and the southern shore of New Guinea, and to this important service, therefore, you will devote the remaining period for which your supplies will last.

In this latter survey you will cautiously proceed from the known to the unknown; you will verify the safety of Endeavour Strait, and furnish sufficient remarks for avoiding its dangers; you will examine the three groups called York, Prince of Wales, and Banks, Islands; you will establish the facilities or determine the dangers of passing through those groups, and by a well-considered combination of all those results, you will clearly state the comparative advantages of the different channels, and finally determine on the best course for vessels to pursue which shall be going in either direction, or in opposite seasons. Though with this part of your operations Cook's Bank, Aurora Reef, and the other shoals in the vicinity will necessarily be connected, yet you are not to extend them to the 143rd degree of longitude, as the examination of the great field to the eastward of that meridian must be left to some future survey which shall include the barrier reefs and their ramified openings from the Pacific Ocean. You are, on the contrary, to proceed, if practicable, but most cautiously, in examining the complicated archipelago of rocks and islands which line the northern side of Torres Strait, till, at length, reaching New Guinea, you will there ascertain the general character of

that part of its shore, whether it be high and continuous, or broken into smaller islands with available channels between them, as has been asserted; or whether, from being guarded by the innumerable reefs and dangers which are marked in the charts, it must remain altogether sealed to the navigator. The nature of the country, as well as of its products, will also be inquiries of considerable interest; and you will, perhaps, be able to learn whether the Dutch have made any progress in forming settlements along its shores; and if so, you will take especial care not to come into collision with any of their authorities.

Throughout the whole of this extensive region, you will bear in mind the mischievous disposition of the natives; and while you strictly practice that dignified forbearance and benevolence which tend to impress far higher respect for our power than the exercise of mere force, you will also be sedulously on your guard against every surprise; and though your boats should always be completely armed, you will carefully avoid any conflict where the ignorant or misguided natives may presume on your pacific appearance, or on the disparity of your numbers.

You will then turn to the westward, and pursue this part of the survey, so as to determine the breadth of the foul ground off the coast of New Guinea, and the continuity or interrupted form of that coast; and you will establish certain positions on the mainland (if the adjacent sea be navigable, and if not on the several advancing islands) which may serve as useful land-falls for vessels coming from the Indian Seas, or for points of departure for those who have passed through any of these straits. You will thus continue a general

examination of this hitherto unexplored coast as far as Cape Valsche, which is now said to be only the terminating point of a chain of large islands, and then across to the Arrou Islands, which are supposed to be remarkably fertile, to abound with resources and refreshments, and to be peopled by a harmless and industrious race, but which do not appear to have been visited by any of His Majesty's ships.

The length of time which may be required for the due execution of all the foregoing objects cannot be foreseen. It may exceed that for which your supplies are calculated, or, on the other hand, a less degree of the supposed complexity in the ground you will have traversed, along with the energy and diligence with which we rely on you for conducting these important services, may enable you to complete them within that period. In this latter case you will return to the Northern coast of New Holland, and selecting such parts of it as may afford useful harbours of retreat, or which may appear to comprise the mouths of any streams of magnitude, you will employ your spare time in such discoveries as may more or less tend to the general object of the expedition.

Before your departure from Sydney you will have learnt that His Majesty's Government has established a new settlement at Port Essington, or somewhere on the North coast of New Holland; and before you finally abandon that district you will visit this new colony, and contribute by every means in your power to its resources and its stability.

We have not, in the concluding part of these Orders, pointed out the places or the periods at which you are to replenish your provisions, because the latter must depend

on various circumstances which cannot be foreseen, and the former may be safely left to your own decision and prudence; but when you have been three years on your ground, unless some very important result were to promise itself from an extension of that period, you will proceed to the Island of Mauritius, in order to complete your stock of water and provisions, and then, touching at either side of the Cape of Good Hope, according to the season, and afterwards at Ascension, you will make the best of your way to Spithead, and report your arrival to our Secretary.

Directions will be forwarded to the commanders-in-chief at the Cape of Good Hope and in the East Indies, and to the governors or lieutenant-governors of the several settlements at which you have been ordered to call, to assist and further your enterprise as far as their means will admit: and you will lose no opportunity, at those several places, of informing our Secretary of the general outline of your proceedings, and of transmitting traces of the surveys which you may have effected, together with copies of your tide and other observations. You will likewise, by every safe opportunity, communicate to our Hydrographer detailed accounts of all your proceedings which relate to the surveys; and you will strictly comply with the enclosed instructions, which have been drawn up by him under our directions, as well as all those which he may, from time to time, forward by our command.

Given under our hands, the 8th of June, 1837.

Signed,

Charles Adam.

George Elliott.

To J.C. Wickham, Esquire.
Commander of His Majesty's surveying vessel Beagle, at Woolwich.
By command of their Lordships.
Signed,
John Barrow.

* * * * *

Nor should the valuable instructions of Captain Beaufort, Hydrographer to the Admiralty, be forgotten; such extracts as may probably prove of interest to the general reader are here subjoined.

EXTRACTS FROM HYDROGRAPHER'S INSTRUCTIONS.

The general objects of the expedition which has been placed under your command, having been set forth in their Lordship's orders, it becomes my duty to enter somewhat more specifically into the nature and details of the service which you are to perform. Their Lordships having expressed the fullest reliance on your zeal and talents, and having cautiously and wisely abstained from fettering you in that division and disposition of your time which the periodic changes of the seasons or the necessities of the vessel may require, it would ill become me to enter too minutely into any of those arrangements which have been so flatteringly left to your discretion; yet, in order to assist you with the results of that experience which has been derived from the many surveys carried on under the direction of the Admiralty, and to ensure that uniform consistency of method in your varied labours, which will so greatly

enhance their value, I will briefly touch on some of the most important subjects, and repeat those instructions which their Lordships have in every former case ratified, and which it is therefore expected you will bear in mind during the whole progress of your survey.

The first point to which your orders advert, after quitting England, is the Eight Stones, where you will probably add one to the many testimonies which have been already collected of their non-existence, at least in the place assigned to them in the old charts; but, before we venture to expunge them, it becomes a serious duty to traverse their position in every possible direction. Should the weather be favourable, it would be desirable, while crossing their parallel, to obtain one very deep cast of the lead, and should that succeed in reaching the bottom, the sacrifice of a few days will be well bestowed in endeavouring to trace a further portion of the bank. A small chart, showing the tracks of various ships across this place, is hereto annexed, and as the meridian of 16 degrees 22 minutes nearly bisects the two adjacent courses, you are recommended to cross their parallel in that longitude.

From the Canary Islands to the coast of Brazil, and indeed throughout every part of your voyage, you should endeavour to pass over the places of all the reported Vigias which lie near your course, either outward or homeward. You will perceive a multitude of them carelessly marked on every chart, but of some you will find a circumstantial description in that useful publication, the Nautical Magazine, and a day devoted to the search of any, which will not

withdraw you too far from your due course, will be well employed.

The rocks off Cape Leeuwin, some near King George Sound, the dangerous patch off Kangaroo Island, and many others, of which accounts are given in the above work, ought, if possible, to be examined, as more immediately appertaining to your own field. Whenever found, the depth, nature, and limits of the banks on which they stand, should be determined, as they might prove to be of sufficient extent to give warning to the danger, and then a direct course should be immediately made by the Beagle to the nearest land, where a convenient place should be selected, and its position carefully ascertained.

At Swan River you will have previously learnt from Lieutenant Roe, the Surveyor-General, whether the above-mentioned rocks off Kangaroo Island, have been again seen, or their position altered, since Captain Brockman's first description, so as to save your time in the search.

You will no doubt obtain from that intelligent officer, Lieutenant Roe, much important information respecting the north-west coast, as well as all the detached intelligence, which during his long residence there he must have collected, relating to every part of the shores of New Holland. From him, also, you will acquire many useful hints about the places in the Indian Sea where refreshments may be obtained, as well as some insight into the disposition of the authorities and the inhabitants whom you will meet there, and he will probably be able to give you a clear account of the duration of the monsoons and their accompanying weather.

If at Port Dalrymple it should so happen that you can wait on Sir John Franklin, it is probable that he will detach Lieutenant Burnett to cooperate with you in the survey of Bass Strait, and it is certain that the Governor will do everything in his power to assist your labours. At Sydney you will have the advantage of seeing Captain P.P. King, whose long experience of all those coasts, as well as of the seasons, and of the manner of dealing with the inhabitants, will be of the utmost use to you; and whose zeal for the King's service, and whose love of science, will lead him to do everything possible to promote your views. If Mr. Cunningham, the Government Botanist, be there, he also will, I am convinced, eagerly communicate to you and your officers everything which may be serviceable in the pursuits connected with Natural History.

At Swan River, at Port Dalrymple, and at Sydney, it may, perhaps, be possible for you to hire, at a low rate, some person acquainted with the dialects of the natives, which you are subsequently to visit, and with whom it will be so essential to be on friendly terms. Such a person will greatly assist in that object; but you will keep him on board no longer than absolutely necessary, and you will take care to provide for his return if the Beagle should not be able to carry him back.

GENERAL INFORMATION.

In such an extensive and distant survey, numerous subjects of inquiry, though not strictly nautical, will suggest themselves to your active mind; and though, from your transient stay at any other place, you will often experience

the mortification of leaving them incomplete, yet that should not discourage you in the collection of every useful fact within your reach. Your example in this respect will stimulate the efforts of the younger officers under your command, and through them may even have a beneficial influence on the future character of the navy.

It has been suggested by some geologists, that the coral insect, instead of raising its superstructure directly from the bottom of the sea, works only on the summits of submarine mountains, which have been projected upwards by volcanic action. They account, therefore, for the basin-like form so generally observed in coral islands, by supposing that they exist on the circular lip of extinct volcanic craters; and as much of your work will lie among islands and cays of coral formation, you should collect every fact which can throw any light on the subject.

Hitherto it has been made a part of the duty of all the surveying vessels to keep an exact register of the height of the barometer, at its two maxima of 9, and its two minima of 3 o'clock, as well as that of the thermometer at the above periods, and at its own day and night maximum and minimum, as well as the continual comparative temperature of the sea and air. This was done with the view of assisting to provide authentic data, collected from all parts of the world, and ready for the use of future labourers, whenever some accidental discovery, or the direction of some powerful mind, should happily rescue that science from its present neglected state. But those hours of entry greatly interfere with the employments of such officers as are capable of registering those instruments with the precision

and delicacy which alone can render meteorologic data useful, and their future utility is at present so uncertain, that it does not appear necessary that you should do more than record, twice a day, the height of the former, as well as the extremes of the thermometer, unless, from some unforeseen cause, you should be long detained in any one port, when a system of these observations might then be advantageously undertaken. There are, however, some occasional observations, which cannot fail of being extensively useful in future investigations:

1. During the approach of the periodic changes of wind and weather, and then the hygrometer, also, should find a place in the journal.

2. The mean temperature of the sea at the equator, or, perhaps, under a vertical sun. These observations should be repeated whenever the ship is in either of those situations, as well in the Atlantic as in the Pacific; they should be made far away from the influence of the land, and at certain constant depths, suppose fifty and ten fathoms, and at the surface also; and this last ought to be again observed at the corresponding hour of the night.

3. A collection of good observations, systematically continued, for the purpose of connecting the isothermal lines of the globe, and made, as above, at certain uniform depths.

4. Some very interesting facts might result from the comparison of the direct heat of the solar rays in high and low latitudes. The two thermometers for this purpose should be precisely similar in every respect; the ball of the one should be covered with white kerseymere, and of the other

with black kerseymere, and they should be suspended far out of the reach of any reflected heat from the ship, and also at the same elevation above the surface of the water; the observations should be made out of sight of land, in a variety of latitudes, and at different hours of the day, and every pains taken to render them all strictly similar and comparative.

5. All your meteorologic instruments should be carefully compared throughout a large extent of the scales, and tabulated for the purpose of applying the requisite corrections when necessary, and one or more of them should be compared with the standard instruments at the Royal Society or Royal Observatory on your return home.

6. All observations which involve the comparison of minute differences should be the mean result of at least three readings, and should be as much as possible the province of the same individual observer.

7. In some of those singularly heavy showers which occur in crossing the Equator, and also at the changes of the Monsoon, attempts should be made to measure the quantity of rain that falls in a given time. A very rude instrument, if properly placed, will answer this purpose, merely a wide superficial basin to receive the rain, and to deliver it into a pipe, whose diameter, compared with that of the mouth of the basin, will show the number of inches, etc. that have fallen on an exaggerated scale.

8. It is unnecessary to call your attention to the necessity of recording every circumstance connected with that highly interesting phenomenon, the Aurora Australis, such as the

angular bearing and elevation of the point of coruscation; the bearing also of the principal luminous arches, etc.

9. It has been asserted that lunar and solar halos are not always exactly circular, and a general order might, therefore, be given to the officer of the watch, to measure their vertical and horizontal diameters whenever they occur, day or night.

Large collections of natural history cannot be expected, nor any connected account of the structure or geological arrangements of the great islands which you are to coast; nor, indeed, would minute inquiries on these subjects be at all consistent with the true objects of the survey. But, to an observant eye, some facts will unavoidably present themselves, which will be well worth recording, and the medical officers will, no doubt, be anxious to contribute their share to the scientific character of the survey.

I have now exhausted every subject to which it can be necessary to call the attention of an officer of your long experience; and I have, therefore, only further to express my conviction, that if Providence permits you to retain your wonted health and activity, you will pursue the great objects of this expedition with all the energy in your power, and with all the perseverance consistent with a due regard to the safety of His Majesty's Ship, and to the comfort of your officers and crew.

Given, etc. this 8th of June, 1837.

F. Beaufort,

Hydrographer.

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