

Selected Documents from the BGS Archives No 1

Instructions for the Local Directors of the  
Geological Survey of Great Britain and Ireland

Henry de la Beche

22nd May 1845

Edited by

Graham McKenna

## Introduction to the Series

This report is the first in a new series “Selected Documents from the BGS Archives” which aims to disseminate more widely, interesting or valuable research material contained in the BGS Library Archive collections. In some cases the contents of the reports will consist of reproductions of manuscript text, in other cases the reports will consist of indexes to significant single collections such as the Bell Papers or Murchison materials held in the Archives. New technology will allow access to both the text of reports in the series and, where relevant, scanned images of archive manuscript material via the Library’s on-line catalogue. The series will cover both official papers and the records of individual geologists dating back to the commencement of Survey activity in 1835.

Graham McKenna  
BGS Chief Librarian and Archivist

## PREFACE

The Instructions are to be found in the Entry Book for Out Letters 1845-1846 p.37 (GSM 1 /4)

The “Instructions for the Local Directors of the Geological Survey” issued by De la Beche on the 22nd May 1845 is an interesting document for several reasons. It was issued at a time when the Geological Survey had just become independent of the Ordnance Survey. Compared to the sections on the geological surveying procedures, the administrative instructions which conclude the document are brief. In the body of the text, the importance of the economic dimension of the Survey’s work is clearly stressed as is the need to map at the 6 inch scale.

Entries in the Letter Book on either side of the Instructions provide an interesting insight into the activities of the Survey at that time. A letter dated 22/5/1845 from De la Beche to Henry James appoints him as Local Director in Ireland and tasks him to survey the area from Dublin to Waterford and to organize the formation of a Museum of Economic Geology in Dublin. A letter from Henry James, as Local Director in Ireland, relates to the appointment of Frederick McCoy to Ireland. A letter from De la Beche to the Earl of Lincoln requests approval from the Office of Woods to appoint Wilkinson Warington Smyth to be “Mining Geologist upon the Geological Survey of the United Kingdom” at a salary of £50 p.a. The Abstract of Expenditure for the quarter to 30/6/1845 shows a balance of £955-16-4½ d of which £ 2-13-8d was spent on postage. Assistant Geologists Aveline, Baily and Bristow received 9/7d per day. On transfer to Ireland, Henry James’s salary rose to 10/- per day.

That the Survey was already developing links with international bodies can be seen in a letter from De la Beche on 17/6/1845 which requests sanction to present geological maps of the United Kingdom to ten overseas institutions including the Academies of Science in Berlin, St Petersburg, Vienna and Geneva as well as the chief libraries in the United States. De la Beche saw this process as “very desirable for the progress of science”. In fact they were to become the forerunners of the many exchange agreements which the Survey Library has operated for over 150 years.

Many facets of the Survey and its activities have changed significantly since 1845 but the concluding section of the Instructions has a familiar ring alongside today’s business plans and core mission statements.

## **Instructions for the Local Directors of the Geological Surveys of Great Britain & Ireland.**

Although it is necessarily considered that the Geologists appointed to fill the offices of Local Directors of the Geological Surveys in Great Britain and Ireland possess the proper qualifications for their appointments, both as regards an extensive acquaintance with the present state of Geology, as the application of that science to the useful purposes of life, it is still desirable, before the more technical portions of these duties are noticed, briefly to advert to a general mode of observing and recording facts, during the progress of the Geological Survey, by which systematic investigations and uniformity of results may be secured.

1. Scientific Observations. Igneous Rocks. It is essential to study these in connection with the rocks of sedimentary origin, including among the latter, for convenience, the various limestones, that as close an approximation as possible may be made to their true geological dates in addition to the ordinary methods of investigation; more particularly seeing how far they may generally resemble the volcanic products of the present day and how far other conditions may be necessary to account for the Phenomena observed. Though apparently so simple there are few geological subjects which have been more fruitful in erroneous conclusions from the want of careful investigation than this. The consolidated ashes of sub-aerial eruptions of the earlier epochs sometimes resemble solid trappean rocks, or those which have been ejected in a state of igneous fusion, as to have been frequently mistaken for the latter. During the progress of the Geological Survey of Great Britain instances have occurred where bands of organic remains have been discovered in rocks which at first sight appeared as resulting from complete igneous fusion, and specimens obtained by unskilled persons, striking off fragments only of the non-fossiliferous portions would have been so termed, leading to erroneous geological conclusions. The history, if the term may be employed, of the intermingling of the igneous with the sedimentary rocks is most important, and often very complex, so that the Geologists and Assistant Geologists employed cannot be too strongly cautioned carefully to study it, requesting aid when difficulties arise, as indeed they should be directed most especially to do in all cases when they may consider it desirable, inasmuch as over confidence on the one side, and expectation of perfect fitness on the other would be most detrimental to the service. In studying masses of igneous rock it is important to observe the effects produced by the different rates of cooling upon the same chemical compounds, varieties of rocks from simply compact to highly crystalline being frequently the results of the different conditions to which the mass has been exposed, often known by different names, though really formed of the same amount of the same elementary bodies. Great care is required not only in observing these phenomena, so important geologically, but also in selecting such specimens for examination in the Laboratory, should that be desirable, as shall fully illustrate the subject. Unskilful research in this respect would be a lamentable waste of the opportunities afforded by a geological Survey of the character of that of the United Kingdom. The subject requires investigation on the large scale, bearing in mind that a map several square miles in extent is but minute considered geologically. It is by carefully investigating points of this order that we arrive at the relative fusibility of the masses, can draw fair inferences respecting their original composition, and reason properly upon the changes they are supposed often to have effected on the sedimentary rocks with which they have been brought into contact, either when thrust up amid or overflowing them. It is often very desirable to ascertain that this contact has not been such as to melt up some portion of the sedimentary rocks adjacent to the original molten mass, thus adding to it, and in such a manner, that the really igneous product may appear to shade off into sedimentary rocks, containing organic remains, the intermediate states being, as it is termed, metamorphic

crystals, such as those of feldspar, appearing, and giving such rocks a porphyritic character.

It would be needless to advert to a variety of other points connected with igneous rocks, to which attention has long been called and which are well understood by Geologists.

Sedimentary Deposits. Investigations on this head should be so conducted that the probable manner in which such rocks have been accumulated should be well understood. The mere grouping together of a number of beds, collectively known by a particular name, finding the boundaries of the mass, and inserting these on the maps and sections is insufficient in the present state of Geology. The different conglomerates, sandstones, slates, shales, marls, &c have to be studied with reference to their original condition of variously distributed gravels, sands, silt, clay, mud, &c. This is highly important, more particularly when taken in connection with any organic remains which may be found in them, for if it be considered that physical changes in the bottoms of seas have produced modifications in the animal life inhabiting them, it follows that particular animal remains, once considered characteristic of given sedimentary rocks, may rise higher in the series, or have existed lower than is supposed, when similar accumulations of sand, silt, mud, or otherwise as the case may be, have occurred over a particular area for corresponding geological periods.

In examining conglomerates and sandstones and even some limestones, such for instance as those in the oolitic series, it is necessary to see if the true beds be divided diagonally, by what has been termed 'false bedding', or constitute a mass without such partings, as, in the former case, we then obtain evidence of the matter composing the beds having been accumulated by the shoving action of water; forcing by its movement, the gravel, sand, shells &c forward over the bottom; while in the latter, the proof of such action is not so apparent, and the bed may have resulted from the deposit of substances actually held in free mechanical suspension in water. It being very important for many considerations to ascertain whether these rocks have been accumulated in the one manner or the other, points of this kind require very careful study in the field, and specimens when selected should have reference to them. A mere piece of the rock struck off without judgement, has comparatively very little value, and hence in investigations of this kind, necessary from the present state of Geology, the specimens of rocks usually collected in cabinets are generally of mere accidental service. As the cleavage and jointing of rocks, due to very different causes, may be confounded by unskilled persons with this false, bedding, it is very important to point out to, and make the Geologists and Assistants perfectly aware of, the difference between them.

In such rocks as are fossiliferous it is most desirable that the manner in which organic remains occur, as respects the planes of the beds, and their distribution over considerable areas, should be carefully studied and those collecting specimens should be instructed not only to obtain the fossils which may be found perfect, but also every kind of organic remain which may be discovered, noting the abundance or scarcity of the different kinds. The Palaeontologist to the Geological Survey, though he may, in very many cases, study the same ground, will thus obtain much needful previous information, of an order moreover enabling him to test the qualifications of those who may have preceded him. He will also thus see the extent to which confidence can be placed, as regards organic remains, in the labours of those who have examined localities which he cannot visit, it being impossible for him to do otherwise than select such as may afford the best information, to be inferred often from the researches of those who thus have first sought for and obtained organic remains.

All limestones should be carefully studied as to their probable origin. Many are well known

to possess every character of ancient coral reefs. Others again are composed of little else than accumulations of shells and other organic remains, while some afford no traces of organic life and appear little else than deposits from chemical solutions in water. For the origin of the latter the aid of the chemist may often be desirable, indeed such aid is frequently of the greatest importance when studying a variety of rocks, and with the cordial co-operation of the distinguished men which the Government has attached to the Museums of Economic Geology in London and Dublin, it may be anticipated that many highly important additions will be thus made to our geological knowledge during the progress of the Survey of the United Kingdom; their assistance being requested not upon light grounds, but upon mature consideration, and upon the responsibility of not unnecessarily and uselessly occupying valuable time. Very desirable chemical investigations present themselves as to the mode in which aggregations of similar matter, such as nodules of limestone, gypsum, ironstone, &c, have been effected amid different clays, slates, and marls; in the changes which have been produced in organic remains, such as the substitution of silica, sulphuret of iron, sulphuret of lead, and other mineral matter, for that of portions of the animals or plants entombed at different geological times; and in the wide range of enquiry connected with the metamorphic rocks.

Very great care is required in examining the rocks considered metamorphic, and more particularly in attributing real changes of this character, observed among the sedimentary deposits to heat alone. It is quite essential to study well the composition of the rocks supposed to be changed, and the probability of that change from the causes inferred before such rocks are entered upon the maps or sections, and assumed to be metamorphic. Very grave errors may be committed without due precaution on this head. As we have every reason to consider that a large mass of beds, commonly known as gneiss, mica-slate, &c, bearing often a somewhat close resemblance to merely altered or metamorphic rocks, skirting masses of protruded igneous matter, exist both in Great Britain & Ireland, this caution is more especially needed when the Survey is engaged in the districts of either country where these undoubted old rocks are found, so that while, on the one hand, we may come to correct conclusions respecting beds really metamorphic, we do not, on the other, necessarily include in the same category those which may have had a different origin. Specimens from the metamorphic rocks should be carefully selected, and always with reference to, and illustrative of, the mode of change considered to have been effected.

It should always be borne in mind whether the igneous or sedimentary rocks are under consideration that it is an important object so to conduct the investigations over the United Kingdom, that approximations may be made to the physical condition of the whole area at different geological times, that we may from the evidence ascertain those parts which were beneath the level of the sea, forming continuous portions of gravel, sand, silt or mud, as the case may have been, at different depths, tenanted by various creatures, and those parts which the like evidence would lead us to infer were above it, clothed with vegetation, inhabited by different animals, and intersected with lakes and rivers, teeming with life, as at present. The distribution of life at different times over the British area from that early geological period when we suppose such life to have first appeared upon it, up to the present time, is a study and a duty more peculiarly devolving on the Palaeontologist to the Survey, but as it is a knowledge highly essential to the philosophical views which should characterize the advance of the Geological Survey, it is extremely desirable that it should be instilled by the Local Directors into those who are under their charge. Frequent intercourse, therefore, is desirable between the Local Directors and the Palaeontologist on points which bear on this subject, and between the former, and the Geologists and Assistant Geologists employed on

the Survey, to whom such knowledge is important for the right progress of the work.

Lines of Contortion and Faults. It is desirable that the attention of the Assistant Geologists and Geologists employed should be called to this subject in such a manner, that eventually when a considerable portion of Great Britain and Ireland shall have been surveyed, these results of disturbing influences may be considered with reference to facts accurately ascertained. Anticlinal and Synclinal lines should be traced as if a model were intended to be made of them, and faults should be very carefully entered upon the maps, all ramifications from them being followed out when possible. Already upon the Geological Survey of Great Britain very valuable information has been collected by careful researches on this head, one connected with scientific investigation of a high class.

Joints and Cleavage. This is another subject requiring very careful attention, and the Local Directors are requested to see that such of those employed under them as can duly appreciate its value, carefully enter the general directions of both upon the maps, whenever practicable, so that on this point likewise we may possess accurate data for generalization.

## II. Economic Geology

Mining. Though from the arrangements respecting the Geological Survey, mining investigations are in a great measure provided for by the appointment of a Geologist expressly devoted to Mining Research, who will draw up proper accounts of the Mines of the different parts of the Kingdom, carefully describing the processes adopted in the various mineral districts, together with other necessary information including mining statistics, the Geologists engaged on the Survey may very materially aid in this class of enquiries, one perfectly in accordance with the view that, eventually, from service upon the Survey, a body of men may be formed, uniting the information of Geologists and Engineers thus constituting one of great value to the country. Lodes or Mineral Veins generally connect themselves with the faults and dislocations of the country in which they are found, and hence their range and direction must be carefully inserted on the maps, as well on this strictly Geological Account, as, for the value of the lines thus laid down to the owners of the ground and those engaged in Mining Operations. Geology is also immediately connected with Mining as regards the study of the rocks or country in which mineral veins are discovered. And the reasoning founded on correct data, which can show, that, under given geological conditions, metalliferous veins or lodes are likely to be more productive than under other; thus, on the one side, pointing out the locality where mining researches are most likely to prove profitable, and, on the other, preventing an useless waste of Capital, becomes of importance to the country. All facts, therefore, bearing upon this point require to be carefully collected. Coal Mining is necessarily a geological study as far as regards a knowledge of, and a search after, the coal in the ground, as for such purposes the beds of coal can only be regarded as beds mingled with others, and partaking of the same mode of occurrence, curved or upheaved, if they be curved or upheaved, and traversed by the same faults. The crops of beds of coal have hitherto been always entered upon the Geological Map of Great Britain, with their thickness attached in those places where they are actually known to be such. All variations in the same accumulation of coal beds become thus known, and the owners of property see at a glance the coal likely to be on their lands.

In Ireland where the maps are on a scale of six inches to the mile, very great precision may be obtained, both as regards the lines of mineral veins, and the outcrop of coal beds, and the

like details will be secured on the Great Britain Survey in those districts for which maps of the same scale are to be adopted. Upon the inch scale of the British Maps, though usually ample for ordinary Geological purposes, the same detail cannot be properly afforded, and such points will have to be considered as shall present the greatest amount of information. In all cases very carefully detailed sections will have to be made of the various coal districts, both horizontal and vertical, upon the scales to be hereafter noticed, affording at the same time both Geological and Mining information, and rendering the Survey as useful as possible to the mining interest.

Agriculture. Though the aid of chemistry is essential to the proper understanding of the substances constituting the food of plants, and the power of given soils to afford as much of this food as is derived from the ground, and, therefore, the co-operation of the chemical strength at the Museum of Economic Geology in London or Dublin, as the case may be, is absolutely necessary for the right examination of the subject, the Geologists employed on the Survey, may render very important assistance on this head. There is scarcely a district they can visit where they will not perceive the very different products which can be successfully grown upon the different soils derived from the rocks beneath, employing the term rock in its geological sense. Every allowance will necessarily have to be made for relative heights and exposure to the sea and prevalent winds, proximity to, or distance from the sea, and a variety of other well understood conditions respecting which the Local Directors are requested carefully to instruct such of those employed under them as may be considered capable of assisting in these researches. Very important practical information can be obtained from the farmers, which it is very essential not to neglect, and it is especially desirable to cultivate a good understanding with those landed proprietors and their agents, who now, in so many parts of the country, devote themselves to scientific agriculture, endeavouring to compare the facts known to them with the information derived from geological researches. In this manner it may be anticipated that a mass of valuable information will be collected, which, with the chemical aid before mentioned, may become of great service to the Agriculture of the Country.

Though natural soils are but the decomposed surface of the rocks beneath, with animal and vegetable matter added to it, from the plants which have grown, and the animals which have left their droppings or died upon the area, and thus the whole much depending upon the original rock beneath, the natural condition of the soil is so often changed by cultivation that fair inferences cannot always be drawn on this head. Great caution is therefore needed in reasoning on this subject, and the newly enclosed lands are often the most proper to consult for the best evidence on it.

Attention should be paid to the effects which might be produced by drainage alone, studying the change that the absence of superabundant water would produce upon the soils, and the survey will have frequent opportunities of appreciating the facilities, geological and physical, which different districts may offer for such drainage. It is very desirable that the Local Directors should caution the Geologists under their charge respecting the descent of soil, down hill and mountain sides, under conditions when one rock, such as Sandstone, occurs on the higher part, and another such as a clay or marl, on the lower, a concealment or commingling of substances, as the case may be, taking place below the line of the upper rock, which may give a false Agricultural character to the lower rock. Such caution is also especially necessary in countries covered by drift of various kinds, burying the subjacent rock, and preventing the soil that would have been produced from it from influencing the growth of surface plants, such as Wheat, Barley, &c, while sometimes the covering is not

sufficiently thick to prevent the exercise of this influence on the trees which can force their roots into it.

Alluvial Soils have often to be studied for the admixtures of the decomposed portions of various rocks washed together - such mixtures being frequently very instructive leading to the artificial mingling of adjacent soils together. These and other considerations of the like kind should be well impressed on those upon the Survey who may possess opportunities for such observations.

Road Materials. These, as the original cost and maintenance of the roads so much depends upon them, should be carefully examined in the different districts, always bearing in mind that both toughness and hardness are the characters required, the first to resist the crushing action of the wheels and weight of carriages, the latter, the blows from the shoes of horses. From experience during the progress of the Geological Survey of Great Britain the best road materials are by no means always selected, and unnecessary expenditure is often caused thereby.

Limestone. Information as well relating to the power of supply, as the supply which really exists, is valuable, the aid of the laboratory being requested whenever the qualities of the lime produced may be thought to require it. Much valuable information may be thus accumulated, useful alike to the Agriculturist, the Architect and Engineer. The essential chemical constituent of hydraulic limes and their localities are often important to be known, particularly in the construction of many large national works.

Architecture. It is desirable to continue the collection of building stones of the United Kingdom, which was commenced by the Commissioners charged with the selection of the Stone for the New Houses of Parliament and deposited in the Museum of Economic Geology in London, and to which large additions have since been made. In Ireland such specimens will be very requisite for the Museum of Economic Geology in Dublin, an institution like that in London, which should receive every aid the Survey of the United Kingdom can render.

Following the plan which has hitherto been found effective, it is requisite that the specimens should be cubed 6½ inches sides, so that they may be reduced and properly tooled to cubes of six inches sides at the respective Museums. It is desirable that the following information be obtained with the specimens - Name of Quarry; Name of Place, Name of County, Nearest Post Town, Name and address of Owner of Land, of his Agent, and of the Quarry-man for the time being, the entire depth of workable Stone, Description of beds, Size of blocks which can be procured, Prices of block Stone at the Quarry, per cubic foot, cost and description of carriage to London, Dublin, or any Locality thought proper, Where known or reported to have been employed, with any general remarks thought advisable. Valuable service may be rendered to this branch of enquiry by the inspection of Churches, and edifices of various kinds, particularly if ancient, in which known stones have been employed, ascertaining the effect of time upon them. In such inspections care has to be taken to examine the sides of buildings most exposed to the influence of the weather, contrasting their condition with those which have been least so. Much information respecting the weather qualities of a stone may be collected from the mode in which it may have stood the decomposing effects of atmospheric influences, in cliffs or projecting portions of rock, and it would appear that this mode of ascertaining their qualities may have been known and employed by the Norman Architects, whose selection of stone has often been excellent and a great contrast to that of

the Architects, who have frequently followed them in the same edifices.

The subject of British and Irish Porphyries, and granites, employed for ornamental purposes, is one much neglected in this country, and deserves every attention from those who possess the abundant opportunities which the Survey affords. Many a neglected locality exists where very beautiful marble and other ornamental rocks may be found, and wherever such are found specimens in cubes of 6½ inches sides should be procured, the name and address of the owner of the land being obtained, so that in the event of such owner not having been previously aware of the fact, and the marble or other rock, as the case may be, turning out upon working of fair value, he should be informed of it. As much of the information required above for building stones as may be applicable to marbles, porphyries, and ornamental granites should be obtained.

Engineering. The knowledge to be acquired by the Geological Survey may be made available for engineering in various ways. As to the rocks which may be applicable for great works, an extension of the enquiry noticed for building stones will be sufficient generally. Under this head a variety of granites and coarse rocks, unfit for ordinary architectural purposes, have to be examined, and the mode in which they may be seen to resist the united and destructive effects of breakers and atmospheric influences on coasts, may be usefully studied, with reference to the employment of such rocks in piers, or other works exposed to similar conditions, always bearing in mind the manner in which the sea and atmosphere can act upon them as they occur on such coasts.

The study of coasts is also very desirable as respects the action of breakers according to the kind of coast, and the depth of water, and the movement, of the sand and shingles by them in conformity with the prevalent direction of the breakers.

Abundant opportunities are afforded for studying the effects on vertical or nearly vertical cliffs of hard rock, rising out of deep water, while near at hand and at the same time, on shallow shores, the effects of ordinary breakers are apparent, pointing to the conditions under which vertical or sloping work, as the case may be, would be applicable.

According to exposure and the kind of coasts is seen to be the accumulation of beaches and shingle composing them, with the mode in which such sand or shingle can be arrested for useful purposes. Indeed it is difficult to conceive how, without an efficient knowledge of the travelling of detritus, the way in which this may be allowed and encouraged to continue, so as not to accumulate in a manner to defeat the objects of the Engineer, or to be arrested, as he may require, a large proportion of artificial harbours can be properly constructed.

The study again of the causes which produce many modern accumulations of detritus required to be noticed for Geological purposes, are equally important as applicable to works intended to benefit the navigation of estuaries. These subjects require great attention, and by well conducted observations, such as those engaged on the Survey have frequent opportunities of making, much valuable information on this head may be procured. It should be borne in mind that the bars or banks at the entrance of many tidal rivers are but the results of given local conditions, and great care and skill are required so to study them that mischief instead of good may not follow from interference with them. A competent knowledge of these natural conditions therefore, so especially necessary to the Geologist for many points connected with the accumulation of Sandstones and other detrital rocks, becomes of great value to the Engineer.

All observations respecting Springs, either thrown out by faults or by the intermixture, under proper conditions, of Sandstones and clays, or other beds pervious or impervious to water, are alike important to the Engineer and Geologist. The proper geological examination of a district will show all the probabilities on this head, if they be not termed certainties, so necessary for those who are engaged in railroad construction, the stability of embankments, and expense and practicability of tunnels so much depending on a right knowledge of this subject.

The judgment necessary for sinking Artesian wells is also geological, as far, at least, as the chances of procuring the expected supply of water are concerned. Though to an unexperienced eye, looking only to the general levels of those combinations of beds of rock which afford apparent grounds for concluding that a given boring will be successful, all may appear satisfactory, the Geologist has to study how far faults may traverse the district, forming natural Artesian wells, if the term may be used, cutting off and throwing up the waters before they can reach the artificial perforation, and how far curvature of the beds may defeat the object proposed.

Mode of Survey, Maps and Sections. The system of observation adopted in the Geological Survey of Great Britain, so well known to the local Directors, having been found effective and productive of the required results, it will be merely necessary to remark that no alteration is contemplated in that system, further than the more complete organisation of the service and its extension into Ireland may require.

For the maintenance of the proper discipline it is desirable that the instructions to proceed to the different stations selected for the various persons employed, as general assistants or Geologists, should be given by the Local Directors, and their discretion or responsibility will be required in so adjusting the labors of the parties under their charge, that the progress of the work shall be as rapid as is consistent with accuracy and effectiveness.

It is desirable to continue the same mode of recording observations upon the maps in the field as is now adopted on the Geological Survey of Great Britain, making the same kind of sections, one class being horizontal upon a scale of six inches to the mile, with such detail as may properly elucidate the subject, another vertical, or rather at right angles to the beds upon a scale of 40 feet to the inch, in which greater detail can be given, in coal districts affording all the important information required, and in fossiliferous districts, the names of as many organic remains being inserted as may be thought requisite on the one side of the vertical column, itself engraved in an appropriate manner while on the other, the mineral character of the rocks is shown, so that at one glance, and on a good scale, the mode of superposition, the organic remains, and the mineral character of the fossiliferous rocks may be apparent.

On the six inch scale of the Irish Ordnance Maps, and when such are published for Northern England and Scotland, on these also, more extensive opportunities for recording all important facts than can be entered upon the one inch maps are or will be afforded, and due advantage will have to be taken of them. Until the one inch Ordnance Map of Ireland, a reduction of the six inch, be published, as is understood to have been ordered, it will be desirable to prepare as sufficient a map from those Ordnance Maps which are given to the public, as will enable the proper work to be entered upon the one inch scale, during the Advance of the Survey. As before mentioned the six inch scale will be the best for the Mineral districts, indeed in all cases where it can be rendered available either for Scientific or Economic purposes, thus all

the needful documents will exist, which the force or funds at the command of the Survey can produce, for whatever mode of publication may be thought advisable.

The Geologists and assistant Geologists should keep note books, the memoranda properly dated, which will not only show their powers of observation and reasoning, but their occupations also; from which note book they will compile those reports upon the districts assigned them, to be forwarded to the Local Directors, as may be required by the latter. Those who can draw should be desired to prepare such minor sections and views having geological bearings as they may consider requisite.

In running the great sections they will enter their instrumental work properly in books specially prepared for that purpose, so that the loss of sections from accidental circumstances may be guarded against, and the proper record of work secured. Printed papers will be prepared to insure the specimens collected from being confounded with each other, as to localities, or the relative mode of occurrence of the rocks from which they have been obtained, and the Palaeontologist will carefully prepare the needful documents for his department, to be transmitted through the Local Directors to the proper parties.

Imprest and Accounts. The Local Directors will, eight times in the year, according to the accompanying form, apply to the Director in Chief for Imprests for the necessary disbursements, namely on the 1st January, April, July and October, and the 15th of February, May, August and November. They will keep the accounts of the Survey, each according to his charge, transmitting such accounts Quarterly, namely for the Quarter endings 30th June, 30th September, 31st December and 31st March, to the Director in Chief, conformably with the annexed forms, shewing the various heads of expenditure, accompanied by the necessary vouchers, and subscribed and declared before a Magistrate agreeably to instructions of the Chief Commissioner of Woods.

They will directly pay all those under their charge, whose salaries do not exceed 10/- per day, the General assistants and assistant Geologists taking receipts in the way usually adopted on the Geological Survey of Great Britain, as in the accompanying forms, for their actual travelling expenses, in conformity with orders, and for such labor help, as the Assistant Geologists and Geologists may, upon their responsibility, consider needed, as has been the practice on the Geological Survey of Great Britain.

They will transmit Quarterly to the Director in Chief Returns of persons who have been permanently employed under their orders during the Quarter, with other particulars specified in the accompanying Quarterly Returns.

---

Although in the foregoing brief notices of the subjects to receive the attention of the Local Directors, by them to be borne in mind when communicating with, or directing the operations of, the parties employed under them, some of the more striking points have been alone mentioned, all enquiries tending to promote the right progress of the Survey, either as regards science or its applications, and which the advance of knowledge may render it

advisable to institute, should receive all due and proper attention. It is, therefore, highly desirable that there should exist the most free intercourse on these subjects between the Local Directors and the Director in Chief, to insure a proper attention to them, and that the public may obtain those results which it has a right to expect from this branch of the public service.

(Signed) H.T. De la Beche  
22 May 1845

Instructions for the Local Directors of the Geological Surveys of Great Britain & Ireland.

Although it is necessarily considered that the Geologists appointed to fill the offices of Local Directors of the Geological Surveys in Great Britain and Ireland possess the proper qualifications for their appointments, both as regards an extensive acquaintance with the present state of Geology, as the application of that science to the useful purposes of life, it is still desirable, before the more technical portions of these duties are noticed, briefly to advert to a general mode of observing and recording facts, during the progress of the Geological Survey, by which systematic investigations and uniformity of results may be secured.

1. Scientific Observations. Igneous Rocks.

It is essential to study these in connection with the rocks of sedimentary origin, including among the latter, for convenience, the various limestones, that as close an approximation as possible may be made to their true geological dates in addition to the ordinary methods of investigation, more particularly seeing how far they may generally resemble the volcanic products of the present day and how far other conditions may be necessary to account for the Phenomena observed. Though apparently so simple there are few geological subjects which have been more fruitful in erroneous conclusions from the want of careful investigation than this. The consolidated ashes of sub-aerial eruptions of the earlier epochs sometimes resemble solid trappean rocks, or those which have been ejected in a state of igneous fusion, as to have been frequently mistaken for the latter. During the progress of the Geological Survey of Great Britain instances have