

## PETER ORLANDO HUTCHINSON (1810-1897) AND THE GEOLOGY OF SIDMOUTH

J.D. MATHER<sup>1</sup> AND R.F. SYMES<sup>2</sup>



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The coastal sections in the cliffs to the east and west of Sidmouth have attracted natural philosophers and travellers for hundreds of years. One of these was local resident Peter Orlando Hutchinson (1810-1897). Unmarried and with a modest private income he was able to pursue his own interests, one of which was geology. In 1843 he published a short book on the geology of Sidmouth and south eastern Devon. Although his interpretation relies mainly on more distinguished previous authors, the book is full of careful and accurate observations and illustrated by his own woodcuts. His legacy also includes over 750 individual drawings, many of which were painted for their geological interest, which depict coastal features, faults and quarry sections, long since eroded or destroyed. Fossils which he collected are described in papers published by the Devonshire Association and retained by local museums. His work forms a valuable resource still of use to modern professional geologists.

<sup>1</sup>Department of Geology, Royal Holloway University of London, Egham, Surrey, TW20 0EX, U.K.  
(E-mail: [mather@jjgeology.demon.co.uk](mailto:mather@jjgeology.demon.co.uk)).

<sup>2</sup>Violet House, Salcombe Road, Sidmouth, Devon, EX10 8PU, U.K.  
(E-mail: [c.symes@tiscali.co.uk](mailto:c.symes@tiscali.co.uk)).

### INTRODUCTION

The recent publication of a new geological map of the Sidmouth area (British Geological Survey, 2005), based on mapping carried out between 1987 and 2000, and its accompanying memoir (Edwards and Gallois, 2004), provides an ideal opportunity to review early research in this area, which has attracted and inspired numerous workers for over 200 years. The 2005 map was the result of the third mapping programme carried out by the Geological Survey in the district. The Old Series Ordnance Geological Survey Map Sheet 22, which includes Sidmouth, was drawn up by Henry Thomas De la Beche in 1834, before his formal appointment to colour geologically the Ordnance Survey maps in 1835. The rocks were described in an accompanying memoir, the first ever produced by the Geological Survey (De la Beche, 1839). The area was resurveyed on the six inch to one mile scale between 1873 and 1876, with a memoir following some 30 years later (Woodward and Ussher, 1906).

However, many years before the Geological Survey became active the Sidmouth district had attracted natural philosophers, agriculturalists, travellers and topographers, many of whom made observations of geological interest. In the modern era the coastal sections around Sidmouth form a key part of the Dorset and East Devon Coast World Heritage Site and are a continuing focus for research and a valuable educational resource.

One individual who contributed to our knowledge of the Sidmouth district was local resident, Peter Orlando Hutchinson, whose small book "*The Geology of Sidmouth*" was published in 1843. Hutchinson was a local notable and benefactor who enjoyed a modest income and, with no need to work for a living, was able to follow his own interests, one of which was geology. He was an accomplished watercolourist and many of his paintings are of geological subjects. It is the aim of the present paper to review early studies on the geology in the environs of Sidmouth, leading up to the work of Hutchinson, and to show why his watercolours and observations are still of significance to modern geologists.

### REVIEW OF WORK PRIOR TO 1840

Early surveys of Devon already provide a description of the main geological formations in the south-eastern corner of the county. Tristram Risdon, writing in about 1630, notes that "...in the entrance [to Devon], on the east side of the shire, the mould [the upper soil of cultivated land] standeth most upon white chalk.....a little further it consists of red and blue marle, which is not] rocky, but an earthy substance...." (Risdon, 1811, p.4). William Chapple partially revised Risdon's account in 1785 writing that "...in the entrance on the east part of it [Devon], near the sea, the mould standeth upon white chalk. In other parts of this neighbourhood it consists either of a red or blue marle, but chiefly the former. The blue is not rocky or gravely....but chiefly of an earthy substance, and of the clay kind. But the red marle is here in great abundance, and in general of a rocky greasy substance" (Chapple, 1785, p.15).

In 1794/1796 the physician, William George Maton, travelled extensively in southwest England, visiting Sidmouth. His geological observations were consolidated on a *Mineralogical Map of the Western Counties of England*, which was in effect one of the first regional geological maps (Maton, 1797). According to this map, Sidmouth was located close to the junction between sand and gravel to the east and argillaceous gritstone and loam to the west.

The first agricultural survey (Fraser, 1794) added little to the account given by Chapple (1785), although it does include a *Map of the soil of Devonshire* on which the known "lime strata" are marked, including chalk to the east of Sidmouth. Polwhele (1797), in his *History of Devonshire*, takes his description of the "strata of soil" from Fraser and, commenting on the distribution of the various rock types, remarks that ".....I do not find that any naturalist has turned his attention to this research in Devonshire." (Polwhele, 1797, p.49). A small scale map, showing the *Soil and Subsoil of the County of Devon*, was drawn up by Charles Vancouver in 1808, to illustrate his report on the *Agriculture of Devon* written for the *Board of Agriculture* (Vancouver, 1808). The rocks to the

west of Sidmouth are described as generally sandy in character but including large bodies of strong red gravelly clay mixed with blue and red indurated marl. To the east, Vancouver (1808) described flinty gravel overlying chalk which was itself underlain by a valuable freestone.

In 1815 Robert Bakewell gave a series of public lectures on geology in Exeter and Bath (Torrens, 2004) and probably visited Sidmouth. In any event, on May 16th 1816, he wrote to the Rev. Edmund Butcher, the local Presbyterian minister, at his request, sending him a series of observations on the geology of the country in the vicinity of Sidmouth. Butcher included this letter in a section on geology in later editions of his Sidmouth guide (e.g. Butcher, 1817). The letter points out that “The southern coast, from Portland Head to Exmouth, exhibits a fine section of the different strata as they rise in succession to the south-west....” and is probably the first description of the Dorset and East Devon Coast World Heritage Site, although this is not recognised in the nomination document (Dorset County Council, 2000). He correctly identifies the local stratigraphic succession as Chalk underlain by the “foxmold” [Upper Greensand] which is in turn underlain by the “red marle” containing beds of gypsum [Mercia Mudstone].

William Smith’s famous map, the first version of which was published in August 1815 (Torrens, 2003), shows little detail over Devon and Cornwall and adds nothing to our knowledge of the Sidmouth area. The financially better supported map, compiled by George Bellas Greenough and members of the Geological Society of London in 1819, is the first map which gives a reasonably accurate representation of the local geology. In assembling this map Greenough consulted a wide range of “works” and undertook geological excursions to many parts of the country. Over three successive summers he was accompanied by his friend William Buckland (Greenough, 1820), who was born in east Devon, at Axminster. Buckland was familiar with the local geology (see Buckland, 1822) and it is likely that he provided details of this area for the Geological Society map.

The first detailed descriptions of the geology of the well-exposed coastal sections to the east and west of Sidmouth were published in the *Transactions of the Geological Society* for 1822. In a paper, first read to the Society in March 1819, Henry de la Beche provided a section of the cliffs from Bridport to Sidmouth and described the various formations beginning with the “...superior, and proceed[ing] in succession to the inferior beds, advancing in each case from the east to the west” (De la Beche, 1822, p.40). William Buckland used the valleys, which enter the sea between Lyme Regis and Sidmouth, to support his catastrophist ideas. He did not believe that the valleys could have been eroded by the streams which now flow in them but that they were the result of a sudden and violent geological deluge in the relatively recent past (Buckland, 1822). In his book *Reliquiae Diluvianae* he used the formation of these valleys as one of his “proofs” which established “the universality of a recent inundation of the earth” (Buckland, 1823 p.228). Both of Buckland’s publications contain two geological views along the coast from Sidmouth to Portland and a geological map of an area from Teignmouth to Portland extending northwards as far as Taunton and Ilchester. The coastal views were drawn by Hubert Cornish who also drew the well known *Long Picture* of the sea front at Sidmouth published by John Wallis in 1815.

The information contained in earlier reports is consolidated in De la Beche’s map of the area, completed in 1834, and the accompanying memoir (De la Beche, 1839). Thus by 1840 there was a reasonably detailed map of the Sidmouth area available at the 1 inch to the mile scale, plus a number of papers describing the individual geological units and their constituent fossils and minerals.

## PETER ORLANDO HUTCHINSON

Peter Orlando Hutchinson (or P.O.H. as he is often known) was born on November 17th 1810 at Winchester where his

father, Andrew Hutchinson, was a physician at the hospital (Linehan, 1983). Andrew was elected FRS in 1804 but does not appear to have achieved anything specific to deserve the honour. The family had returned to Devon by 1812, living in Tiverton and Teignmouth before settling at Sidmouth in 1825 when Peter was 15. This was his base for the rest of his life, firstly at 4 Coburg Terrace and then at the Old Chancel, which he had erected next door, using stone which he rescued from the parish church, when it was rebuilt in 1858/60, and materials which he acquired from elsewhere. He never married and spent his life as a gentleman of leisure with sufficient funds to enable him to avoid the need for paid employment.

He wrote an unpublished 5 volume *History of Sidmouth*, which is held in the West Country Studies Library in Exeter, a 5 volume diary for the years 1848-1894 and 6 volumes of sketches, which are held by the Devon Record Office, also in Exeter. In addition he was a prolific writer of books, journal and magazine articles, local guides and letters to newspapers. Unfortunately he destroyed much of his early work, including diaries written before 1848, considering them useless and childish (Linehan, 1983). Extracts from the diaries up to 1870, augmented with extracts from other writings, and illustrated by his sketches, have recently been published (Butler, 2000).

P.O.H. was a sickly child and was educated at home and at local schools, rather than being sent away to board. He had an infection in his left hip when he was about 7 years old, probably tuberculous (Linehan, 1983), and had a limp all his life. When he reached adulthood he began a series of walking tours in the hope of curing his affliction, spending months walking around Wales and Scotland. In 1837/8 he was in North America, visiting localities associated with his ancestors who had lived there before the Revolution. After his father’s death, in 1846, he seems to have settled down to life in Sidmouth where he had a busy social life and sometimes spent days on foot exploring the neighbourhood, often with his friend Nicholas Heineken, a retired Unitarian minister. During these trips he made a comprehensive collection of fossils, minerals and flint implements, many of which are now in local museums.

He became a well-known local eccentric; often shown wearing the uniform of a lieutenant in the Volunteer Artillery and Rifle Corps, formed in 1859 when relations with Emperor Napoleon 3rd became strained and an invasion became a possibility. He had a wide range of interests, from carpentry to playing the flute, to archaeology and had a reputation amongst local people as an expert on more or less anything (Butler, 2000). However, out of all his interests his diary records that the one subject which never lost its fascination for him was geology and even at the age of 82 he gave lectures at the Old Chancel on geology, illustrated with drawings (Linehan, 1983).

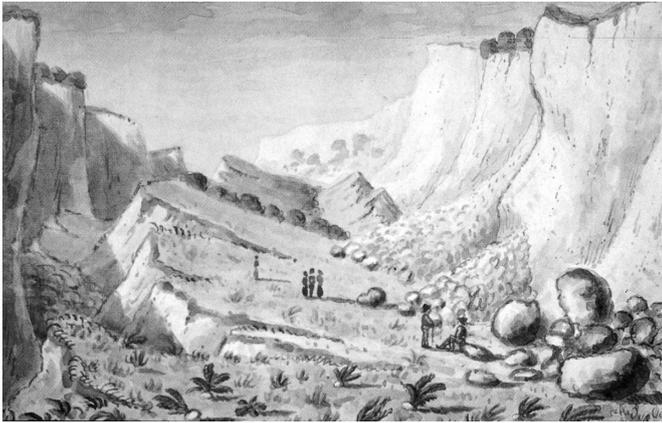
In a diary entry of November 17th 1881, in which he looked back over his life, he recorded that “When I was a boy, my young mind had been opened to the wonders of geology by a niece of my mother’s, a very clever person indeed, who died a few years after. I had supposed that the round world was merely a mass of earth and rocks pressed together like a snowball, but when she explained to me the regular succession of strata and the great facts involved in their deposition, a new field of research was opened up to me which has never lost its interest. I studied the great section of the Red Marl of the Triassic on the Sidmouth cliffs when bathing” (Butler, 2000 p.vii).

## THE DOWLANDS LANDSLIP

Beginning on Christmas Eve in 1839 a major landslip occurred at Dowlands Farm between Lyme Regis and Axmouth. About six hectares of land, which became known as Goat Island, was displaced seawards. A chasm, some 64 m deep, separated it from the main cliff, extending about 800 m from east to west, and some 60 m across from the inland cliff to the island at the eastern end and 120 m at the western end. In the chasm were ridges and pinnacles of Chalk and some large blocks, a hectare or more in size, were tilted backwards towards the main cliff. However, the island itself

was so little disturbed that hedges survived and crops which had been sown were harvested the following summer (Arber, 1973).

Eminent geologists such as Buckland and Conybeare were rapidly on the scene and sketches made by Mary Buckland, which were “drawn on the spot”, are dated 30th December 1839 (Conybeare, 1840). The event caused considerable alarm locally and Conybeare, then vicar of Axminster, was quick to publish a letter, in a local paper, emphasising that the cause of the “convulsion” was local groundwater rather than some deep seated geological event (letter dated 31st December 1839, published in *Woolmer’s Exeter and Plymouth Gazette* 4th January 1840 and quoted in Hallet, 1840).



**Figure 1.** View of the landslide near Axmouth, Devon, looking towards the west. Painted on January 14th 1840.

Hutchinson was also on the scene within a few weeks, painting a number of watercolours dated January 14th 1840 one of which is reproduced as Figure 1. A short article appeared in the Penny Magazine of February 15th (Hutchinson, 1840a) which includes an etching derived from this watercolour. He followed Conybeare in arguing against an earthquake origin for the landslide, citing the springs which issued from the soft sands of the lower beds of the Upper Greensand (the fox mould) immediately above Liassic clays. He considered that “In the course of ages these springs carry with them, slowly but inevitably, great quantities of the friable and loose earth, undermining the superincumbent strata, and preparing them for a subsidence as soon as an extraordinary wet season, such as we have just experienced, shall both hurry away more of the remaining support from beneath, and saturate with a greater weight of moisture the several soils above” (Hutchinson, 1840a p.57). His explanation differs from that of Conybeare who felt that the sand had been reduced to the condition of a quicksand into which the chasm had foundered (Conybeare, 1840).

Later in that year he wrote an illustrated guide to the landslide (Hutchinson, 1840b) which was clearly popular with visiting sightseers as it went to a third edition. He first described the event and the resulting topography. He then went on to examine its causes considering the theories of the “aquistis”, who believed that water was responsible, and the “ignists” who believed that fire could alone have been the agent and that the earth had fallen or subsided and not slipped. His personal view was still that the cause of the landslide was entirely land springs, which filtered through the soil, hastened by an inordinately wet season. The third section of his book gave directions for visitors who wanted to visit.

His guide was in competition with one by George Roberts, published in Lyme Regis (Roberts, 1840), which went to at least five editions. The landslide seems to have become a profitable event for local landowners as an admission fee of six pence was demanded at Dowlands Farm. If visitors exploring the landslide strayed on to land within the Bindon Estate another six pence was demanded before they were allowed to pass (Roberts, 1840).

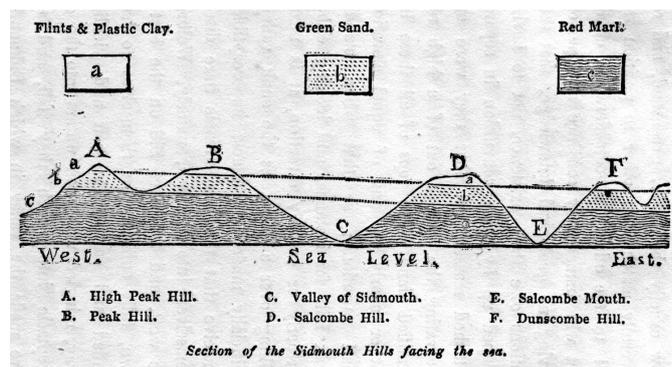
## THE GEOLOGY OF SIDMOUTH

In 1843, perhaps inspired by what he had seen at Dowlands Farm, Hutchinson produced a small book of 69 pages, entitled *The Geology of Sidmouth and of South-Eastern Devon*, published by John Harvey of Sidmouth (Hutchinson, 1843). He was clearly not entirely happy with the book in later life, describing it, in his will, as a “juvenile performance” (Linehan, 1983). The book has no accompanying map but is illustrated by five aquatint plates by H. Haseler, inserted to give an idea of the general features of the cliffs, and fifteen woodcuts engraved by Hutchinson himself. The woodcuts are rather crude and the author apologises for them in his preface (Hutchinson, 1843). The text is not subdivided in any way and represents a rather unstructured account of the geology, partly derived from existing sources. However, he had clearly explored the area in far greater detail than any previous worker and their conclusions are critically discussed in the light of his own observations.

The book follows the scheme adopted by most geological memoirs beginning with a description of the local topography and the situation of Sidmouth. Hutchinson then goes on to describe the oldest and most abundant rocks exposed in the Sidmouth cliffs the “New Red Sandstone Group” (or the Poikilitic Series, following the terminology of Werner). He recognised that the Lias “which according to regular geological succession, we ought to have had” (Hutchinson, 1843, p.15) was missing and gives an explanation for this. He then discusses the Greensand, supposing its colour to be derived from chlorite. He felt that the capping of clay and flint on the cliffs immediately to the east of Sidmouth might “...be considered as the debris of the supracretaceous rocks, which once existed in a more perfect state than now” (Hutchinson, 1843, p.19) and drew a section looking towards the cliffs from the sea (Figure 2). This section is very crude compared with those which he produced subsequently (Figure 3).

Some 20% of the book is devoted to the formation of the valley of the Sid and other river valleys along the coast. He did not support Buckland’s catastrophist view on the origin of these valleys and after considerable discussion agreed with Lyell that they had been shaped out progressively by “aqueous erosion”. Although he was a regular churchgoer, sometimes attending three services on a Sunday (Linehan, 1983), he does not appear to have had any problems reconciling the long timescale needed for such processes to take place with biblical teachings.

He noted that faulting of the strata, although infrequent (Figure 4), was related to the “forces which threw up the granites of Dartmoor” (Hutchinson, 1843, p.38), failing to recognise the true age relationships between the two events. He discussed the occurrence of useful minerals in the succession, gypsum from the red marls and freestone from the Chalk at Beer. He was intrigued by the origin of the flints which he found widely distributed, even where the Chalk was absent, and by processes which had formed the natural arches at Ladram Bay. Later these arches were to form a frequent subject for his watercolours. He identified what he thought to

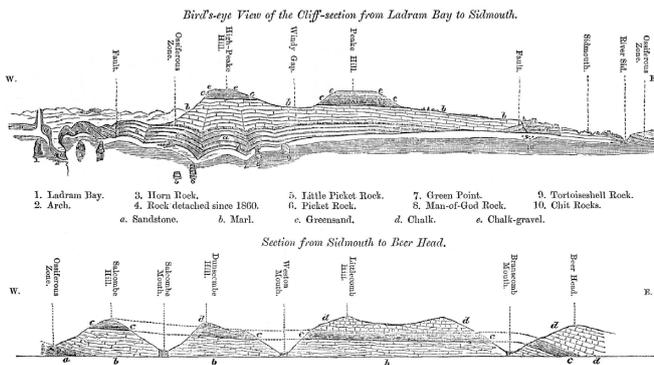


**Figure 2.** Section of the Sidmouth Hills facing the sea (from Hutchinson, 1843).

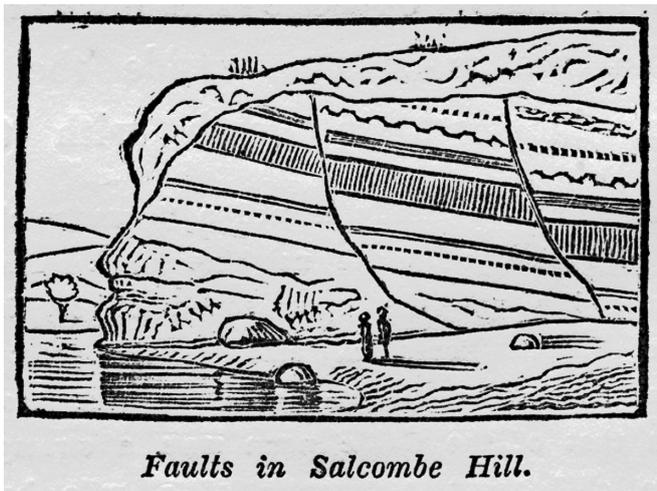
**THE SIDMOUTH CLIFFS**

As Butler (2000) has pointed out many of Hutchinson's landscape views were chosen more for their geological or curiosity value than their scenic qualities. Faults, quarry sections, springs and blocks of stone interested him more than the pastoral scenes produced by other artists. He was critical of the artistic licence used by others and his subjects are always faithfully depicted. For example a watercolour of a wrecked barque on the beach beneath High Peak has the stratigraphic succession in the background cliffs faithfully represented.

During his lifetime he periodically returned to paint the same scene, providing a record of the formation and erosion of stacks at Ladram Bay and the gradual disintegration of the Elephant Rock, near Dawlish. However, from a geological point of view his most valuable pictures are those that show features in the cliffs at Sidmouth which have now been lost by erosion or covered by coastal engineering works. Figures 5 and 6 show the sandstone cliffs at the western end of the Sidmouth Esplanade, painted on October 28th, 1848. A walkway, completed in the late 1950s, now runs around the base of the cliff and the pattern of faults and fractures has been partly hidden by stabilisation works. The complex fault to the west of the lime kiln (flying the Union flag in Figure 6) separates sandstones of the Otter Sandstone Formation from mudstones of the Sidmouth Mudstone Formation and is now completely obliterated by stone and concrete.



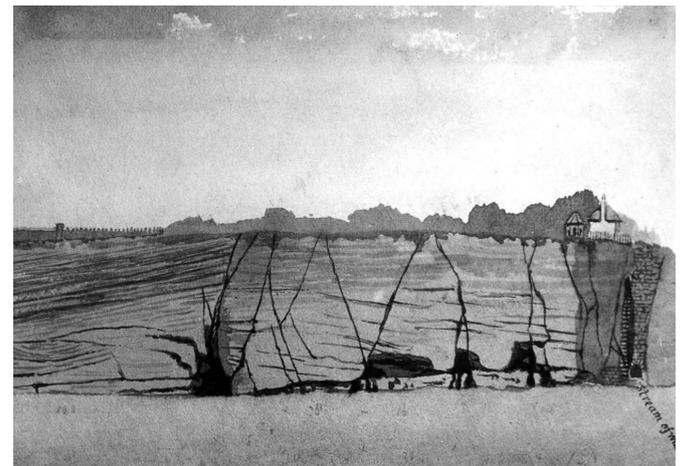
**Figure 3.** Sections to the east and west of Sidmouth, drawn by Hutchinson and published in Johnson-Lavis (1876).



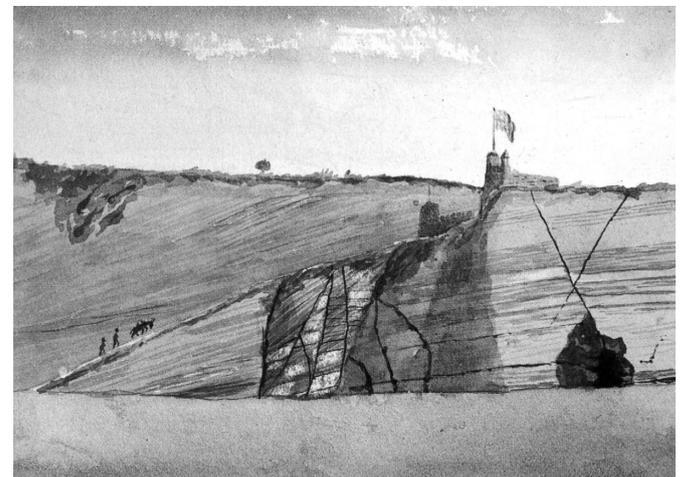
**Figure 4.** Faults in Salcombe Hill (from Hutchinson, 1843).

be veins of volcanic matter injected into sandstones, within the New Red formation, noting that they had been dislocated by a fault subsequent to injection. His diagnosis of these veins as volcanic was based on their resemblance to amygdaloidal rocks in Exeter. However, a site visit suggests that the "veins" are in fact composed of rubble derived from broken up carbonate concretions formed around plant roots during the deposition of the sandstones. These concretions were subsequently eroded and redeposited as discrete beds and lenses within the sandstones.

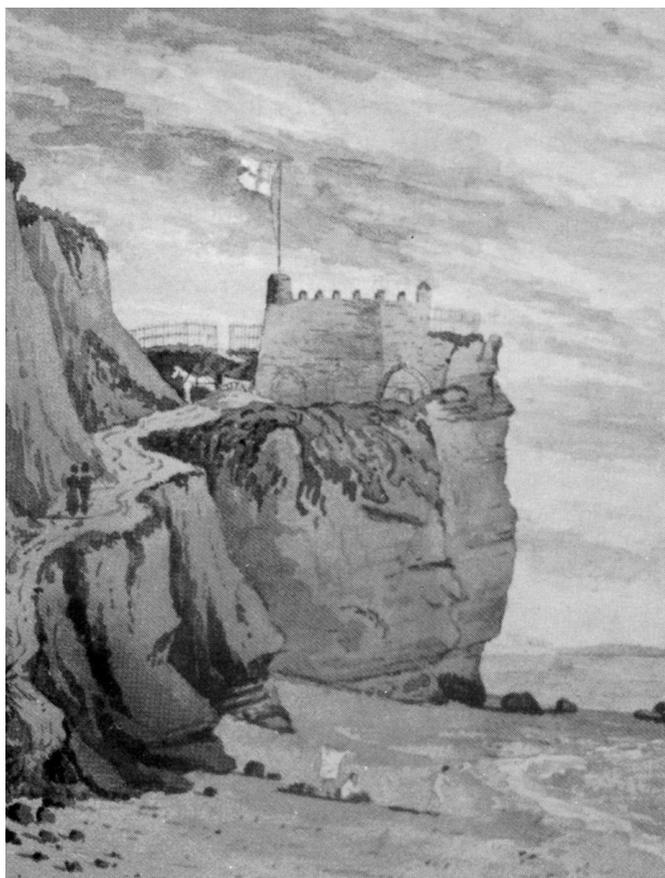
It seems unlikely that P.O.H. had any formal instruction in geology. His knowledge was gained from papers and books which he consulted, perhaps on his periodic visits to London or later in the apartments of the Devon and Exeter Institution, which he joined in 1857 (Linehan, 1983). In the preface to the *Geology of Sidmouth* he lists Buckland, Conybeare, Lyell, Mantell, Murchison, De la Beche and Fitton as his principal authorities and many of the direct quotes in the text are taken from De la Beche (1839). Although his book provides no new insights into geological processes, or proposes any new theories, it is of value because it is packed with his own detailed observations. For example, he described cylindrical fossil-like remains about the size of a finger, some with a longitudinal hole through their centre. These are now interpreted as calcareous concretions precipitated around plant roots and are still common along the coast. He commented on the shape of gypsum nodules, and described the horizons of white sandstone, the sand from which was collected by the poorer inhabitants for whitening kitchen floors and steps. The book shows that he was a perceptive observer but it is in his watercolours that this ability is shown to its fullest advantage.



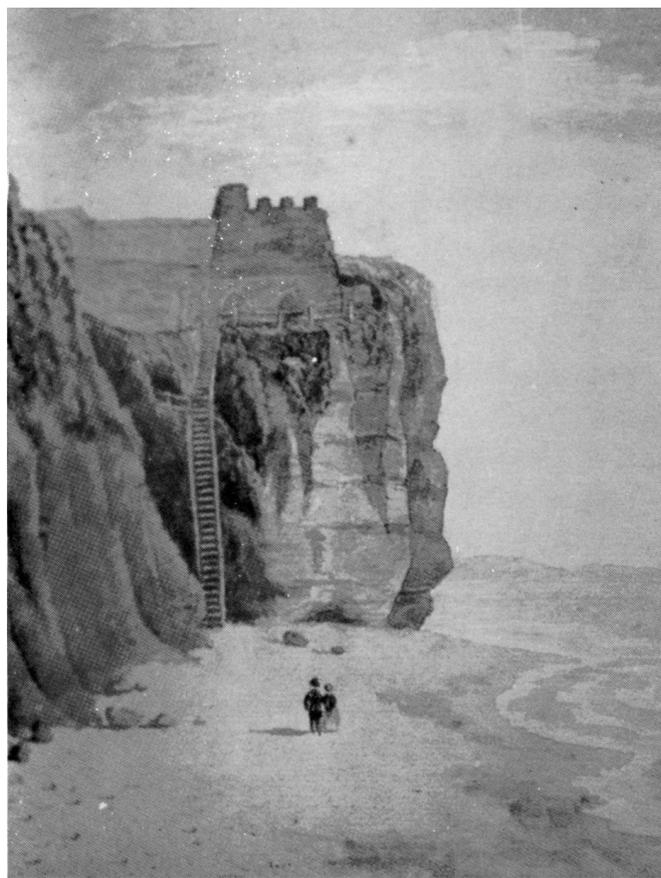
**Figure 5.** View of the cliff at the western end of the Sidmouth Esplanade. Painted October 28th 1848.



**Figure 6.** View of the cliff to the west of Figure 5. The Union Flag is flying from the old lime kilns. Painted October 28th 1848.



**Figure 7A.** The lime kilns and track to the beach. Painted June 3rd 1851.



**Figure 7B.** The lime kilns and Jacob's Ladder. Painted June 3rd 1871.

The first two views in Figure 7, painted by Hutchinson exactly 20 years apart in 1851 (Figure 7a) and 1871 (Figure 7b), show the lime kiln sitting on top of the sandstone cliff. In 1850 steps were cut down the side of the cliff by the lime kiln to the beach. This developed into a cart track which is depicted on the 1851 view. The path and much of the kiln fell down in about 1870. The public had got so used to having access to the beach that an extremely long ladder was erected, like Jacob's ladder to heaven, in place of the path (Lane, 1990). The access way to the beach, since 1963 a chineway, has since been known as Jacob's Ladder. A modern photograph of the same view is also shown as Figure 7c. Protection works beneath the sandstone cliff mean that limited erosion has occurred since 1870. However, the mudstone cliffs without protection have continued to erode, retreating some 80 m over the intervening 135 years.

Hutchinson himself was aware that his detailed observations, made over many years, could be used to calculate rates of coastal erosion. In 1882, at its meeting in Southampton, the *British Association for the Advancement of Science* set up a Committee to inquire into the *Rate of Erosion of the Sea-Coasts of England and Wales and the influence of the artificial abstraction of shingle and other material in that action*. They drew up and circulated a list of 19 questions relating to coastal erosion and P.O.H. completed a questionnaire for Sidmouth (Hutchinson, 1886). He estimated an erosion rate of "...an inch [2.5 cm] a year for the last fifty years, which I remember; there are soft places in the cliffs that have gone twice or three times as much, and harder parts not half as much." (Hutchinson, 1886, p.421). He concluded the questionnaire by stating his conviction that, as well as the land being worn away by the sea, it was also gradually going down. He noted that shingle on the beach seemed to accumulate and diminish cyclically and that in January 1873 it had been almost totally removed. This had exposed stumps of alder trees dotted about the beach, together with five or six mammoth



**Figure 7C.** The lime kilns and Jacob's Ladder. Photographed on December 10th 2005.

teeth, which were from 4 to 5 ft [1.2 to 1.5 m] under water at high tide. On the basis that the trees were above water at the time of the Norman Conquest he suggested that the land had subsided 6 feet 8 inches (2 m) over the past 800 years. Such "submerged forest" beds are widely distributed around the coastline of south-west England. There is no evidence in this area for isostatic rebound during the Holocene (Campbell, 1998) and the drowned forest beds are now thought to be the result of rising sea levels, rather than subsidence of sea shores, and to be very much older than Hutchinson supposed.

**OTHER GEOLOGICAL WORK**

In addition to the publications already discussed, Hutchinson contributed items on geological subjects to journals and local publications. In 1857 he was asked to write a new guide to Sidmouth by a local bookseller. This was published later in the year and Hutchinson records in an entry in his diary for November 20th of that year “This evening I sat down and wrote a review of my own book, the *New Guide to Sidmouth for Woolmer’s Exeter and Plymouth Gazette*. Perry the publisher thought it was the best plan to adopt and I thought he was right” (Butler, 2000, p.119). Hutchinson seems to have been totally unconcerned by this blatant piece of self-promotion, although perhaps the editor of the *Gazette* was, as it does not seem to have been published! The guide eventually went to nine editions, the final one appearing in 1926, almost 30 years after his death.

Early editions (such as the first edition of 1857) consist of a brief historical sketch of the town followed by an extended section on walks and excursions to places as far away as Honiton and Axminster. Many excursion descriptions contain information on the geological formations encountered and are accompanied by woodcuts from his *Geology of Sidmouth* (Hutchinson, 1857). In later editions (such as the eighth edition of 1894) much more attention is given to the town itself and to its immediate neighbourhood and excursions to more distant places are omitted (Hutchinson, 1894). A short section on geology is included, mostly derived from Hutchinson’s own publications.

Hutchinson joined the Devonshire Association in 1868 and during the first decade of his membership was a frequent contributor of papers. Many of these concerned geological topics, in particular finds of fossil teeth. Hutchinson (1869) reports on the find of a fossil elephant’s tooth. This was found on the sea bottom, just to the west of Sidmouth, at low water spring tide, by a sailor. P.O.H. paid him five shillings for it and presented it to Exeter Museum. A second find of a fossil tooth was reported to the meeting of the Association held in 1871 (Hutchinson, 1871). This one was found by a visitor from Manchester, who unfortunately took it home with her although Hutchinson was able to draw it before she did so (Figure 8).

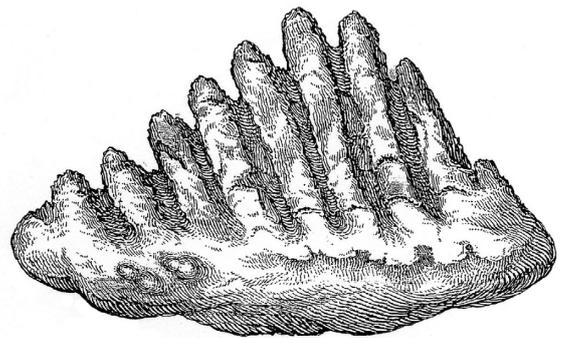
Yet more teeth were reported by Hutchinson (1872). The first, much worn by attrition, was found close to that reported in 1869. He surmised that all of the teeth might have come from the skeleton of some large mammal buried close to this locality and was in fact offered a large curved piece of bone, supposedly the tusk of an elephant, also from the seabed. He rejected the “tusk” as “not of ivory”. Yet another tooth was found by a fisherman in the bed of the River Sid about half a mile from the sea. This specimen weighed 12 lbs 5 oz (5.58 kg). The exposure of the submerged forest at Sidmouth during the stormy winter of 1872/3 was reported by Hutchinson (1873). He excavated around one of the trees to demonstrate whether or not it was in situ and found it rooted in blue clay. Four more teeth were found associated with the trees, all of which he collected, presumably at some cost.

In the spring of 1878 a large rock fall brought many tonnes of red marl on to the foreshore about 1.6 km west of Sidmouth. Hutchinson described one of the slabs as follows (Hutchinson, 1879, p.383): “This slab, with a top like a table, was composed of beds of clay, loose sandstone and loam. The surface was slightly ripple-marked, as we sometimes see the clay at the bottom of a pond, or the sand at low water on the shore; and faint traces could be discerned, as if annelids or other creatures had been crawling across the mud. But what attracted my attention more particularly was the presence of several stalks or stems of a gigantic reed, equisetum, or calamite, lying across each other, as if they had been growing on the margin of a lake, and had fallen in and sunk to the bottom.” This description demonstrates his excellent powers of observation and his ability to articulate to his readers precisely what he has seen in an easily accessible style.

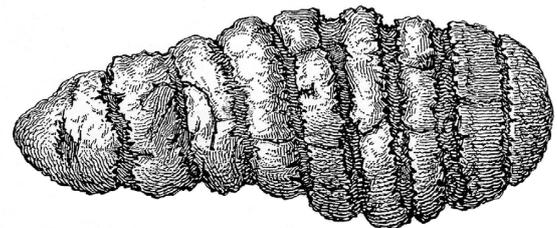
Hutchinson also contributed a view of the cliff section from Ladram Bay to Beer Head to illustrate a paper by Johnston-Lavis (1876) on the occurrence of an ossiferous zone containing bones of a *Labyrinthodon* in the cliff section to the west of Sidmouth (Figure 3). Lavis was a visitor to the town who, whilst walking on the beach following a major cliff fall, extracted the bones from fallen material which was gradually being washed away by the sea. This must have irritated Hutchinson who records that he had passed and examined the heap of debris “once or twice, but detected nothing” (Hutchinson, 1893, p 175).

In 1875 the Devonshire Association appointed a “Committee for the purpose of noting the discovery of such facts in any department of scientific inquiry, and connected with Devonshire, as it may be desirable to place on permanent record, but may not be of sufficient importance in themselves to form the subjects of separate papers”. Known as the “Committee on Scientific Memoranda” Hutchinson’s name first appears on the list of members in 1888. Although he does not make many contributions to the work of this Committee, in 1893 he reported on a significant cliff fall which occurred on June 8th 1893 beneath High Peak Hill about 2.4 km west of Sidmouth (Hutchinson, 1893). At the time the Sidmouth branch of the Church of England Temperance Society was holding an open air meeting, over the natural arch at Ladram Bay, about 800 m away. There was a terrific rumbling, resembling an express train at full speed, followed by a loud crash with further smaller falls for about ten minutes. The 100 people in attendance must have wondered what message The Almighty was trying to send to them.

Hutchinson’s unpublished five volume *History of the Town, Parish and Manor of Sidmouth*, which was begun in about 1852 and completed in 1881 (Linehan, 1983) also begins with a description of the local geology. This builds on his previous writings and provides a detailed description of the red marls and sandstones. He subdivides these strata into a number of distinct units which he can trace through the cliff section. He also incorporates the finds made along the coast, such as the bones found by Johnson-Lavis and the celestine-lined hollow nodules from a horizon close to the junction of marl and sandstone.



SIDE VIEW.



CROWN OF TOOTH.

**Figure 8.** Fossil tooth, found on Sidmouth beach by a visitor from Manchester and drawn by P. O. H. (from Hutchinson, 1871).

## DISCUSSION AND CONCLUSIONS

Although Hutchinson had a modest private income, which was sufficient to ensure that he did not have to work, he was not affluent and was careful with money. Home life was spartan and he lived on an almost vegetarian diet. He never married, considering this a risky and expensive undertaking. However, he considered that living as a bachelor was also hazardous as it left a man at the mercy of servants who were usually extravagant and dishonest (Linehan, 1983). Geology was one of the many interests which he pursued throughout his life and which, in part, substituted for both the profession and the family which he never had.

The word amateur has been used over the last 200 years in a variety of ways. Thus an amateur can be regarded as someone who is an enthusiast, or is unpaid, or lacks formal qualifications or who is second rate (Torrens, 2006). Hutchinson qualifies as an amateur under three of these definitions. He was certainly an enthusiast who visited, measured, mapped and drew cliffs, quarries, fossils and stones within a twenty mile radius of Sidmouth. He was unpaid, although it is possible that he made some money from his guide to the Dowlands landslip and his *Geology of Sidmouth*. He also lacked formal qualifications and most of his geological knowledge was derived from books and papers, of which he seems to have been an avid reader. Through the Devonshire Association he would also have benefited from contact with other Devonshire geologists such as William Pengelly of Torquay and Arthur Champenowne of Dartington Hall. However, his legacy of publications and drawings shows that he was certainly not second rate.

His *Geology of Sidmouth* and other publications contain a wealth of detailed observations which are still relevant and useful to a modern professional geologist. His watercolours record scenes and geological localities which have long since eroded away, been removed by quarrying or covered by infilling. The fossils which he collected enhance the collections of both the Royal Albert Memorial Museum in Exeter and the Sidmouth Museum. The influence of P.O.H is still felt in Sidmouth. His gravestone stands in the cemetery, his image points tourists towards the museum, his house, The Old Chancel, guards the bowling green and the red cliffs, which he “studied.....when bathing” and which inspired his interest in geology still dominate the coastline.

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