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

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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.

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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 Ordinance 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 1875 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 gravelly…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 Butler, the local Presbyterian minister, at his request, sending him a series of observations on the geology of the country in the vicinity of Sidmouth. Butler included this letter in a section on geology in later editions of his Sidmouth guide (e.g. Butler, 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 “foxinold” (Upper Greensand) which is in turn underlain by the “red marl” 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 proceeding in” in succession to the inferior beds 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 of 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 Exeter and Teignmouth. Andrew’s son Peter Orlando, born at his parents’ old house in Exeter, in 1840, grew up at Axminster where his mother’s family originally came from. Peter Orlando Hutchinson and the geology of Sidmouth

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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

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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).

Hutchinson was also on the scene within a few weeks, painting a number of watercolours dated January 1-4th 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 landslip, citing the springs which issued from the soft sands of the lower beds of the Upper Greensand (the fox mould) immediately above Liasic 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 immediately above Liassic clays. He considered that “In 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
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.

### 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.
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 1953 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 doted about the beach, together with five or six mammoth 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.
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 5). 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.

Peter Orlando Hutchinson and the geology of Sidmouth

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 Champernowne 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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