ENGLISH NATURE

Earth Heritage Site Interpretation in England - a review of principle techniques with case studies

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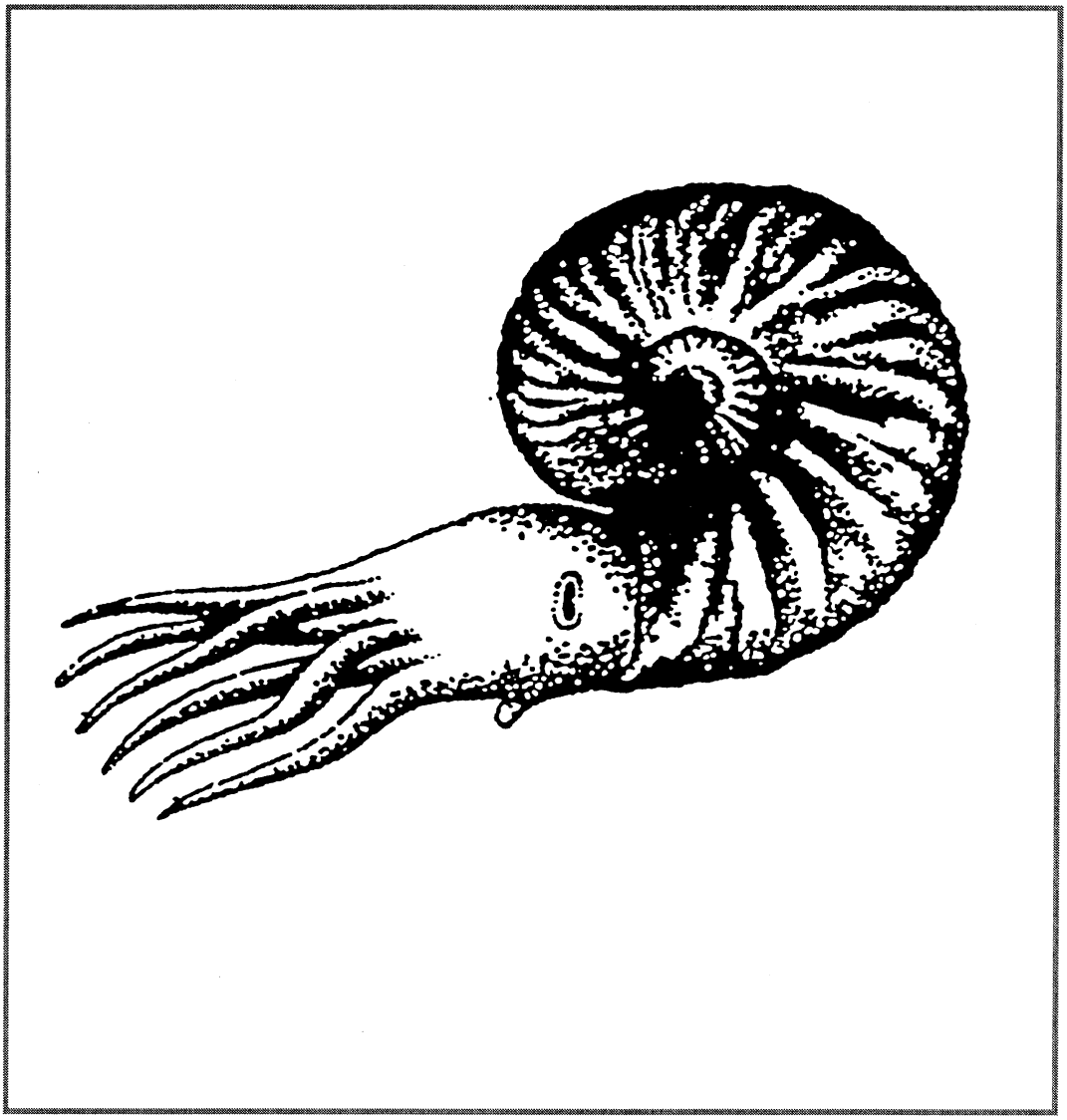

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English Nature Research Report

Number 176

Earth Heritage Site Interpretation in England: a review of principle techniques with case studies

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1. Introduction

Since its creation in 1991, as one of the successor bodies to the Nature Conservancy Council, English Nature has looked hard at how it can achieve and raise public support for nature conservation. It has sought new opportunities to present nature conservation to its various audiences, particularly so with regard to geology and geomorphology which are still considered by some to be marginal subjects to 'mainstream' biological conservation issues.

The natural processes of the earth, together with the rocks they create, are an integral part of all natural systems, although people do not generally appreciate their own dependence on the Earth's geology. The underlying bedrock defines the very nature of the land above it, having a major effect on its physical appearance and the ecology of the animals and plants that live in it - including people. In the home, a huge range of products are used with little appreciation that they are the end result of a manufacturing process that starts with raw materials drawn from the earth.

English Nature believes that increased public awareness of earth science conservation will have major benefits for promoting greater public involvement, improve our ability to safeguard sites and, most importantly, gain wider acceptance of, and long term support for, the subject. Indeed, a key initiative within English Nature has identified 'Natural Areas' throughout England, on the basis of their combined geological, biological and land-use character (Duff 1994) - this holistic approach to conservation being seen as a powerful tool in stimulating greater public support and involvement with nature conservation. Conventionally, there are three broad ways in which this awareness and support can be raised, as briefly summarised by Page and Wray (1995):

1.1 Broadcasting through the media

The media is a key tool for promoting conservation, and very occasionally Earth scientists and conservationists have opportunities to use the medium. One recent and novel example being a radio nature trail, recorded by BBC Radio Cambridgeshire with English Nature specialists. The trail took listeners around Peterborough city centre looking at the materials used in some of the major buildings and discussing their associated geology. This guided tour or excursion approach to promoting geological heritage has been successfully used for a number of series of programs on both BBC television and radio and on Channel 4 television, including, respectively *'On the Rocks'* (1978), *'Rock Solid'* (1994) and *'Landshapes'* (1988).

Geological issues are also occasionally dealt with in newspapers and magazines and reporters may invite comment on conservation issues direct from English Nature specialists. Such issues, however, usually relate to potentially damaging activities and only occasionally can be considered as promotional or educational.

1.2 General education

An appreciation of the importance of earth science is required by a range of interest groups if conservation is to be effective. Partnership is an important aspect of this work and English Nature has produced a range of leaflets targeted at such groups as local authority planners, the minerals industry and

fossil collectors (listed within Appendix 4). These leaflets outline the importance of geology and ways in which the various groups and English Nature can work together to benefit conservation. Additional aids have also been produced including a video describing the best practice for safely restoring the faces of quarries or road cuttings, by using smooth-blasting rather than destabilising production blasting.

Other projects have been more site specific, for instance at Grinshill Quarry, Shropshire, a leaflet has been produced in collaboration with the operators, English China Clays, which gives advice to employees and visitors on recognising the rare early reptile remains for which the site is important (Larwood 1992). The aim of such a leaflet is to ensure that no new discoveries are lost by encouraging people to identify and safely recover any new specimens that may be revealed during quarrying operations.

Educational aspects of site use are of course of great importance, at all levels from primary school to adult education. The National Curriculum in particular requiring that children become familiar with geological materials. Many community related projects are stimulated by these needs and a recent EN sponsored symposium on Urban geology entitled *'Geology on your doorstep'* was held at the University of Greenwich in January 1994. Attended by conservationists, school and university teachers, museum staff and local authority officers, the symposium examined the way in which geology can be made accessible and useful in an urban environment and how local communities could be involved with it and learn about it (Bennett, Doyle, Larwood and Prosser, 1996). Occasional direct participation in such work has been possible as well, an example being the participation of EN staff in geology-orientated childrens' activities and fossil-identifying sessions during Peterborough Museum's phenomenally successful *Jurassic Week* in 1994 when the equivalent of around one fifth of the city's population passed through the museum's doors.

1.3 On-site interpretation

To all intents and purposes, most geological features are static, unlike biological: land and rock forms are clearly visible, even if the processes and events that formed them are not. As a result site interpretation provides an excellent method of telling the geological story and it is in this field that English Nature has devoted its main effort in interpreting geology to date. Such projects are typically not one-off events like many of those described above but sustained facilities with the potential to significantly influence a much wider non specialist audience, and over a period of several years. Such facilities can justify higher initial input as regards staff time and finances as the actual costs, per "client", and their long term effectiveness is much greater than more ephemeral methods. In most cases also, ongoing maintenance costs are less as regular staff involvement is avoided. As a result site interpretation including: (i) interpretive signs and (ii) self guided trails can be very cost-effective. In addition where site use is very high, the establishment of (iii) visitor centres can also be justified.

These three facets of geological site interpretation are therefore reviewed further here based on recent experiences, their quasi-permanent rather than ephemeral nature being best suited to the long-term aims of site management and conservation. Section 3, on self-guided trails, is a self contained

assessment but for sections 2 and 4, on sign-boards and heritage centres respectively, independant evaluations of specific projects are included in Appendices 1 and 3.

Appendix 5 reviews the basic principles of on-site interpretation, modified from Page (1992b) and is intended to aid the assessment of the potential of any given site for interpretation of its geological or geomorphological features. Once such potential has been reviewed it should be clear whether the interpretative scheme is viable and what type of scheme is appropriate.

2. Site Information Boards, a review of English Nature's recent experience (K.N. Page)

Although most people have had no direct experience of geology and geomorphology, they regularly visit sites of Earth Heritage importance - coastlines with cliffs and beaches, and upland National Parks being typical examples. These visitors are many and varied as are their aims, from passive recreation to active outdoor sports. Most will be totally unaware of the significance of the features they are enjoying, and indeed the conservation measures needed to protect such features. For many of these people the existence of guide books and trail leaflets may be irrelevant as they will not necessarily have visited an information centre or a local museum, where such guides are normally distributed (Page and Wray 1995). The only opportunity, therefore, to communicate with such visitors and raise their awareness and commitment, is to install suitably designed and targeted Site Interpretation Boards. Naturally of course, more informed visitors can also gain from such interpretation, which can reinforce their experience and indeed help to manage their (active) use of the site.

Realising the potential value of site-interpretation boards at Earth Heritage sites (especially statutory designated Sites of Special Scientific Interest), English Nature initiated a project in 1991 to investigate how best the medium could be applied to sites of geological and geomorphological importance, and also to 'trial' a number of appropriately designed signs at selected sites (Page 1995). The initial phase of the project aimed to produce a report, establish the principles and 'best practice' which should be applied when selecting a site and/or implementing an interpretation scheme. The final report (available as a separate English Nature Research Report, (Page, 1992); and summarised by Page, 1994) synthesised a number of well established advisory guides and other works (Aldridge, 1975; Countryside Commission, 1977; Allwood, 1981; Wray 1991, etc.) and incorporated geological and earth-heritage conservation principles and perspectives. Structured as a working guide to planning and implementing schemes, the report was designed to help would-be interpreters through the thought processes and production stages necessary for the successful implementation of an effectively designed and targeted scheme.

Having established the basic principles, the next stage would be to select appropriate sites for a pilot project. Considering the cost of producing and installing a board (around £3,000-£5,000 in 1993-1995) it was imperative that some criteria were drawn up for selection. Incorporating recommendations from the original report and observations made by the Centre for Environmental Interpretation (CEI) of the Metropolitan University of Manchester in a specially commissioned site assessment (1992, see Badman, 1994), these criteria were:

1. The site must be visible from, or within tourist areas, established viewing points or otherwise visited by significant numbers of visitors (effectively 10,000+ per annum). The interpretative scheme must be designed to meet the needs of a significant proportion of these visitors.

2. The site must have an appropriate level of management to ensure the interpretative facility is maintained in good order.

3. Full cooperation of site owners and managers is essential - in practice a 'partnership' approach is most reliable and productive.

4. The risk of vandalism or erosion must be at such a level that the longevity of the sign is not significantly prejudiced. If necessary, adhesive backed plastic signs may be most appropriate - these are "sacrificial" and can be readily replaced once damaged (providing the sign mount remains intact).

5. Interpretative signs are most effective if they link into an existing or planned natural and/or man-made heritage interpretation or management program (eg with links to museums, interpretative centres, self guided trails, site-management agreements, etc).

6. There must be a strong and interesting story to be told, and preferably dramatic or 'un-missable' features *visible from the site of the board*, for the interpretation to work, ie the information provides links with features which people can see or experience (Page and Wray 1995).

In the first instance, it was decided to implement two schemes, admirably fulfilling all of these criteria, namely at the east coast resorts of Scarborough and Hunstanton. After initial visualisation had been provided by English Nature, CEI were contracted to design, produce and install the boards.

Both completed signs use the view seen by the observer as a background or base for the interpretation. In the case of Hunstanton, the simple question is asked "Why are Hunstanton's cliffs striped?" (a question often posed to the town's Tourist Information Centre!). The text then briefly and simply answers the question using actual thin sectioned rock samples embedded in the sign. The addition of a reconstructed ammonite emphasises that the fossils on the beach were once real living animals (Figure 1).

At Scarborough the interpretation also directs viewers to layers in the cliff, but under the title "Tropical Scarborough", describes the ancient environments these represent - from dinosaur-infested jungle swamps to tropical seas and coral reefs. The addition of an illustration of a fossil ammonite named after the town (*Cardioceras scarburgense*), provides cultural links with the history of the area and the early geological pioneer in the region, John Phillips (the nephew of William Smith - the acknowledged "Father of English Geology") (Figure 2).

Both signs include a contact address for further information and the panels are of Duralite mounted on a steel lectern shaped stand (thereby being easily readable and relatively unobtrusive). The initial response to these signs has been very favourable and an independent assessment of their effectiveness has been undertaken (Hose, 1995, 1996) and a new and detailed evaluation of the Hunstanton sign by T A Hose is provided in Appendix 1 to this report.

HUNSTANTON'S CLIFFS

WHY ARE THEY STRIPED?

Look carefully at the cliffs in front of you. You can see that they are made up of three differently coloured layers of rock, known as the Carstone, the Red Chalk and the White Chalk. They were formed when prehistoric seas covered North Norfolk between 70 and 125 million years ago.

Sediments formed in layers on the sea bed and slowly hardened into rock. Millions of years later, huge earth movements slowly lifted the hardened layers of rock to form land. Most recently the sea has eroded away the cliffs to expose a layer-cake of rocks in the cliffs.

Can you see that there is more White Chalk in the furthest cliffs than those beside you? That's because earth movements have tilted the rocks from their original horizontal position.

(White Chalk sample)

White Chalk is a limestone and comes from the bed of a warm, clear tropical sea when Hunstanton had a climate like the Bahamas today. It is mostly made of the remains of billions of tiny plants and animals - actually prehistoric plankton!

(Red Chalk sample)

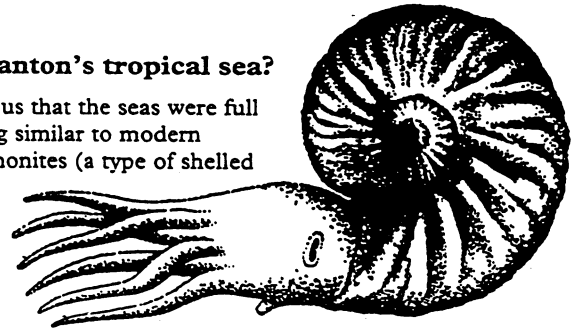
Sea level rose and the **Red Chalk** limestone was deposited on the top of the Carstone. Geologists think it was formed on a relatively high part of the sea bed. The Red Chalk is a rare rock and Hunstanton is one of the few places it is found. Look for its distinctive knobbly pebbles on the beach - some contain fossil shells, belemnites (extinct cuttlefish-like squids) and Y - shaped shrimps burrows.

(Carstone sample)

Carstone is a sandstone and contains may small pebbles which rolled around on the ancient seafloor. It is brown because it contains a lot of iron oxide - literally rust!

What lived in Hunstanton's tropical sea?

Fossils from the chalk tell us that the seas were full of life. Belemnites (looking similar to modern cuttlefish) and coiled ammonites (a type of shelled squid) swam in the warm, clear water. The sea-bed was home to sea urchins and various clams and other shellfish.



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Geological SSSIs

The geology of this area is of national importance and has been designated a Site of Special Scientific Interest (or SSSI). The site is managed by The Borough Council of King's Lynn and West Norfolk in partnership with English Nature.

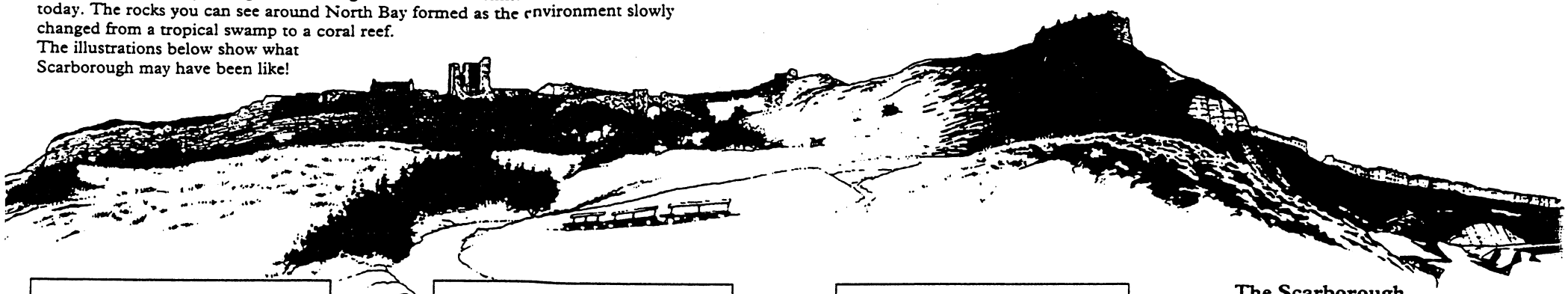
Please help us to care for it.

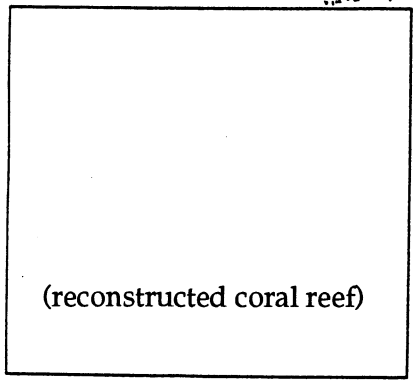
To find out more about Hunstanton's unique geology ask for the free leaflet at the Tourist Information Centre, The Green, Hunstanton.

Figure 1: Pre-production design for the '*Hunstanton Cliffs*' site-interpretation board.

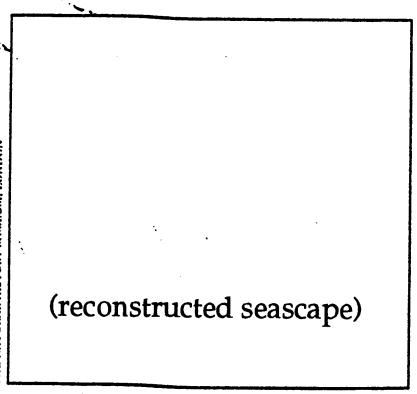
TROPICAL SCARBOROUGH

Over 150 million years ago Scarborough had the same climate as the Bahamas have today. The rocks you can see around North Bay formed as the environment slowly changed from a tropical swamp to a coral reef.
The illustrations below show what Scarborough may have been like!

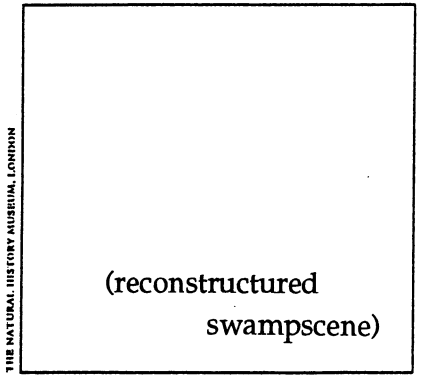




Coral reefs *(155 million years ago)*
The sea became shallower again. The limestone rocks at the top of Castle Hill formed in a warm, clear, tropical sea - just like the Bahamas of today. Coral reefs grew nearby, and sea urchins, snails and clams lived in crevices between the corals.



Shifting Sands *(160 million years ago)*
The swampy delta was slowly drowned as the sea level rose. The orangey sandstone in the cliff facing you has been formed from sands washed onto the sea bed by ancient currents and tides.

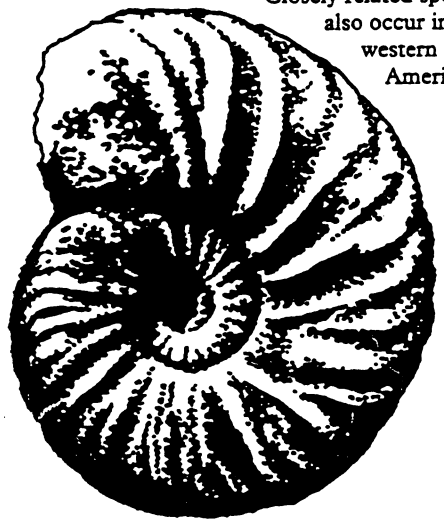


Steamy Swamps *(165 million years ago)*
The grey rocks you can see by the road come from a swampy, tropical river delta. It would have been very humid with ferns and trees growing where land was exposed. There were dinosaurs too who left footprints in the muddy ground.

YOUNGEST ROCKS ← → OLDEST ROCKS

The Scarborough ammonite

The cliffs at Scarborough helped to shape the course of science. Many fossils were first found here, and one - a shell called *Cardioceras scarburgense* is even named after the town. This small fossil 'ammonite' (a type of extinct squid) was first discovered in Scarborough in 1828 and can be found as far away as Poland. Closely related species also occur in western North America.



ENGLISH NATURE

Geological SSSIs

The geology of this area is of national importance and has been designated a Site of Special Scientific Interest (or SSSI). The site is managed by Scarborough Borough Council in partnership with English Nature.

Please help us to care for it.

You can find out more about Scarborough's unique geology at The Wood End Museum of Natural History, The Crescent, Scarborough.

Figure 2: Pre-production design for *'Tropical Scarborough'* site-interpretation board.

Two additional schemes have also been produced, but unlike Scarborough and Hunstanton there has been much closer working between English Nature, the site managers and the graphic artists and sign makers. Both schemes, at Burrington Combe in the Mendips (Avon) and at Wolferton on the Sandringham Royal Estate (Norfolk) were designed after extensive discussion with the site owners and managers (Woodspring District Council, Burrington Combe Conservators and the Mendip Hills Warden Service for Burrington Combe; and English Nature's site manager, in the case of Wolferton). Once the design and text had been agreed between all parties, an appropriate artist was contracted in each case to produce first the colour visuals and then the final artwork. Working closely with the artist enabled scientifically accurate images to be produced - all illustrations being approved at a preliminary sketch stage (thereby ensuring a high level of technical accuracy in the final product).

Both signs take a slightly different approach to interpreting the site from that used on the earlier schemes. At Burrington there is no one phase in the geological history of the gorge that is a more significant story than any other - but it is the very varied nature of the geological history which is fascinating, from Carboniferous tropical seas to Triassic deserts to Ice Age tundra and early human habitation. On a conventional interpretation sign, it would be impossible and indeed counter-productive to cover all these stories separately, so a novel approach was required and under the title *"The Burrington Combe Story"*, a cartoon narrative was constructed (Figure 4). With numbered boxes, pictures and short blocks of text, 350 million years of earth history is related. And to complete the artwork an artist with considerable experience of such work was contracted.

The value of a cartoon narrative is that it can tell a complex story in an attractive form and is a medium known to and understood by almost everyone. The finished sign has been screen printed and encapsulated in GRP (Glass Reinforced Plastic), placed in a protective frame and will be mounted in a plinth of local stone by the site managers - as before, to 'blend' the installation into the natural surroundings.

The fourth sign to be produced has a slightly different origin to the first three, the initiative and finances coming entirely from an English Nature site manager - the site being a Neolithic cliff line, now several kilometres from the sea, at Wolferton, in Norfolk. The design and text were developed in conjunction with the site manager and rather than use a modern view from the "cliff" top site, the main illustration would be that of 6,000 years ago - with a sea-view below the sign and not a forest as is present now (Figure 3).

To breath life and a human perspective into the view - a New Stone Age hunter and an appropriate species of sea-bird were inserted. Below, after an introduction to the site, three separate reconstructions demonstrated the geological history of the area from a Cretaceous sea bed to the present day. To complete the artwork an artist experienced in geological illustrations for scientific publication and museum displays was contracted.

The completed sign was produced in GRP in a similar fashion to that for Burrington Combe but has been mounted on a more conventional upright stand, which is completely appropriate for its on-site location.

Having now completed these four signs and therefore the pilot project, a number of lessons have been learnt. The most important being:

1. Select and assess your site very carefully, if something isn't quite right (high risk of vandalism, low visitor numbers, etc), don't be afraid to "pull the plug", before too much time and money has been committed. Ensure your aims are clear, and you understand some of the 'philosophy' behind environmental interpretation (e.g. refer to Appendix 5). Investigate the sign's context within a framework of other interpretative facilities or site-management programs in the area. Having decided that a scheme is possible, ensure that the owner or managers are completely behind the proposals (which may include being willing to apply for a relevant planning permission).

2. Get quotes from designers and sign makers to ensure that you can raise enough money to complete the whole production process (NB: to get the desired effect, the cheapest will not necessarily be the best!).

3. Take the time to work closely with the designer and/or artist and in the initial stages with the site owner or manager (someone who probably knows more about the site than anyone else). Whatever is produced must not prejudice the management of the site and ideally it should positively contribute. It must be attractive, accessible, accurate and entertaining. Look at pre-existing attempts to interpret sites - what can you learn from successes and mistakes made in the past?

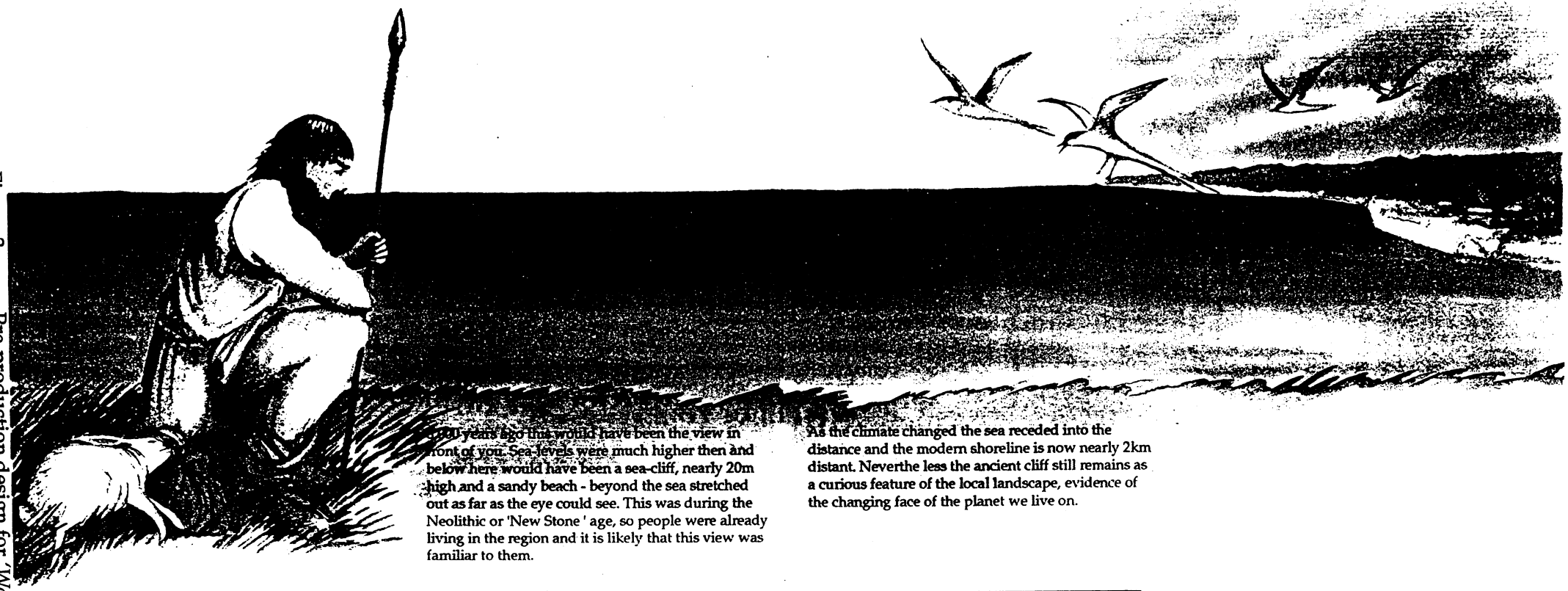
4. Ensure that the illustrations and text are scientifically as accurate as possible, but at the same time avoid using technical terms and diagrams - run it past a specialist who will spot technical mistakes (before someone else does on the completed board!). It is useful if you can 'check' the artists' working drawings before they are completed. Nevertheless it is crucial that words are kept to a minimum; the main effect for most visitors comes from the illustrations, text should simply introduce or explain in a simple, readable, even story-like, but completely understandable manner. Pass the design around to as many people as possible, and see what they think (but only incorporate sensible modifications - everyone has their own personal view or prejudices of what 'works'!).

5. Before deciding on how to produce the board, for instance colours, style of illustration, etc., talk to the sign manufacturer (if the designer/artist has not already done so) - they will know what techniques are available and can advise on the best materials - the method of printing, for example, may constrain how the artist produces the final art work. In addition, some materials are stronger or longer lasting than others, for instance screen printed signs could potentially survive 10-15 years whereas photographically produced signs may last less than 5 years.

6. Commission a colour visual before the final artwork, in order to check colour balances and that the general layout is OK, get it agreed with the site owner or manager (and the text also).

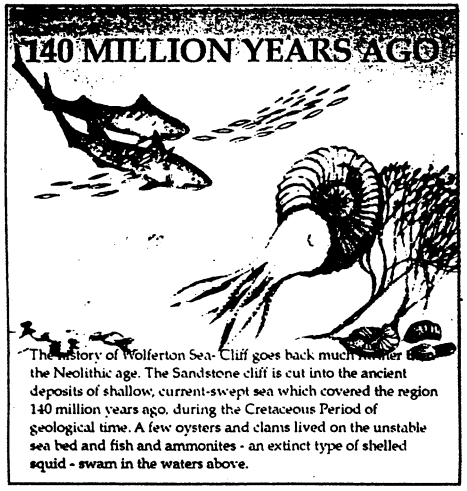
7. Once the final artwork is under production, ensure that all text is checked thoroughly (letter by letter!) before being incorporated - spelling mistakes and incorrect punctuation can make a sign look 'unprofessional'.

WOLFERTON SEA-CLIFF

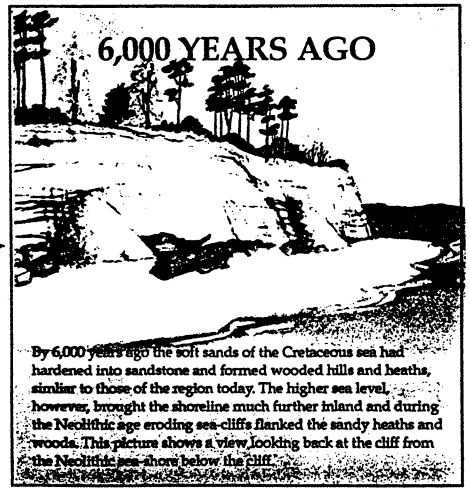


6,000 years ago this would have been the view in front of you. Sea-levels were much higher then and below here would have been a sea-cliff, nearly 20m high and a sandy beach - beyond the sea stretched out as far as the eye could see. This was during the Neolithic or 'New Stone ' age, so people were already living in the region and it is likely that this view was familiar to them.

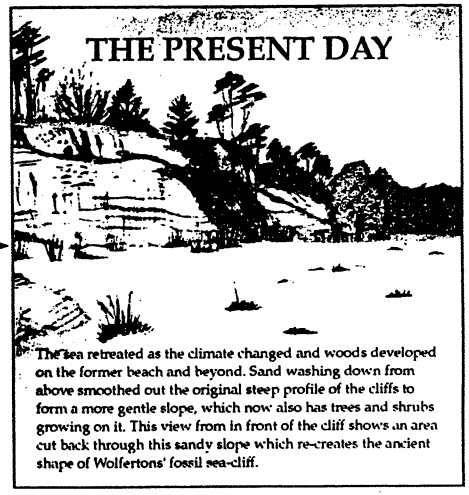
As the climate changed the sea receded into the distance and the modern shoreline is now nearly 2km distant. Neverthe less the ancient cliff still remains as a curious feature of the local landscape, evidence of the changing face of the planet we live on.



The history of Wolferton Sea- Cliff goes back much further than the Neolithic age. The Sandstone cliff is cut into the ancient deposits of shallow, current-swept sea which covered the region 140 million years ago, during the Cretaceous Period of geological time. A few oysters and clams lived on the unstable sea bed and fish and ammonites - an extinct type of shelled squid - swam in the waters above.



By 6,000 years ago the soft sands of the Cretaceous sea had hardened into sandstone and formed wooded hills and heaths, similar to those of the region today. The higher sea level, however, brought the shoreline much further inland and during the Neolithic age eroding sea-cliffs flanked the sandy heaths and woods. This picture shows a view looking back at the cliff from the Neolithic sea-shore below the cliff.



The sea retreated as the climate changed and woods developed on the former beach and beyond. Sand washing down from above smoothed out the original steep profile of the cliffs to form a more gentle slope, which now also has trees and shrubs growing on it. This view from in front of the cliff shows an area cut back through this sandy slope which re-creates the ancient shape of Wolfertons' fossil sea-cliff.

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Geological SSSIs

The geology of this area is of national importan and has been designated a Site of Special Scientific Interest (or SSSI).

Figure 3: Pre-production design for *'Wolferton Sea-Cliff'* site interpretation board.

Figure 4: Final artwork for *'The Burrington Combe Story'* site interpretation board.

8. Ensure that all contracts are tightly managed - you will have a desired installation date, but this will only be achievable if the designer/artist delivers to the sign manufacturer on time and they in turn deliver a sign to be installed by whoever is responsible for that stage.

9. Try and organise a publicity event when the sign is installed, this will draw more visitors to the site and should contribute to whatever aims the sign was designed to fulfil. Indeed, some form of celebration of having successfully crossed the production minefield can be of great value in bringing together everyone responsible for the site and the sign itself - thereby leading to future successful collaborations!

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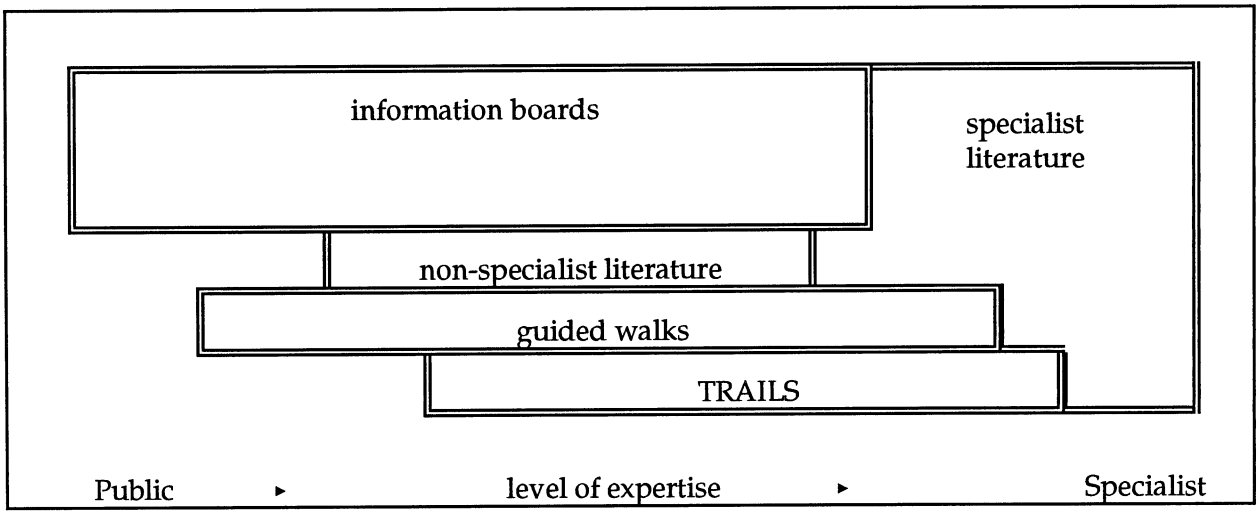
3. Self-guided trails as a technique for site interpretation; a review of Nature Conservancy Council's site guide projects (P. Keene)

3.1 A review of NCC involvement in trails

Written trails can be defined as booklets involving the identification and explanation of a collection of linked sites which can be examined by the reader without the physical presence of an interpreter and at a pace determined by the user.

Such booklets have been employed by the Nature Conservancy Council (NCC), prior to the establishment of English Nature, as one of a range of interpretation strategies for Earth Heritage sites or sites of geological or geomorphological educational interest. Generally the niche which they have occupied has been a narrow one, nesting between, (a) site information boards and guided walks thought appropriate for the general public and non-specialist visitor and (b) academic literature and papers relating to specialist interpretation (Figure 5).

Figure 5. Interpretation strategies and their potential audience



Four examples of trails or guides which fall into this trail/guide category, were published by the NCC in the 1980s, and are listed below:

MENDIPS; NEW SITES FOR OLD; a student's guide to east Mendips geology (Duff, McKirdy and Harley 1985).

BURRATOR, Dartmoor landform trail (Keene and Harley 1987).

MALVERN HILLS; a student's guide to the geology (Bullard and Morris 1989).

WENLOCK EDGE; a geology teaching trail (Harley 1988).

The introductions to these booklets sometimes suggest that they aspire to a wider audience than is suggested above. For example in the Burrator guide (Keene and Harley 1987, p.3) it is stated that, "There is a deliberate attempt to make explanation accessible to the interested non-specialist". However, in practice those who purchase and use these booklets have predominantly been teachers and those with some level of earth science competence. In cases where the target audience was specifically identified at the planning stage, before publication, this limited audience range was clearly acknowledged. An example of this is demonstrated in Appendix 2 (*'Writing Trails; a students guide'*, p. 4) where a Venn diagram drawn up in the planning stage of 'Burrator, Dartmoor landform trail' suggests overlapping target audiences but predicts little public uptake of the trail.

Subsequent English Nature involvement in trail production has largely been limited to grant aiding projects initiated and completed by external groups, such guides are not considered here but includes Toghill (1992), Macadam (1994) and Toghill and Beales (1994) and Dawn (1995).

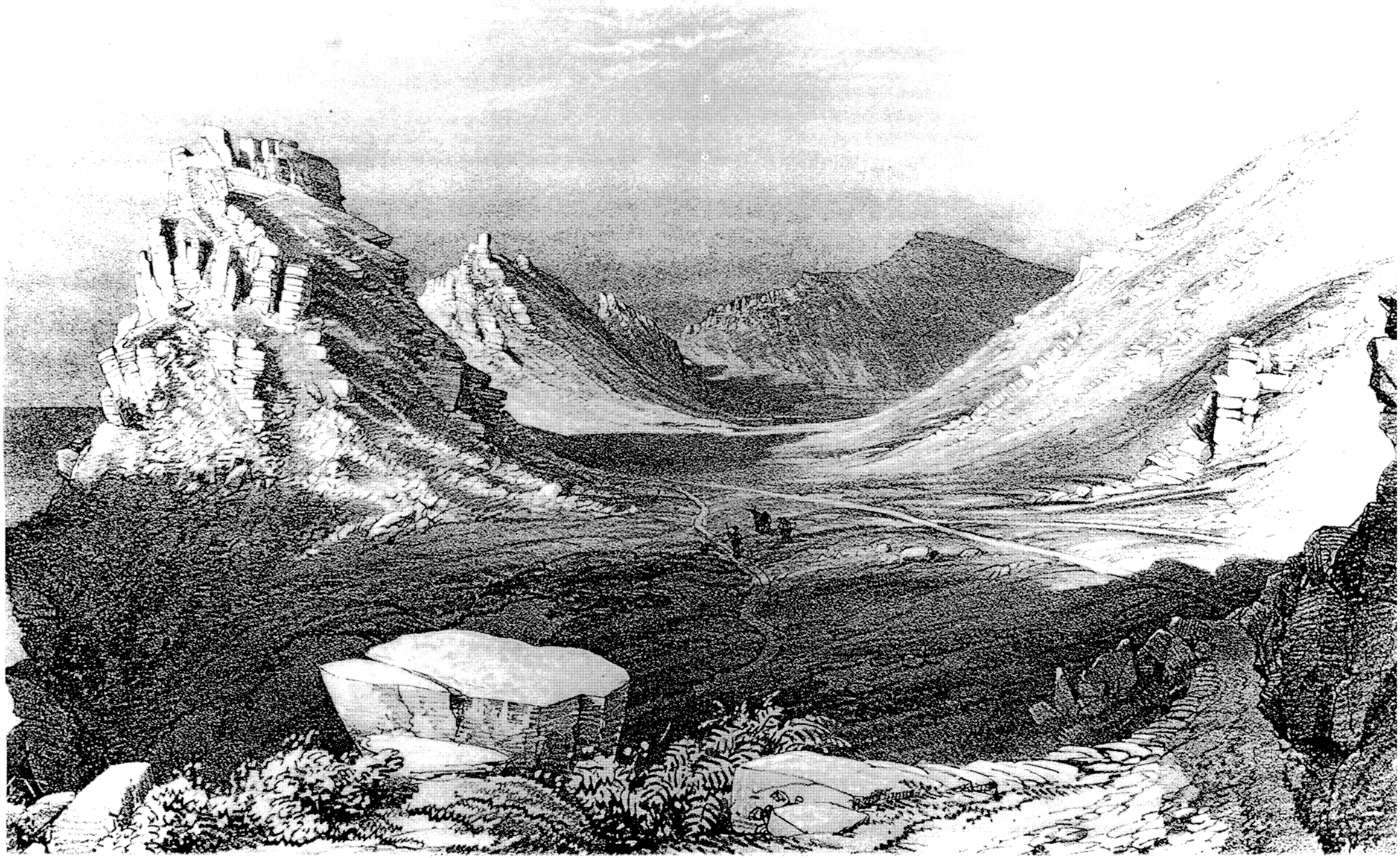
3.2 Success, problems and possible solutions

3.2.1 The Success Story

Independent journal reviews written at the time of publication of the four NCC guides listed above, suggest that they represented a welcome addition to the range of interpretative information then available. In particular, such booklets, specifically addressing the interpretation of geology and physical landscape, were all too thin on the ground compared with the relative abundance of nature trails, ecological field interpretation booklets and historical site guides. Tutors and teachers using these earth science trails with field groups were very appreciative of the 'service' provided.

Often the booklets furnished field information at a level appropriate to the teachers themselves; information which they could then use to construct trails at a level suitable to their own circumstances. One by-product of this was that trails were seldom bought as class sets but were purchased in ones or twos by the teachers concerned.

Figure 6: The Valley of Rocks, Lynton, Devon, from a nineteenth century lithograph by W. Spreat (c.1850).



3.2.2 Problems and Dilemmas

At the time of publication, it would be fair to say that, each trail or guide fulfilled the following criteria:

1. The project was regarded as educationally worthwhile.

2. Such work complied with the broad perceived remit of the organisation.

3. The production of guides reflected well on the enterprise and activities of the relevant sub-section of the NCC.

4. Publication projected a positive image of the NCC as a whole.

5. Compilation could be largely achieved within the capacity of the expertise of in-house staff, (excluding graphics).

The results were publications which certainly reflected to the credit of the NCC and projected a very positive image of the organisation. The cost of production, however, was not directly related to any direct financial return that could be expected upon sale of the guides (although JNCC did have a mandate to recover as much as possible from sales). Site visits and work by NCC staff would have been a significant component of total costs although as such these cannot be disentangled from the overall running costs of the organisation as a whole.

The guides and trails catered for a very worthwhile educational market, but one which could not support the costs of producing such material. It was accepted that the publication of this material was part of the remit of the organisation. Specialist literature of this type, almost by definition, covers a very limited market sector, and each booklet has a very localised focus. Sales of such material is usually low and were compounded by an essentially passive marketing strategy relying primarily on orders by post from individuals and organisations responding to NCC produced and distributed catalogues.

The creation of English Nature was part of a cultural sea-change which involved devolution, a general tightening of financial constraints and an emphasis upon financial accountability within cost-centres. In this environment resources were prioritised towards achieving specific organisational action programmes, and the educational sector was not considered to be a priority target (especially when measured against the high costs and low sales of guides and trails). As a result, such trails were seen as a low return 'investment' and were downgraded within English Nature's interpretation strategy. Direct sales from English Nature of the four guides listed above were discontinued, and the stock transferred to the educational publishing charity, *"Thematic Trails"*, who now handle marketing and sales.

NCC and English Nature's direct experience with trail guide production may therefore be summarised as follows:

1. Trails and guides were relatively expensive to produce, in part due to:

    a. Style. The size and format considered necessary to project the correct corporate image and attract a non-specialist audience.

    b. In-house production requiring a considerable amount of staff time, including numerous staff site visits, was expensive.

2. The market up-take was small because;

    a. The target audience for the style of trail / guide produced was always going to be small and localised.

    b. Mass marketing and advertising is not appropriate to EN's (and NCC's) remit and the more passive approach adopted did not therefore reach a wider public audience.

There is an inherent danger therefore that, because of this previous experience, the use of interpretive trails and guides could be neglected in favour of other forms of interpretation. Such an approach, however, would fail to recognise that different interpretative strategies are complementary rather than being in competition. Some of the advantages and disadvantages of the use of trails are summarised by Keene (1995), see Appendix 2.

3.2.3 Possible Solutions and the work of *Thematic Trails*

Amongst other commitments, *Thematic Trails* provides a research platform for investigating the flexibility of the boundary between (a) public, market-orientated, booklets and (b) guides and trails, such as the four mentioned above, which were principally designed for educational and academic use (see Appendix 2, figure 3). In other words, *Thematic Trails* is investigating the degree to which trails of specialist value can be modified and adapted to penetrate the area of mass public consumption (Keene, 1994). The recent experience of *Thematic Trails* can therefore be of value in reviewing the options available when modifying trails to extend the audience range of such literature.

The following options are not mutually exclusive but do address the central problem of high cost - low circulation, for the style of Earth Science interpretation booklet previously considered the norm.

Option A Continuing the tradition of providing booklets encouraging relatively specialist on-site interpretation of locations of Earth Science interest.

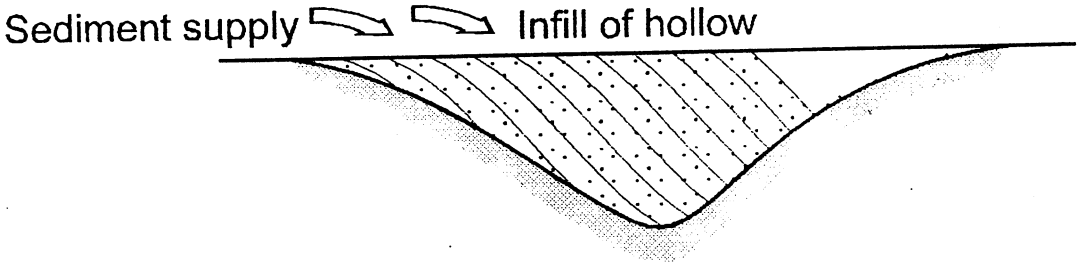
What is meant by STRUCTURE?

Here we are concerned mainly with the presence (or lack of) sedimentary structures such as beds. Characteristics such as cross stratification, trace fossils and ripple marks can indicate the environment of deposition. Faults and folds might reveal something of the subsequent history of the deposit. When studying the structure of sediments at Saunton consider such questions as:

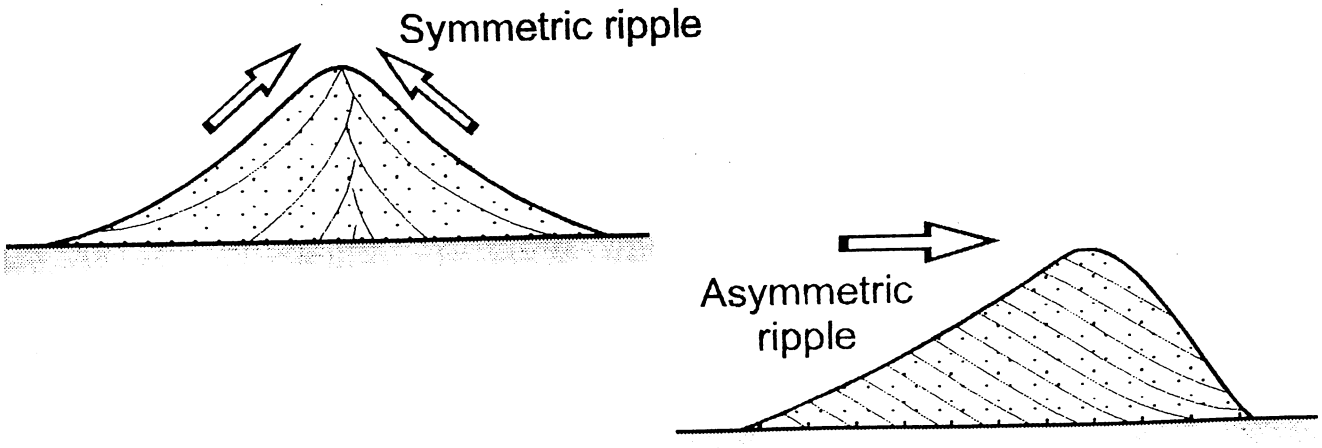
BEDS Can you detect any sheet-like structures (layering, bedding) in the deposit under examination? A bed is a distinct sheet of sediment having common textural characteristics. Beds are separated from one another by surfaces (bedding planes) which mark breaks in sedimentation.

CROSS STRATIFICATION

Are there beds (stratification) dipping at an angle to the main bedding direction? This cross stratification can be caused by the movement of ripples or on a large scale by the movement of dunes where sand avalanches down the lee slope. Cross stratification can also be caused by the infilling of hollows, similar to avalanching foreset beds in a delta. Cross stratification can indicate ancient current directions (palaeocurrents).



RIPPLES Are the ripple marks symmetrical (formed under wave activity) or asymmetric (formed by wind or water moving in one direction)? Ripple marks commonly occur on bedding surfaces. If deposition is occurring, the down-stream or down-wind migration of ripples can form cross stratification.



Also consider post-depositional deformation such as faults, joints, folding and slumping.

Figure 7: An example of a 'topic box' from Keene and Cornford (1995): *'The Cliffs of Saunton'*.

It is recognised that material of this type plays an important part in teaching conservation awareness, provides a valued educational service and reflects well upon the public image of an organisation such as English Nature. These positive attributes can result in a decision to subsidise such material (eg Toghill, 1992). However, it should be acknowledged that this style of booklet has a relatively small target audience, restricted by education and by the inevitably local focus of such trails and guides. It may therefore be considered a good survival strategy, ensuring the continued production of such material, to publish booklets at a cost which more closely reflects eventual financial returns upon sale. Such a strategy could include:

1. Smaller print runs, aiming to clear stock within two to five years (depending on extra-organisational auditing requirements) but leaving the option open for reprinting. Wenlock Edge (Harley 1988) had a print run of 5,000 of which 2,500 are still held in stock by *Thematic Trails*.

2. Reducing the use of high-cost colour printing and more expensive grade of paper to reflect the costs of smaller print runs. Visual impact is important but an educational audience is more interested in content than presentation, particularly if the option is between a low cost production or none at all.

3. The more effective use of grants to encourage local community action and educational expertise to combine to produce a guide. An example of this is the use of the local RIGS structure in North Wales (Wilkins and Cambell, 1995).

4. A more devolved marketing structure for instance, by relying on local expertise for identifying sales sites for any particular local interest publication. Alternatively, the use of an external distribution agency may be appropriate.

Option B A more radical approach to publishing literature which encourages on-site interpretation of sites of Earth Science interest is to focus upon the interpretation of the site rather than upon the subject discipline. Many sites lend themselves to such a multidisciplinary approach often much to the advantage of overall interpretation.

Problems associated with this more holistic approach often stem more from the current limited dialogue between interpreters of differing disciplines (Hopkins, 1994) rather than any resistance on the part of the readership to accept information in this form. Certainly there are obvious overlaps between ecology, geomorphology and geology which are all too rarely exploited.

A more critical problem related to this option may be the degree to which the depth of information and interpretation is sacrificed in order to achieve the breadth of vision to which a more holistic approach might aspire. This is a problem that can only be addressed within the possibilities offered by any particular site. As part of the *Thematic Trails* research programme, there has been involvement in the writing

of a trail which sought to integrate an even broader span of disciplines (Keene & Pearce, 1993). In this case the trail attempts to integrate Earth Science material with the historical and aesthetic interpretation of the site by writers, artists and poets who experienced the drama of the Valley of Rocks, near Lynton, in North Devon (Figure 6). A loss of geomorphological detail is obvious but in this case, it was felt that this was by far compensated for by the injection of a sense of place which opens up the possibility of some understanding of the processes controlling the physical landscape to a new, wider and, by report, appreciative auidence and the very real advantage of achieving comparatively buoyant sales for a trail of this type, (around 1,200 copies per annum!). Such a booklet is promoted as a 'landscape companion' rather than as a 'trail', the latter being a term which for some adults has unpleasant school days associations.

Option C A third approach is to radically redefine what is normally considered to be the content of a trail by emphasising its wider reference or source book potential.

A booklet may focus on discussion and explanation of a specific site but can also provide reference material and background information which transcends its local perspective and single site applicability. The booklet may therefore be seen as having a value independent of its site use. In such circumstances its target audience will include an increased proportion of people who find the reference material of value but do not necessarily intend to visit the site. An as-yet unevaluated example of this approach is the booklet 'The Cliffs of Saunton' (Keene & Cornford, 1995). This trail is enhanced with topic boxes covering such detail as the diagnostic structures and textures which might be used to identify paleo-dunes or raised beach material anywhere (Figure 7). Other boxes introduce sea level fluctuations or a method of measuring the preferred orientation of clasts in a cliff exposure. Thus, although the detail is very 'specialist' (Figure 5), the target audience is enlarged by the provision of material which is relevant to the study of a variety of sites.

Option D Another approach is to enhance the 'souvenir' quality of the trail.

The inclusion of material providing the public with an attractive memory of the walk might be considered by some as simply sugaring the pill. If the result is that the participants learn something more about the environment than they otherwise would, then the 'mission' has been successful.

The best selling *Thematic Trail* is 'Lyn in Flood' (Keene and Elsom, 1990). This is now in its 4th impression, 7000 copies having been printed. The research objective of this trail was, (a) to produce a booklet which would be acceptable to a wide range of the public who visit the National Trust property of Watersmeet on the East Lyn, near Lynmouth, North Devon and, (b) to retain sufficient depth of interpretation and information to make the booklet useful for teachers, who could use the trail to devise their own fieldwork at a level

Figure 8: Examples of pen and ink sketches utilised by Keen and Elsom (1990) in the *'Lyn in Flood'*.

appropriate to their own needs. By site-specific educational trail standards this booklet has been a success, both at the public participation end of the scale and also amongst academics, teaching at a variety of levels.

In publishing trails of this style, the degree to which depth of study has been sacrificed to public involvement, is an area of constant reappraisal. The public 'bait' here was the inclusion of a range of riverside pen and ink sketches which caught the browsers instant attention (Figure 8). The reader was reassured by the exclusion of technical language. As one might predict, discussion of feelings and responses to spate and flood conditions of the river involved the average reader more readily than the more dispassionate sections discussing the causes of flood and need for flood control (Figure 9).

3.3 A summary of basic principles: what makes a good trail?

The examples above illustrate a variety of approaches which might increase the audience participation of self-paced trails which here have been treated as distance-learning packages. That assumes a particular objective for the trail and a specific idea as to the audience which it aims to capture.

At a more fundamental level, the basic principles of trail content and approach need to be considered before a trail is written, even if the decision is not to have any controlling principles.

'Writing Trails, a student guide' (Keene, 1995) is reproduced in its entirety in Appendix 2 to this report. Although this booklet is aimed at students who might be undertaking trail writing as part of an educational exercise, the major considerations in trail writing that are addressed are relevant to all who might be considering trails as an interpretative tool. The student guide also includes a bibliography which suggests some further reading. This topic will not be developed separately here, except to summarise below, some central questions which should be asked before committing yourself to a structure for any proposed written trail:

1. **Is your trail really necessary?** Is a trail booklet really the best way of communicating what you have to say? Consider other options seriously before you commit yourself.

2. **Target audience?** Who do you expect to use the trail? Do you anticipate that the expectations of this target audience will determine the approach adopted in preparing the trail? How?

3. **Focus?** What is the **theme** of the trail? What specifically do you wish your target audience to gain from using this trail? Is the focus on a narrow topic or does it take a wider more generalised approach. Why?

4. **Participation?** How should your selected target audience be approached? For example what degree of interaction do you expect to achieve with your chosen target audience? Should your approach be more passive? Why?

5. **Adjustment to audience?** How do the needs, expectations and aptitude of your chosen target audience differ from other possible target audiences? What adjustments to approach might be necessary when considering different target audiences? Do you wish to target a combination of different audiences? What are the problems associated with this? How do you anticipate overcoming these problems?

6. **Authorship?** Are you the best person to be preparing this trail? Those with most knowledge are not necessarily the best communicators, particularly if the target audience includes a public element. Academics often tend to over-qualify what they say; conscious, perhaps, of critical peers looking over their shoulder?

3.4 Guidelines for setting up trails

Finally there are administrative and organisational considerations in setting up trails which, although they may seem mundane, are of central importance for the successful creation of a trail and its maintenance. A list of the advantages and disadvantages of trails are noted by Keene (1995 - see Appendix 2). A few initial critical guidelines are outlined below.

1. **Sponsorship.** It has to be accepted that few trails can be written with the confident expectation that they will be a financially viable proposition. *Thematic Trails* has only achieved this by the sponsorship of initial print runs and the advantage of a reservoir of voluntary, unpaid, specialist support. Serious consideration therefore needs to be given to the financial implications of publishing anything other than the simplest of photocopied trails.

2. **Safety.** Whatever disclaimers are included in the text, the publication of a trail involves some degree of liability; in particular, that of negligence if attention is not drawn to potential hazards which might be met whilst following the advised route. These hazards include rough terrain, cliff edges with dangerous grass overhangs, unstable slopes, dangers associated with rogue waves, swimming in areas of tidal currents, cliff-foot walking in areas of high tidal ranges, mountain weather hazards and narrow roads lacking footpaths. All trails should detail potential hazards in the introduction and if necessary point out that the trail is not suitable for unaccompanied children.

3. **Rights of way.** If the trail does not follow established rights of way then landowners and other interested parties must be approached and clear-cut agreement reached. What may appear to be common access, such as walking on parts of Dartmoor, may well be only at the discretion of the landowner whose attitude to parties walking a published trail might be very different to sanctioning the odd lone free-ranging walker.

4. **Maintenance.** Before establishing a formal trail, problems of possible long term maintenance need to be considered. On reserves these might include footpath erosion due to increased traffic or concentration of activity, clearance of vegetation or degraded faces at geological exposures, and general maintenance of safe access.

THREE MOODS OF THE LYN

MOOD	Tumbling brook	Spate	Flood
WORD ASSOCIATION	Picturesque Romantic Harmonious Tumbling Splashing Oneness with Nature Clear and pure Sparkling Murmuring	Exciting Dramatic Awesome Shooting flow Turbulent Powerful Murky Rushing Surging	Horrific Hostile Overwhelming Lashing Thundering Intimidating Catastrophic Threatening Tempestuous
STATE OF WATER	Splashing with clear pools	Strong waves with muddy or peaty/frothy water	Violent chaotic dark waves with tossing thrashing debris
LOAD BEING TRANS-PORTED	Solution dominant Chemicals and minerals from fields, soils, rock and air, dissolved in the water	Suspended load dominant Silt and mud in suspension. Sand and small stones bounce along bed, smoothing and polishing bedrock. Larger stones spin in eddies	Bedload movement dominant Boulders and stones rolled or bouncing along. Much floating debris such as large branches and even whole trees. Sand and finer material in suspension
FREQUENCY AND INTENSITY	High frequency.....Low frequency.....Very Low frequency (most days) (5 to 25 days a year) severe floods: once every few years catastrophic floods: once a lifetime? once a century? Low intensity.....High intensity (each 'event' very small) (each 'event' very powerful and potentially very damaging)		
CONDITIONS CONDUCIVE TO THIS MOOD	Rain showers sink into soil. Water filters out slowly from springs ensuring some flow even in dry periods	Heavy rain (thunderstorm) cannot soak into the soil quickly enough so water runs rapidly into the streams and fills channels to overflowing. Many days of prolonged moderate or heavy rain initially saturates the soil and then the remainder will run off into the streams and fill channels to overflowing. Melting snow adds to the run off	Exceptional weather conditions such as a very deep frontal depression provides an overwhelming deluge of rain which saturates the soil then produces vast amounts of overland run off which fills the channels to overflowing. If the ground is frozen then all the rain is added to the streams as none sinks into the soil

Figure 9: 'Three Moods of the Lyn', an analysis of feelings and responses from Keen and Elsom (1990), *'Lyn in Flood'*.

[Peter Keene is a senior lecturer in Geomorphology at Oxford Brookes University and is also editor and chair-person of the non-profit making educational publishing charity, Thematic Trails Trust, School of Social Sciences, Oxford Brookes University, Oxford, OX3 0BP.]

4. The potential of visitor centres: a case history
(R.P.H. Edmonds)

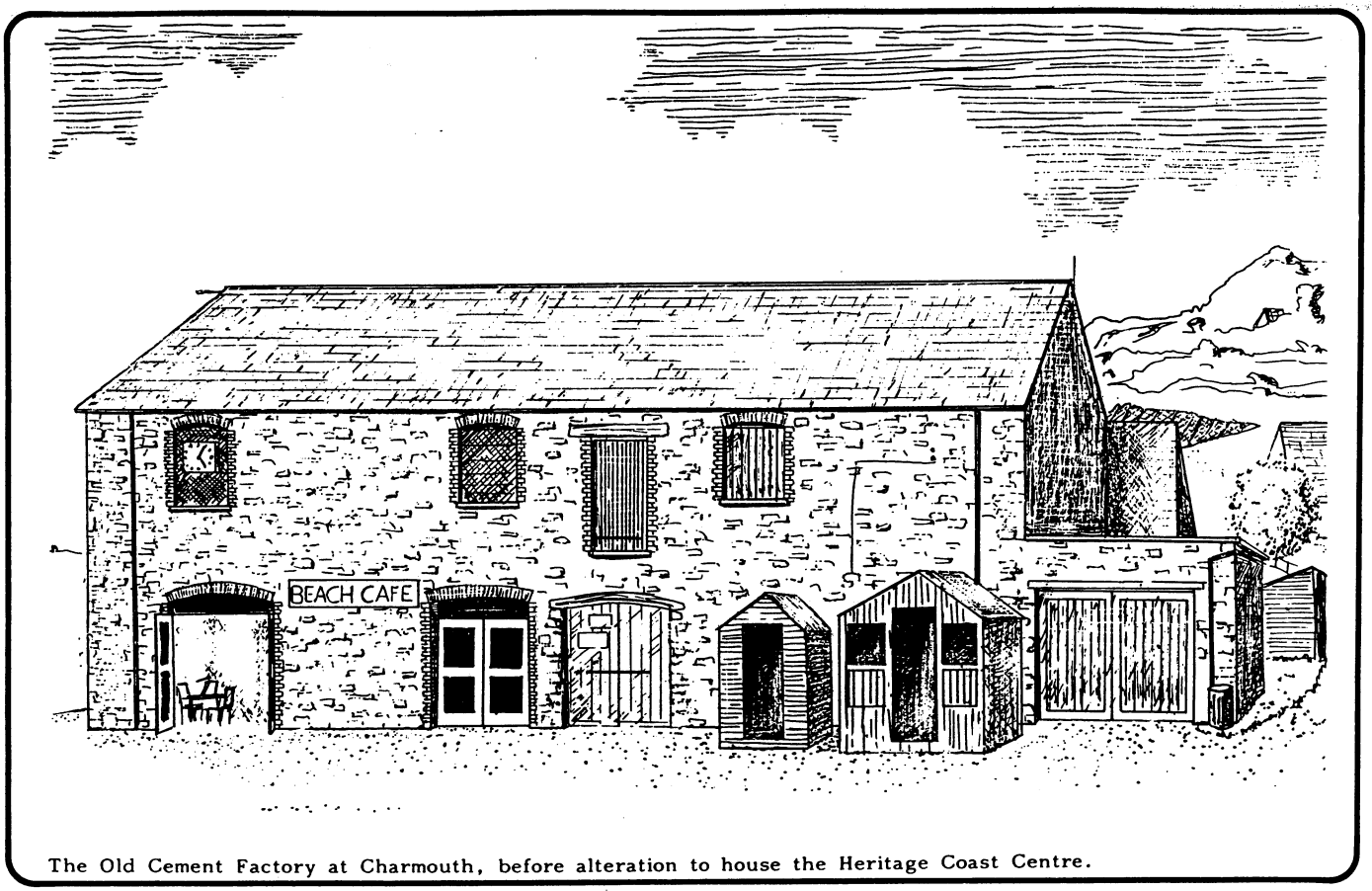
The Charmouth Heritage Coast Centre - interpreting Dorset's true Jurassic Park

The West Dorset coast is world famous for its exposures of Jurassic and Cretaceous rocks and their contained fossils. The coast is also a popular holiday destination for it is an unspoilt 'Heritage Coast' with good beaches, superb walks, wildlife and lots of attractions to entertain the family on those wet days of summer. Lyme Regis and Charmouth, in particular, are focal points for fossil-collectors and have a number of fossil shops and exhibitions.

The Charmouth Heritage Coast Centre came about as a direct result of the enormous interest shown by the public in fossil collecting. In 1982 a public inquiry was held in Charmouth as a result of concern about the damage inflicted upon the cliffs by collectors. The inquiry, at that time, concluded that natural erosion far outstripped the erosive effects of fossil collectors (for instance Black Ven west of Charmouth is the site of the largest coastal mudflow in Europe), and that byelaws prohibiting collecting might be difficult to enforce. Nevertheless, it was also acknowledged that some people were putting themselves at risk by digging into the cliffs where generally only crushed and crumbling fossils are found. On the other hand, natural erosion can uncover thousands of superb fossils each year which are washed onto the beach and if not collected, could be destroyed by the sea. So, with a huge public interest and a perceived constant supply of fossils, why not promote this natural feature by providing people with the information they need to look for fossils safely and successfully on the beaches and also to educate them about the natural history of the fossils themselves and the site which yields them; and so the idea of the Heritage Coast Centre was born!

The original move came from T.M. Sweeney, the then Heritage Coast Warden for West Dorset, part of Dorset County Council's Countryside Service. He found enthusiastic support from the Charmouth Society and Charmouth Parish Council who owned a building on the sea front, the first floor of which was unused. A charitable Trust was subsequently formed in 1984 and money raised from the Countryside Commission, West Dorset District Council (WDDC), businesses and other charitable trusts. Dorset County Council provided interpretative and graphic skills towards establishing the displays. The Charmouth Society volunteered to construct and run the Centre while the Parish Council provided half of the first floor, rent free on a 25 year agreement (Figure 10). Since 1985 the Centre has been open on a seasonal basis with free admission, and a full time Warden was appointed in 1986.

In 1993 the Centre was doubled in size to provide further display areas, including an Audio/Visual Theatre and improved office and domestic facilities. Again money was raised from charitable trusts, the Countryside Commission, WDDC, local businesses and also English Nature. Volunteers carried out over 80% of the work in a stunning effort of community involvement. Voluntary effort is now coordinated by the Friends of Charmouth Heritage Coast, which ensures that the Centre is manned when open to the public (on an average 155 days per year) and provides a working party for maintenance and development.



The Old Cement Factory at Charmouth, before alteration to house the Heritage Coast Centre.

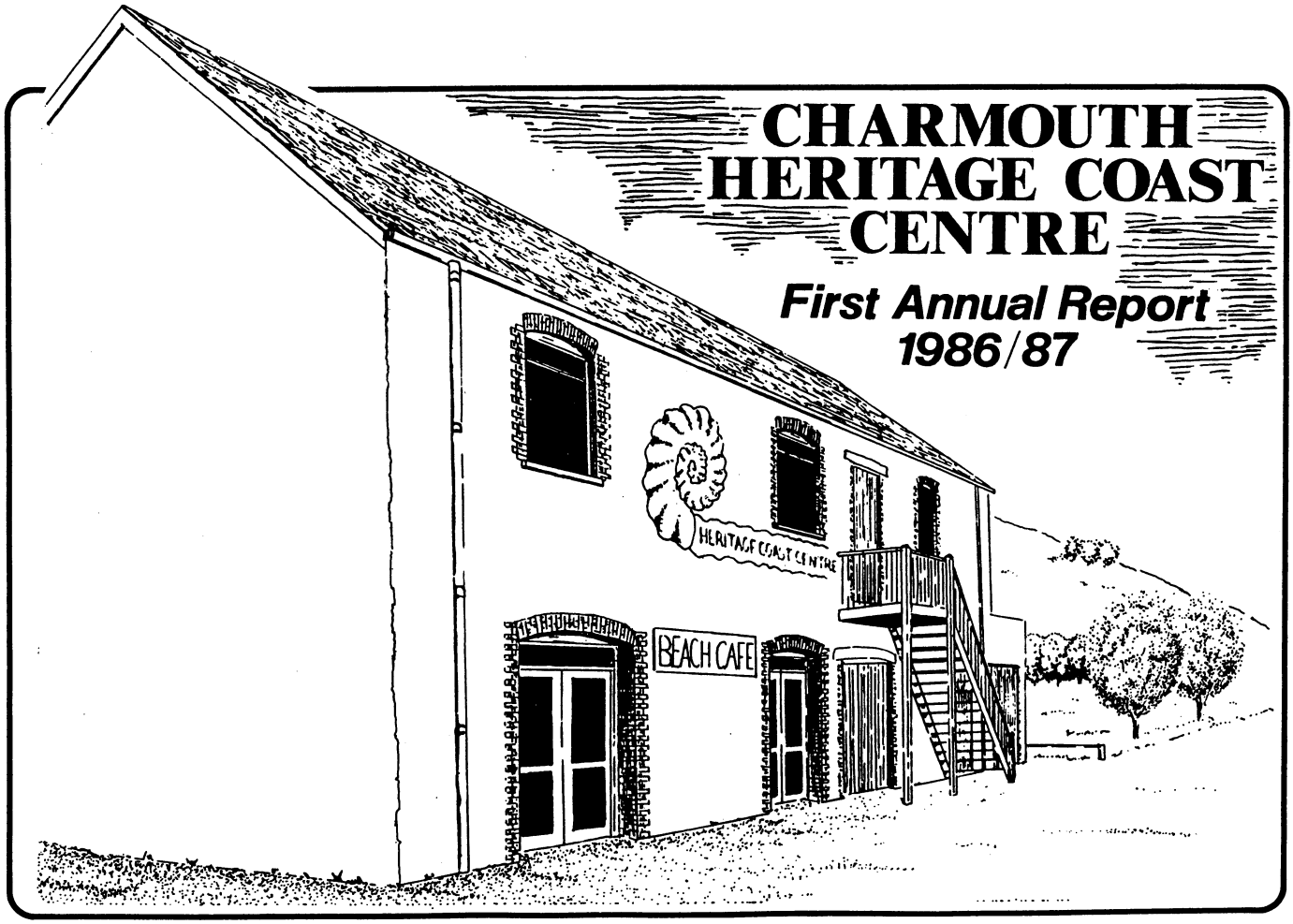


Figure 10: The Charmouth Heritage Coast Centre, before and after construction.

A Seasonal Assistant Warden was employed for the first time in 1994 under a Marine Awareness Project grant aided by English Nature and WDDC and this was continued in 1995. An assistant has become essential due to the increase in the Centre's activities (especially by schools) and from the broadening of its themes.

In a typical year, the Centre receives 33,000 visitors, meets 80 school groups for fossil-hunting walks, runs a further 35 walks for the public and gives 18 slide shows to local educational groups. These activities along with sales, donations and admission to the theatre generate approximately half the Centre's income with the remainder being made up from grants from WDDC, English Nature and the Countryside Commission.

The Centre's Displays

The Centre occupies a space approximately 20 m by 8 m on the first floor of the old cement factory located right on the Charmouth seafront and adjacent to beach car parks. The original displays, set up in 1986, consist of traditional panels, most of which deal with the main theme; Charmouth's rocks and fossils. A hexagonal touch table of typical and common rocks and fossils forms a central display while, to one side, a cabinet of well preserved fossils provides a contrast.

The panels are set against a backdrop of a large 4 m x 1½ m illustration of *'Charmouth 180,000,000 BC'*. This is an airbrush illustration of the creatures from the Lower Jurassic sea using a 'Scanachrome' cloth print. A sloping lectern shelf provides text about the creatures illustrated. On either side of this are six 1 m^2 panels of text, photographs and specimens which in order deal with; *'How are Fossils Formed?'*, *'Finding Fossils'*, *'Some Charmouth Fossils'*, *'Rocks of Charmouth's Cliffs'*, *'Building the Rocks'*, *and 'The Black Ven Landslip'*.

The remaining geological display is the Jurassic Theatre with its 16 minute slidetape programme *'The Wonderful World of Fossils'*.

Other themes within the displays deal with *'The landscape and its wildlife'*, *'Charmouth - The Good Old Days'* (old photographs) and a marine theme based around a rocky shore aquarium with a new instructive CD Rom display. A sales area and Tourist Information point fill the remaining space.

Strengths and weaknesses of the displays

Without a doubt, the touch table is the most popular display. It is a jumble of common and typical fossil specimens, often poorly labelled and difficult to identify but it is 'interactive' and robust enough to cope with 33,000 pairs of hands every year. Simple sign boards deal with the main fossil types displayed while some items are labelled using cards attached by string glued with araldite. The net result is that it is a very informal display, people feel comfortable using it and come forward to ask questions about things they cannot identify. In turn, the surrounding displays can be used to talk about the specimens in question. People do also like to see spectacular fossils and the cabinet with beautiful and unusual fossils is popular. The panel displays on their own are less well used, despite the range of their content and complexity. The *'How are fossils formed?'* and *'Finding Fossils'* panels are a simple mixture of photographs and short single sentences. *'Rocks of Charmouth's Cliffs'* and *'Building the Rocks'* in contrast are quite complex and text heavy.

The net result of these displays is that there are tiers of information, 'something for everyone', from the simple touch table to the more complex displays, yet they can be linked by staff answering people's questions.

A further important supplement to the displays are the information leaflets provided in the sales areas. There is a *'Guide to the Geology Display'* leaflet that contains all the information displayed on the panels, and also a full colour fossil guide to the local area that contains simple advice about where to find fossils and what they are. Both these leaflets are very popular and are sold at a number of other locations including shops and Tourist Information Centres.

The Audio/Visual Theatre

The extension of the Centre in 1993 allowed room for the *'Jurassic Theatre'* to be established which is large enough to accommodate a class of school children.

The equipment chosen was a four projector slide/tape system which included a programmer to enable the Warden to compile the show. *'The Wonderful World of Fossils'* programme lasts for 16 minutes and shows how fossils form, why Charmouth is famous and how to find fossils. One great advantage is that the programme contains photographs of superb and rare specimens that could not be put on display. Though essentially an amateur production, the programme has received a great many compliments from satisfied customers and has been produced at a fraction of the cost of a facility produced by a professional consultancy.

Approximately 25% of the Centre's visitors use the theatre where there is an admission charge of 50p for adults and 25p for children. It was felt important that people should see the programme from start to finish without interruptions despite the difficulty this creates in operation. As a result, the programme is run on demand, but as visitors are sometimes reluctant to ask to see the show there is an audio-announcement which can be broadcast. Once the show has started no others are admitted. This type of operation requires staff, in our case volunteers, to actively control the theatre but it is thought worthwhile in order that people can see the show with minimum distraction. However, some sites may not have this luxury and a continuous loop system with open access obviously has a role. School groups see the programme before they go on the beach walks and this works very well as elements within the programme can be referred to during the walk. Children's identification of fossils is vastly improved after seeing the show, even to the point of being able to identify trace fossils and coprolites!

The theatre has proved to be highly effective and represents a flexible and powerful interpretive tool. Getting more people to see the show remains a challenge, for despite signs and the audio-announcement, some visitors still appear unsure what the theatre is about. The small admission charge made to cover expenses, rent and running costs, is good value and achieves its aims. The equipment used is as follows: 4 x ECTAPRO 5000 35 m SLIDE PROJECTORS, 1 x SMARTPAX, 1 x PAX, 1 x MIC 3+ PROGRAMMER, 1 x TASCAM 134 SYNCASET 4 TRACK TAPE DECK, 1 x HAMAHA P4050 AMPLIFIER, 1 x CTI PROLIGHT - LIGHT DIMMER.

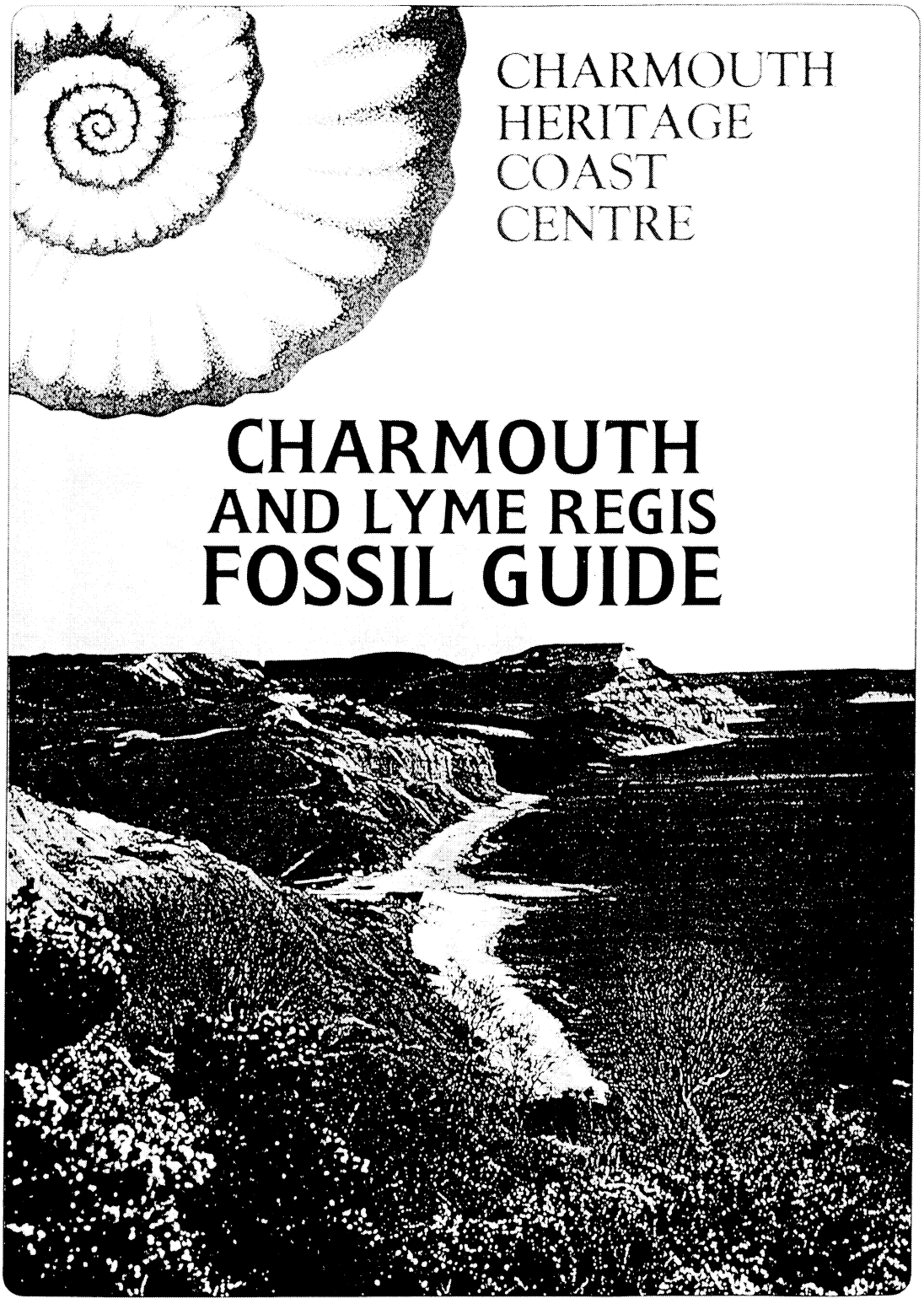


Figure 11: Charmouth and Lyme Regis Fossil Guide, published by the Charmouth Heritage Coast Centre.

Future Plans

The majority of the displays within the Centre have been in place for ten years and it is now felt that they should be changed. Plans are in hand to further develop the marine displays and update the wildlife and geology displays over the next five years. While static display panels will remain, a range of more interactive displays are planned, some of which will use compact disc and or computer based systems.

In 1995 we developed a simple and inexpensive CD Rom display to aid identification in the rock-shore aquarium. This was based on photo CD technology using a Kodak CD player, television, film, disc comprising 82 pictures, handset adaptation, with a total cost of around £485. This is just about as simple as a disc can be and comprises a main menu, a series of sub menus and photographs of the animals with text in between. Like all displays it works by varying degrees with different people but it is heavily used by most. Problems usually occur with those children who just like pressing buttons, but there are plenty who are quite capable of using the system constructively, and for those who do not, it is best to 'take control'. Because the display is linked to the aquarium and the live animals within, it is possible to play a game whereby animals appear on the screen and have to be spotted in the tank. During this process it is possible to talk about the creatures and convey the information contained within the display.

There are plans for a second CD Rom aimed at helping visitors identify and discover more about their own finds. This will be a more complex display due to the sheer range of specimens, some of which are fragments of fossils or just odd shaped rocks. The display will also be linked to the touch table, thereby aiding the identification of specimens there.

With regard to the display panels, the intention is to retain the main illustration as a backlit transparency of a similar size. Text and information relating to this display will become visible when shapes of the various creatures are pressed. The *'How Fossils Form'* display may become a series of illustrations and text illuminated in sequence upon a command. With the landslips section, we hope to use video of the cliffs moving and this could be based on a CDi, a compact disc capable of storing video and stills images.

These ideas are at an early stage and are being worked into a five year plan. Sponsorship will be sought towards the costs, some of which could be considerable.

So what makes a good Centre?

Interpretation can be a difficult area - something that works on one site may not succeed on another. The range of sites with a geological interest alone are so variable that all forms of interpretation are likely to have a successful application somewhere.

Probably the most useful exercise is to highlight what has been successful at Charmouth:

1. The greatest strength at Charmouth is the huge public interest in fossils and the fact that people can participate in fossil collecting.

2. The site, right on the seafront, is ideal although the first floor location is a disadvantage, especially concerning disabled access.

3. The displays are multi-tiered, there is something for most people from the simple touch table to the more complex displays.

4. Having a warden, brings the displays to life and enables a whole range of guided walks to take place outside the building.

5. A range of home produced information leaflets enables the Centre's story to be taken away in people's pockets for leisurely consumption.

6. Interactive displays are highly popular from the simple touch table to CD technology. For the latter it is good to link the information on the disc with physical objects within the displays or on the site. Make plans to avoid 'random button pressing' although this cannot be totally avoided.

7. Spectacular geological specimens draw people's attention.

Some general comments on interpretation include:

8. The theme or themes of a display should be clear and clearly defined from each other.

9. Display panels must be clear and simple, avoiding large blocks of text.

10. Displays should look attractive. Good art work, though expensive is well worthwhile.

With regard to setting up a Centre, we have found that:

11. The Trust, made up from a number of different organisations contributing in different ways has been a real strength.

12. A strong community involvement has provided a superb volunteer force. This relies on finding a few key people prepared to put a lot of effort into the project. Charmouth has a large retired population which is a major factor.

13. A charitable status allows for many sources of funding to be sought. Potential sources need to be clearly identified and approached with clear and simple projects in mind, ie, it is better to make a small number of well researched requests than a large number of hazy appeals.

14. The value added to public funding by the voluntary effort put into a project is a strong selling point to potential sources of funds.

The key elements to the Centre's success is a strong interest in the local fossils and geology, an excellent location and high community involvement. In addition, the Trust, being made up from a number of different bodies creates a broad base. After ten years' working experience plans are now in hand to update and further improve the displays and the service to the public.

Table 1: Visitor figures for the Charmouth Heritage Coast Centre in 1994

Days open	153
Visitors	34,690
Total school visits	108
School walks	79
Guided walks	34
Talks	16
Audio/visual visitors	7,975

[Richard Edmonds is the Warden of the Charmouth Heritage Centre, Lower Sea Lane, Charmouth, Dorset, DT0 6LL]

5. Concluding remarks

There can be no prescriptions as to what categories of site have most potential for interpretation. The range of available techniques and production methods makes it financially possible to develop some form of a scheme for any site, even if the 'facility' is no more than a photocopied leaflet.

The most important first consideration "is the audience (actual or potential) large enough to justify the time taken to produce the facility?" If the answer is 'yes' and there are no significant constraints on the site which would deleteriously affect an interpretive scheme (cf. question 4, in Appendix 5), then geology and geomorphology can provide such rich and fascinating stories (if presented thoughtfully!) that the site has potential for some form of interpretation.

The second consideration, however, is prioritisation; having established that a site has potential, the resource implication will be such that decisions must be made on which of a group of sites should be considered as being the most appropriate to develop. It is then that local and national objectives become significant and a balance between organisational and site-specific priorities must be made.

Appendix 5 provides a framework to help identify site specific issues and priorities, and it is suggested that any proposal to establish any interpretive scheme addresses each of the points and questions listed here. Taking the time to plan the scheme carefully, however will ensure that a cost-effective and successful project is implemented. Earth Heritage interpretation is a relatively small but developing discipline and every new project has the potential to gain new insights and develop the subject - and well planned and implemented schemes can become models for others!

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Appendix 1: Interpreting Geology at Hunstanton Cliffs SSSI, Norfolk - A Summative Evaluation (T.A. Hose)

1. Old seascapes, new views?

1.1 Seasonal geology

The popularity of fossil hunting and pebble collecting along England's actively eroding coast can be readily witnessed, both during and outside the holiday season, at the popular resorts. Such recreational geology activities could extend the tourism season and it offers the prospect of enhanced employment in the catering and hospitality sectors, and in giftware and souvenir production. Unlike many other forms of outdoor recreation it is not really limited by the seasons. Indeed, the leafless trees and reduced herbaceous layer ('weeds'!) of the out-of-season short, cool late autumn to early spring days, make it easier to examine rock exposures and appreciate rock structures. Also, the seasonal sea conditions help create a ready supply of new collectible material. Given that interpretation is:

> *"... the art of explaining or revealing the character of an area through the inter-relationships between rocks, soils, plants and animals, and man to .... increase visitor awareness of the significance of the site visited and the desire to conserve it."* (Aldridge, 1975),

an interpretive strategy for these coastal localities could help raise public awareness of the importance of, and need to conserve, England's rich geological heritage. Such sites, as possible points of contact between Earth Science conservationists and the public, much underexploited educational and promotional potential.

1.2 Geotourism: purposeful site-specific geological interpreation

Recognising the educational value, promotional possibilities and the economic potential of site-specific geological interpretation, the concept of geotourism can be appreciated as:

> *"The provision of interpretive and service facilities to enable tourists to acquire knowledge and understanding of the geology and geomorphology of a site (including its contribution to the development of the Earth sciences) beyond the level of mere aesthetic appreciation."* (Hose, 1995).

An English Nature report (Page, 1992) outlined three approaches to on-site signage at English Earth science SSSIs:

a. **Site Specific Information Plaques** - basically interpretive and tailored to each site.

b. **Standardised Site Management Signs** - applicable to most sites and containing basic designation and conservation information.

c. **Visitor Management Instructions** - applicable to most sites and containing ownership information and basic conservation instructions.

It also indicated that at least 55 English Earth science SSSIs had some potential for on-site interpretation. The Hunstanton Cliffs SSSI was identified and two interpretive themes were suggested:

a. **Geological history** of the rock forming the cliff (age, environment, etc).

b. **Geomorphological and Quaternary context** of site.

The first theme was selected and a **Site Specific Information Plaque**, the focus of this study, was produced. Annually, up to 10,000 casual passers-by and interested visitors were expected (Page, 1992) to view the panel.

2. Hunstanton Cliffs SSSI

2.1 The site

Hunstanton Cliffs SSSI is a prominent, low feature adjacent to a sandy beach, promenade and funfair, in the small east coast resort which is some 160 km north-east of London. Its conservation status and context has been relatively recently reviewed (Funnell, 1992). The site's SSSI status, with exposures of Lower Cretaceous Albian (Aptian-Carstone and Hunstanton Formations) and Upper Cretaceous (Cenomanian-Lower Chalk) sediments in clearly seen beds which have an apparent gentle north-easterly dip, is purely geological. The rocks are generally arenaceous and calcareous in character with fossils restricted to a few beds. Fairly abundant fossils, including bivalves, belemnites and trace fossils, can be found in the large light grey blocks of Lower Chalk beneath the cliffs. Lower down the beach, erosion of the Carstone Formation along joint planes has left conspicuous, green-seaweed covered rock mounds encrusted with Common Mussels - making a useful comparison with the fossil bivalves within the Lower Chalk. The Carstone Formation, locally some 12 m thick, is a generally unfossiliferous, limonitic sandstone with a pebbly base. It grades upwards into the distinctively coloured Hunstanton Formation (formerly known as the 'Red Chalk') which is locally some 1.3 m thick. Above this is the 0.1 m thick Sponge Bed which marks the base of the Lower Chalk, of which some 19 m is locally exposed. Overall, the rocks indicate the slow progressive deepening of a tropical sea in early the late Lower Cretaceous and early Upper Cretaceous (Cenomanian) (Albian) times; whist the Carstone Formation was deposited as the sea flooded the land, the Hunstanton Formation and Lower Chalk were deposited in relatively deep-water conditions.

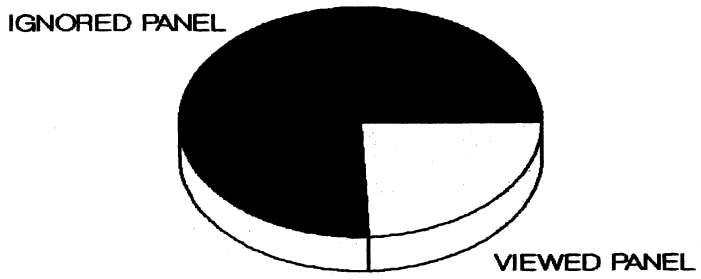
2.2 The writing above the beach

The challenge for the interpreter was to select and explain those elements of the site's geology most likely to be appreciated and potentially understood by visitors; in this, Wray's caution is apposite:

> *""Rocks are boring!" Sadly that is the view of many people about earth science. Much effort is put into earth science conservation .... and it will be wasted if the public at large cannot appreciate its value."* (Wray, 1991).

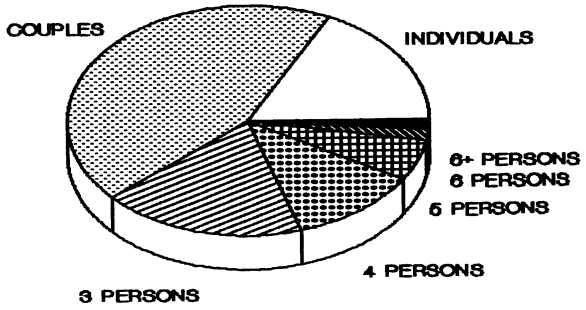
An angled 84 cm x 60 cm interpretive panel with descriptive text, orientation drawing and photographs of the principal rocks (designed by the Centre for

HUNSTANTON CLIFFS SSSI
Logged Visitors' Response to Panel



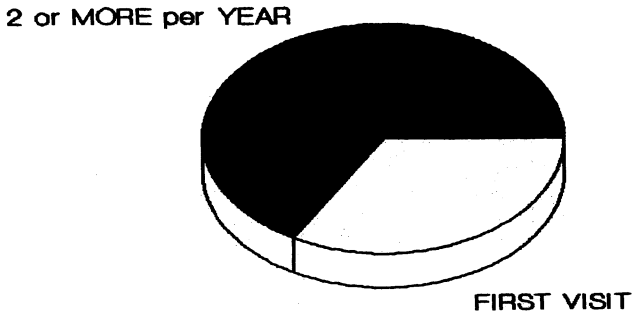
[Figure 1]

HUNSTANTON CLIFFS SSSI
Party Size of All Logged Visitors



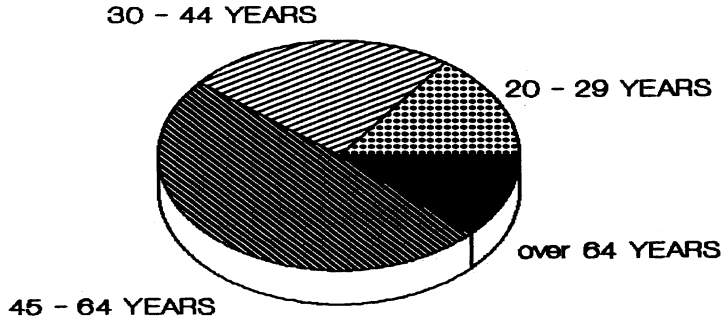
[Figure 2]

HUNSTANTON CLIFFS SSSI
Interviewees' Site Visitation



[Figure 3]

HUNSTANTON CLIFFS SSSI
Age Profile of Interviewees



[Figure 4]

Environmental Interpretation of the Metropolitan University of Manchester) was erected by English Nature in 1993. Situated at the eastern end of the promenade it lies just beyond the steps to the adjacent beach. It explains some of the main points of geological interest. Visitors' effective use of the panel was judged to require at least one minute's attention. Its size, colour scheme (sympathetic with the local rocks), graphic content and siting has resulted in an aesthetically pleasing and environmentally unobtrusive panel.

3. Methodology

3.1 The surveys

A provisional summative evaluation (Screven, 1976), to assess the interpretive panel's effectiveness was undertaken on three successive spring Sundays (to ensure that genuine resort visitors, rather than shoppers, were sampled) namely the 15th, 22nd and 29th May 1994. The somewhat unseasonal weather (which varied from heavily overcast with rain to brilliant sunshine with an onshore wind of varying strength and consequent chill factor!) affected the implication of the surveys. Visitor interviews were conducted, over some 10.17 hours, at various states of the tide. Thirty-two interviews, representing some 80% of those who read the panel during the survey periods, were completed; there were three refusals. Inclement weather, on several occasions, forced temporary suspension of the interviews. A log was also kept, over 11.75 hours, of the panel's attracting and holding powers (Bitgood, Finlay & Woehr, 1986) for visitors; some 844 visitor parties were observed and their responses recorded.

3.2 The Interviews

Structured interviews on a first to leave the panel basis, and undertaken within two-hour periods (11 am to 1 pm and 2 pm to 4 pm), were conducted with those viewing the panel in excess of 30 seconds. They involved direct questioning on information recall, qualitative and aesthetic judgements and basic psychographic and demographic data. Two illustrated prompt cards on common British fossils and a reproduction of the panel's graphics were used; the former to assess interviewees' prior knowledge and the latter their retention and recall of panel data. Both closed and open questions were used; the latter particularly to obtain responses on the merits or otherwise of the panel. All responses were recorded on questionnaire sheets, authenticated by interviewees at the close of the interview. Low-level graphic analysis of some of the data is presented and considered in the summary and supporting figures; a full account is published elsewhere (Hose, 1994a).

4. An evaluation

4.1 Visitor demography

The high percentage of those aged 45 years and older (Figure 4) and couples (Figure 2), together with the relative paucity of first-time visitors (Figure 3) almost certainly reflects Hunstanton's strong retiree base and usage for recreational outings from within the region and the East Midlands. Some 40% of interviewees were from the relatively local towns of Cambridge and Peterborough and their immediate areas. Also, some 45% of interviewees were from the East Midlands' towns of Coventry, Leicester, Northampton and

Nottingham and their immediate areas. The high readership levels of tabloids, and the fact that just over 40% regularly read no newspaper (Figure 5), is also indicative of the interviewees' socio-economic origins. The level of formal educational attainment (Figure 6) reflects both the age profile and the traditional local trend for chiefly agricultural employment, coupled with the former regional concentration on mining and manufacturing. For example, almost half the interviewees had not undertaken any post compulsory age schooling (Figure 6). This is also reflected in the low level of broadsheet readership (Figure 5).

4.2 Visitor responses

The apparently low attracting power of the panel (Figure 1) reflects both its position on the promenade and probably respondents' general desire to partake of the usual English seaside activities! American studies (Bitgood, Paterson, Benefield & Roper, 1986 & Robinson, 1930) show that overall most signs in museums and zoos, with their somewhat 'captive audiences', only manage to attract 8% to 40% of visitors'. Attracting power varied with accessibility to the sandy beach; it improved as high tide approached forcing people off the beach onto either the promenade or the thin strip of beach beneath the chalk cliffs. The maximum holding time recorded was 2.51 minutes; the minimum was 0.05 minutes and the mean was 1.02 minutes. The frequently unseasonable inclement weather was also undoubtedly a factor in recorded attracting and holding power.

4.3 The rocks understood?

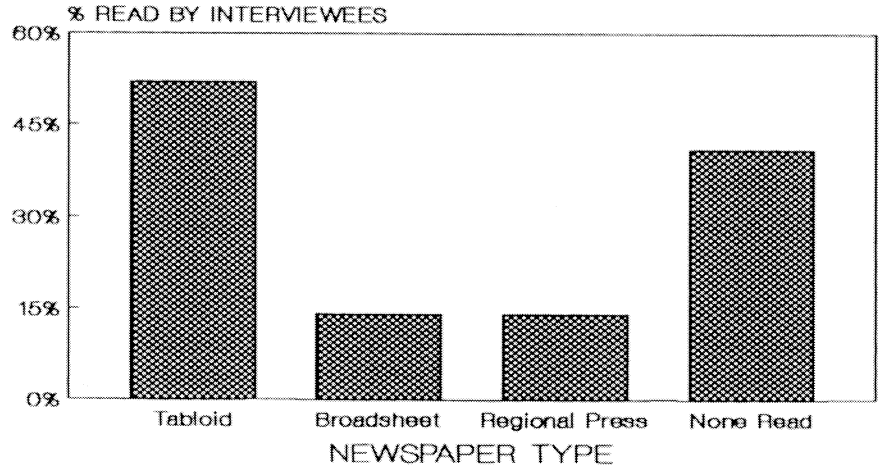
Just over half of interviewees could give an accurate age in millions of years for the site's rocks (Figure 10). The high recall rates for 'Chalk' and 'Red Chalk' are not, given their common usage and readily appreciated appearance, surprising. However, the ability of almost one-half of respondants to recall 'Carstone', a somewhat uncommon and unfamiliar term, is encouraging (Figure 10). Two-thirds could accurately recall the site's palaeoenvironment (Figure 10). Clearly, the panel's use of common terms and colourful word pictures is helpful to visitors. One-third could either describe or recall an 'ammonite'. Media hype has clearly influenced the ability to name geological systems (Figure 9) such as the 'Jurassic'. The generally low accurate recall rates (Figure 8) for fossils, except for the easily recognisable bivalve mollusc (very similar to those found encrusting the Carstone) suggest that respondents can recall such material from drawings and/or knowledge of similar living material; their knowledge shortfall probably lies in a lack of exposure to fossils in an area lacking hard rock sites. Not surprisingly, very few had studied geology (Figure 7). None of the interviewees were aware, despite specific reference to its availability on the bottom right of the panel, of the free (Stevenson, 1992) descriptive geology leaflet; even a student geologist on the beach was not aware of its existence!

5. In summary

5.1 Implications

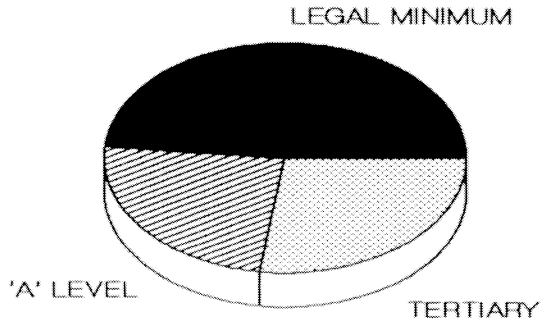
The high readership level of the tabloid press indicates the limited vocabulary and textual style that can be employed in interpretive material at the site. The high tabloid, and relatively limited regional press, readership, is also

HUNSTANTON CLIFFS SSSI
Interviewees' Daily Newspaper Readership



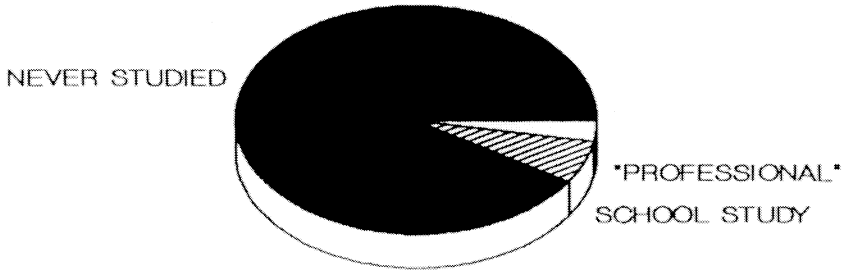
[Figure 6]

HUNSTANTON CLIFFS SSSI
Interviewees' Educational Attainment



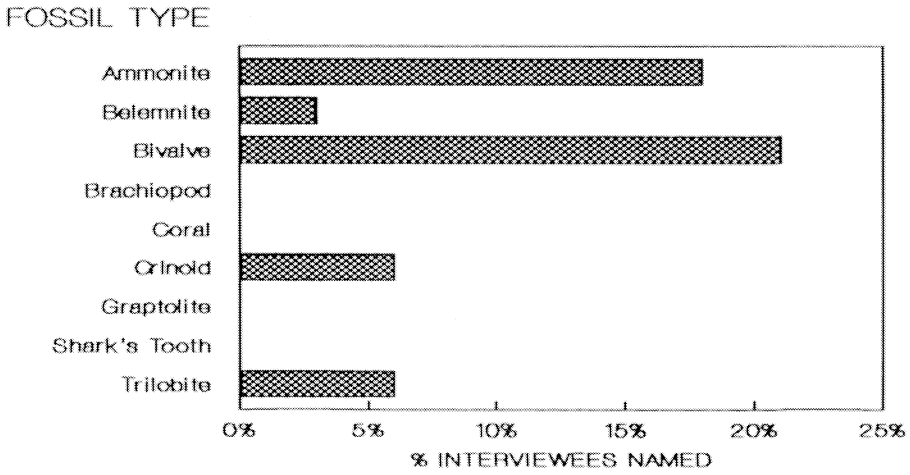
[Figure 6]

HUNSTANTON CLIFFS SSSI
Interviewees' Geological Education



[Figure 7]

HUNSTANTON CLIFFS SSSI
Interviewees' Common Fossil Recognition



[Figure 8]

significant in the marketing of the site and Earth Science attractions in general. However, the survey suggests that there *is* some public interest in geology which, with appropriate interpretation, can indeed be memorable; particularly helpful at Hunstanton is the inclusion of word pictures and a simple, themed storyline on the interpretive panel. Greater exposure of the public to geological terms, and familiarity with fossils other than dinosaurs, would help promote interest in geology and an awareness of geological conservation. Clearly, given that none of the interviewees could recall any panel reference to the locally available interpretive leaflet, further consideration needs to be given to the local promotion of the site.

5.2 Closing thoughts

There is clearly potential for the development of geological attractions for general tourists. However, such developments, to be successful, require consideration of further more detailed analyses (Burek & Davies, 1994; Hose, 1994b) of visitors to existing provision. In conclusion, the remarks of an early pioneer in promoting geology to the general public have much relevance today for those concerned with the promotion and conservation of England's earth science heritage:

> *"All the discoveries, all the works of human genius, are of great importance to the community; but that their full effects may be produced, it is necessary that the public mind be prepared to enjoy them and to estimate their advantages. The general diffusion of letters and philosophy is necessary to the progress of the higher inventions of the mind; for unless the labours of men of ingenuity meet with public support and approbation, they can never be actively pursued, and must soon languish and die."* (Davy, 1805).

Acknowledgements

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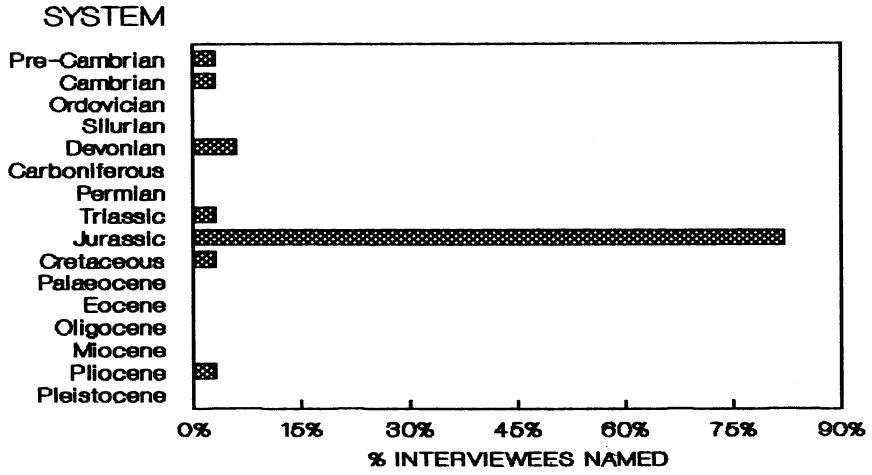
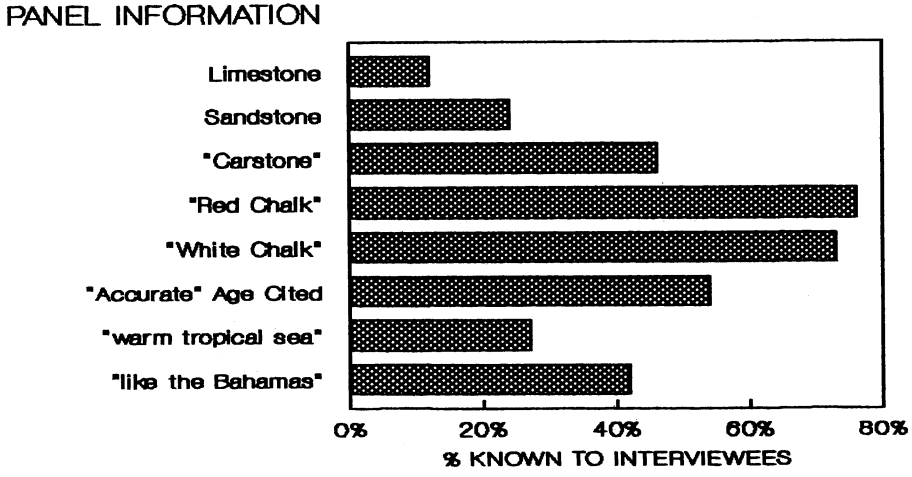
HUNSTANTON CLIFFS SSSI
Interviewees' Named Geological Systems



[Figure 9]

HUNSTANTON CLIFFS SSSI
Interviewees' Panel Information Recall



[Figure 10]

Appendix 2: *Writing Trails, a student's guide* (Keene, P. 1995)
Modified and reproduced by courtesy of Thematic Trails, Oxford Brookes University.

WHY A WRITTEN TRAIL?

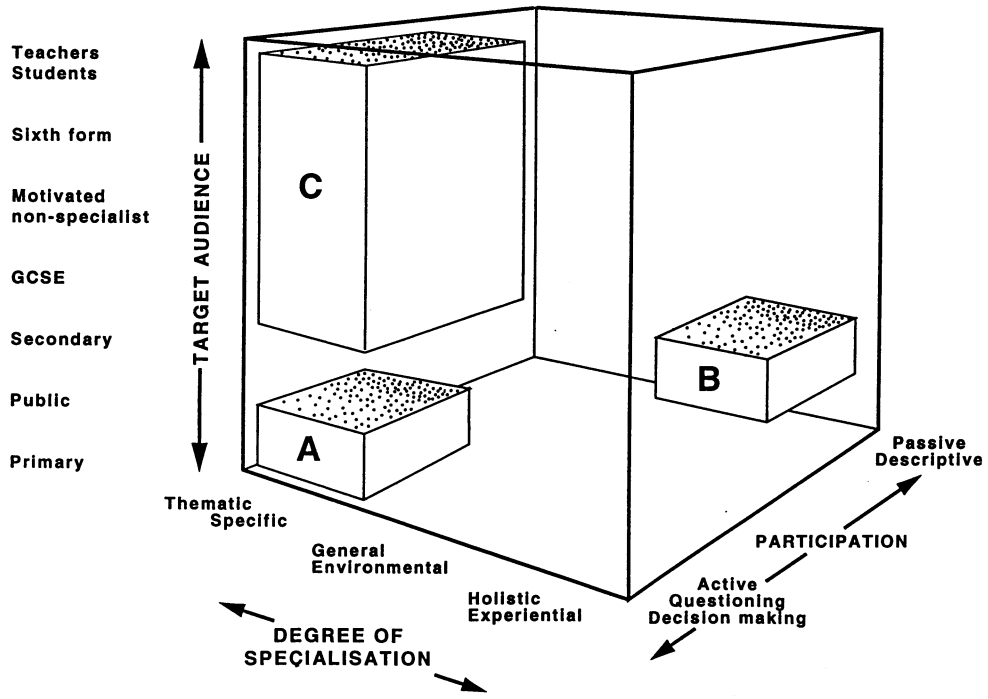
A booklet is one way of providing sequential instructions, guiding people in the field and being able to communicate with them without your physical presence; but it is not the only way. For example, a sequence of signposts can constitute a trail. Information may be presented on display boards or plaques. A `Walkman' commentary may seem a more `user-friendly' way of communicating with your audience. A video to be viewed before the visit may provide an appropriate stimulus or sense of place that you may wish to communicate. A booklet to be read before the participant explores the site may be considered a good idea.

The first question may therefore be whether a trail booklet is the best vehicle for what you have in mind and this in turn may depend upon your anticipated target audience and what you wish to say to them. Some general advantages and disadvantages of trails are listed in at the end of this appendix.

Trails may be regarded as self-paced structured distance-learning packages. The guidelines which follow, outline some central points which should be considered before determining the structure of a written trail. Three major elements are considered:

1 Target audience addressed.
2 Focus. The degree of specialisation.
3 Participation. Level of involvement. In addition;
4 Adjustments which might be necessary for a wide target audience are considered.

Figure 1 Three major considerations in designing trails.



Examples A: An interactive trail with a specific focus designed for Primary School children.
B: A descriptive general trail designed for the general public.
C: An interactive thematic trail designed for interested adults.

1 Target Audience

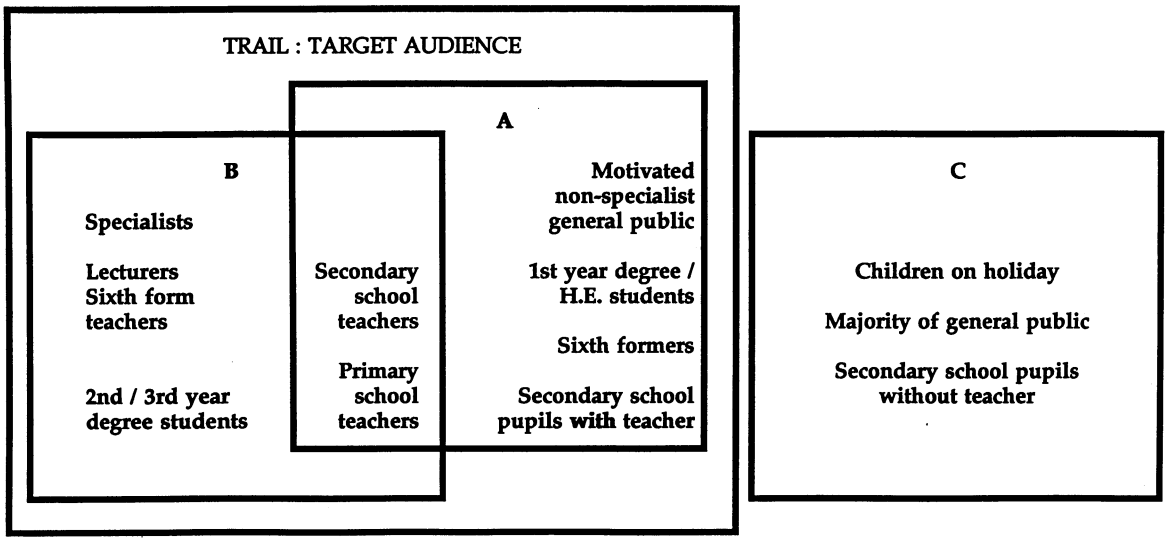
Who is the target audience?

Target audience may be something that you haven't thought too much about before. Written work may be perceived as being a vehicle to convince the tutor of the writer's intellectual calibre and grasp of the subject at the highest level. Students, almost by definition, write to the limits of their knowledge and understanding. In such circumstances the exercise too often degenerates into an `all I know about N' exercise. The question of work being aimed at a particular target audience and the material reflecting a selection from a wider reservoir of scholarship by the writer, is often not on the agenda.

One of the stimulating things about writing trails is that the focus is upon communicating. Trails are clearly something actually written to be read by `an audience'. In this respect it is much more like the type of material that students may be asked to present once they have left academia. This is one good reason why designing trails may be considered as a good teaching tool in its own right.

The target audience clearly should determine the approach adopted in devising the trail. Who is the trail designed to interest? The audience you know best are your fellow students and a trail designed for next year's students should pose few problems in this respect. However, consider what modifications you would make for a different age group or for a `non-specialist' adult audience? How might this affect the complexity of concepts that you may wish to explain? You may have to illustrate relatively complex ideas without recourse to specialist terms. Would a glossary be a good idea? How wide a target audience band can you hope to span? There are no correct answers to these questions but they are issues which need to be addressed before the structure of the proposed trail is too far advanced. A range of target audiences is suggested in figure 1.

Figure 2
A venn diagram can help indentify the possible target audience for a trail. `Burrator, Dartmoor Landform Trail' (Keene, P. & Harley, M) Nature Conservancy Council 1987.



SET A : Those treating trail as a learning exercise, hoping to know more about environmental theme being explored.
SET B : Those to whom material taught is familiar but treat trail either
(i) as guide to interesting sites or (ii) as structure for preparing fieldwork for others.
SET C : Trail NOT aimed at this group.

2 Focus

What exactly do you want your audience to get out of the trail? Do you wish to include everything of interest in the environment or is there a focus or theme which you wish to develop? Can the understanding of such a theme be enhanced by introducing some form of progression, perhaps developing ideas as the trail unfolds? Is it possible to achieve sufficient understanding of your theme for participants to transfer that knowledge to the interpretation of similar environments elsewhere?

Degree of Specialisation

The axis on figure 1 which considers the degree of specialisation is perhaps rather too simplistic, but it does draw attention to a reoccurring problem in constructing trails. To what extent can you / should you include all the fascinating detail which you could draw attention to along the way? A written trail is physically constrained by the limits on what can be realistically included and read by the participant in the time available, but there is also the restraint needed to ensure that the main focus of what you want to get across is not obscured by a mass of perhaps interesting but less important detail. Selectivity is as important here as it is in any essay.

Thematic and Specific

If the focus is going to be a theme which will be developed throughout the trail, then this might well determine the selection and sequencing of sites. What specifically, will the participant get out of this trail? At the planning stage, can you make a list to demonstrate how your trail achieves progression; how ideas or observations are introduced and developed as the trail unfolds? A specific topic will inevitably mean that material will have to be edited, not only to ensure that the subject of the trail is central to the text but also to adjust the commentary to the level of the audience. These `adjustments' are considered in more detail later (4 Adjustments to audience).

There are clear advantages in reducing the scope of a study, rigorously excluding peripheral material and sharpening the focus so that within the complexity of reality, the topic under scrutiny can be better understood. For example, the landform trail (figure 2) was centrally concerned with the reasons for the granite-tor landscape of Dartmoor.

General, Experiential, Holistic.

It was considered inappropriate and beyond the scope of the Dartmoor trail to include thoughts on the smell of the moor after rain or the roughness of the granite against one's cheek. Yet these elements of the environment are all experienced by anyone who walks up onto the moor. A `smell' or `touch' trail might justifiably focus on these specific experiences and in that respect could be regarded as still occupying the thematic end of the scale (figure 1). Yet if the focus of the trail were `a sense of place' then many (unfiltered?) experiences might be responses that are actively encouraged. Envisage situations where such considerations might be a justifiable focus for a trail.

Designing open-ended, non-specialist, holistic or experiential trails often attract students as being something different and perhaps exciting. However, this type of trail is often badly executed. The unfettered freedom implied by encouraging the reader to indulge in an uninhibited experience of place, does not extend to the author writing the trail! Precision of thought, planning and objectives are no less rigorous here than in any other successful written communication.

3 Participation

An Interactive Approach

Most educationalists feel that the passive handing out of information is not as effective a teaching tool as material which is designed to stimulate the user into active participation in the learning process. The reader can become involved by being asked questions, undertaking specified observations or tests, writing or commenting on the surroundings, or perhaps being asked to make some decision.

If your trail aims to `teach' something, whether to children, students or the general public, then the degree to which the participants are able to interact with the trail or with each other should be given some thought. Does your trail make people think? One definition of a good teacher is one who acts as a facilitator, encouraging `autonomous learning' (where the participants are sufficiently motivated and have acquired sufficient skill to control and direct their own education). This may have some bearing on the way you design your trail.

Mission-driven material

Material which is produced with a specific aim in mind (such as the wish to educate!) can be described as `supply' or `mission' driven material', since the driving force behind publication is the wish of the supplier to say something, rather than simply following strong market demand (profit?). Most educational material assumes some participation on the part of the user and so on the `participation' axis (figure 1), educational material will usually be found at the `active, questioning, decision-making' end of the spectrum.

Market-driven material

At the other end of the spectrum is material which is produced largely to satisfy the demand of the mass market. It is a characteristic of this material that it is seldom demanding of the user, the content is predominantly descriptive and the role of the reader is assumed to be passive rather than interactive. Producing material which spans the full range of this spectrum is notoriously difficult.

Figure 3 Attributes of educational and public audiences compared

An `educational' audience is generally receptive to the structured academic approach familiar to students. Words suggesting some of these academic attributes are listed on the left. However, a public audience, or indeed ourselves functioning outside the academic context, may behave in a very different way. Perhaps you feel that the right-hand column provides a closer approximation to the way people privately address the world? Although such a list invites caricature, it is useful to set this seeming dichotomy in juxtaposition, elements of which might prompt some modification in the way literature for a public audience is approached.

ACADEMIC ENDEAVOUR	▸ ◂	PRIVATE ENJOYMENT
MISSION-DRIVEN	◂ ▸	MARKET-DRIVEN
EDUCATIONAL OBLIGATION	◂ ▸	CONSUMER DEMAND
INTELLECTUAL ELITIST	◂ ▸	POPULAR MARKET
PROCESS	◂ ▸	DESCRIPTION
STRUCTURED LOGICAL LINEAR	◂ ▸	RANDOM ACCESS
ANALYTICAL SCIENTIFIC	◂ ▸	EXPERIENTIAL
RATIONAL CONTROLLED	◂ ▸	FEELING INTUITIVE
CONCEPTUAL UNDERSTANDING	◂ ▸	ENCOUNTER SENSE OF PLACE
PYRAMIDICAL FOUNDATION	◂ ▸	`NEED TO KNOW' AVAILABILITY
CONSTRUCTIONISM	◂ ▸	POST MODERNISM
LAWS	◂ ▸	PHENOMENA
AUTHORITY ORDER	◂ ▸	ANARCHIC
PRECISION REDUCTIONIST	◂ ▸	GENERAL HOLISTIC
DETACHED DISPASSIONATE	◂ ▸	SENTIMENTAL EMOTIONAL
WORK SERIOUS SOLEMN	◂ ▸	LEISURE TRIVIAL HUMOROUS

Passive or Interactive

If your target audience spans the education/public divide then the approach adopted needs particular care. Most educationalists would favour an interactive approach but care must be exercised if the audience includes non-specialists. A proportion of the public (labelled `motivated non-specialists' in figure 1) will be quite happy with an approach which assumes an active, questioning response on the part of the reader. This approach is common in educational material. However, the further into the public market that this style of material is designed to penetrate, the greater is the care needed.

Best of both worlds?

Trails which challenge the public reader too directly, ask questions which are too reminiscent of schooldays, use language that is too difficult to grasp easily or assume knowledge that few non-specialists possess, seldom sell well to the public. Imagine yourself in the same situation on holiday! Various attempts have been made to span this divide:

(a) Direct questioning can easily appear condescending or be too overtly educational! However, questions can be used in a less threatening way if integrated into the text or asked in a semi-rhetorical way.

(b) It is possible to present the text at two levels. For example, pages of larger print may offer simple directions and a straightforward commentary suitable for the general public. Alternating pages in finer print may provide more detailed or more specialist information, which may be regarded by non-specialists as additional notes which may be dipped into as desired.

(c) The projected image of the trail can be enhanced with attractive illustrations, so that it becomes a souvenir as well as being regarded as a more permanent reference booklet. This need not undermine its function as an interactive trail.

Glossary, or integrated explanation?

If the target audience includes non-specialists, then the use of unusual words needs to be considered. The use of some specialist terms may be thought unavoidable or even desirable particularly if space is at a premium. For the initiated, the use of exact specialist terminology can save paragraphs of explanation and succinct precision of language can sharpen the explanation or interpretation being attempted. However, consider your target audience. If your audience includes non-specialists then explanation of `professional' words is needed. One obvious option is to define the meaning of these words within the text as you write. There may, however, be times when such explanation disturbs the flow of the text. An alternative is to provide a glossary of specialist terms. If your trail is intended for a public audience you might regard the need for a glossary as a defeat:

" I believe that we can still have a genre suitable for and accessible alike to professionals and interested lay people. The concepts of science, in all their richness and ambiguity, can be presented without any compromise, without any simplification counting as distortion, in language accessible to all intelligent people. Words, of course, must be varied, if only to eliminate a jargon and phraseology that would mystify anyone outside the priesthood, but conceptual depth should not vary at all between professional publication and general exposition." Stephen Jay Gould (1989).

On the other hand it might be felt that it would be useful for the audience to gain familiarity with technical terms and that the best way of providing this opportunity without condescension is to explain them discretely in a glossary. Another choice to be made.

Guidelines and Introductions

The same dilemma may be faced when deciding whether an explanatory introduction or set of guidelines is needed before the trail is attempted. If the concepts about to be examined are relatively complex or likely to be unfamiliar to the intended reader, then it might be considered worthwhile to include guidelines which introduces concepts or background information which may be considered a necessary prerequisite for any non-specialist to participate successfully in the trail. If this were the case it might be suggested that these guidelines might be read at leisure before the walk commences. This might avoid overburdening the text which is expected to be read whilst walking.

If the introduction is being used to `tutor' the non-specialist to a level where the trail can be better understood, then even more particular care should be taken in this section to avoid academic jargon. Hopefully, this does not mean that accuracy or seriousness of interpretation is sacrificed. Aim here at simplicity without trivialisation.

On the other hand you may feel that the need for specific `guidelines' undermines the coherence of the trail and that new concepts are best introduced against examples in the environment itself on a `need to know basis? Again, there is no right answer!

Sites and Questions

The need to refer constantly to the trail can be an irritant to participants. It is therefore suggested that the continuous commentary approach is avoided and blocks of reading should be concentrated on a limited number of specific locations along the walk. If interaction is to be encouraged by questions then these too can be linked to specific stops.

Selecting appropriate questions is particularly important. The success of participant involvement may well depend upon questions being sufficiently serious and probing and yet giving the hope of achieving a reasonable answer on the spot. For the general public the questions might be presented in a rhetorical way, perhaps simply anticipating the sort of queries raised by the curious non-specialist, tempting involvement but providing an option of passivity.

Self-explanatory nature of the trail

Unless you assume participants have a suitable reservoir of knowledge which they bring to the trail, then the trail should be self-explanatory in the sense that at the level of understanding it attempts to achieve, all the information necessary to complete the trail `successfully' is either provided within the booklet or can be deduced from the surroundings. If questions are posed, it is an unsatisfactory position if the participant is left with no `answer'. The question should be addressed somewhere within the text. It can, of course, be stressed that in many cases there may be no definitive answer. Often one can only present the most probable explanation, or it may simply be a matter of opinion.

Directions

A good trail map is essential. The trail fails if the participants get lost! However, the chances of losing people is halved if crystal clear written directions are also given. Try the Trail out on people using, (a) only the map and (b) only the written directions. Both should work!

Illustrations and Diagrams

Illustrations enliven the text but also can often communicate information more clearly and succinctly than the same area of print.

Concise and to the point

There are finite limits to the reading matter that can be absorbed comfortably on a walk. A major constraint is therefore that of size. Unless the booklet doubles as a reference manual or souvenir then 32 pages of A5 is too long. One of the fascinations of designing trails is the challenge of making the most effective use of limited space and time. There is often a superabundance of useful material. Selecting that which is central to the thrust of the argument, presenting this succinctly, but at the same time not sacrificing accuracy or seriousness of interpretation is what it is all about. Again, for most audiences, the aim is simplicity without trivialisation.

Advantages and disadvantages of trails

INTERPRETIVE ADVANTAGES	INTERPRETIVE DISADVANTAGES
☐ Distance learning packages (trails) encourage interpretation by throwing responsibility of learning onto the participant - there are advantages in NOT having `staff' immediately on hand. ☐ Shrewdly written, trails can provide reassurance and support for the hesitant interpreter. ☐ No mark on the landscape - can offer interpretation whilst not destroying the environmental experience of others by intrusive, inescapable interpretative control (e.g. interpretation panels). ☐ Discusses features *in situ* so the participants can experience / interpret a tangible environment in the field. ☐ Provides an effective means of structurally linking sequence of otherwise isolated features. ☐ Provides self-paced interpretation at a speed selected for the convenience of the audience. ☐ Good scene-setter. Encourages people to explore area. ☐ Can provide off-site reference book / souvenir / landscape companion.	☐ Difficult to incorporate exciting or lively communication techniques. ☐ Difficult to be interactive - only allow one-way communication. ☐ Lack element of personal contact. ☐ Impossible for a trail to respond to spontaneous events which might occur. ☐ Hard to adapt to the needs of all the various potential audiences. ☐ Tend NOT to appeal to the full cross-section of the general public and rarely sell well. Therefore hard to promote. ☐ Difficult to use in poor weather. ☐ Probably used on site only once by a visitor, even if site subsequently visited. ☐ Trails are easy to write but difficult to write well.
MANAGEMENT ADVANTAGES	**MANAGEMENT DISADVANTAGES**
☐ Cheap alternative to most other forms of interpretation (e.g. permanent staff, panels, tape). ☐ Allows access at any time. ☐ Large numbers can be catered for with relative ease. ☐ Takes people through an area in such a way as to minimise damage. ☐ Can direct people to areas which can stand up to heavy use and relieves pressure on more fragile areas. ☐ Stops people getting lost. ☐ Puts people at ease by making it clear that they are safe from natural hazards and from accusations of trespass. ☐ Can reach audiences far from site.	☐ Trails focus people so can lead to erosion or excessive trampling on paths or around points of interest. ☐ Pauses on trails can cause congestion if path is used by non-trail users. ☐ Liability may increase if a trail is published. Costs for maintenance may be higher than first expected because of need to provide and maintain safe access. ☐ Instruction posts may cause vandalism. ☐ Vending points for un-staffed sites a problem.

Constructing Trails: further reading

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Appendix 3: Interpreting Geology at Charmouth Heritage Coast Centre, Dorset: A Summative Evaluation (T. A. Hose).

1. Seaside recreation and recreational geologists

1.1 A world class heritage

The popularity of fossil hunting along the actively eroding coast of Dorset can be readily witnessed in the Charmouth to Lyme Regis area both during and outside of the traditional holiday season. The international value of the area to geology and the consequent need for some geological conservation has been underlined by a relatively recent proposal:

> *"The geological importance of the Dorset coast is perhaps most graphically illustrated by its appearance in a UNESCO list of Provisional World Heritage Sites .... for its classic Jurassic-Cretaceous sequences and coastal geomorphology. If we consider that geological World Heritage Sites currently include the Grand Canyon, the Hawaiian volcanoes and Yosemite National Park, then we can begin to see the importance of this stretch of the coastline."* (Anon, 1994).

Dorset's coast has been significant in the development of both geology as a formal science and its exploitation for commercial gain. This is due to the presence of well-preserved fossil material in the local rocks which led to the development of a trade supplying specimens primarily to tourists and private collections in Britain.

1.2 Seasonal geology

Whilst the warm summer weather makes the searching for, and collecting of, fossils a pleasure, it is during the cooler weather of the winter and spring storms that the best fossils are exposed by wave action and rock fall. Also, the leafless trees and the relative absence of weeds (especially nettles, bracken and brambles!) of the out-of-season short, cool late autumn to early spring months, make it easier to examine rock exposures and appreciate rock structures. Recreational geology, of which fossil hunting and collecting is a component, unlike many other forms of countryside recreation, is not really limited by the seasons. Hence, it could extend the tourism season and offer enhanced employment prospects in the catering and hospitality sectors, and in giftware and souvenior production; the latter is already well exploited at both Lyme Regis and Charmouth. Naturally, however, there is now increasing concern within Dorset and elsewhere for both the conservation of important geological sites **and** their contained fossils and for the safety of the public and recreational geologists.

1.2 Geotourism, or site-specific geological interpretation

Given that interpretation has the:

> *".... dual purposes of serving the best interests of the visitors who come to see and exsperience a site and also those of the place itself. Good interpretation will raise the value of a site in the eyes of those*

> *who come to visit; greater value will lead to greater conviction of the need to preserve and protect".* (Herbert, 1989),

an interpretive strategy for these coastal localities could help raise public awareness of the importance of, and need to conserve, England's rich geological heritage. They have, as possible points of contact between geological conservationists and the public, much educational and promotional potential. Recognising the popularity of fossil hunting and collecting and the educational value, promotional possibilities and economic potential of site-specific geological interpretation, the concept of geotourism has been developed as:

> *"The provision of interpretive and service facilities to enable tourists to acquire knowledge and understanding of the geology and geomorphology of a site (including its contribution to the development of the Earth sciences) beyond the level of mere aesthetic appreciation."* (Hose, 1995).

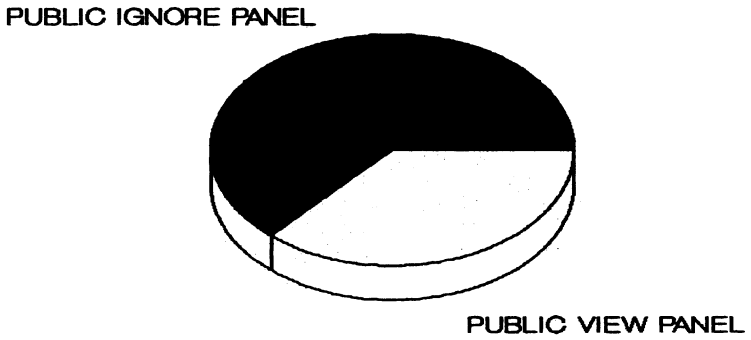
Consequently, research (Hose, 1994, 1995, 1996) has been undertaken at numerous interpreted geological sites (including museums) in England to gain an understanding of the nature and needs of users of such identified sites; Charmouth was surveyed in the summer of 1994.

2. Charmouth Heritage Coast

2.1 The site

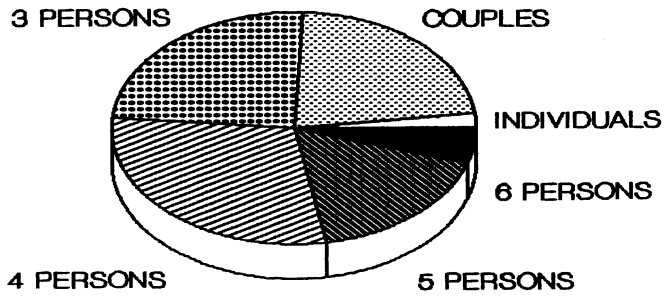
Charmouth is a large, quiet Dorset seaside village some 200 km south-west of London. Its coastal frontage is both a recreational tourism and a popular fossil hunting and collecting site. The area really became famous, along with its neighbour Lyme Regis, amongst geologists in the early nineteenth century though the activities of commercial fossil collectors such as Mary Anning. Subsequently, considerably scientific research has been carried out in the area, consolidating the importance of the geological exposures. The term 'Lias' is probably Celtic in origin, meaning layered, and aptly describes the appearance of the thinly-bedded, 'Lower Lias' deposits comprising shales alternating with limestones in the tall, highly unstable cliffs near Lyme Regis (higher levels in the sequence, near Charmouth are however more massively bedded shales and marls). These Lower Lias rocks are of Lower Jurassic age and were laid down in a fairly deep tropical sea where only the finest muds from distant shores could reach. These sea floor muds became today's thin limestones, shales and clays often rich in the fossils of extinct sea creatures such as the free-swimming, cuttlefish-like belemnites, the coil-shelled squid-like ammonites, also sharks, bony fish and reptiles such as the dolphin-like ichthyosaurs. The nature of the rock layers and their local dip, coupled with the sea conditions and climate have led to spectacular land slips and rockfalls. The disturbed ground often supports uncommon animals and plants and it can consequently be of national biological significance. The area's geology is well detailed, with itineries in recent field guides (Allison, 1992; House, 1993). The interpreter's challenge, then, was to select and explain those elements of the area's geology and geomorphology most likely to be appreciated and understood by both casual recreationalists and geology enthusiasts.

CHARMOUTH HERITAGE COAST
Response to Geology Interpretive Panel



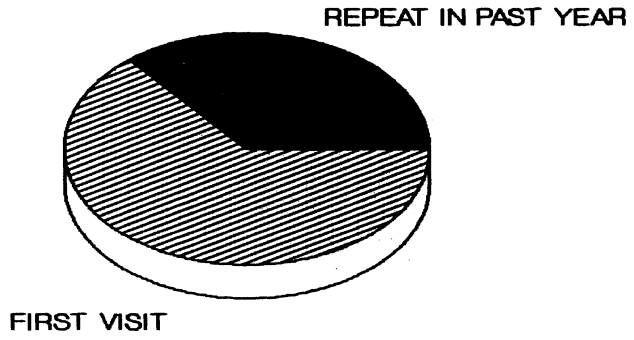
[Figure 1]

CHARMOUTH HERITAGE COAST CENTRE
Respondents' Party Size



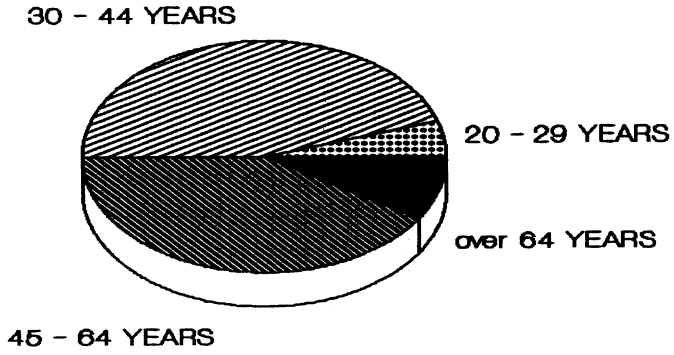
[Figure 2]

CHARMOUTH HERITAGE COAST CENTRE
Respondents' Site Visitation



[Figure 3]

CHARMOUTH HERITAGE COAST CENTRE
Age Profile of All Interviewees



[Figure 4]

2.2 Charmouth Heritage Coast Centre

Adjacent to the pay-and-display sea front car park at Charmouth is the Charmouth Heritage Coast Visitor Centre, opened in 1985, to which admission is free. It has some 30 to 35,000 annual visitors. The Centre is on the first floor of an old stone-built cement factory; underneath are a commercially operated cafe, geology and general souvenir stores. The displays, mainly installed in 1986, are a mixture of traditional panels, specimen cases and 'hands-on' facilities. Whilst these are predominantly on geology, space is also found for information on local history, weather and wildlife. A small cold marine aquarium feature is also present. In 1993 an audio-visual facility, for which a nominal admission fee is charged, was opened; it shows a populist slide-tape presentation, very professionally prepared by the Centre's Warden, on the local fossils. Lastly, a fairly well stocked souvenir and publications desk is present. The warden also provides a free fossil identification service for visitors. In addition to the displays and other activities, the Warden also leads, for a nominal fee, guided geology and general natural history walks. Outside of the Centre, three full-colour interpretive panels, on an angled stone plinth overlooking the car park, on the topography, wildlife and geology of the adjacent heritage coast are present. All were designed and erected by Dorset County Council. The geology panel has similar graphics to one of the Centre's main displays.

3. Methodology

3.1 The surveys

A summative evaluation (Screven, 1976), to assess the Centre's interpretive effectiveness was undertaken in the summer of 1994. Both structured interviews and a respondent-completed questionnaire were used. The former were undertaken during the period 21 to 27 August 1994. The latter were available during August 1994. Informal observation and tracking, both during the guided geology walks led by the Centre's Warden and outside of the interview periods, was also carried out during the period 21 to 27 August 1994. Additionally, during the periods 25 to 26 June 1994 and 3 July 1994, visitors' response to the interpretive panels, and especially that for geology, in the car park was observed and recorded over some 6.17 hours. However, interviews, to assess the communicative effectiveness of the geology panel were suspended when it was found that very few interviewees had actually read it!

3.2 The interviews

Visitors using the Centre were selected for interview (during two-hour survey blocks: 11.00 am to 1.00 pm and 2.00 pm to 4.00 pm) on a first-past-the-post basis as they exited the building; 58 interviews (90% response rate) were completed, the commonest reason given for refusal being the need to return to a vehicle before the parking ticket expired. Two illustrated prompt cards were used; one on common British Fossils and one a colour reproduction of the large Jurassic seascape panorama displayed in the Centre. The prompt cards were designed to assess interviewees' prior and site acquired knowledge. The respondent-completed questionnaires, highlighted by a small illustrated collection box at the Centre's entrance, were available from both the desk and by the exit; they were also issued to those participating in the guided geology walks led by the Centre's Warden and 143 questionnaires were returned.

Low-level graphic analysis of some of the data is presented in the figures and is also considered in the following summary.

4. An evaluation

4.1 Visitor demography

Two-thirds of visitors were first time arrivals (Figure 3) and many were casual arrivals. The importance of the area as a family holiday venue, with about two-thirds of respondents arriving in family groups, is clear; about one quarter of respondents (Figure 2) arrived alone or in couples. Over four-fifths of respondents were aged either 30-44 years or 45-64 years with a roughly equal split between the two age groups (Figure 4). This was a more or less equal tripartite split between minimum schooling, 'A'-level and tertiary (Figure 6) levels of respondents' initial education study. For those who read newspapers (Figure 5), tabloids were an important (approaching one third) component; regional newspapers were also widely taken and broadsheet readership was undertaken by about one-fifth of respondents. Significantly, compared with other sites, one-third of respondents had studied geology to some level; indeed, a fifth had studied the subject as a hobby (Figure 7).

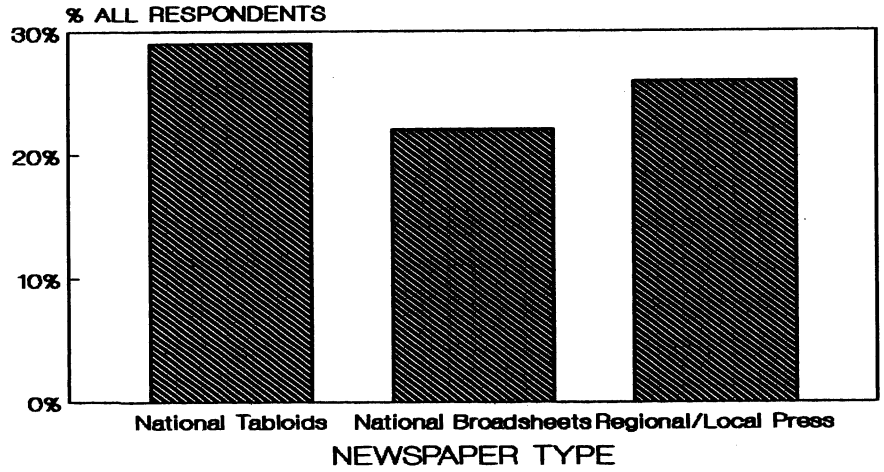
4.2 Visitor responses

The attracting and holding power (Bitgood, Finlay and Woehr, 1986) of the car park's interpretive panels was clearly somewhat limited (Figure 1); the pattern and amount of usage was similar to that found in studies (Bitgood, Paterson, Benefield & Roper, 1986) in the USA in which signs were shown to generally attract and hold only some 8% to 40% of visitors. At Charmouth, panel usage was greatest in the afternoon, when it was cooler, and at high tide. There was a wide variation between the maximum viewing (4.36 minutes) and the minimum (0.03 minutes) viewing times; the mean time of 1.04 minutes roughly equated to the minimum time required to read and digest the panel's contents. Within the Heritage Centre much visitor activity, especially for the children, focused on the handling section; this often became the main point of social exchange within the building. The bulk of retail purchases centred upon inexpensive themed (Centre, geological and dinosaur) souvenir items such as postcards, pens, pencils, pencil sharpeners and erasers.

4.3 The rocks and their remains understood?

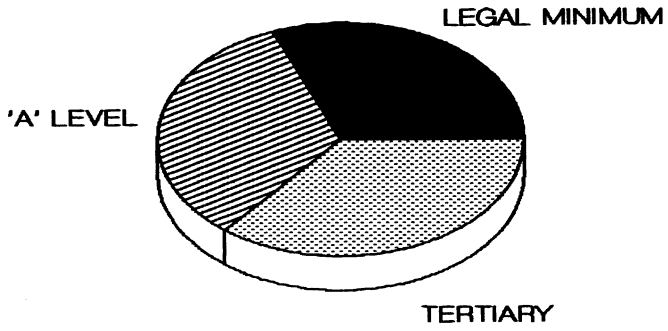
Only a fifth of the interviewees could recall that the area's rocks are of Jurassic age. The influence of popular culture, with the ability to name the Jurassic system (the major film 'Jurassic Park' was fresh in most people's minds at the time), is obvious (Figure 9). The Cretaceous was recognised by about one-quarter and the Devonian by a fifth of interviewees. Again, only a quarter could accurately recall the palaeogeography as that of a 'tropical sea'. Almost four-fifths of interviewees correctly recognised the local rocks as sedimentary; a tiny minority thought both igneous and sedimentary rocks were present. Three-quarters of interviewees recognised shale as the principal rock type; the importance of limestone, clay and sandstone was also noted by at least half of the interviewees (Figure 12). Almost three-quarters of interviewees could recognise an ammonite. Other common local fossils, such as belemnites and bivalve molluscs were identified (Figure 8) by just over a third of interviewees. Sharks' teeth (four-fifths) and trilobites (just over one-third) were also

CHARMOUTH HERITAGE COAST CENTRE
Respondents' Newspaper Readership



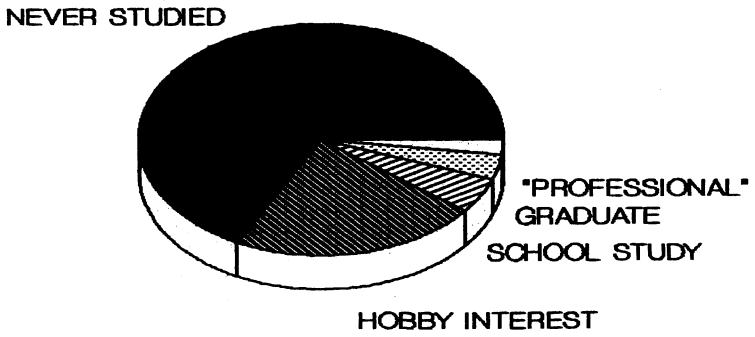
[Figure 5]

CHARMOUTH HERITAGE COAST CENTRE
Respondents' Initial Education Level



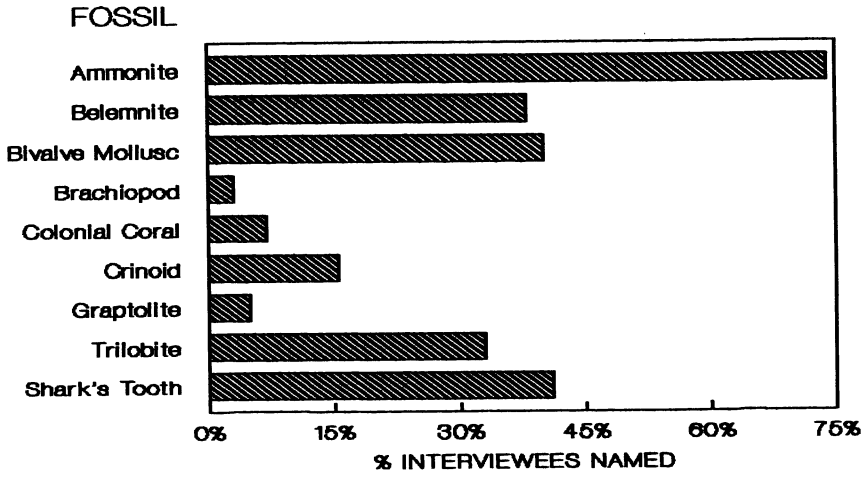
[Figure 6]

CHARMOUTH HERITAGE COAST CENTRE
Respondents' Geological Education Level



[Figure 7]

CHARMOUTH HERITAGE COAST CENTRE
Interviewees' Common Fossil Recognition



[Figure 8]

identified by interviewees. The majority of interviewees correctly identified ammonites as a local fossil. Just over half of the interviewees also knew that belemnites could be found in the rocks (Figure 10). Other important local fossils were generally unknown to most interviewees. The information recall from the large panoramic picture display (Figure 11) was disappointing. About a third of interviewees correctly identified the plesiosaur and the ichthyosaur. Belemnites were identified by a sixth of the interviewees; the other illustrated fossils were either not identified or were recognised by only about a tenth of the interviewees.

4.4 Supplementary observations?

During informal observation and tracking it was noted that the clear warnings, within the Centre's displays, on the adjacent interpretive panels and within the numerous geology field guides and leaflets, on the dangers of collecting beneath the area's unstable cliffs and to collect (in the interests of conservation) only from loose blocks were ignored by numerous individuals; this, despite several large and spectacular rockfalls during the period of the survey. Observation within the Centre evidenced the reluctance of the public to purchase even inexpensive geological publications; on two occasions relatively expensive, unplanned, purchases of geological hammers and safety goggles, were made but very inexpensive leaflets showing where fossils could be found were declined! Specifically geological publications, whether inexpensive leaflets or reasonably priced books, were generally examined by browsers but not purchased, suggesting that greater attention needs to be paid to the graphic format, textual style and intellectual content of such material.

5. In summary

5.1 Implications

The recognition of some of the area's commoner fossils suggests that given sufficient exposure, the public can recall geological terms. The poor recall rates for the panoramic diorama indicates that full-colour illustrations might not be an effective interpretive vehicle. Observations on the three interpretive panels clearly indicates that information on geology presently cannot compete with other natural history and general heritage material; it needs to be presented either in isolation or integrated within a themed landscape approach.

5.2 Closing thoughts

There is potential for the development of geological attractions. However, such developments, to be successful, require consideration of further more detailed analyses of visitors to existing provision. In conclusion, a comment from a study on recreational geology in Australia, where participants are colourfully termed 'fossickers', seems apposite, since:

> *"Fossicking provides economic and social benefits.... It also encourages appreciation of the cultural and natural environment, especially for the less experienced fossicker. The results of analysis will hopefully contribute to better marketing and management of fossicking opportunities...."* (Jenkins, 1992).

Acknowledgements

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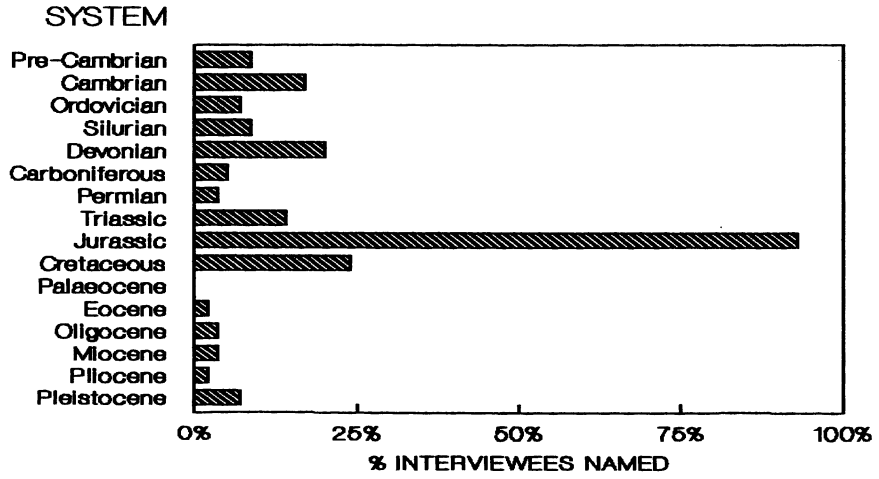
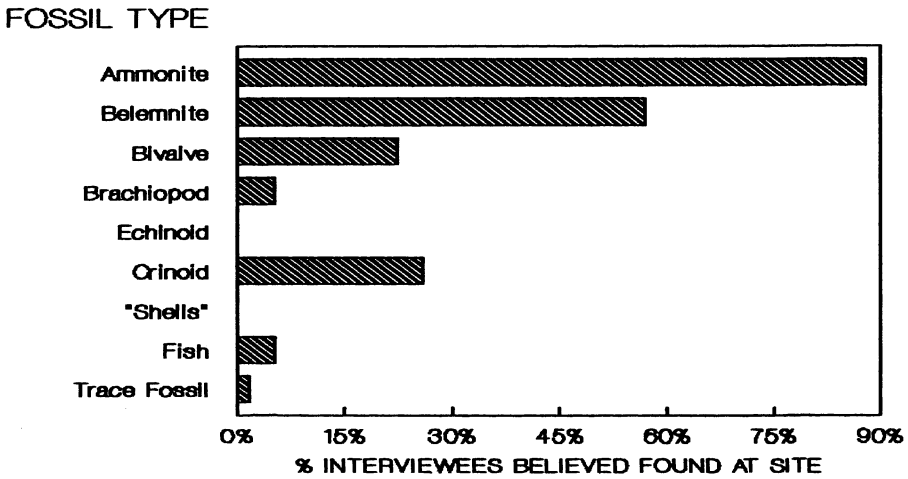
CHARMOUTH HERITAGE COAST CENTRE
Interviewees' Named Geological Systems



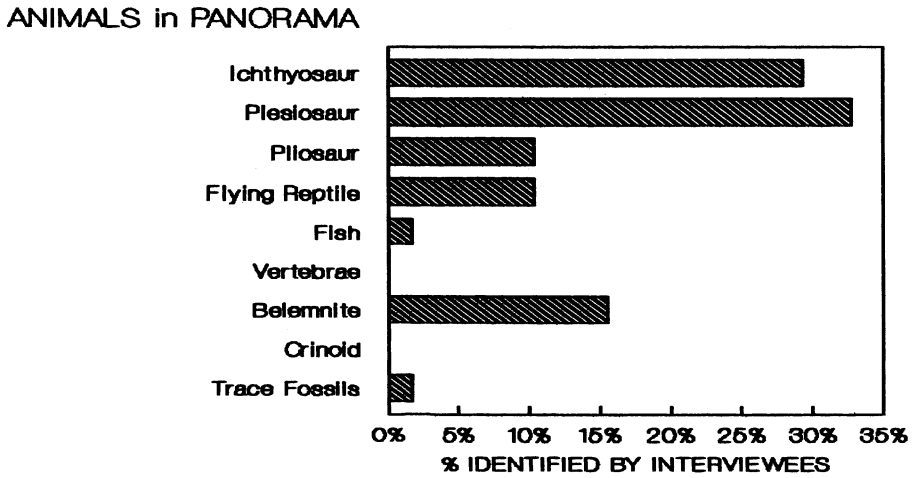
[Figure 9]

CHARMOUTH HERITAGE COAST CENTRE
Fossils Interviewees Believed at Site



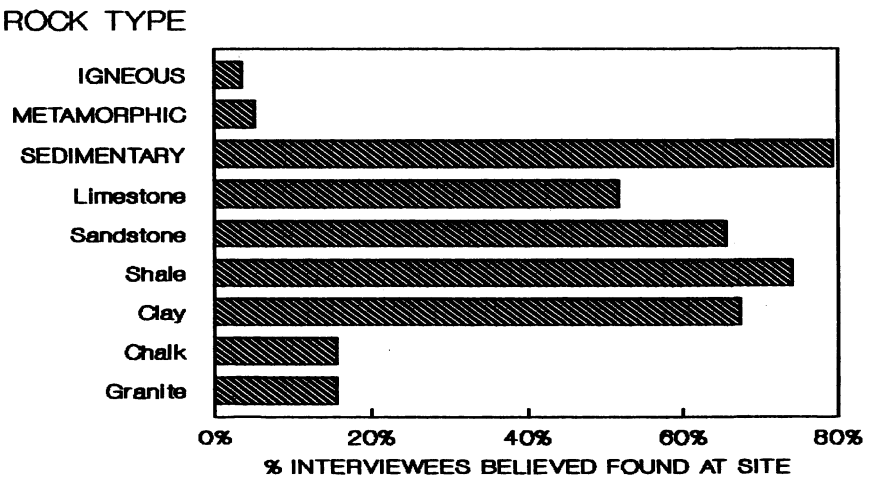
[Figure 10]

CHARMOUTH HERITAGE COAST CENTRE
Fossil Animals Identified in Panorama



[Figure 11]

CHARMOUTH HERITAGE COAST CENTRE
Rocks Interviewees Believed at Site



[Figure 12]

Appendix 4: Nature Conservancy Council and English Nature Earth Heritage Conservation and Interpretive Publications of relevance to England (N.B. some publications are now out of print)

BULLARD, D.W. and MORRIS, L. 1989. *Malvern Hills: A student's guide to the geology of the Malverns*. NCC, 73 pp (available from Thematic Trails).

CUTLER, A., OLIVER, P.G. and REID, C.G.R. 1990. *Wren's Nest National Nature Reserve, Geological Handbook and Field Guide*. Dudley Leisure Services Department and NCC, 29 pp. (available from Dudley Leisure Services).

DUFF, K.L. (ed.). 1985. *The story of Swanscombe Man*, Kent County Council and NCC, 40 pp.

DUFF, K.L., McKIRDY, A.P. and HARLEY, M.J. (Eds) 1985. *New Sites for Old; a student's guide to the geology of the east Mendips*, NCC, 192 pp (available from Thematic Trails).

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ENGLISH NATURE, 1991a. *Earth Science Conservation for Farmers and Landlowners*, EN, 3pp.

ENGLISH NATURE, 1991b. *Earth Science Conservation for landfill Managers*, EN, 3pp.

ENGLISH NATURE, 1991c. *Earth Science Conservation for Teachers and Lecturers*, EN, 3pp.

ENGLISH NATURE, 1992a. *Earth Science Conservation for the mineral extraction industry*, EN, 3pp.

ENGLISH NATURE, 1992b. *Fossil collecting and conservation*, EN, Peterborough, 3pp.

ENGLISH NATURE, 1992c. *Earth Science Conservation for District Planners*, EN, 3pp.

ENGLISH NATURE. 1993. *Pre split smooth blasting*, EN video.

ENGLISH NATURE. 1996. *Conserving England's Earth Heritage*, EN (folded leaflet).

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HAMBLIN, R.J.O., WARWICK, G.T. and WHITE, D.E. 1978. *Geological Handbook for the Wrens Nest National Nature Reserve*, NCC, 10pp.

HARLEY, M. 1988. *Wenlock Edge; a geology teaching trail,* NCC, 22 pp (available from Thematic Trails).

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JOHNSON, G.A.L. 1963. The geology of Moor House: a National Nature Reserve. *Monographs of the Nature Conservancy* **2,** 182 pp.

KEENE, P., & HARLEY, M. 1987. *Burrator, Dartmoor landform trail,* Peterborough, NCC, 22 pp. (available from Thematic Trails).

LARWOOD, J.G. 1992. *Have you seen the Grinshill Rhyncosaur,* EN (leaflet).

LARWOOD, J.G. and MARKHAM, D. 1995. *Roads and geological conservation, a discussion document,* EN [28 pp]

LAWSON, J.D. 1977. *Mortimer Forest, Geological Trail,* NCC, 16 pp.

MACFADYEN, W.A. 1970. *Geological highlights of the West Country - a Nature Conservancy Handbook,* Butterworths, 296 pp.

MATHIESON, A. 1981 *Staple Edge, Geology Teaching Trail,* NCC, 24 pp.

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NATURE CONSERVANCY COUNCIL 197? *Wren's Nest, National Nature Reserve,* NCC, 20 pp.

NATURE CONSERVANCY COUNCIL 1977. *Axmouth to Lyme Regis Undercliffs National Nature Reserve,* NCC (folded leaflet).

NATURE CONSERVANCY COUNCIL 1977. *East Anglia: localities of geomorphological importance,* NCC, 52 pp.

NATURE CONSERVANCY COUNCIL 1978. *The last Glaciation* (folded leaflet) NCC.

NATURE CONSERVANCY COUNCIL 1980. *The conservation of limestone pavements,* NCC, 7 pp.

NATURE CONSERVANCY COUNCIL 1982. *The conservation of limestone pavements,* NCC, 9 pp.

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NATURE CONSERVANCY COUNCIL 1987. *Cherry Gardens Railway Cutting, geological site description,* NCC, 2 pp.

NATURE CONSERVANCY COUNCIL 1989. *Cowraik, geological site description,* NCC, 2 pp.

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PAGE, K.N., KEENE, P., EDMONDS, R.P.N. and HOSE, T.A. 1996. *Earth Heritage site interpretation in England: a review of principle techniques with case studies.* English Nature Research Report 176, EN.

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Appendix 5. Earth Heritage site interpretation - a review of general principles and techniques

Page (1992) reviewed some basic principles which should be taken into account when considering any site-interpretive scheme - these guidelines are summarised in a modified form below:

The definitions of interpretation

Interpretation is "... an educational activity which aims to reveal meanings and relationships through the use of original objects by first hand experience and by illustrative media, rather than simply to communicate factual information."

Tilden (1967).

Environmental interpretation is therefore "... the act of explaining or revealing the character of an area through inter-relationships between rocks, soil, plants and man to... visitors in the field, with preparation and follow-up usually in thematic or story form, to increase visitor awareness of the significance of the site visited and the desire to conserve it."

Aldridge (1975).

The principles of countryside interpretation

The following basic principles for interpretation are widely applicable and quite relevant in the context of a conserved geological site:

a. "Some sites do not need interpreting at all. They speak for themselves and to place a communicative medium between the feature and the visitor could diminish or destroy the experience."

b. "Interpretation provides more than factual information, it should explain features and provoke a response."

c. Interpretation should present a complete picture, emphasising relationships between the parts."

d. "The interpretive message is more likely to be understood if developed as a theme or story, rather than disjointed facts."

e. "To achieve maximum understanding, interpretation should relate what is being displayed or described to something within the personality [or experience] of the visitor."

f. "Visitors take part in interpretation from choice - it therefore must be enjoyable or they will switch off."

g. "Interpretive programmes should be geared to specific age and interest groups."

h. "Visitors are likely to gain a greater appreciation of the story if encouraged to interact."

d. Publicity for and promotion of the scheme is usually important for adequately meeting the primary objectives for installation of the interpretive facility by the promoting organisation.

e. Monitoring the impact of the scheme is essential for assessing whether the primary objectives have been achieved. Is adequate staff time or other resources available?

f. Based on information gleaned by monitoring the interpretive scheme, would the installation benefit from modification at some later date? (for instance when it has 'worn out').

7. **Where, when and how should the site be interpreted?**

a. What type of interpretive method would be most appropriate for the site? Is a sign, a trail or even a centre suitable? Can any of these methods be justified in terms of the level of site use and resources available?

b. Are there any other sites in the area or region which would be better suited and still fulfil your aims for a proposed interpretation scheme?

c. Can interpretation at the site be fitted into a wider regional program, and if so, would delaying implementation allow the development of a better integrated and more effective regional network of related schemes?

i. "Subject specialists are not necessarily expert communicators - particularly to the general public and *vice versa*. Therefore the preparation of an inter-active programme is best achieved by a combined exercise between subject and communications specialists."

(Countryside Commission 1977, 1987)

Planning for interpretation

When planning an interpretive scheme at a site a number of questions should be asked; which will not only help decide whether a scheme is appropriate but will also help determine what type of scheme has potential:

1. **Why provide interpretive facilities?** What are your objectives?

2. **What features could be interpreted?** What are the themes and stories that can be developed to meet your objectives?

    a. What geological or geomorphological features exist at the site? As a general hint, for geological SSSIs, the Geological Conservation Review (GCR) site-selection subject blocks form a useful way of characterising key aspects of the interest. There may, of course, be other earth science features at a site not mentioned in any notification documents or available literature, so expert advice from geologists who know the site is usually very useful.

    b. Are there any features of wildlife, archaeological or historical importance which should be referred to in the site interpretation? There is often a strong link between biological and man-made features and a site's geological or geomorphological context. Expert advice from ecological, archaeological or local history experts in organisations such as English Nature, Countryside Commission, Wildlife Trusts or English Heritage is appropriate here.

    c. Does the site have any special potential for interpretation? eg appropriate buildings, viewpoints, a conservation-sensitive owner such as a local authority or voluntary organisation, or available finance for interpretation through collaborative schemes with the site owner.

    d. What information on the site is available? (eg published papers, unpublished descriptions, photographs, maps, etc). How can this information be gathered? Is adequate staff time and finance available for this research or can it be (reliably!) contracted out?

    e. Has the site potential for the direct labelling or marking of features present and thereby increasing the effectiveness of the interpretation?

3. **For whom are you interpreting?** What sort of audience visits the site or what sort of audience would you **like** to visit the site? What does the audience itself want from the interpretation?

    The number, characteristics, distribution and needs of visitors will influence the depth of interpretation, its exact location and subsequent management - important considerations are:

a. What scale of site use is anticipated? How many people are known to visit the site?

b. What is known of the types of visitor to the site, and their relative numbers?

Major groups are likely to be:

i. General public with little or no scientific or conservation background (including both local people and tourists)

ii. Educational groups from schools and colleges with little or low background knowledge.

iii. University, academic and amateur geological groups with a basic or strong science or geological background.

iv. Amateur conservationists, natural history enthusiasts, archaeologists and historians with an interest in the environment but with no specialist knowledge of earth sciences.

v. Landowners, industrialists, local government officers, and other site owners, operators or developers who may have little or no scientific background but who may be strongly affected by conservation methods.

c. What aspects of the site's interest will be of most interest to the group or groups to be targeted by the interpretation? (Groups as outlined above.)

d. Can facilities be made available for groups with special needs? For instance, can the facility be made accessible for people with physical disabilities.

4. What constraints on the interpretive scheme does the site itself present?

a. What interpretive facilities elsewhere in the area might influence or be influenced by facilities provided at this site?

b. Are there any other sites where the features might be better or more appropriately explained?

c. What is the size, character and present use of the site and its relationships to other areas?

d. How accessible is it from population centres? Can it be reached by public transport, private car only or by foot?

e. Is access to the site adequate? eg will approach roads be able to take the extra traffic? Can the site take the extra visitors?

f. Would the interpretation affect nearby communities? Beneficially? Harmfully?

g. Are there facilities to distribution of materials such as leaflets and guides?

5. **What constraints might there be on establishing the interpretation scheme?**

a. What environmental or physical constraints could restrict the use of the site? ie are there any ecologically or geologically sensitive areas? Are any areas dangerous?

b. What level of visitor use could the sites' surroundings support? How much car-parking space is available? Are there nearby refreshment or toilet facilities? Are there litter bins?

c. What legal or administrative constraints could restrict site development? eg planning permission needed and would it be forthcoming? Does the landowner or occupier fully support the scheme?

d. What financial constraints could prevent or restrict development? eg how much finance is available to support the scheme, and from where would it be forthcoming? Would conditions attached to any potential funding be deleterious to the aims of the information board scheme, the site, or the promoting organisation?

e. Is sufficient staff time available to develop the project, from conception, through production to installation?

f. Would the interpretive scheme affect any management agreements or long-term management plans applied to the site? Would the effect be beneficial or harmful.

6. **What subsequent management is necessary?** Is staff time and finance available to monitor, maintain or man the interpretive facility?

Installation of a site interpretative facility is not the end of the installers responsibility. Subsequent management is essential to ensure adequate maintenance of both the facility and the site itself. Important points to consider are:

a. Can the site be adequately maintained? eg vegetation clearance and grass cutting (if appropriate), fence maintenance, path maintenance. Is adequate staff time available (including in a managerial capacity)? Is finance available?

b. Can the facility be adequately maintained? What provisions can be made to replace or repair the facility if it is damaged? Is adequate staff time available (including in a managerial capacity)? Is finance available?

c. Is the likelihood of damage or vandalism so great as to effectively prohibit installation of any facility or markers on site?