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The Group is affiliated to the Geological Society of London. It was founded in 1974 to improve the status of geology in museums and similar institutions, and to improve the standard of geological curation in general by:

- holding meetings to promote the exchange of information
- providing information and advice on all matters relating to geology in museums
- the surveillance of collections of geological specimens and information with a view to ensuring their well being
- the maintenance of a code of practice for the curation and deployment of collections
- the advancement of the documentation and conservation of geological sites
- initiating and conducting surveys relating to the aims of the Group.

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Cover: Two geological standing stones in Rochdale Public Cemetery. See article by A. Baldwin and D.M. Alderson, p. 227-231.

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GEOLOGICAL CURATORS' GROUP - October 1996

AN UNUSUAL METHOD OF MOUNTING AN ICHTHYOSAUR

by W. Lindsay and G.M. Comerford

Lindsay, W. and Comerford, G.M. 1996. An unusual method of mounting an ichthyosaur. *The Geological Curator* 6(6): 221-225.

Conservation approaches to the restoration of an ichthyosaur *Eurhinosaurus longirostris* (Mantell), BMNH R3938, at the Natural History Museum, London are described. In the process of the work the original mounting methods were uncovered, clarifying uncertainties about the conservation state of the specimen caused by the presence of sulphur.

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Introduction

The treasures of the Natural History Museum, London include one of the most extensive collections of Jurassic marine reptiles gathered under one roof. Unfortunately, a leak in one gallery roof meant that many of the wall mounted specimens of ichthyosaurs and plesiosaurs had to be removed in 1987 for conservation work to be carried out (Cornish, Doyle and Swannell 1995). One of the commonest conservation problems associated with specimens of Jurassic marine reptiles is that of pyrite decay. Since the presence of sulphurous precipitates on the surface of specimens containing pyrite is an indication of decay, finding that sulphur had been used as a mounting agent in a specimen of *Eurhinosaurus longirostris* was, at the least, surprising. This paper describes the unusual mounting methods used in this ichthyosaur and the conservation work undertaken.

The specimen and its condition

Eurhinosaurus longirostris (Mantell), BMNH R3938 (Figure 1) was one of many specimens removed from the Natural History Museum's eastern galleries following exposure to damp on the gallery wall. It measures 1650mm x 600mm x 70mm in its frame. The specimen, from the Upper Lias of Holzmaden, Germany, consisted of a well preserved but distorted skull with an unusually short lower jaw and was purchased in 1912 from B. Hauff. Although it appears that the fossil material is embedded in a slab of shale matrix a joint around the perimeter of the fossil suggested a more complex construction. A set of filled holes around the edge of the shale slab revealed steel screws by which it was held in place. The underside of the specimen was covered by tightly fitted wooden boards and the whole specimen was framed in polished wood.

Damage caused by exposure to damp conditions was visible on the surface of the specimen. This took the form of a group of major cracks, radiating outwards from a raised area at the back of the skull roof, and passed through the surrounding shale to the extremities of the block. Cracks had also opened around the rear perimeter of the skull where matrix close to the fossil had been attached to the surrounding slab (Figure 2). The indications were that, as in other specimens in our experience, pyrite decay was active in the matrix below the skull roof forcing the fossil upward. The tell-tale smell of sulphur seemed to confirm this diagnosis and sulphur was identified by x-ray diffraction from fragments in the cracks

Dissecting the mount

Our scheme of work was to remove the wooden base, expose the decaying area of matrix and fossil from the rear which could be treated. Following this, a new support would be fixed to the back of the specimen and the cracks on the front surface would be consolidated and cracks filled

Since most of the work would be done on the underside, it was necessary to lay the specimen face down. In order to do this safely, a support was required for the front surface. Having removed the screws from the front, we consolidated the exposed bone with Alvar 1570 (polyvinyl acetal) and the gaps were filled with Alvar/ Jute/Kaolin/Sepiolite (AJKS) dough. Polyvinyl alcohol

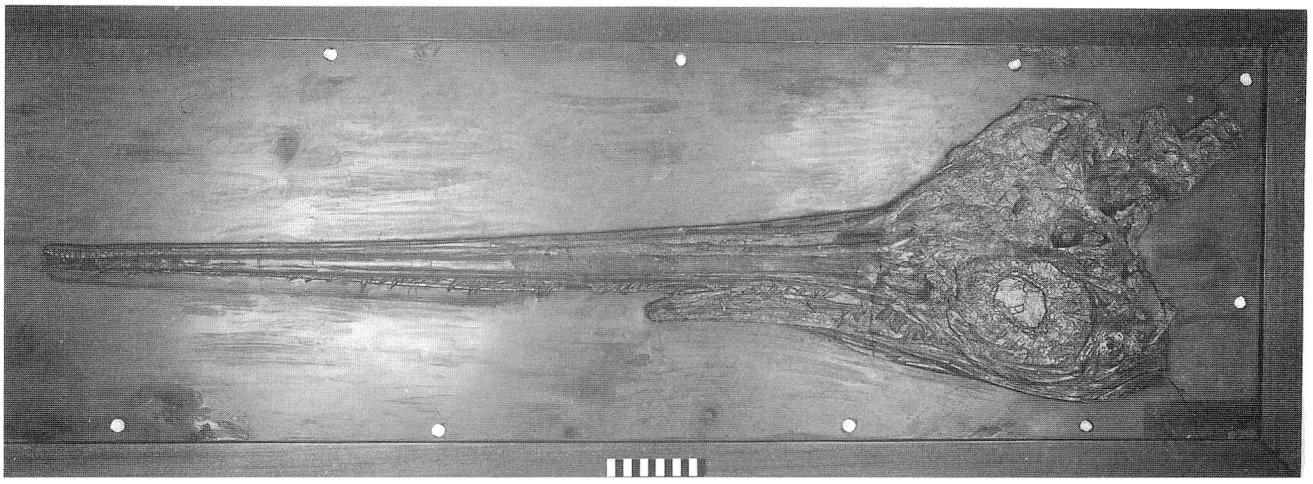


Figure 1. *Eurhinosaurus longirostris* (Mantell), BMNH R3938 before work began. Cracks and plaster filled screw holes are visible.

was applied as a separator to the surface of the specimen and several layers of M Polymer 3100 (Wacker Silicone) were spread over the whole surface including the wooden frame. This was covered with a jacket of polyester resin and glass fibre, the rubber and plastic together providing good protection for the surface of the specimen. Before turning, the jacket was tightly strapped in place and a layer of polyether foam beneath the inverted specimen cushioned the whole structure.

Although removal of the wooden base had seemed a straightforward task it took considerable time and effort. The base was made up of three layers of tightly glued wooden boards. The upper and lower set ran laterally, while the middle layer ran longitudinally. In the region of the skull roof the wooden base was thinner to accomodate a greater thickness of matrix. Each layer was fixed to the next with animal glue and wire nails, hammered through from the upper, front surface. An inner frame had been fixed around the perimeter of the wooden base with large nails and hidden from external view by a polished wooden veneer. Although the glue was soluble in water we avoided this because of the suspected pyrite and the boards were carefully and painstakingly removed with a hammer, chisel, saw and jemmy (Figure 3).

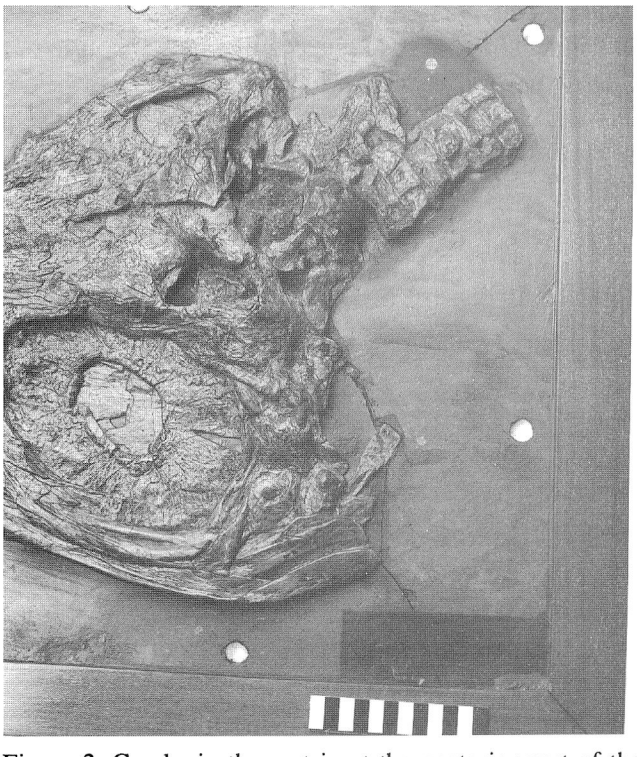


Figure 2. Cracks in the matrix at the posterior part of the skull.

The wooden base was underlain by a layer of bituminous felt in three pieces. The felt passed down around the edge of the slab towards the surface and was fixed in place by the wire nails. The process of discovery continued as the felt layer was removed, revealing a cage of chicken wire nailed to the preceding layers and embedded in a patchy bituminous cement (Figure 4). Chicken wire has been identified by radiography in other mounted specimens of ichthyosaurs (Branca 1907). Beneath the cement was a layer of yellow/ brown crystalline sulphur (Figure 5).

Sulphur might be interpreted mistakenly as a particular consequence of or association with the decay of pyrite in high humidity environments. However, the products of pyrite oxidation are yellow and white hydrated ferrous sulphates, as well as sulphuric acid, commonly detected by sight and smell. The chemical reactivity and structure of elemental sulphur are quite distinct from those products of iron sulphide decay. This use of sulphur as a supporting medium was a surprise to us but had no connection with any percieved pyrite decay in the specimen. In the event, the most significant deterioration of the fossil was the structural damage caused, probably, by previous minor pyrite decay within the specimen and by the response of the shale surround to changing environmental conditions.

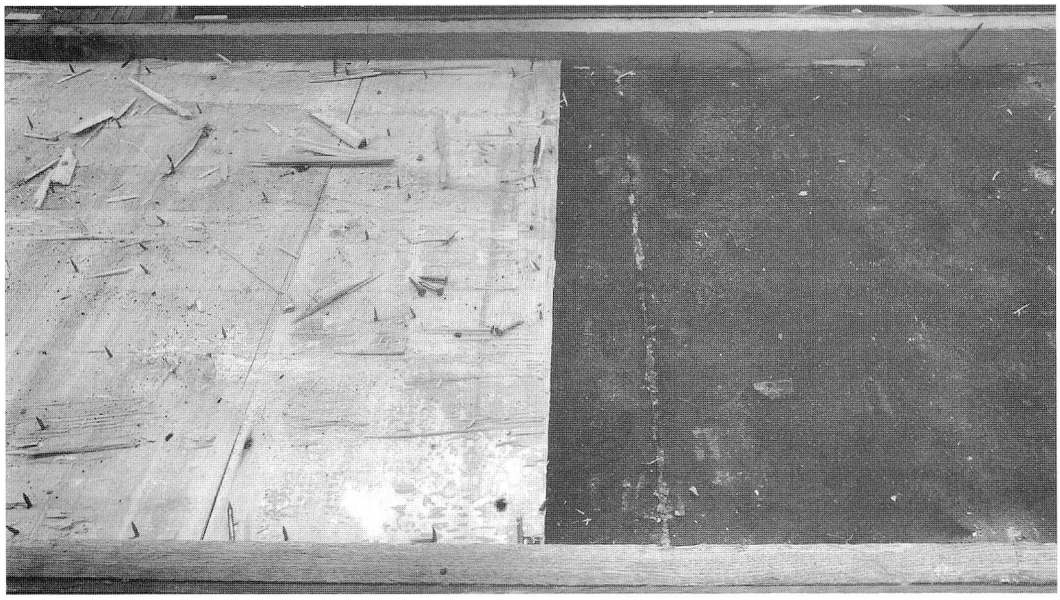
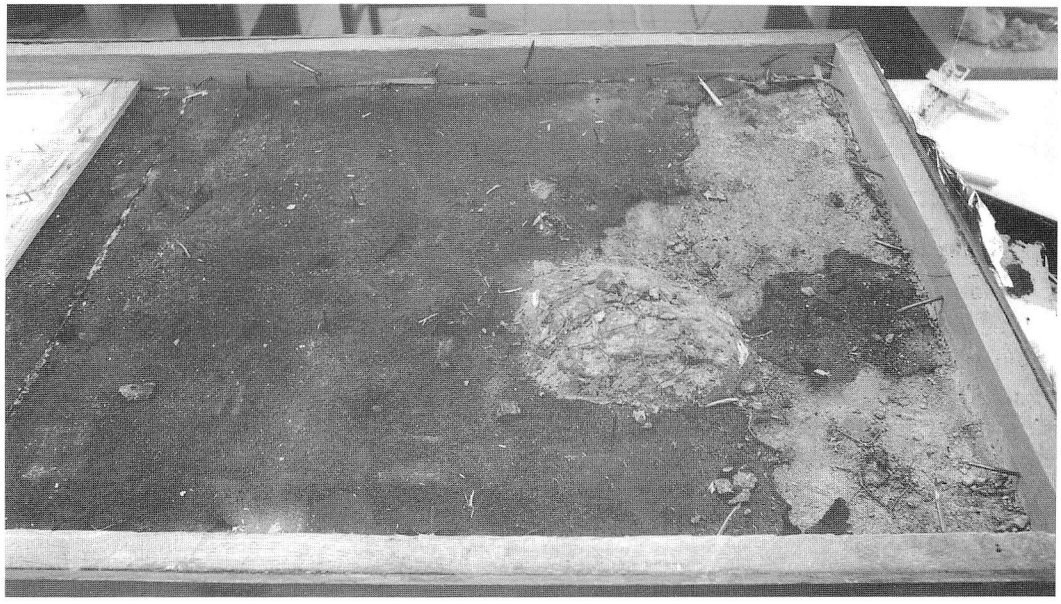


Figure 3. Wooden base panels partly removed, exposing nails and bituminous sheet.

Figure 4. Cement layer with chicken wire reinforcement underlying bituminous sheet.



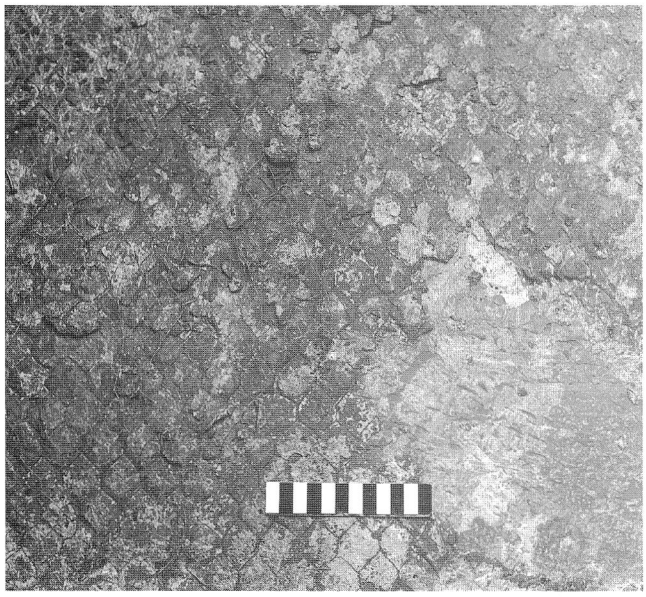
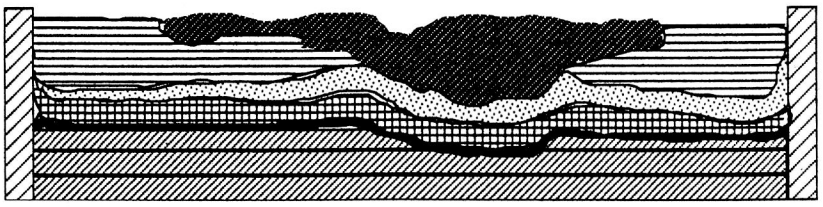


Figure 5. Detail of chicken wire and sulphur.

Figure 6. Nodular fossil-bearing matrix projecting through the shale slab. The sulphur layer has been removed but traces are visible in the join between the two matrices.

Figure 7. Construction materials and their position in *Eurhinosaurus longirostris* (BMNH R3938). (Not to scale)



The chicken wire, cement and sulphur were cleared away, revealing the domed area of matrix beneath the skull roof. This projected through the false matrix surround formed by the shale slab (Figure 6). No visible decay products were seen in this nodular region and it appeared that any decay had stabilised following removal to drier conditions. However parts of the matrix had cracked and were loose, exposing the enclosed fossil.

The construction of the specimen as a multi-layered composite (Figure 7) had probably been carried out in the following order:

1. A wooden base was made by nailing and gluing together wooden boards.

2. A wooden frame was nailed onto the wooden base forming a shallow box.

3. The wooden base was cut away to form a recess for the nodule beneath the skull roof.

4. This box was then lined with a layer of bituminous felt.

5. A layer of chicken wire was nailed onto the wooden base through the felt.

6. Bituminous cement was poured over the chicken wire, but did not cover it. completely.

7. Molten sulphur was poured over the cement.

8. A slab of shale, cut to fit around the specimen, was placed in the box while the sulphur was still molten.

9. Before the sulphur had set, the specimen - in two pieces - was placed into the gap in the shale slab.

10. When the sulphur had solidified the joints around the slab and specimen were sealed and coloured.

11. Holes were drilled through the shale and this was fixed in place with screws.

12. Finally the highly polished outer wooden frame was fixed over the inner frame.

Conserving the fossil

The undersides of the fossil bearing matrix and shale slab were consolidated with a solution of Alvar. The narrower cracks in both rocks and in the fossil were sealed with Alvar dissolved in acetone and the remaining gaps were filled with Fibrenyle (Rixon 1976). None of the removed layers were replaced. Instead the exposed rock surfaces and the inner surfaces of the wooden frame were lined with a sheet of polyethylene, stapled to the frame and sealed against it with polyethylene applied from a hot-melt glue gun. The existing screw holes were to be re-used and the polyethylene sheet was pierced over the holes. Short lengths of polyethylene tube were inserted into the holes leaving them projecting vertically from the polyethylene sheet. The junction between the tube and sheet were sealed, again with melted polyethylene. The polyethylene liner provided a barrier between the specimen and a structural support.

Several layers of glass reinforced polyester resin, to a thickness of approximately 4mm, were laid down onto the polythene sheet within the frame, leaving the polyethylene tubes standing proud. When the resin had cured, the excess projecting tube was cut away. Wooden struts were bonded to the reinforced resin to give extra

strength and rigidity and the sides of the glass fibre and resin support were screwed onto the frame. This provided a strong but light support at the back of the specimen which can be removed if necessary.

Turned to rest on one side, the foam packing, glass fibre and rubber support were removed from the surface of the specimen. Bolts were inserted through the countersunk screw holes in the shale slab from the front, passing through the polyethylene tubes to the back. Wing nuts were tightened onto the screws on the rear face thus holding the specimen in place against the glass reinforced plastic backing.

The polyvinyl alcohol applied as a separator was removed from the front surface which was then consolidated with Alvar and the bolt heads were covered with AJKS dough and painted over.

Health and Safety

The chemicals used in the conservation of this specimen are all potentially hazardous to some degree. All chemical processes were carried out with fume extraction and personnel protective equipment was worn at all times. Extra personnel were required for the lifting and turning of the specimen.

Conclusion

Methods of construction and mounting are extremely varied and there are many marine reptile specimens in museums with no records of their construction. Cruickshank (1994) described some of these methods and gave a warning to conservators and preparators to be aware of "bizarre and damaging methods used in the past". The methods used in the original mounting of *Eurhinosaurus longirostris* were new to us, but our experience with this gallery collection has yet to identify any two specimens mounted in the same manner.

Our approach to the conservation and remounting of *Eurhinosaurus* was to reduce the variety of materials used and to replace them with a more simple and reversible structure. The completed specimen can now be seen in the refurbished Gallery 30 at the Natural History Museum. The humidity and temperature are being monitored within selected cases in the gallery and in the general gallery space. We hope this newly restored specimen will incur no further decay and will remain on display for many more years.

Acknowledgements

Thanks are due to Phil Crabb, Natural History Museum Photo. Unit for the photographs, Steve Somogyi of the Museum's Mineralogy Department for x-ray analysis and to Angela Milner and Lorraine Cornish for comments on this paper.

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A REMARKABLE SURVIVOR: A NINETEENTH CENTURY GEOLOGICAL TRAIL IN ROCHDALE, ENGLAND

by A. Baldwin & D.M. Alderson

Baldwin, A. & Alderson, D.M. 1996. A remarkable survivor: a nineteenth century geological trail in Rochdale, England. *The Geological Curator* 6(6): 227-231.

Rochdale Public Cemetery, laid out in 1855, contains a geological trail, of thirty standing stones that represent the geology of the British Isles. It was highly praised by the geologist William Boyd-Dawkins in 1881, and remains in a reasonable state of repair today. The stones are identified in this paper. Such a geological trail has a high educational value even after one hundred and forty years.

A. Baldwin and Don M. Alderson, 286 Whalley Road, Accrington, Lancashire BB5 5DQ, U.K. *Received 7th March 1996.*

Introduction

A unique and remarkable survival of an early attempt to promote geology can still be seen in Rochdale Public Cemetery (Figure 1). A series of at least 30 geological specimens of different ages, mainly pillars 3ft to 4ft high, have been arranged along one side of the carriageway which surrounds the SE portion of the grounds from Bury Road to Sandy Lane (Figure 2). The specimens marked the demarcation line in the cemetery between the Church of England, Roman Catholic and Nonconformist denominations.

History

The cemetery was opened in 1855, and must surely be one of the earliest 'geological trails' in the country. James L. Maxim (1877-1952) F.G.S., local teacher with a profound knowledge of Rochdale history, left detailed descriptions of the stones in his extensive notes (summarized on page 229). Abraham Stansfield planned the cemetery but was assisted by two enthusiastic geologists; James Horsfall (b.1835) of Healey Nursery and Robert Law F.G.S. of Todmorden, both well known for pioneering the collecting of flint implements on the local moors. No doubt they arranged this interesting group of specimens to 'educate and instruct others in the science of the earth'. (Maxim ms, note 133).

The distinguished geologist Professor Sir William Boyd-Dawkins F.R.S., F.G.S. (1837-1929), based in his adopted city Manchester, was obviously impressed by this geological trail. He gave a public lecture and field trip in June 1881 to 30 members of Rochdale Literary and Scientific society. A newspaper report (Anon. 1881) of the event brings out the 'flavour' of the occasion. 'The Professor promised that he had been asked to come there that day to speak about *one of the most extraordinary collections of geological specimens which he knew of,* and it seemed to him a singularly fitting and proper thing that the boundary lines between the tombstones of one sect and the tombstones of another sect should be formed themselves by a line of tombstones belonging to the old world, which were completely innocent of all sect, and were common, he might say, to all. The pillars of which he had to speak represented some of the most important stages in the history of the world; each one had its own story to tell, and a story which for the most part was far more interesting and far more eloquent than those stories which were to be read upon the tombstones around them...' (Anon 1881).

Dawkins then described the pillars in ascending geological order, emphasising the whole range of conditions throughout geological time: crystalline molten rocks, fire, deserts, oceans, estuaries, ending with ice of the last glaciation.

'In conclusion' he said, 'I congratulate you very much upon possessing a corporation which is so geologically minded - (laughter) - as ever to have dreamed of putting here such a series of earth tombstones, of geological tombstones, that I have attempted to describe for you. I think, if any of you will take note of a few of my remarks, you will look upon these stones with rather different ideas from those you had before. To my mind, as a geologist, one of the great charms of geology is that one is able to read the inscriptions upon these stones,

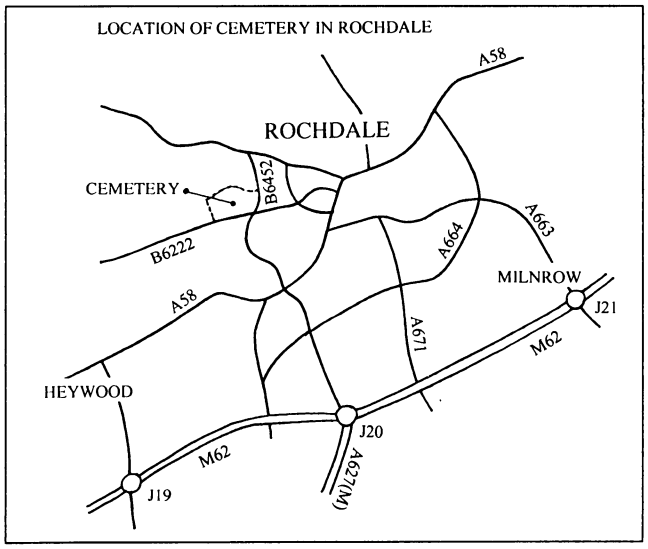

Figure 1. Location of the cemetery in Rochdale.

instead of walking by, not thinking that these make things more eloquent of a past history which is by no means unimportant'. (much applause)

Replying to questions, Professor Boyd-Dawkins said it had been a great pleasure to him to be there and give that lecture. He had never seen such a 'show' as that before, to use an Americanism. The last place in which he saw geological stones used as tombstones was on the west coast of Australia. At a place he got to there (as a consulting geologist) they used large natural blocks of granite.

Specimens

Some 30 pillars have been laid out in the trail (Figure 2), and the 28 geological pillars are listed in the table interpolated from Maxim's notes. In addition the START STONE and FINISH STONE of local sandstone have very appropriate and moving quotations from the Scriptures, and introduce the trail as if a person were using it in ascending or descending order of strata.

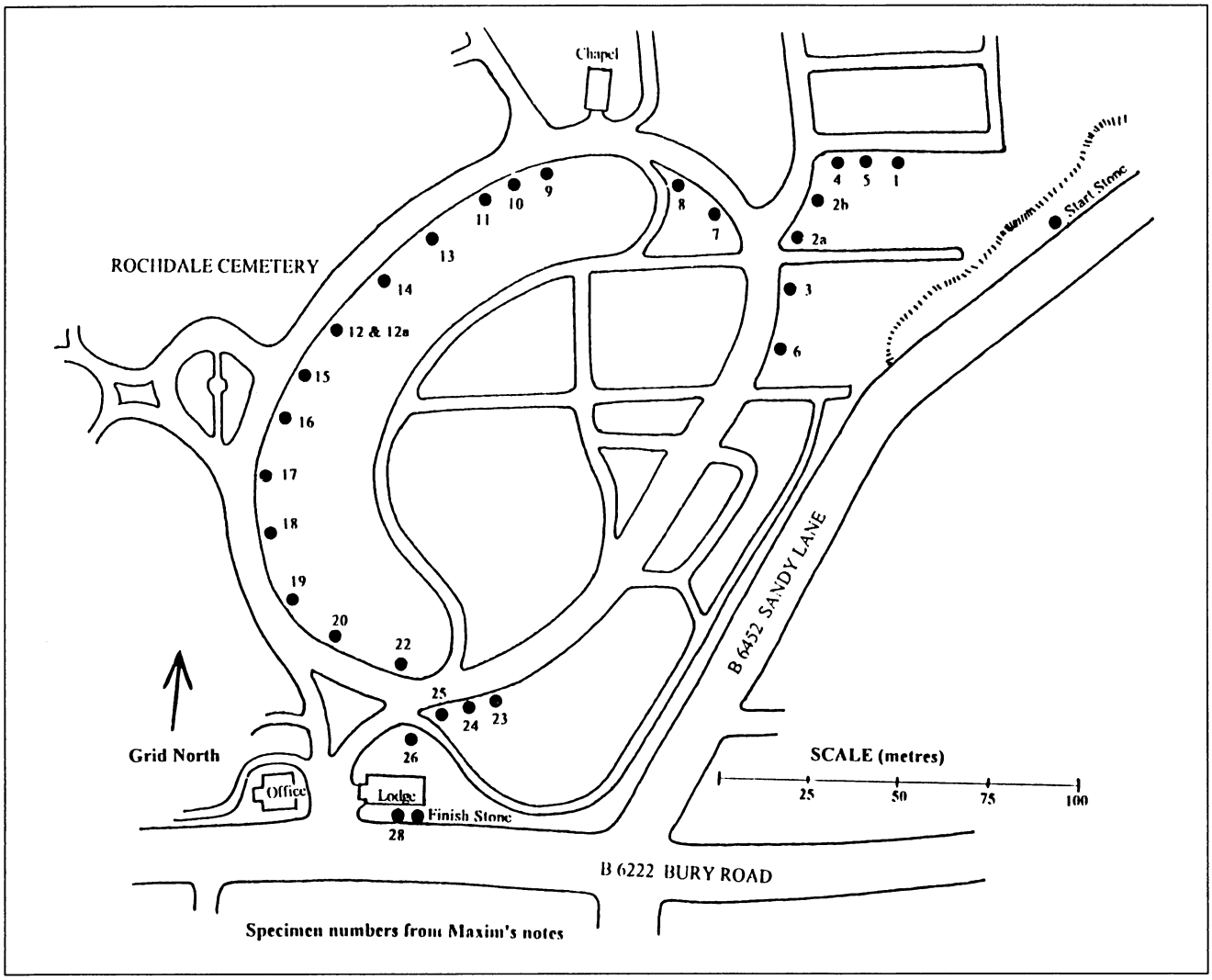

Figure 2. Plan of Rochdale Public Cemetery showing location of the geological trail.

Start Stone text: *'In the beginning God created the Heaven and the Earth'.*

'The series of pillars commencing here with Lava and in ascending order, terminating with Boulder Stones, elucidates the arrangement of the strata of the Earth's Crust in the order they were formed by the Creator'.

'Of old hast thou lain the foundations of the Earth'.

	AGE	ROCK TYPE	LOCATION	SIZE
1)	Volcanic series	Basalt columns	Giant's Causeway N Ireland	3 slabs approx. 1ft x 10"
2)	Plutonic series	a) Red granite b) Grey granite	A McDonald's works, Aberdeen	3 ft. high / 1 ft. sq.
3)	Metamorphic series	White marble	Carrara, Italy	2 ft. High / 1 ft. sq.
4)	Metamorphic series	Pink serpentine	Ireland	3 ft. High / 1 ft. sq.
5)	Metamorphic series	Green porphyrite	N. Wales	2.5 ft. High / 1 ft. sq.
PALAEOZOIC ERA				
6)	Cambrian series	Clay slate	Dinorwic quarries, Bangor, N. Wales	2 ft. 8" high
7)	Silurian series	Wenlock limestone	Wenlock, Salop	Arched 2 ft. 3" high
8)	Old Red Sandstone series	Red sandstone a) Septarian nodule on top	Dumbartonshire	3 ft. 6" high / 1 ft. Sq. 14" wide x 6" thick
9)	Carboniferous series	Black marble	Galway, Ireland	Pillar, 3ft. high / 1 ft. sq.
10)	Carboniferous series	Encrinital marble	Limerick, Ireland	Pillar, 3 ft. high / 1 ft. sq.
11)	Carboniferous series	Mountain Limestone	Dove Holes Dale, Buxton	3 ft. x 3 ft. x 1 ft. Irregular
12)	Upper Carboniferous Coal series	Cannel coal a) Ironstone bullion	Wigan	Originally fragments in trough 2ft. x 17" x 13" - 2 halves 20" diameter
13)	Coal series	Millstone Grit	Blackstone Edge, Littleborough	4 ft. High / 14" sq.
14)	Coal series	Fine grained sandstone	Clough Head, Todmorden	3 ft. 10" high / 13.5" sq.
15)	Coal series	Flagstone	Middle Hill, Whitworth	3 ft. 6" high / 1 ft. sq.
16)	Coal series	Sandstone	Bagslate (Rochdale)	3 ft. 6" high / 11" sq.
17)	Coal series	Sandstone	Middle Hill, Whitworth	
18)	Coal series	Sandstone	Craigleith, Scotland	4 ft. High / 17" sq.
19)	Permian Age	Limestone	Roche Abbey (E. of Newquay)	4 ft. High / hexagonal
MESOZOIC ERA				
20)	Salt series	New Red Sandstone	Runcorn	4 ft. High / octagonal
21)		Gypsum	weathered remnants	not seen
22)	Liassic series	Various limestone fragments not seen	Whitby to Lyme Regis	Small sandstone marker 26"x7"x2.5"
23)	L. Oolitic series	Stonesfield Slate	Oxon	Split 25" x 34" x 15"
24)	M. Oolitic series	Corallian Limestone	(corroded)	3 ft. High / 2 ft. 6" wide
25)	U. Oolitic series	Portland Stone	Isle of Portland ?	4 ft. 6" high
26)	Wealden series	Bethersden Marble	Kent	2 ft. 6" / 1 ft. 6" / 6"
27)	Chalk series	Kentish Rag	Iguanodon Quarry, Maidstone	3 ft. High / 1 ft. 2" sq. (not seen)
28)	Drift series	Glacial stones	(found in cemetery)	A few small boulders

Finish Stone text: *'He made the Earth by His power. He hath established the world by His wisdom'.*

'The series of pillars commencing here with Boulder Stones, and in the descending order terminatingwith Lava elucidates the arrangement of the Strata of the Earth's crust in the order they were formed by the Creator'

'Speak to the Earth and it will teach thee'.

Figure 3. Stone 1: Basalt from Giant's Causeway, Co. Antrim, Ireland.

Condition

The only specimens not located, and presumed weathered or lost are: weathered remnants of Gypsum (21), and Kentish Rag (27). At location (12) a carved stone trough is present with the inscription 'Cannel Coal from Wigan', but '9 cuboidal fragments' of coal are not seen. For the 'Liassic series' (22), Maxim records a small collection of nodules, some calcareous stones and a few septaria, only a small sandstone marker is present.

In general the state of weathering is medium to poor for limestones and soft sandstones the result of over a century of acid rain from Rochdale's mills.

Figure 4. Stone 2b: Grey Aberdeen granite.

Figure 5. Stone 6: Cambrian slate from Bangor, north Wales.

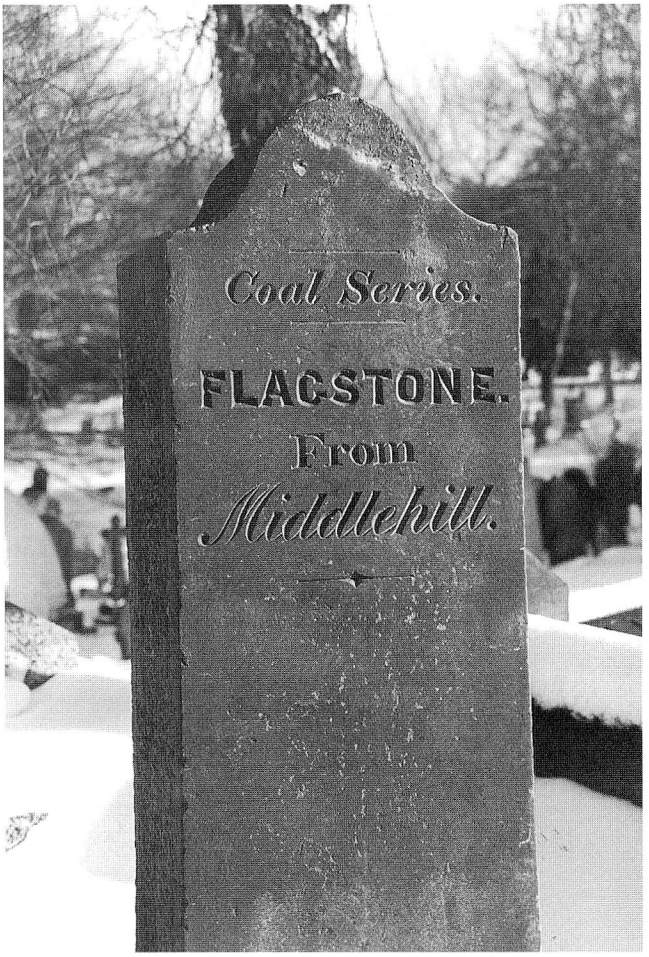

Figure 6. Stone 15: Upper Carboniferous flagstone from Middle Hill, Whitworth.

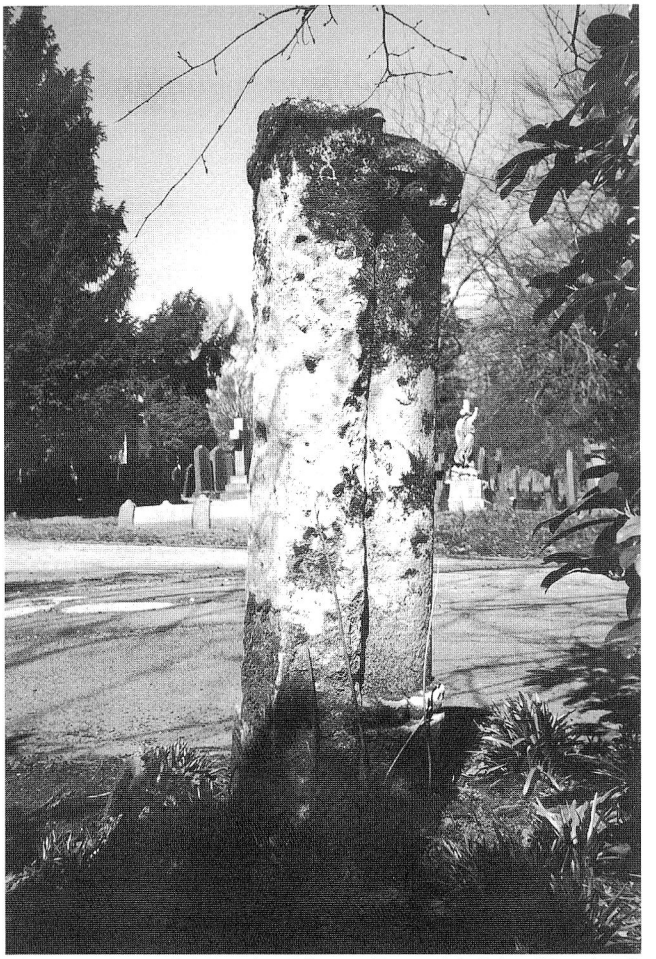

Figure 7. Stone 25: Portland Stone (Jurassic), Isle of Portland, England.

Many of the harder stones are in excellent condition with crisp, easily legible text, especially the granites (2a & 2b), slate from Dinorwic (16), and the Millstone Grit and Coal Measure sandstones (13-18).

Specimens 1 to 6 are somewhat difficult to arrange in proper order. The original curving driveway has been replaced by straight footpaths, disturbing the original sequence. The marker 'Start Stone' is in a very awkward location at the foot of a steep ditch next to the boundary wall.

Educational value

This compact geological trail, in relatively safe surroundings, would be particularly useful to teachers instructing pupils in elementary geology. An approximate duration of one hour, would allow explanation of the trail.

Acknowledgement

We are grateful for permission from staff at Rochdale cemetery to investigate and photograph the specimens.

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GEOLOGICAL SURVEY DONATIONS TO THE GEOLOGICAL MUSEUM IN QUEEN'S COLLEGE GALWAY: 19TH CENTURY INTER-INSTITUTIONAL COLLABORATION IN IRELAND

by David A.T. Harper and Matthew A. Parkes

Harper, D.A.T. and Parkes, M.A. 1996. Geological Survey donations to the Geological Museum in Queen's College Galway: 19th Century inter-institutional collaboration in Ireland. *The Geological Curator* 6(6): 233-236.

The early years of the Geological Survey of Ireland and Queen's College Galway were closely linked beyond their foundation in 1845. Official policy of the Survey included donation of teaching materials and specimens to the Queen's Colleges, mainly fulfilled by Joseph Beete Jukes as Director. However, today only a small fossil collection is identifiable as the residue of the 19th century donations, which includes Portlock Collection specimens.

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Received 10th September 1996; revised version received 12th September 1996.

Introduction

During 1845 both the Queen's colleges in Belfast, Cork and Galway and the Geological Survey were founded by acts of Parliament. 1995 marked the 150th anniversary of the establishment of both institutions and the year was punctuated by appropriate, and occasional joint, celebrations. During the early years of development of both institutes there was important collaboration emphasising the strong generic links between the island's geological survey and its geology departments.

Sir Henry De la Beche, through his friendship with Sir Robert Peel, was determined to establish a Geological Survey in Britain and Ireland with specialists competent to compete with the best in Europe (McCartney 1977). His early researches in Jamaica (Draper 1996) laid a basis for his Geological Manual and subsequent, if controversial, work in Devon. The Survey in Ireland was founded in 1845, the same year as the Queen's colleges; but De la Beche also had a major role to play in the appointment of the first professors in Mineralogy and Geology[1] on the island. William King was appointed to the chair in Queen's College Galway (Harper 1988) and was arguably one of the more influential of Ireland's 19th century academics (Ó hEocha 1984), very much part of the college's 'nest of scholars' (Foley 1990). King's research on the fossils of the Permian System (1850) and Neanderthal Man (1863) together with his contribution to the *Eozoon* debate (King and Rowney 1869), established both King and Galway in the vanguard of 19th century science.

At an early stage all three Queen's Colleges recognised the importance of a museum resource. Four areas of science and engineering were to be represented in the museum in Galway;[2] but the professor of Mineralogy and Geology would have overall responsibility for the collection, curation and display of material. It did, however, take some years to establish the museum; the report of the museum committee of May 1852[3] listed acquisitions but noted the aspirational responsibility of the college to have representative collections of regional rocks, minerals and fossils together with flora and fauna. King's salary for both positions was £200 per annum.[4] Incidentally the museum appears to have purchased a substantial part of the King collections that probably originated in the Hancock Museum. King, however, did argue for a full-time curatorship of the museum,[5] an aspiration finding little sympathy with college authorities past and present.

King was ideally suited to manage the museum and its collections. Firstly he had experience, if controversial, from his curatorship in the Hancock Museum, secondly he brought with him substantial amounts of material from the North of England and elsewhere and thirdly he was a collector of some repute likely to continue with the acquisition of material during his tenure. Many years later D'Arcy Wentworth Thompson Jnr was to remark that 'Old King of Galway was a collector of

Figure 1. Joseph Beete Jukes (from a photograph in the School of Botany, Trinity College, Dublin).

some note, always boasting about the size of his *Turritella*'; the specimen in question is, in fact, extant in the James Mitchell Museum (JMM), a turretted gastropod, probably *Campanile giganteum* (Lamarck) from the Eocene of the Paris Basin, measuring nearly a metre in length! The early (Anderson 1899) and later (Fewtrell 1979, Fewtrell and Ryan 1979) history of the museum in Galway has been discussed in detail (Harper 1992) together with controversy surrounding the arrival of the King collection in Galway (Pettigrew 1980, Turner 1980).

The close relationship between the Geological Survey in Ireland and the Queen's colleges was also manifest in the gift of teaching materials to the geology departments and the museums. Sir Henry De la Beche arranged for the Decades, together with copies of the one inch, hand - coloured geological maps together with representative rock, mineral and fossil specimens, to be donated to the Mineralogy and Geology departments in Ireland.[1] Thomas Oldham, local director of the Survey, was instructed, in 1846, to collect five

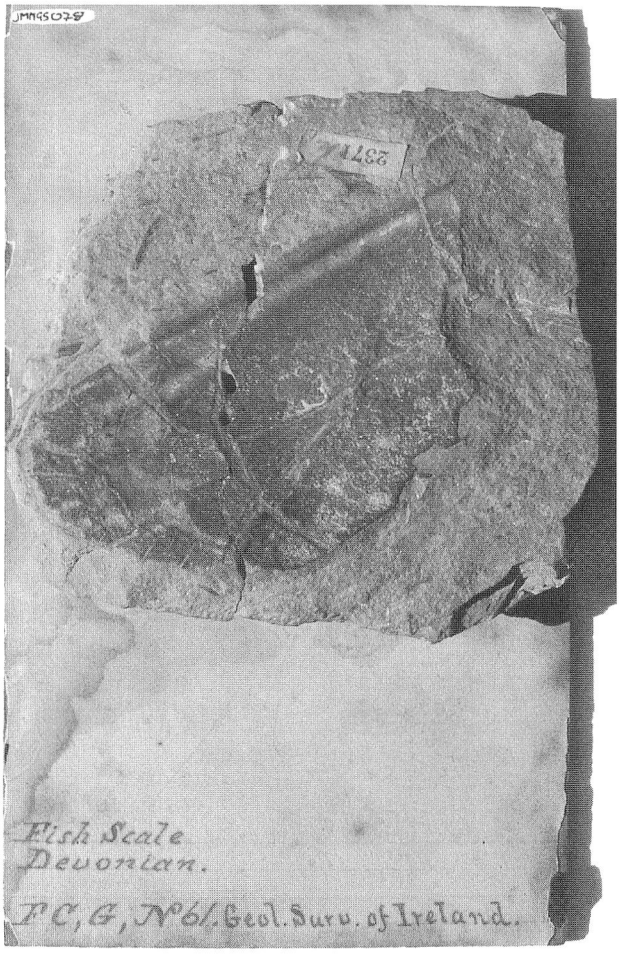

Figure 2. A fragment of a fish from the Upper Devonian locality at Kiltorcan, Co. Kilkenny. JMMG078 is mounted on a typical Galway Museum 19th century display tablet but with the GSI label still attached.

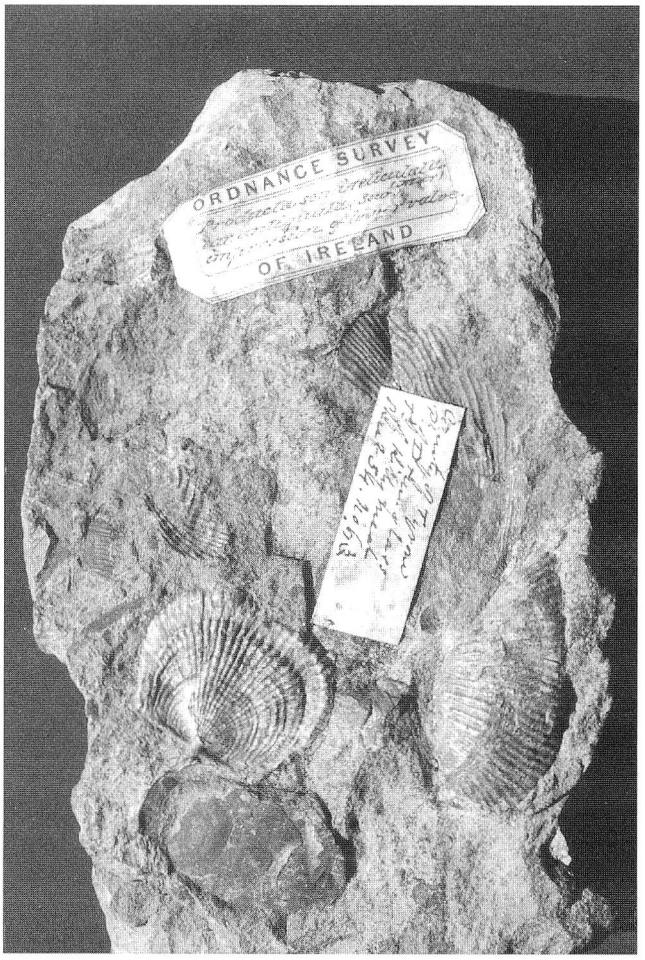

Figure 3. Portlock Collection specimen (JMMGS005) of *Producta semireticulata* var. *antiquata* and a second typical label with locality information. It reads: County of Tyrone, Ph [parish] of Drunglass, Td [townland] of Killymead, Sheet 54, No 63.

representative sets of specimens; one each for the museums at Craig's Court in London and in St. Stephen's Green, Dublin but also for the new geological museums to be established in the Queen's colleges in Belfast, Cork and Galway (Herries Davies 1983). There were, however, delays. Although Oldham approached De la Beche for the authority to send these materials during 1849 for the opening of the colleges, these were not sent to the college Presidents for deposition in the geological museums until 1851 by the remarkable Joseph Beete Jukes (Figure 1). During the mapping programme the Survey accumulated a large collection of rocks, minerals and fossils. During May 1864 Beete Jukes reported to a Select Committee on Dublin's scientific institutions that 1,000 rock specimens, 11,821 Irish fossils and 5,598 British fossils were currently on view in the Museum of Irish Industry; many more fossils were available for study (Herries Davies 1995). The collections, in fact, contained not only Survey material but also specimens assembled during the work of the Ordnance Survey including rocks and fossils collected during Portlock's Survey (1830-1843).

Jukes (1867), however, later noted during a lecture at the invitation of Sir Robert Kane, President of Queen's College Cork, the procedures of collection and documentation of rock, mineral and fossil material. But more importantly he emphasised the importance of communicating these data to schools and other institutions. There was nothing unusual about this procedure; for example during the 19th century the French Government supplied schools with geological materials presumably through the indigenous Geological Survey. Jukes on occasion donated hand-picked specimens to various institutes, 'on the sly', to avoid the red tape surrounding the office of the Director-General.

Although there was clearly a policy in place, the current evidence would suggest it probably did not operate satisfactorily. Modern curation of the extant GSI collection has shown that although a particular final destination may be indicated in the fossil register, it is more often the case that it is incorrect. Specimens allegedly sent to Galway (or Cork, London, Belfast or even rejected and discarded) turn out still to be in the collections of the GSI in Dublin. Nevertheless King's teaching programme, initially to agricultural and engineering students, was field based, requiring sets of relevant rocks, minerals and fossils from throughout Ireland[6]. Irish geological specimens were clearly essential to drive his programmes; gifts from the Survey would have formed a necessary part of his teaching collections.

A small collection extant in the James Mitchell Museum (JMM) was derived from this era of collaboration between the two institutes. This has been curated and all retrievable information from the GSI given to UCG. There are nearly 100 former GSI specimens, mostly of Carboniferous material but several Devonian Kiltorcan specimens and a few Lower Palaeozoic specimens are also present. A 10 page manuscript list dated 11 February 1862 and labelled as a rough list of duplicates for Queen's College Galway includes 269 duplicate specimens which were sent to Galway. Of the material now present in the JMM, 73 specimens are recognised as former GSI material by their old labels. Only 40 of these are listed, so there must have been other separate transfers at different times. For example, the first 80 records in the register with the letter **i** were collected from Permian rocks of Co. Down in the Townland of Ballycultra, north of Hollywood. Of these 15 were noted as being sent to Professor King, Galway. It is quite likely that many of the specimens dispersed to Galway are still present, possibly now in the King Collection of Permian fossils, but no longer recognisable as former GSI material.

Of particular note is the presence of a small part of the famous Portlock Collection. This material, collected by the Ordnance Survey of Ireland (OSI) under Captain Joseph Ellison Portlock between 1832 and 1843 from counties Derry, Tyrone and Fermanagh, was presented to the fledgling Survey in 1845. Ó Riordan (1981) has noted the dispersal of this natural history collection. Of the fossils, the Lower Palaeozoic material has been catalogued by Tunnicliff (1980). All the 21 specimens in the JMM recognisable as part of the Portlock Collection by their labels are from the Carboniferous or younger rocks. Some 29 specimens from the Portlock Collection are also recognised in the GSI Collection. The GSI Portlock Collection contains a variety of Palaeozoic and some Mesozoic specimens including Lower Palaeozoic material not documented in Tunnicliff's catalogue (1980).

It should also be noted that in more recent years there has been good inter-institutional co-operation in Ireland with unregistered specimens being exchanged to return them to their original collections where most appropriate. In some cases this even includes type and figured specimens temporarily resident in the Geology Museum of Trinity College, Dublin (Wyse Jackson 1994) returned to the GSI (Wyse Jackson and Sleeman 1990).

Notes

1. Sir Henry De la Beche correspondence, Archives of the National Museum of Wales, Cardiff, Wales.

2. *Queen's College Galway, Calendar* (1852), UCG Archives.

3. *Queen's College Galway, Museum Report* (1852), UCG Archives.

4. *The Colleges Act Letters and Patent* (1859), UCG Archives.

5. *The Queen's Colleges Commission: Report* (1858), UCG Archives.

6. *Galway Vindicator and Connaught Advertiser,* Saturday 22nd December 1849.

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LOST & FOUND

Enquiries and information, please to Patrick Wyse Jackson (Department of Geology, Trinity College, Dublin 2, Ireland). Include full personal and institutional names and addresses, full biographical details of publications mentioned, and credits for any illustrations submitted.

The index to 'Lost and Found' Volumes 1-4 was published in *The Geological Curator* 5(2), 79-85. The index for Volume 5 was published in *The Geological Curator* 6(4), 175-177.

Abbreviations:

CLEEVELY - Cleevely, R.J. 1983. *World palaeontological collections*. British Museum (Natural History) and Mansell Publishing Company, London.

GCG - *Newsletter of the Geological Curators' Group*, continued as *The Geological Curator*.

LF - 'Lost and Found' reference number in GCG.

237 Plant fossils from the Keele Formation, central England described by Emily Dix (1935).

See GCG 6(5): 207.

Dr John Faithfull, Hunterian Museum, University of Glasgow, Glasgow G12 8QQ, Scotland, writes:

The Hunterian Museum, Glasgow has large holdings of Emily Dix plant material, which was purchased from her in 1947-48. However, there is no Warwickshire material among the 600 or so catalogued specimens which are almost all from South Wales, or Holland, Belgium and Germany.

Luckily, we recently uncovered two crates in our remote store which also contained Emily Dix Carboniferous plant material. These had never been opened and contained material wrapped in newspapers dating from 1947 and 1948. It is possible that these came via L.Hawkes at Bedford College. One of these crates contained duplicate material from South Wales; the other contained Warwickshire specimens.

On reading of Dr Cleal's interest in this material (GCG 6(5): 207), we unpacked both crates and found a lot of interesting material, including 5 specimens from the Keele Beds of the Foleshill/Longford brickpit. There is a specimen of *Odontopteris* sp., one of *Pecopteris polymorpha*, a *Cordaites*, a "shell", and a piece of red marl.

Other Warwickshire localities represented include: Chilvers Coton, Stockingford Clay Pit, Arbury Road Pit, Pooley Hall Colliery, and Tunnel Colliery.

The material is currently recorded as Hunterian Uncatalogued Group HUG 108.

241 French volcanic rocks in Dublin.

Patrick Wyse Jackson (address above) writes:

In the Geological Museum, Trinity College, Dublin is a collection of French volcanic rocks bearing printed rectangular lables 120 x 57 mm in size (Figure 1a). Specimens also carry a small losenge-shaped label with a blue border and a number hand-written in black ink (Figure 1b). Does anyone recognise these labels? Could they be from a French dealer? Any information would be most useful.

Figure 1. Labels on TCD collection of French volcanic rocks. 1a (above). Printed label; 1b (below). Hand-written sample number.

242 Molluscs and bioclastic limestones from the Wealden Group (Lower Cretaceous) of Dorset, southern England.

Jon Radley, Bristol City Museum and Art Gallery, Queen's Road, Bristol BS8 1RL, U.K. writes:

The non-marine Wealden Group of the Dorset Coast is poorly fossiliferous. However earlier published accounts indicate the local presence of unionacean

bivalves in the alluvial Wessex Formation, and bioclastic limestones ('coquinas') in the overlying Vectis Formation (e.g. Arkel 1947, *Geology of the country around Weymouth, Swanage, Corfe and Lulworth.* Memoir of the British Geological Survey).

I would be interested to know of relevant material, in museum, university or private collections.

243 The Middle Jurassic pliosaur *Liopleurodon (Pliosaurus) ferox.*

Leslie Noè, School of Environmental and Applied Sciences, University of Derby, Kedleston Road, Derby DE22 1GB, U.K. [e-mail: l.f.noe@derby.ac.uk] writes:

I am studying the Middle Jurassic pliosaur *Liopleurodon (Pliosaurus) ferox* and would be grateful to know of Middle and Upper Jurassic marine reptile material, especially from the Callovian, Oxfordian or Kimmeridgian stages, that are in museum or other collections.

244 Brittlestar block.

Richard B. Aronson, Dauphin Island Sea Laboratory, P.O. Box 369, Dauphin Island, AL36528, U.S.A. [e-mail: raronson@jaguar1.usouthal.edu] writes:

On a visit to the Philadelphia Academy of Natural Sciences a few years ago, I came across a small block of fossil brittlestars. The brittlestars were well-preserved and articulated, and they formed almost the entire volume of the block, which is 8 cm x 7 cm x 4 cm thick. The only data accompanying the block were on a small card, written in an archaic hand:

Ophiuran Limestone

J. Struthers Jurassic?

I would be grateful for any information on the age and provenance of the block, as well as details about Struthers that might help me learn more about the brittlestars.

MINUTES OF AN EXTRAORDINARY GENERAL MEETING OF THE GEOLOGICAL CURATORS' GROUP, HELD AT LIVERPOOL MUSEUM, 26TH JUNE 1996.

1. The meeting was opened at 15.10 by the Chairman Dr John Nudds who explained that the EGM had been convened for members to vote on proposed minor changes to the constitution as outlined in *Coprolite*, the Group's Newsletter, published in May. The Chairman read clause 19 of the Constitution, dealing with amendments, and explained that a simple majority was necessary to approve the changes. There being more than ten members present, the meeting was deemed quorate.

2. The Chairman read the original version of clause 8 and clause 16 and explained the reasons behind the amendments and the addition of clause 17.3. He also explained that the Geological Society of London, our parent body, had approved these amendments and had withdrawn their earlier request for an additional clause outlining who would take financial responsibility of the Group, since the GCG was a charity in its own right and that therefore the committee members, as trustees, were responsible.

3. The motion to accept these amendments was proposed by the Recorder, Dr John Faithfull (Glasgow University) and seconded by Ms Wendy Simkiss (Liverpool Museum).' The motion was put to the vote and carried unanimously.

GEOLOGICAL CURATORS' GROUP

CONSTITUTION.

Names and Aims

1. The name of the Group shall be the Geological Curators' Group (affiliated to the Geological Society of London).

2. The purpose of the Group shall be to advance the education of the public in geology in particular by improving the standard of geological curation and by improving displays and information in public museums and other institutions.

In furtherance of the above objectives but not further or otherwise the Group shall have the following powers:-

2.1 to hold meetings of persons and bodies concerned with the subject for the exchange of advice and information;

2.2 to survey collections and draw up a code of practice to ensure that they are maintained and presented to the best advantage;

2.3 to further the documentation and conservation of geological sites;

2.4 to conduct surveys for the promotion of the aims of the Group;

2.5 to do such other lawful things as may from time to time be necessary.

Membership

3. Ordinary Membership of the Group is open to those with an interest in, or responsibility for, the collection, conservation and interpretation of geological specimens and information and/or the conservation of geological sites, who are registered with the Membership Secretary of the Group.

4. Ordinary Membership of the Group is open to all Fellows, Honorary Members and Junior Associates of the Geological Society on registration with the Membership Secretary.

5. There will be no fee for membership of the Group.

6. Members of the Museums Association who are not members of the Group may attend all meetings of the Group.

7. Honorary Membership of the Group may be conferred at the discretion of the Committee with the approval of the Annual General Meeting.

Committee

8. The management of the Group shall be vested in a Committee consisting of a Chairman, Secretary, Minutes Secretary, Treasurer/Membership Secretary, Programme Secretary, Editor of the journal, Editor of the newsletter, Recorder, and four members. The Committee may in addition co-opt for a specified period, up to four non-voting members, one of whom shall normally be nominated by the Biology Curators' Group as their representative.

9. Officers and Members of Committee shall be elected annually. The Chairman will serve for not more than three consecutive years in that capacity and Members of Committee for not more than two consecutive years.

10. Officers and Members of Committee for the ensuing year shall be elected at the A.G.M. of the Group, when those present shall vote by means of a ballot on a list of candidates each of which shall have been nominated by at least two members of the Group; such nomination having been received by the then Secretary, in writing, at least 21 days prior to the A.G.M.

11. Four Officers of the Geological Society will also, ex-officio, be members of the Committee.

12. Two Officers or their nominees will represent the Group on the Specialist Groups Committee of the Geological Society.

13. The Committee shall have the power to fill casual vacancies as they occur.

14. The Committee, of whom four or one-third of the members, whichever is the greater shall form a quorum, shall meet when summoned by either the Chairman, the Secretary, or the Treasurer, or any three members of the Committee, three weeks notice in writing being given.

15. The Committee shall have the power to make Bye-Laws and Regulations consistent with the Constitution.

Annual General Meeting

16. The Annual General meeting (at which ten shall be a quorum) shall be held in the period of November to January.

16.1 The right to vote at an Annual General Meeting or Extraordinary General Meeting shall be restricted to voting Members that is, members who have paid the annual charge for receipt of the Group's Journal.

16.2 Subscription Members shall not be entitled to vote.

Finance

17.1 The Group shall incur no financial obligation chargeable to the Geological Society.

17.2 The Treasurer of the Group will be responsible for the keeping of proper accounts and at least once a year, normally at the Annual General Meeting, will present a Balance Sheet for the inspection of Members. This Balance Sheet will have been examined and its correctness ascertained by **two** Auditors appointed at the A.G.M.

17.3 All cheques drawn on the Group's account must be signed by at least two members of the Executive Committee.

General

18. The Group shall not take any action which may conflict with the terms of the Charter and Bye-Laws of the Geological Society.

Amendments to the Constitution

19. Amendments to the Constitution can only be made at an Annual General Meeting or an Extraordinary General Meeting specifically convened for this purpose. Members must be notified of the proposed changes, in writing, at least 21 days prior to the date of the meeting. Changes to be approved by simple majority. No amendment to the Constitution shall be made without the prior consent of the Charity Commissioners for England and Wales.

Dissolution of the Group

20. Dissolution of the Group shall be carried out at an Extraordinary General Meeting convened for this purpose. 21 days notice shall be given of such a meeting. If upon the dissolution of the Group, there remains after the satisfaction of all debts and liabilities any property whatsoever, this shall not be paid or distributed among members of the Group but shall be given or transferred to a charitable organisation or organisations having similar objects.

Founder Members

21. Those listed as present in the Minutes of the Inaugural Meeting held at Leicester on the 15th February, 1974, are considered to be Founder Members of the Group.

BYE-LAWS:

Annual Charge

1. An annual charge to be set by the Committee and approved at the Annual General Meeting will be made to Ordinary Members of the Group who wish to receive the Group's Journal and any supplementary material. This charge will confer the right to vote at an Annual General Meeting and Extraordinary General Meeting.

Subscription Members

2. Institutions are not eligible for Ordinary Membership of the Group, but may subscribe to the Journal by becoming Subscription Members.

3. The annual charge for Subscription Members will be set by the Committee and approved at the Annual General Meeting.

Meetings

A small charge may be made for attendance at certain meetings to help cover administrative costs.

27th June 1996.

BOOK REVIEWS

Woodcock, N. H. and Bassett, M. G. (eds). 1993. *Geological excursions in Powys, central Wales.* University of Wales Press, National Museum of Wales, Cardiff, 366 pp. ISBN 0-7083-1217-9. Paperback.

Geological excursions in Powys, central Wales is the long awaited successor to the highly acclaimed Geological excursions in Dyfed (Bassett 1982). Unlike its increasingly over-populated neighbour (rapidly becoming the Arran of the South) Powys remains a little frequented and poorly known county to most people, rendering the new guide especially welcome. A good field guide, like a good travel guide, should combine authority with both readability and an eagerness to guide one into unsuspected but rewarding nooks and crannies. This the new volume manages admirably - despite having Powys virtually on my doorstep, fewer than half of the excursions in this guide were familiar.

The geology of Powys is dominated by Ashgill, Silurian and Lower Devonian sediments of the appropriately entitled Powys Supergroup. In the south east of the county, the shallow water sediments of the Midland Platform are represented, whereas to the northwest deeper marine slope and turbidite facies are present. Post-Silurian rocks occur only on the southern edge of Powys, where part of the North Crop of the South Wales Coalfield lies within the county, and in the northeastern corner, where Permian red beds overstep the Caledonian basement. These geological proportions are reflected in the emphases of the guide.

Six of the itineraries include Ordovician localities covering north-east Powys (Cave & Dixon), the southern Berwyns (Brenchley), the Machynlleth and Van inliers (Leng & Cave), the Builth inlier (Bevins & Metclafe), Rhayader (Wilson), the anticlinal cores along the Towy lineament (Wilson *et al.*) and the Llanwrtyd Wells area (Mackie). Within the Silurian-Lower Devonian of the Powys Supergroup, the shelf facies of the basin margin are visited around Newtown (Cave *et al.*), Radnor Forest (Woodcock & Tyler; Woodcock) and the Wye Valley (Cherns). Comparison can be made with the corresponding deeper water facies located to the northwest. Along the basin slope, laminated hemipelagic mudstone facies were deposited, at times under anoxic conditions, and are the subject of excursions around Newtown (Cave *et al.*), Radnor Forest (Dimberline & Woodcock ; Woodcock & Tyler), Rhayader (Waters *et al.*) and Newbridge (Bassett). Turbiditic facies developed periodically, particularly around the Llandovery - Wenlock boundary, and are examined around Radnor Forest (Dimberline & Woodcock; Woodcock & Tyler), Machynlleth and Llanidloes (Leng & Cave), Rhayader (Waters *et al.*) and Llanwrtyd Wells (Mackie).

The late Silurian (Pridoli) rocks mark a change from marine to marginal marine and, eventually, to the non-marine facies of the Old Red Sandstone. This transition is the subject of itineraries in the areas of Radnor (Woodcock & Tyler), Newbridge (Bassett) and the Brecon Beacons (Almond *et al.*). Finally, the geology of post-Silurian Powys is covered by excursions to the Old Red Sandstone of the Brecon Beacons and Black Mountain (Almond *et al.*) and the Carboniferous Limestone of the North Crop of the South Wales Coalfield (Dickson & Wright).

As a county, Powys lacks the lithological and stratigraphical variety of neighbouring Dyfed. However, the guide emphatically disproves the commonly heard dismissal of mid-Wales as a sea of uniform, grey, cleaved mudstones - the itineraries described are sedimentologically, structurally and faunally varied.

Having recently struggled through the western US with the best, and superficially similar, guides available there, the authority and style of this series stands out clearly in comparison. This is not a book for the raw amateur, but those with some goelogical background will be richly rewarded by following the several weeks of field work described here. It is much to be hoped that the National Museum of Wales intends to complete its field guide series to the counties of Wales as a geological counterpart to the architectural 'Pevsners'.

Bassett, M.G. (ed.) 1982. *Geological excursions in Dyfed, south-west Wales.* National Museum of Wales, Cardiff. 327 pp.

Paul Smith, Lapworth Museum, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK. 2nd September 1996.

Hall, A. 1994. *West Cornwall.* Geologists' Association Guide No. 19. Second Edition. The Geologists' Association, 50pp. ISBN 0-900717-57-2. Paperback. Price: £7.80.

The cover of this second edition is graced by a spectacular view of Botallack Mine engine house perched on the cliffs high above a foamy white sea. This is a visual taste of the concise, clear and interesting guide to follow. A short introduction (4 pages) includes a clear map outlining where the 5 itineraries are in west Cornwall, a star rating for interest for those with limited time available, plus the tide level requirements at each locality. These are very useful since almost all localities are coastal.

The five itineraries are of different length. The fifth, covering the Lizard, accounts for 16 of the 50 pages and includes a neat précis of the ophiolite model. It takes you round the Lizard peninsula in anticlockwise fashion, covering all the major units and their relationships to each other. The author is unafraid of spelling out the controversial problems and generally does not impose his preferred choice. In fact he succeeds in bringing to the text some of the liveliness of debate and enthusiasm of an argument over an outcrop, that all geologists will know.

The itinerary for the St. Agnes district on the north coast covers two small granite bosses, their metamorphic aureoles and the extensive mineralisation and mining associated with them. Also on this tour is the only outcrop of Miocene sedimentary rocks in Britain, on St.Agnes Beacon. Tour IV around Falmouth Bay is the shortest mainly covering the petrological interest of intrusions at Pendennis Point and Swanpool.

Both Itinerary I, which covers the Lands End Peninsula and Itinerary II, which covers St. Michaels Mount to Porthleven are essentially similar. They both offer a diverse mix of excellent geology covering granite intrusions, their metamorphic aureoles, basic intrusions, metasomatic alteration, mineralisation, old mine workings and a reasonable helping of Quaternary deposits and geomorphology too.

In short, there is a good mix of geology in this guide; more than enough to enhance a holiday visit to West Cornwall, and enough to base a University field trip on, perhaps with assistance from the 37 references cited, most of which are modern. The copy I had was unprinted on one A4 sheet (pages 20 and 29), which I hope is an isolated occurrence. The maps and diagrams are clear and useful, although Fig. 7 and Fig. 11 both occupy a page each, which if remodelled or put on the same page could have allowed a little more detail on something else. The access details are useful, particularly if taking a coach, which in some places just can not fit down a Cornish lane! I did not have the first edition to compare this one with, but all in all this guide is a valuable addition to the series, and a serious temptation to take a holiday in Cornwall.

Matthew A. Parkes, Geological Survey of Ireland, Beggars Bush, Haddington Road, Dublin 4. 15th August 1996.

Janssen, Arie W. 1995. *Systematic revision of holoplanktonic Mollusca in the collections of the 'Dipartimento di Scienze della Terra' at Torino, Italy.* 233pp, 14 plates, 3 text-figures and 2 tables. ISSN 1121-7545, ISBN 88-86041-07-1. Hardback. Price: 80,000 Lire, available from: Museo Regionale di Scienze Naturali, Via Giolitti, 36-10123 Torino, Italy.

Arie Janssen will be known to many readers as a leading example of a museum professional who has successfully bridged the difficult gap between curation and research. Since 1969 he has been Curator of the Palaeontology Department of the National Museum of Natural History in Leiden, The Netherlands, whilst his wide-ranging researches in molluscan palaeontology have concentrated since 1980 on holoplanktonic Mollusca - better, if less accurately, known as 'pteropods'.

For the uninitiated pteropods are planktonic gastropods known from the fossil record by their delicate internal shells. Their chief value lies in their potential as biostratigraphic indicators on a global scale. In common with such organisms as planktonic foraminiferans, their pelagic lifestyle ensures wide dispersal, making them a valuable tool in wide-ranging biostratigraphic correlation.

From this standpoint the slightly unwieldy, if undeniably precise title of Arie's book perhaps rather undersells the importance of the work within. The collection examined comprises a significant accumulation of Neogene holoplanktonic Mollusca, whose richness is in a large part due to the abundance of deep-water strata in northern Italy; the value of this collection is increased by the presence of numerous type and figured specimens, including material published by Bellardi, Audenino, Sacco and Pavia & Robba.

The book itself is well bound in plastic-coated boards with a slip cover and printed in a clear typeface on good quality paper, the overall presentation being rather better than many comparable works. It is clearly and concisely written in good grammatical English, and typographical errors are so few as to be undetectable on first reading.

The major part of the book is given over to a painstaking systematic revision of the material in the Torino collections. The systematics, synonymies and references are all given in great detail, but are nowhere overburdened with secondary information. The written diagnoses are accompanied by fourteen plates of well-executed and lucid line-drawings - much preferable to photographs when dealing with fragile, often fractured specimens many of which are preserved on matrix blocks. A new family, three new genera and a new species are introduced, while four neotypes are designated and fifteen lectotypes are selected; an appendix sees four other new taxa erected.

Secondary in extent, but of equivalent worth, is an appendix giving details of all holoplanktonic mollusc specimens held in the Torino collections, including catalogue numbers and type status. Such a catalogue will be equally valuable to curation staff and researchers alike.

The broader application of this work lies in its usefulness to anyone dealing with Neogene holoplanktonic molluscs, especially in Europe and circum-Mediterranean provinces but also, because of their wide distribution, further afield. In particular all the taxa dealt with are well illustrated, making this a handy extra weapon in any worker's armoury of identification guides.

This work must have provided its author with considerable personal satisfaction in its completion; he has tackled a well-defined project with attention to detail and applied his researches to all aspects of the material dealt with, including the more prosaic consideration of collection status, which is so often neglected in similar works by authors lacking a curatorial background. A commendable achievement, and one I hope that will be emulated by future workers.

Paul Jeffery, Department of Palaeontology, The Natural History Museum, Cromwell Road, London, SW7 5BD, UK. 24th September 1996.

Figueirôa, S.F. de M. and Lopes, M.M. (organisers). 1994. *Geological Sciences in Latin America: scientific relations and exchanges.* Campinas: Universidade Estadual de Campinas, pp. iv+402. ISBN 85-85369-06-X. Paperback. Price: US$20.00. Available from Silvia Figueirôa, Caixa Postal (P.O. Box) 6152, 13.081-970 Campinas - SP - Brazil.

The papers that make up this volume were presented at the XVIII INHIGEO International Symposium, held in Campinas and Ouro Preto, Brazil, from 19th to 25th July 1993. The symposium was a well-deserved tribute to the work done on the history of geology in recent years by scholars in Brazil, ably led by the organisers of the conference, Silvia Figueirôa and Margaret Lopes.

The aim of the conference, as stated in the foreword to the volume, was to take a new look at the history of geology in South America. Particularly under scrutiny was the traditional view that the impulse for new developments has always come from Europe, with national workers and institutions simply receiving and absorbing.

The twenty six papers printed in the volume focus on Brazil (twelve papers), with Venezuela (four papers) close behind, and Bolivia, Mexico, Argentina and Peru also represented. Thirteen of the papers are in English, with the remainder being in Spanish, Portuguese and French. Although most papers relate to the nineteenth century, Carlos Serrano provides a chronology which runs right back to the fifteenth, while Carlos Schubert and other writers take their stories up into the 1950s and 1960s.

With such a broad canvas, it is surprising that the papers overlap and complement each other as well as they do. Hugh Torrens, writing on the mineral surveyor Joseph Fryer, relates usefully to Bill Sarjeant on Joseph Pentland, and both papers link up to some extent with those of David Branagan on Australian-South American connections and John Dickenson on British work in Brazil. Margaret Lopes gives a fascinating picture of the intemal workings of the Rio de Janeiro National Museum at the end of the nineteenth century, which relates well to the papers of William Brice and Silvia Figueirôa on Charles Hartt, José de Santana on the "Os Sertoes" literature, and José Alves on the Academia Brasiliera de Ciencias. It is the presence of links like this that give a symposium volume coherence and validity. It is a pity that the organisers did not write an introduction drawing out some of these links for us, and relating the papers to the stated aims of the conference.

This is a very useful volume, which documents many areas of the history of South American previously unknown to European scholars. It is a pity that more effort was not devoted to style and typographic accuracy. Papers were printed 'as they were received', when a number badly needed careful editing to make the English clear and comprehensible, and other would have benefited from the comments of a critical referee.

John Thackray, The Natural History Museum, Cromwell Road, London SW7 5BD, U.K. 27th November 1995.

THE GEOLOGICAL CURATOR

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