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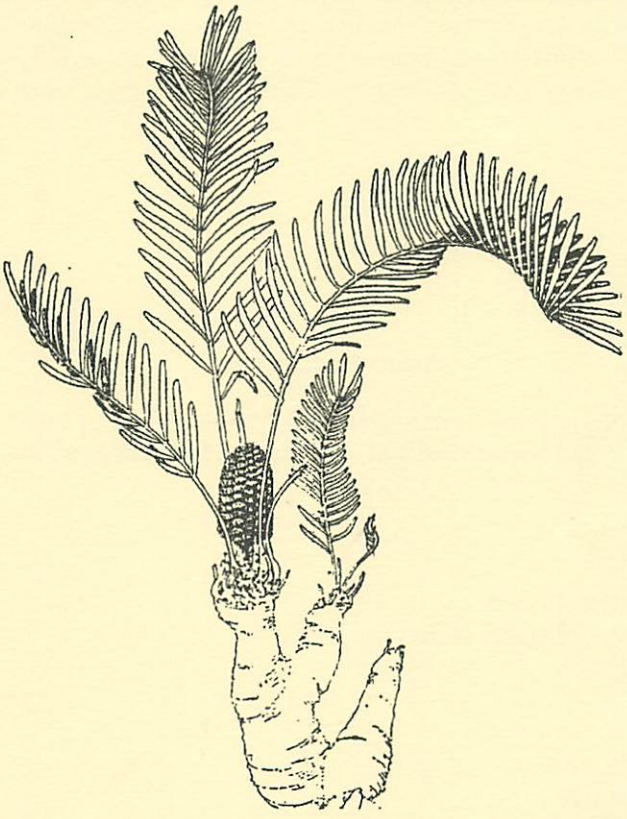

THE EDINBURGH GEOLOGIST
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Cover Illustration

The cover shows the living cycad, *Zamia floridana*, from the central and southern Florida peninsula. This is one of the 'living fossils' described by Bill Baird in his article on page 3 of this issue and was originally published in *Ancient plants and the world they lived in* by Henry N. Andrews, Comstock Publishing Associates, 1947.

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Editorial

Welcome to the Autumn edition of THE EDIN

by Alan Fyfe

Welcome to the Autumn edition of THE EDINBURGH GEOLOGIST. There is a veritable feast for you all here, with some regular features and some new and interesting articles.

Bill Baird starts us off with a piece on living fossils. We are not talking about the coelacanth, which seems to have reared its ugly head again in the media, but of plant fossils. He makes a very interesting suggestion for the establishment of a **real** Jurassic Park. Any readers who have a few thousand acres to spare might like to give his idea some serious consideration.

I have put together a couple of short snippets about encounters with James Hutton. The first is from Ellis Yochelson and Gordon Craig, who contributed the article on James Macie (Smithson) in the last issue. The second is derived from some reading that I have been doing recently, which I had initially thought had nothing to do with geology.

I have introduced a new type of article and would be interested in readers' reactions. This is in the form of an interview with last year's Clough Medallist, Barry Dawson, of the Grant Institute of Geology. Barry has carried out a lifetime of research in Africa and in this issue he tells of his work there, as well as his time at university and in the RAF. It had been suggested that I put a headline on the cover of this issue, 'Exclusive Interview... Dawson tells all!' I was tempted but thought better of it!

It is clear that scholars of ancient Greek are well ahead of the game in geology and there is scope for another 'What's in a Name?' on that very subject. In this issue, the subject of discussion is the Tertiary. This age has been 'dropped' by recent stratigraphic commissions. I look at the details and the implications. There has also been a wealth of correspondence after the last 'What's in a Name?' by Ken Hitchen. I have reproduced the letters here and hope that readers may find them of interest.

There are two articles on this year's field excursions. The first, by Liz Hide, tells of the trip to Appin and, in particular, of the exciting new fossils found in the Loch Aline Sandstone. David and Fiona McAdam give a contrasting view on what a geologist and non-geologist found of interest on the weekend field excursion to Elgin in June of this year.

Editorial

James Hutton stars again in an article by Dennis R. Dean and Tom Sharpe, who discuss a letter from George Mackenzie, of the old Huttonian school, to Henry De la Beche. This was on the definitions of stratification and bedding, a topic that may still cause confusion to first year geology students.

There is more on the new Dynamic Earth exhibition. Having heard in the last issue from Stuart Monro, this time, there is a chance for the punters to have their say. Five critical appraisals of the exhibition have been sent to me, providing points of view that should be interesting to the museum directors as well as of entertainment to our readers. The average age of these contributors is under 22... and one of them is Norman Butcher.

I have been well-nigh overwhelmed with contributions for the 'Poet's Corner'. Thank you to all those that responded to my plea. I cannot publish them all in this issue, so some will have to wait until the future. If the Muse takes you, however, do send me your verse, because it is nice for an Editor to have material in hand!

Puzzlers will be pleased to know that Angela Anderson has another ROCKSWORD in this issue. She tells me that she was alarmed to read that she would provide these on a regular basis... but she has sent me two more, which will see us up to the end of this Millennium. Beyond then, we can only hope!

I am still keen to receive more articles and snippets from professionals and amateurs alike for the next issue, which will be published in the Spring. If you would like to contribute anything, I would be grateful to receive it before the end of February 2000... or sooner if possible!

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Living fossils

by Bill Baird

The age of the Dinosaurs is normally presented to the public in the form of fossil bones or sometimes imaginative reconstructions. The few remaining living animal genera from the Mesozoic period are mostly small, rare and not particularly closely associated with Dinosaurs evolutionarily. On the other hand, plants from the Mesozoic have survived in considerable variety and numbers. This aspect of the living world is often misunderstood by those of us fed on a diet of books and television programmes written by zoologists. They, if describing plants at all, often do so as though they were some sort of green animal. Plants, of course, dismiss zoologists as short lived ephemera and go on with their lives in a different way, less energetic but on a vastly more expanded timescale.

The Mesozoic relict plant species are sometimes represented in botanical gardens and arboreta as individual specimens, often grouped with other more modern species to provide landscape or artistic effects rather than scientific impact. Only in a very large country park could such ancient species be planted on a scale that would give a realistic experience of what it might have been like to walk in the forests of the Dinosaurs.

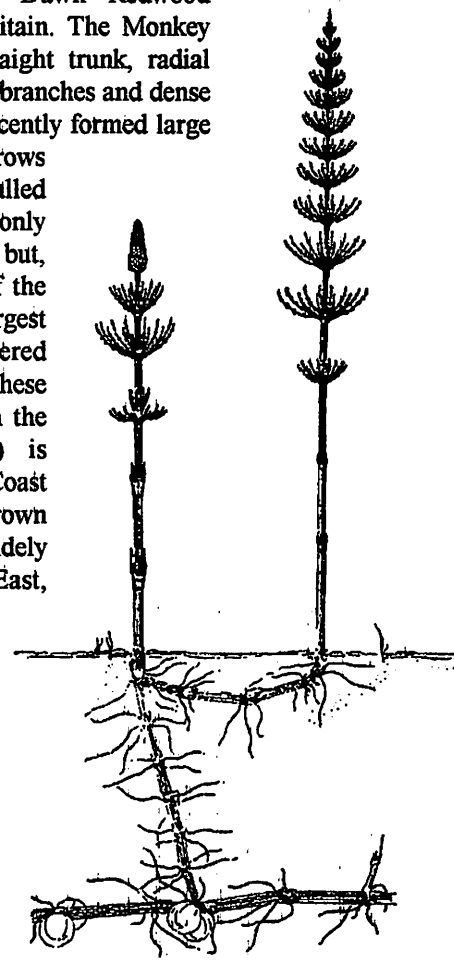
By Cretaceous times (140 - 65 Million years ago) the ancestors of many broad-leaved trees known to us all had already become firmly established. Most people are familiar with the Oaks, Beeches, Holly and Plane trees. The magnificent Tulip Tree (*Liriodendron*), the Magnolia (*Magnolia*) and the Laurel (*Lauraceae*) should be added to the above. From the southern hemisphere the pollen of Antarctic Beeches (*Nothofagus*) had appeared by the late Cretaceous. At the level of ground cover and shrub layer we again meet plants which can be annoyingly common. The Horsetails (*Equisetum*) are successful and widespread survivors from the Carboniferous period. Their structure and form has changed little during the last 350 million years. The Royal Fern (*Osmunda*) was once a widespread native plant now unfortunately largely confined to a few remote locations in Scotland, or as a feature in large gardens. The shrub Candleberry or Snowberry (*Symphoricarpos*), introduced to Britain as pheasant cover, has an evolutionary history dating back to the Cretaceous. Amongst the climbers the Aralias, a group to which the Ivies belong, have an equally long lineage.

Ponds or lochs may already contain abundant representatives of our Mesozoic flora. These range from the beautiful showy flowers of the common water lily, family *Nymphaeaceae*, which first shows its pollen in the early Cretaceous of

Living fossils

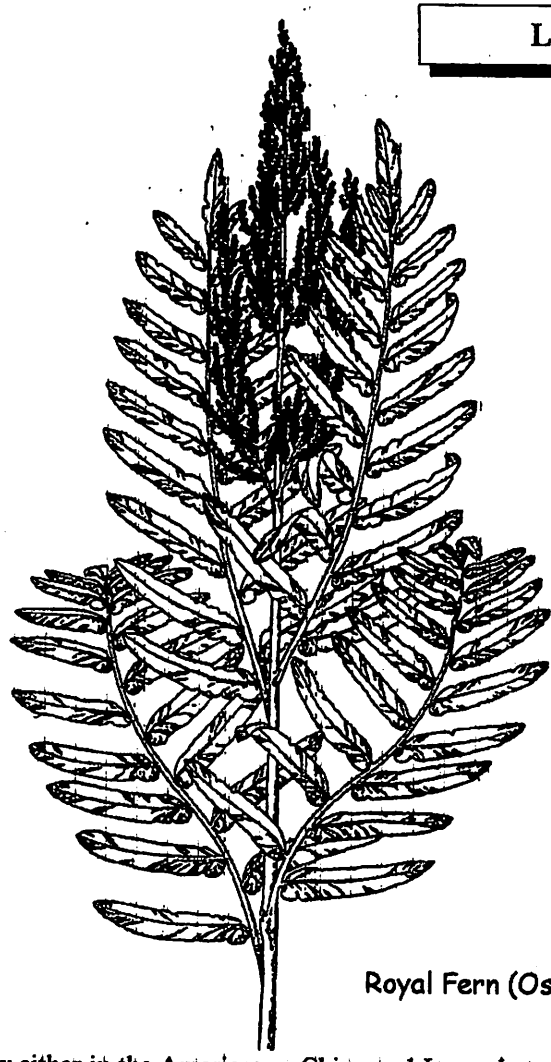
Europe, to the much more primitive submarine quillwort (*Isoetes*), which remains a hidden inhabitant of many Scottish loch bottoms.

However, it is among the gymnosperms (naked seed trees) that we find the widest range of trees which formed the great forest stands of the age of reptiles. The Maidenhair Tree (*Ginkgo*) is widely planted as a specimen tree and has an ancient lineage. Once only known as a fossil, but rediscovered as a living species in China in the 1940s, the Dawn Redwood (*Metasequoia*) grows well in Britain. The Monkey Puzzle (*Araucaria*), with its straight trunk, radial whorls of symmetrically dividing branches and dense plate like angular leaves, until recently formed large forests in southern Chile. It grows well here and has even been trialled for timber. The Redwoods are not only long-lived trees in their own right but, they were also the true giants of the age of Dinosaurs. Even the largest Dinosaur could have sheltered beneath the shade of a grove of these 125 metre high giants. Although the Wellingtonia (*Sequoiadendron*) is commonly grown in parks, the Coast Redwood (*Sequoia*) can also be grown in appropriate sites. Less widely known are, from the Far East, Chinese Fir (*Cunninghamia*) and Golden Larch (*Pseudolarix*), while from swamps in the Eastern USA comes the Bald Cypress (*Taxodium*).



Horsetails (Equisetum)

Although the list of trees is not large, taken together, its constituent species are surprisingly extensive and geographically wide ranging. The present source of many of



Royal Fern (Osmunda)

these trees is now either in the Americas or China and Japan, but at one time they were much more widespread, as a study of British fossil plants soon reveals. Viewed over a sufficiently long period of time some of these trees are as native to the Scottish scene as capercaillies to the Aviemore pine-woods. An added benefit is that most above-mentioned are hardy, being viable down to at least minus 15 degrees Centigrade. If even cool greenhouses were available to grow the less hardy plants such as cycads, some ferns and the sole remaining species of the Chinese Swamp-Cypress (*Glyptostrobus*), then an amazing array of ancient plants could be grown in Scotland.

Living fossils

Currently a project is underway to save some of the world's most endangered conifers. The Conifer Conservation Programme (CCP) is based at the Royal Botanic Gardens in Edinburgh. Its aim is to cultivate conifers grown from specially collected seed and maintain precise data relating to their growth and original location. The intention is to broaden knowledge of these species, widen the genetic base and build up a resource bank which would enable the restoration of depleted wild populations. So far, more than 10,000 trees have been planted at over a hundred sites in the UK.

The large acreage of many of our bigger country parks already hosts some of the above trees, mainly planted as single specimens. However, the establishment of carefully sited stands of these living relicts to re-create a Mesozoic woodland has never been done before. The extensive grounds and varied landscape of a large country park could lend itself to such a major enterprise. By planting the living fossils of today we could create for tomorrow's children a truly unique experience. To do so would be a long-term project eventually providing a new educational attraction where visitors could walk through the still-growing forests of the Dinosaurs. It would only require a modest leap of imagination for tomorrow's children to populate their present with the giants of the past.

Further reading:

Andrews, H.N. Jr., 1947. *Ancient Plants and the World they lived in*, published by Comstock Publishing, Ithaca, New York, USA.

Gardner, M., Winter 1997/98. Conserving the World's Rarest Conifers, *The Dendrologist*, Vol. 12, No. 5, pp. 6 & 7.

White, M.E., 1990. *The Flowering of Gondwana*, published by Princeton University Press, USA.

Bill Baird is the President of the Edinburgh Geological Society and is a regular contributor to THE EDINBURGH GEOLOGIST. He previously worked in the Royal Museum of Scotland, where he was an expert on fossils.

The illustrations are taken from *Ancient plants and the world they lived in*, by Henry N. Andrews Jr., Comstock Publishing Associates, 1947.

Encounters with James Hutton

contributions by Ellis L Yochelson, Gordon Craig and Alan Fyfe

An article in the last issue of THE EDINBURGH GEOLOGIST on the roots of the Smithsonian Institution, left untouched an intriguing instalment on the relationship between James Macie and James Hutton. Readers may remember that Hutton had entrusted to Macie a sum of money with which to procure fossil specimens from Stonesfield, near Oxford. Macie was almost a total stranger and Hutton must have been very impressed with both his knowledge of geology and his character. Ellis Yochelson and Gordon Craig take up the story:

Almost as fascinating is the question of why Hutton was interested in material from Stonesfield at all. Hutton did consider fossils as having significance in geology, but if there is one word that best summarises James Hutton, it is 'granite'. Even in the eighteenth century that rock was about as far from the study of fossils as it is today. Fortunately this little mystery can probably be resolved.

> Stonesfield seems to have been known for its fossils from the middle of the seventeenth century, if not before. Robert Plot mentions them in his 'Natural History of Oxfordshire', 1677 and they are frequently noted by Edward Lhwyd in 'Lithophysacii Britannici Ichnographia', 1699. John Woodward in 'An attempt ... Natural History ... fossils of England', 1729 quotes Lhwyd and makes mention of Stonesfield. So, by the mid eighteenth century Stonesfield should have been well known to savants and dilettanti.
>
> One notable fossil from that period comes to mind. It is the large bone described in 'Account of the great fossil thigh bone ... from Stonesfield' by Joshua Platt in Phil. Trans. Roy. Soc. For 1758. Emanuel Mendes da Costa mentions seeing this bone at Mr. Platt's at Oxford. This is in his annotated copy of his book 'Natural History of Fossils', 1757 now in our library [Oxford University]. He goes on to write a page and a half about his visit to Stonesfield on Wednesday 21 September 1757 in the company of the learned Edward Wright M.D. of Edinburgh.
>
> H.P. Powell to ELY 11 December, 1997

From this information, it is reasonable to draw the inference that Hutton was not interested in fossils in terms of what would be considered today as biostratigraphy or palaeoecology. Rather, like many of his contemporaries, he interpreted the bone as evidence of an ancient race of giants and was anxious to obtain more evidence of their existence.

If that is the 'why' of Hutton's interest, this extract also shows the 'how'. During the travels of his youth, Hutton may well have seen the 1758 *Transactions of the Royal Society of London*. It is equally likely that he could have consulted the volume in Edinburgh. A third route to knowledge of giant men may have come from Edward Wright M.D. for it is logical that he crossed paths during his career with James Hutton M.D.

Acknowledgement

Thanks are due to Mr. E.R. Powell, Oxford Museum of Natural History, for allowing us to quote his letter.

I have recently been reading a biography of Robert Burns and it came as something of a surprise to find that he had, on one occasion, met with James Hutton. What the Ayrshire Ploughman and the Father of Modern Geology said to each other is, unfortunately, not recorded, but the encounter is interesting despite that:

Professor Adam Ferguson, born in 1723 and educated in Perth and St. Andrews, held the Chair of Moral Philosophy at the University of Edinburgh until 1785, when he retired, in part because of a stroke that he had suffered some years earlier. His doctor was none other than Joseph Black, the distinguished chemist, and with the help of his ministrations, Ferguson survived to be well over ninety when he died. The late eighteenth century was the time of the Scottish Enlightenment and Adam Ferguson used to invite the great minds of the day to his house in Sciennes. Recent exploration had discovered the Siberian Kamchatka Peninsula and, because of the isolation and bleakness of the wild moors to the south of the city, Sciennes Hill House was often affectionately known as Kamchatka.

On an autumn evening in 1787, Adam Ferguson's friend Dugald Stewart asked whether he could bring the poet Robert Burns to one of these soirées. Burns was on his first visit to Edinburgh and everyone was wanting to meet this Ploughman-Poet. Indeed, Burns must also be considered as having played a part in the Enlightenment, if not for his literary work, then certainly for his publicly-known

liberal attitudes. On that evening, the Professor had asked Joseph Black and his friend and fellow-scientist James Hutton. Also present were the historian and playwright, John Home and possibly Adam Smith. Young Adam Ferguson, the Professor's eldest son, was also there with a school-friend.

Burns must have felt somewhat out of his depth amongst all these great men of learning and is reported to have spent the first part of the evening looking at the paintings that hung on the walls. It is a well-known story, but he was captivated by one picture in particular, a sentimental portrait of a soldier lying dead in the snow, with a woman and child on one side and a dog on the other. The caption ran:

> Cold on Canadian hills, or Minden's plain,
> Perhaps that parent wept her soldier slain
> Bent o'er her babe, her eye dissolved in dew,
> The big drops mingling with the milk he drew...

Burns was moved to tears and asked whether anyone present knew the identity of the author. The school-friend of young Adam Ferguson was able to enlighten the assembled intelligentsia that they were the words of John Langhorne. Burns turned to the boy and said, "You'll be a man yet, sir." That boy was Walter Scott.

The area around Sciennes Hill House is now built up and when the Burns and Scott societies put a plaque there in 1927, it was described in the Burns Chronicle as "in a working-class district; and the old front is now at the back of the house, facing a drying green, enclosed on three sides by tenements and on the fourth by a factory wall." The plaque is still to be seen outside No. 7 Sciennes House Place. It is maybe a pity that no mention is made of the other great minds that used to gather there and in particular, we may think, of James Hutton. We must accept, however, that Burns was aware of the developments in Science that were going on around him and finish with the Bard's own words in his ADDRESS TO EDINBURGH:

> Here Wealth still swells the golden tide,
> As busy Trade his labours plies;
> There Architecture's noble pride
> Bids elegance and splendor rise;
> Here Justice, from her native skies,
> High wields her balance and her rod;
> There Learning, with its eagle eyes,
> Seeks Science in her coy abode.

Out of Africa

The Editor speaks with last year's Clough medallist, Professor Barry Dawson

Barry Dawson won the Society's Clough Medal last year for the significant impact that he has made in geology, which has involved a lifetime's fieldwork in Africa. He was on the staff when I was at St. Andrews University and I visited him in his office where he currently works in retirement at the Grant Institute.

Tell me, Barry, when did you first become interested in geology?

I was brought up in the North Riding of Yorkshire and was therefore surrounded by the fine landscape of the Yorkshire Dales and the Millstone Grit crags and so on. When I was still at school, we would go hill-walking or pot-holing up in the Dales, so I guess that even when I was a young lad I was aware of rocks all around me. I suppose that if you are brought up in the Fens or somewhere like that, you must have a very dreary existence. But I became interested in geology *per se* only later on in school when I did physical geography, and I found that extremely fascinating.

And then did you go straight from school to university?

No, between leaving school and going to university I had a spell in the airforce on National Service. Actually, that was probably formative because when I was doing my flying training over northern Canada I could see these vast dyke swarms and enormous fold belts and shear wrench faults. Then, in the library in the Royal Canadian Airforce in Winnipeg, I actually found a copy of Holmes's Principles of Physical Geology and I read this and thought 'This is something that I would like to do.' So when I came back from my National Service, I decided that I would go to university and read geology.

So did you enjoy your National Service?

The RAF was fantastic. There were those who said it was all a waste of time but I would do it all over again if I had the chance. It was funny because the last thing my mother said to me when I left home at 18 was "For goodness sake, don't go flying." But, having done the normal basic training of square bashing, you got the princely sum of four shillings a day, which was not a lot. But they said, "Of course, if you go flying then you get flying pay" and it virtually quadrupled. So, in spite of my mother's advice, I thought, 'Well, if you are going into the airforce, then there's only one thing to do and that's fly.' I became a navigator and this suited me

philosophically, because I liked being a member of a highly-trained small interdependent team. If you were in the army, you were just part of a great lowing mass of people, and that didn't appeal.

Of course, it was not entirely risk-free. Some of the guys on the course were killed in air crashes and the like. It was nothing like the war, of course, when you got shot out of the sky but, yes, you grew up fast: the extra money we were being paid was not just because they liked the colour of our eyes. It was just because it was a high risk business.

So after that, did you go straight back to Yorkshire?

Well, actually, I interviewed three professors. I came up to Edinburgh and spoke to Professor Holmes, whose book I'd read in Winnipeg, but although he was a very fine writer, Holmes was not very good on a one-to-one basis, and I was a bit dismayed by that. I went to Imperial College and spoke to Professor Read. He was a very nice fellow but the trouble was that I'd spent the last part of my National Service at Uxbridge, just outside London, and I had really had enough of the deep south by that time. So I thought, 'I may as well go and see what is in my own backyard' and I dropped in and had a chat with Professor Kennedy at Leeds. I found that he was a charming man and he inspired me no end, so I thought 'Well, okay I'll go to university here and enjoy my mother's good cooking at the same time.' It wasn't as if I had never flown the nest: when I was in the airforce, I had been away as far as Vancouver and San Francisco in one direction and across the Canal Zone and the Andaman Islands to Singapore and up to Hong Kong in the other direction. So I'd seen a bit of the world and was quite happy to go back home.

You say that Professor Kennedy inspired you. In what way?

William Kennedy was the head of department and famous for his work on the Great Glen Fault. The Scottish influence was very strong. He had been a Geological Survey man before going into academia and one of the first things he did was to introduce a four-year course at Leeds. He believed that because geology was not taught in schools, it was impossible to do a degree in three years. Several other universities followed his line but eventually it faded away because people thought that if they could get a degree in three years then why should they bother with four. Of course, the four-year course in Scotland was supposed to compensate for the different entrance levels that they had with Scottish Highers, but I think that having done my Higher School Certificate in England and then a four-year course on top of that was immensely beneficial.

Out of Africa

And when did you first think about going to Africa?

Well, the other important thing that Kennedy did when he was at Leeds was to set up the Research Institute of African Geology, funded by the Anglo-American Corporation. When I graduated he invited me to go out and work on kimberlites in what was then Basutoland, now Lesotho. In the mid to late fifties, there was little hope of getting any work on kimberlites within South Africa itself because it was controlled by de Beers but they had no control in Basutoland. Kennedy picked up on this and the fact that kimberlites had been found there and he knew very well that these were windows to the interior of the earth, so here was an opportunity of having some research done on them rather than just looking at them as diamond producers. So I suddenly found myself on the ground floor of a new wave of mantle petrology. I was extremely fortunate in that respect and owe it all to Kennedy. I didn't get into it through my own perspicacity!

And then you continued to work in Africa?

Yes, I developed a love for the place and it has never gone away. After I had finished my PhD, I went out to work on the Geological Survey of Tanganyika and the first thing I had to do was to work on a volcano up in the northern province in the Rift Valley called Oldoinyo Lengai; there were reports that it was going to erupt again so I was sent to map it. This, of course, turned out to be a unique place for it was the only active carbonatite volcano in the world. I was lucky. I was the first person to go down into the crater, which was about 500 feet deep, and I found these lavas that were behaving in every way like basalt, except that they were pure alkali carbonate. And of course the blocks in the pyroclastics over most of the volcano showed us that here was a classical carbonatite complex, with phenites and aegilites and various kinds of nepheline syenite and, lo and behold, out of the top came bubbling alkali carbonates in the form of lavas. So the die was cast and between studying the carbonatites of the Tanzanian Rift Valley and mantle petrology derived from kimberlites and their xenoliths, these are the two main themes that have kept me off the streets. Apart from teaching people like yourself.

Yes, I was going to come on to that eventually! But to return to Africa, I gather that you are going off there again next week.

Yes, we are going to try to climb Mount Kenya and Kilimanjaro. But this is not a geological trip, though I am told that on Kibo, there are some nice big rhombs of orthoclase feldspar that have been frost-shattered out of the phonolites, so I might just slip a couple into my pocket. Well, that's if we make it. I say we are going to

try and I use that word advisedly because you don't know just how you are going to adapt to altitude. Kilimanjaro is nineteen and a half thousand feet, and though we won't be doing the highest points on Mt Kenya, we'll have a go at Point Lenaana, which is just about 16,100 feet high. The higher peaks require technical climbing and anyway I am told that, because of climatic warming, up on the two main peaks of Batiaan and Nelion, where the fractured rock was once glued together by ice, there is now a lot of loose material.

So presumably, you go walking in this country as well?

Oh yes, when I was at Leeds, I was in the mountaineering club but I found myself climbing with people who were better climbers than I and I had one or two experiences that tended to be a bit unsettling, such as falling off Gimmer Crag in Langdale. That's mainly rhyolite, you will recollect, and wet rhyolite is not very nice. When we started off, it wasn't a bad day but it came on to rain and then sleet. My fingers became numb and it was not funny. Anyway, apart from that, I realised that whereas I could do rock gymnastics, I didn't particularly enjoy spending the whole day on one bit of rock. I always wanted to see what was on the other side of the hill, so hill-walking was far more interesting.

And in Scotland, I have about forty Munros yet to do, though my wife, Christine only has six to go. She has three to do in Skye, the new one on Beinn Eighe, in Torridon, Ben More on Mull, and one on the Ballachulish horseshoe, which we'll do last because we have the cottage in Glencoe and we are going to have a party with various folk who have walked Munros with us. It will be a great celebration.

Anyway, to come back to teaching people like me, when did you come to St. Andrews?

After with the Tanganyika Geological Survey, I had a spell as a post-doctoral fellow in Canada, working on the Bay of Fundi area of Nova Scotia. But I had corresponded with Charles Davidson, who was the Professor of Geology at St. Andrews because he had also been interested in carbonatites. He had also been my external examiner. So I was in Canada and suddenly out of the blue I had a telegram from Professor Davidson saying that he had a teaching position available and did I want it? Like all post-docs, I was looking for a permanent job and I said 'yes' because, whilst I had been working on my PhD, I had been up to the St. Andrews area, because there are certain similarities between kimberlite vents and those in East Fife. So I thought, 'St. Andrews... fantastic'. That was my first teaching job and I spent fourteen very happy years there.

Thinking on your university teaching, there is a lot of discussion at the moment on the 'great fieldwork debate'. What do you feel about that?

I have to declare myself as one hundred per cent biased. It is so fundamentally important. Good field mapping and observation in the field is our basic data. Everybody is sitting computer modelling nowadays, but computer models are only as good as the data you put in. I guess that field mapping is maybe a little old fashioned, but I do seriously believe that field mapping is such a good discipline. When an undergraduate is doing their mapping, it is 'decision-time'. They have to make the observations and put the lines on the map and justify why they do it. There is no fudging; it is something that they have to concentrate on. There are not many disciplines where you have to make so many decisions that then have to be assessed by your senior colleagues - through your field notebook and field slips. You have to have the courage of your convictions before you put it down on paper. Does that answer your question?

Yes, I think so; I see where you stand on that issue. Do you have any recollections of your own undergraduate field mapping?

Well, yes. In my undergraduate mapping project I was mapping the area at the head of Loch Kishorn, up towards Shieldaig and I mapped it and I found a slice of quartzite in there which was in an imbricate zone. I thought 'this is a strange thing to find here' and I drew it to the attention of John Hemmingway, who was my supervisor. He confirmed that it was quartzite and I thought nothing further of it until when my mapping project was being assessed. We were sitting down with Dorothy Rayner, who was also a mapping tutor at Leeds, and was on the panel. She said, "What's this chunk of quartzite doing in here? It's not on the IGS map." Hemmingway came to my defence and said, "Yes it's definitely there; I saw it myself and I can only assume that Peach and Horne missed it." Dorothy Rayner just snorted and said, "Well maybe they did, but Clough would never have missed it." So it was that I was first made aware of this mythical mapper called Charles Clough, who was apparently the finest mapper in the whole world.

This was my earliest impression of Clough, and indeed, he was supreme. Of course, it was he who did the mapping and interpretation of the Glencoe cauldron subsidence with Edward Bailey. I think that his contribution in that is understated.

Well, now you have been awarded the Clough Medal and I'm sure that you have carried on his tradition of good observation and field mapping. I will offer you my personal congratulations and thank you for speaking with me.

— What's in a Name? —

In the second in this series, the Editor looks at an aspect of modern thinking on stratigraphic nomenclature and wonders where we go now.

The demise of the Tertiary (and a lesson in ancient Greek)

It may come as some surprise to many of the non-professional geologists in the Society, and maybe some of the professionals as well, that the Tertiary is now no more (or should that be is then no more?). Recent developments in stratigraphy have led to this extraordinary situation. The ramifications are immense, but let us start by looking at the history of the nomenclature.

The word 'Tertiary' is a throwback to a very old style of nomenclature, where three main ages of rocks were recognised. These were known as 'Primary', 'Secondary' and 'Tertiary'. To these in later years was added the 'Quaternary', which represented the most recent of rocks. The rise of palaeontology led to an appreciation that there were rocks in which no fossils were to be found and rocks where fossils were visible. Geological time can therefore be divided into the **Archaean** (from the Greek *archaios*, ancient), the **Proterozoic** (from the Greek *proteros*, earlier, and *zoe*, life or *zoion*, animal) and the **Phanerozoic** (from the Greek *phaneros*, visible).

The Phanerozoic, now taken as everything down to and including the Cambrian, was divided into three further subdivisions, again based on the form of the fossils seen in the rocks and using Greek prefixes to -zoic. These are the **Palaeozoic** (Gk. *palaios*, old), the **Mesozoic** (Gk. *mesos*, middle), and **Caenozoic** (Gk. *kainos*, new). The spelling of Caenozoic has been the matter of some uncertainty over the years and we have had Caenozoic, Cainozoic and, more recently, Cenozoic. The general agreement now seems to be that we go with the last spelling and from now on, I shall use that term. The fact that it comes to us from America makes this version rather disagreeable, but we need to have some degree of consensus and it is a small concession, even though it does lose a little of the Greek root with it.

The Proterozoic and Palaeozoic are largely equivalent to what Hutton referred to as the Primary rocks, while the Mesozoic is represents what was once the Secondary

rocks. The Cenozoic, then, inherited the terms Tertiary and Quaternary, and there they stuck till around 1989, when the international geological community generally abandoned the terms (Harland, 1989; Berggren, 1995; Gradstein & Ogg, 1996).

It was Charles Lyell who first divided up the Tertiary and Quaternary into a number of epochs, proposing the terms Eocene, Miocene, Pliocene and Pleistocene. Those who have followed the Greek lesson so far will have realised that the suffix -cene derives from the same root as that of Cenozoic, i.e. *kainos*, new. The prefixes, for the record, are borrowed from *eos*, daybreak, *meion*, smaller, *pleion*, more numerous and *pleistos*, most numerous. Apart from *eos*, it will be noted that these are all quantitative. Lyell made it quite plain that they were not true stratigraphic terms. Instead, they were based on a statistical study that he had carried out into British, Italian and French molluscs. He related these to the fossil record and the epochs are based on the following table of longevity:

Pleistocene	90-95% still living
Pliocene	over 50% still living
Miocene	20-40% still living
Eocene	less than 5% still living

The Palaeocene and Oligocene epochs were introduced in the latter part of the nineteenth century, as fieldwork showed that the Eocene as it had first been mapped did not represent the full period between the end of the Cretaceous and the start of the Neogene. What Neogene? Where did that come from? Well, in 1853, Hornes introduced the terms Palaeogene and Neogene. At that time, the Palaeogene included only the Eocene while the Neogene comprised the Miocene to Pleistocene. The term Holocene has now been added to the list, representing everything since the last glaciation, including today (but not yet tomorrow). And for those who really want to know, Oligocene comes from *oligos*, little or few, and Holocene from *holos*, whole, these designating how the terms fit into Lyell's statistical molluscan scheme.

We thus arrive at the chronostratigraphy that we know today, which is shown in the chart to the left, albeit with the embodiment of the terms 'Tertiary' and 'Quaternary' as units that have now been abandoned. Some

stratigraphers prefer to retain these terms as names for sub-eras of the Cenozoic, but they are fighting a losing battle. The terms are on the way out. So how do we survive this and what do we use instead?

The real problem is that there are a number of well-documented uses of the words 'Tertiary' and 'Quaternary'. Apart from numerous reference books and treatises on rocks and sediments of these ages, there are everyday phrases such as the 'K–T (Cretaceous–Tertiary) boundary', 'Tertiary Volcanic Province' and 'Quaternary glaciation', which will be rather hard to eradicate. Just how this may be achieved is difficult to imagine. I fear also that the subject of geology has entered a rather conservative phase and there will be those will oppose this change. Perhaps the words will remain in general use and it will only be the academics that use the new terminology. But when it comes down to it, we should do our best to use 'Cenozoic', 'Palaeogene', 'Neogene' or 'Pleistocene' where these apply, because 'Tertiary' and 'Quaternary' are indeed antediluvian (Latin this time: *ante*, before, *diluvium*, The Flood).

Up-to-date information for the serious-minded from:

Berggren, W.A., Kent, D.V., Swisher, C.C. & Aubry, M., 1995. A revised Cenozoic geochronology and chronostratigraphy, in Berggren *et al* (editors), *Geochronology, time scales and global stratigraphic correlation*, SEPM Special Publication no. 54, pp. 129-212.

Gradstein, F.M. & Ogg, J.G., 1996. A Phanerozoic time scale. *Episodes*, vol. 19, pp. 3-5.

Harland, W.R., Armstrong, R.L., Cox, A.V., Craig, L.E., Smith, A.G. & Smith, D.G., 1990. *A geologic time scale 1989*, Cambridge University Press.

As well as editing this magazine, until June of this year, I was on the staff of the British Geological Survey, where, most recently, I was working on the post-Eocene chapter of the North Sea Millennium Atlas to be published late next year. It was when I started on the project that I realised the revolution had happened!

My thanks are due to Martyn Stoker for checking up on the most recent literature for the time scale of the stratigraphic column.

What's in a Name?

- Postscript -

Ken Hitchen's original 'What's in a Name?' article on the naming of features in Rockall has prompted a mailbagful of correspondence, which we thought that readers might find interesting. The first was received from 'Antony Swithin':

Department of Geological Sciences,
University of Saskatchewan,
114 Science Place,
Saskatoon, SK S7N 5E2
Canada

Dear Dr. Hitchen,

I received today from my friend Ellis Yochelson a copy of your article in the recent EDINBURGH GEOLOGIST. I am absolutely delighted and quite thrilled that some of the names I chose for localities on my imaginary sub-continent of Rockall have been perpetuated and given reality on Rockall Bank!

Please accept my sincerest thanks. I should, however, point out that I am still a geological lecturer, at this university since 1972, and that I came here from Nottingham, not Leicester. The confusion is understandable in that the old Nottingham Geology Department's personnel were mostly transferred to Leicester when that Department closed; however, by then I was already in Saskatchewan. 'Antony Swithin' are my middle names, by the way; I was born on the 15th of July.

I have five more books about Rockall awaiting publication. Unfortunately, Harper took over Collins and promptly cancelled my contract, since which time I have been seeking a fresh publisher in vain. (It is not easy to persuade a new publisher to take on, not only the publication of the new books but also the republication of the original four!).

With good wishes and my sincerest thanks once again; truly I am greatly honoured!

Sincerely yours,

(Prof.) William A.S. Sarjeant, D.Sc., F.R.S.C.

The remaining correspondence was related to the naming of sea-bed features discovered during fisheries research:

'Swanlea',
1a Esk Road,
Montrose,
Scotland

Dear Dr. Hitchen,

Chance led me to read your article 'What's in a Name?' in THE EDINBURGH GEOLOGIST. May I comment? The George Bligh Bank was named after a ship (probably a Royal Navy survey ship) which first mapped it out. Bill Bailey's Bank is named after a fishing skipper, probably from Milford Haven. Whether he was trawling or great-lining I know not. Lousy Bank is so-named because fish, particularly halibut, caught there tended to be heavily infested with sea-lice. I have seen this for myself when hauling great lines on the bank, as many as a dozen lice on one halibut.

I am passing a copy of this letter and your article to Jim Adams, of 2 Drummond Place, Edinburgh, who knows much more than I do about the history of oceanography and fisheries.

As a smallish boy, I was privileged to go on a number of excursions of the Edinburgh Geological Society, many led by Robert Campbell, and some by Murray MacGregor, so I was quite interested to be shown this edition by my daughter-in-law, who is a member.

Yours sincerely,

Robert Craig

What's in a Name?

2 Drummond Place,
Edinburgh,
Scotland

Dear Dr. Hitchen,

As you know, my former colleague, Bobby Craig, passed me a copy of your interesting article, which appeared in THE EDINBURGH GEOLOGIST. I would not claim to be as expert as Bobby suggests. However, your article did encourage me to look at some texts which I had to hand. As a result, I would like to comment on the names of two of the banks.

George Bligh Bank

Bobby was partly correct in his supposition that the *George Bligh* was a naval ship. However, according to A J Lee's excellent history of MAFF's Directorate of Fisheries Research, by the time the vessel discovered the bank in April 1921, she was on her maiden voyage after conversion as a fisheries research vessel. The survey in which she was involved was aimed at locating new fishing grounds.

The vessel had been built as a *Mersey* class naval trawler during World War I, and, on being purchased from the Admiralty after the war, the Ministry retained her original name, *George Bligh*. I can find no evidence that the name in turn is based on that of a famous explorer. Indeed, H T Lenton and J J Colledge, in their *Warships of World War II*, state that the names of the *Merseys* (and the *Castles* and the *Straths*, also built as naval trawlers) were taken from the muster rolls of the *Victory* and the *Royal Sovereign* at the time of Trafalgar.

Another of the *Mersey* class naval trawlers, the *John Felton*, was purchased for the use of the Marine Laboratory in Aberdeen. However, the name was changed to *Explorer*, and she continued in service as a fisheries research vessel until 1956. Her successor, also named *Explorer*, was in service from 1956 to 1984 and is currently in the Edinburgh Dock, Leith, where a group of enthusiasts are attempting to preserve her as part of Scotland's maritime history.

continued...

Rosemary Bank

This bank was also discovered during a survey aimed at finding new fishing grounds. However, on this occasion the vessel was the *HMS Rosemary*, working during the course of the second of two cruises which the Admiralty agreed to undertake in 1929-30 in response to pressure from the fishing industry. Again, A J Lee provides the details.

Since she was a naval vessel, it should not be difficult to establish the origins of the name *Rosemary*, although it could be the plant, rather than the lady.

Yours sincerely,

Jim Adams

Further reading

The publications referred to in this correspondence are:

A.J. Lee, 1992. *The Directory of Fisheries Research: its Origins and Development*; MAFF. [ISBN 0-907545-025].

H.T. Lenton & J.J. Colledge, 1963. *Warships of World War II*, part six, *Trawlers*; Ian Allan, London.

Anthony Swithin's published books on mythical continent of Rockall are:

Book 1 Princes of Sandastre
Book 2 The Lords of the Stoney Mountains
Book 3 The Winds of the Wastelands
Book 4 The Nine Gods of Safaddne

All are published by FONTANA.

Where have all the fossils gone?

by Liz Hide

Sand mines must be few and far between, and certainly ones in such beautiful settings as Loch Aline. Tucked away around the corner from the Mull Ferry, the Loch Aline sand mine has, since the 1940s, produced pure white sand for the precision glass-making industry. For me, visiting the mine was perhaps the highlight of the EGS long excursion in May of this year. Equipped with hard hats, lamps and high visibility vests, we spent an afternoon touring the mine on foot, accompanied by staff from the mine and Anne Smith from Tilcon (Scotland) Ltd., the company which now runs the mine.

The sand mined at Loch Aline is Upper Cretaceous in age, and lies conformably on the Greensand. It dips only very slightly to the west and north west and is overlain by Tertiary lava flows, though elsewhere in the area is overlain by the Chalk. The sandstone unit varies from 10 to 12 m in thickness and is generally extremely friable, but is characterised by a number of laterally inconsistent hardbands where a siliceous cement is present. Sand is mined from the base of the unit to within a maximum of two metres from the uppermost hard band, which is left as a roof. Supporting pillars of sandstone are also left at regular intervals. Small displacements along a series of approximately vertical faults mean that from time to time, it is necessary to open up a new section of the mine at a different level. The sand is also cut by basaltic dykes, from 2 cm to 8 m in thickness, which contrast strikingly with the white sandstone.

The very pure 'millet seed' nature of the sandstone has led workers to suggest deposition under desert conditions, a conclusion perhaps supported by the absence of clastic sediment in the associated Chalk. Judd in 1878 considered it to be an estuarine deposit, while Bailey, in 1924, thought that the deposit probably represented material blown into the sea from a neighbouring desert. However, up until now, interpretations have been supported more by the lack of any observed structure or fossils rather than positive observations. Hence the origin of the sand remains equivocal.

As a palaeontologist, I was obviously interested in what fossils had been found in the Loch Aline Sandstone. But I was also interested from the point of view of how any fossils might help us to understand the depositional setting of what is quite an unusual rock. Body fossils are extremely rare in the sandstone – Judd states that it is unfossiliferous and in fact Anne Smith of Tilcon (Scotland) was only aware of a

single specimen. It had been found by the miners in the 1940s, illustrated in a paper by MacLennan (1949), and then lost (perhaps it still sits on someone's mantelpiece) This specimen was a starfish, a rather attractive cushion star, preserved as partly external and partly internal moulds within one of the hardbands. However, a further specimen, tentatively identified as *Calliderma* sp. nov. exists in the NMS collections in Edinburgh. This is shown in Figure 1. This, at very least, indicates a marine influence in the deposition of the sediment.

Two starfish, however, do not make an environmental interpretation, although this had not stopped MacLennan (1949) suggesting that the although the deposit may well have been water-lain, it could be a desert sand deposited on the edge of a shallow sea and that the starfish might have been blown up on to the beach. During our visit to the mine we were able to find more evidence that can feed into an environmental interpretation. On some fresh rock surfaces exposed by blasting in the mine, it is possible to see cross bedding, on a scale of a few centimetres, at a number of places within the sequence. Small amounts of iron impurities highlight the cross-sets. Cross bedding has not previously been recorded here, and may well

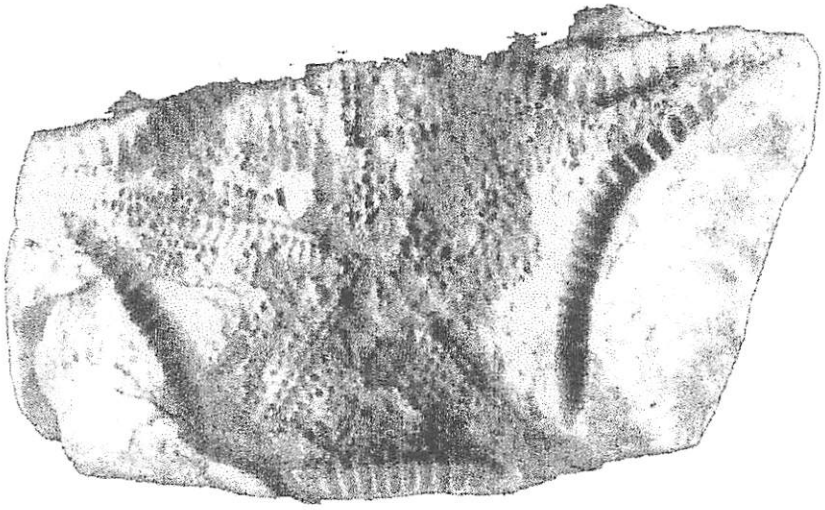


Figure 1: Starfish Calliderma *from the Loch Aline Glass Sand, in the collections of the National Museums of Scotland.*

occur more extensively but is less easy to spot due to the purity of the sandstone - and because it is dark in the mine!

In addition, large amounts of burrowing were found in the sand during this visit and in a further visit that I made to the mine last month, reinforcing the conclusion that the sediments were laid down in water. Areas of intense bioturbation occur throughout the sequence, and indeed, during my second visit the mine, workers were extremely helpful in finding quite a few places where this occurred. The burrows are frequently organically lined, 5-10 mm in diameter and may extend for as much as 30 cm. In weathered blocks of the well-cemented hard bands found on the foreshore at Loch Aline, these organic-rich linings have preferentially weathered away, leaving the burrow fill in relief. A preliminary survey shows that there are a number of different types of burrows in the sandstone. Vertical burrows are seen, with and without branching bases. Vertical burrows suggest rapid sediment deposition – they may be escape structures as the animal struggled to keep up with the rising sediment surface. In places, however, extensive horizontal and oblique burrow systems suggest that at least part of the time, deposition rates were lower and the sediment was stable enough to support quite extensive communities of infauna.

Thus it seems that rather than the starfish representing isolated examples of fossilisation in a sandstone that was largely barren, a much more varied community of animals probably existed on the sea bed at the time of deposition of this sandstone, perhaps on a sand bar. It is reasonable to assume that the starfish are preserved in situ, or with minimal post-mortem transport. However, what seems remarkable is that those working at the mine have not found other body fossils in the sandstone. Belemnites, for example, are extremely robust and likely to survive transport and reworking in a high energy environment – why do we not find them in the Loch Aline Sandstone? The underlying Greensand is, in places, thick with *Exogyra* and other bivalves – what happened to them? If anyone knows of any other fossil finds from the Loch Aline Sandstone (please check your mantelpieces!) I'd be very glad to hear about them!

Liz Hide looks after the invertebrate and plant fossil collections at the National Museums of Scotland in Chambers Street, Edinburgh. She was one of the minibus drivers on the Appin field trip (see page 36).

Elgin weekend excursion - two viewpoints

by David and Fiona McAdam

This weekend was arranged following the successful, if somewhat inclement, 1998 weekend excursion to Hexham. Our leader was Sinclair Ross, one of the Society's more far-flung members, and currently President of the Highland Geological Society. As with the Hexham trip, participants were left to arrange their own accommodation from the Tourist Office list provided by the organiser, Ian Jackson. As Excursion Secretary and proposer of the venue, and newly restored from a heart-bypass operation, David was keen to go. As a bonus it would provide an opportunity to visit daughter Fiona's new home in Torphins; indeed, Fiona might enjoy the excursion too. First hurdle was cleared easily; two single rooms free that weekend in The Lodge Guest House in Duff Avenue, Elgin.

Friday 18th June

The drive from Edinburgh to Torphins, was followed by the chance of a first trip on the Rhynie – Dufftown road, long-known from radio snow reports. No obvious sign, though, of the Rhynie Chert locality. Arriving in Elgin, we found some others from the party had also chosen to stay at The Lodge Guest House, and so joined up for a meal before heading for the Elgin Museum Hall, a leisurely walk away.

Once all the party had congregated, Sinclair Ross was introduced to discuss the weekend's itinerary. Fiona, knowing little about geology, found his illustrated talk very interesting and thought that Elgin Museum itself was very good, although her interests there were rather more general than the geology and fossils. We were also impressed by the detailed 24-page handout produced by Sinclair and Ian.

Saturday 19th June

After stocking up at the local Safeway's we all met up at Grant Lodge in Cooper Park to rationalise cars. The convoy departed for Burghead. There we took a short walk (in the rain which had just started) to the pier, where the party stopped to look at and discuss the Triassic Burghead Beds. We then visited the Roman Well which was very interesting and was well documented archaeologically on a plaque placed there by the National Trust for Scotland.

The party headed on to Cummingston where we walked along a now-disused railway line (still raining – and with wet grass to test the waterproof properties of

Grant Lodge

boots). We went down on to the beach which had lovely pebbles shining from the rain, and walked up through a cave through the faulted contact between the Burghead Beds and the Hopeman Sandstone.

At Hopeman East Beach, Fiona chose to stay in the car and thought all the different colours of the beach huts were wonderful. The rest of the party set out in the rain and were treated to spectacular dune-bedding and other sedimentary structures in the Permian Hopeman Sandstone, as well as a display offshore by the local dolphin population. Further on, the sandstone is still wrought at Clashach Quarry, chosen for the impressive cladding for the New Museum of Scotland. At the quarry, too, there was a display of reptile footprints on large blocks saved during quarrying. It was a long walk back after a satisfying trip (and the rain had cleared mid-afternoon). However, Sinclair had more delights in store and we motored on to Lossiemouth to see garden and golf-course exposures of the Lossiemouth Sandstone overlain by the Cherty Rock with galena mineralisation.

Dismissed at last, we returned to Elgin where dinner was taken in a highly recommended Italian restaurant patronised by many of the party.

Sunday 20th June

Departing from Grant Lodge we drove the 13 miles to Spey Bay, parking at the Tugnet Ice House car park. While the main party were impressed by the storm beach shingle ridges, Fiona was equally impressed by the pretty mosaics and a wonderful sculpture she saw as she walked round the ice house.

Our route took us on past the old airfield at Nether Dallachy to Port Gordon where we parked on the harbour promenade and were enlightened as to just how much coast had been eroded away here. At the harbour itself, while the party walked on down to the beach, Fiona sat on the harbour wall and watched an R.N.L.I. Lifeboat come in.

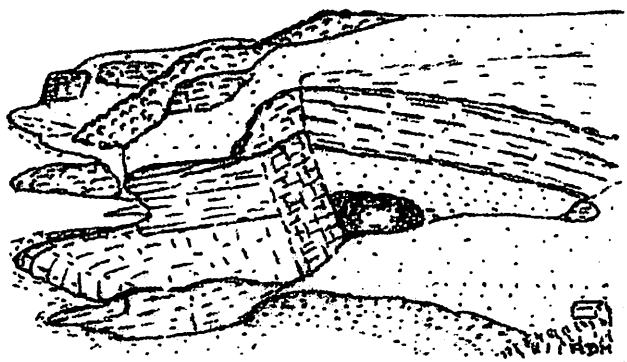
Further on, long arguments ranged across the foreshore over the relationships, unconformable and otherwise, between the Middle Old Red Sandstone, Grampian Group Cullen Quartzite and Lower Old Red Sandstone Buckie Beds. We had lunch back in Elgin at Cooper Park. After this, Caroline Paterson modelled the new EGS high-visibility jackets, complete with logo, successfully encouraging several sales.

We then headed inland to where Rosebrae Quarry is hidden by a Forestry Commission forest. Fiona enjoyed the nice walk through the forest, but was not alone in being puzzled by the unconformity between the Permian Hopeman Sandstone and the Upper Old Red Sandstone Rosebrae Beds.

The final, and most spectacular, locality of the weekend was Randolph's Leap. A very pretty walk took us down to the gorge in the River Findhorn which Randolph had leapt. Fiona took photographs of the party examining the granitic and pegmatitic veins in the Grampian Group micaceous psammites.

Half-way up the ascent and overlooking the Findhorn, Tom Kerr took the opportunity to thank Sinclair on behalf of all the party for organising and leading this interesting and educational weekend. He also presented a well-deserved token of our appreciation, a bottle of Highland Park, Sinclair's favourite.

Most of the party headed off for the A9 and return to Edinburgh, a few took the opportunity of an extended stay in Elgin, while we returned to Fiona's for a day exploring Torphins.



Clashach Cove

David McAdam is well-known to Edinburgh Geological Society Excursion-goers. He is the Excursions Secretary and has recently retired from the British Geological Survey. His daughter, Fiona, who works in an insurance office in Aberdeen, is less fascinated by geological sightseeing, especially when it is raining. The illustrations are by David.

Letter from an old Huttonian
Sir George Mackenzie to Henry De la Beche, 11 April 1836

by Dennis R. Dean and Tom Sharpe

Sir George Steuart Mackenzie (1780-1848), Baronet, is best known today as the principal author of *Travels in Iceland* (Edinburgh, 1811), a geological travel book published during the height of the Neptunist-Vulcanist controversy in Scotland and generally favourable to the Huttonian side, which is to say that he attributed the origins of many types of rock to heat rather than some effect brought about by the agency of water:

> In Iceland, the effects of heat constitute not only, as in some other parts of the world, one of the principal geological features, but they seem to embrace the whole mineral masses of the country. If we take a general view of the continent of Europe, we find that only in a very few spots subterraneous heat has shown itself externally in full activity. With regard to the extent to which operations may be traced, geologists differ widely. Those who are disposed to ascribe the most extensive influence to fire, even the most decided Huttonians, consider heat as having acted with but little intensity on by far the greatest proportion of rocks. Thus, whenever stratification occurs, they consider the heat that operated in this instance as having been comparatively moderate, since a strong degree would have reduced the strata to such a state of liquidity as would have obliterated every trace of deposition. Even in those strata which appear to have lost the whole of their original structure, the heat supposed to have acted upon them has been confined within certain limits. The instance of tufa excepted, I saw no trace of stratification in Iceland...
>
> (360-361; see chapter IX generally) [1]

Though Mackenzie disagreed with Hutton in several instances (like James Hall, for example, he rejected the idea of slow atmospheric erosion), he closely identified with the Huttonian school and, in one memorable instance, suffered the humiliation of having a play written by himself condemned on the first night by Wernerian opponents. [2]

It was therefore with no little interest that Mackenzie in 1836 belatedly read Chapter XIV of Henry De la Beche's *Researches in Theoretical Geology* (London, 1834). Within that chapter, De la Beche considered the two common geological

terms 'stratified' and 'unstratified', which were normally taken to be equivalent to 'aqueous' and 'igneous' in origin, respectively. 'Practically,' he affirmed 'this division is highly valuable; but theoretically, it is not so satisfactory, at least, if we are to infer that all rocks divided into tabular masses, one resting on another, must have been deposited either chemically or mechanically from water.' (287)

Certain Cornish and Dartmoor granites, for example, had been divided into tabular masses by 'cleavage planes' [joints]. Basalts, similarly, might be divided into beds (like those of the Giant's Causeway and the island of Staffa) and yet were of igneous origin. De la Beche attributed their origin to a series of depositions, like successive lava flows. 'Igneous rocks,' he concluded, 'may therefore be stratified, that is, rest in tabular masses upon each other, such tabular masses being produced at different intervals of time.' (289). It was, in his opinion, unwise to associate stratification with aqueous deposition exclusively. De la Beche wished to retain the usefully descriptive words 'stratified' and 'unstratified' but suggested that any attribution of rocks to either igneous or aqueous causes was still premature.

It was in response to this proposal that Mackenzie, now well into middle age, felt moved to address De la Beche, a stranger, by writing to him at his publisher's address. The whole of this previously unpublished letter[3] being of interest, we have transcribed it in full:

Henry De la Beche Esq,
V.P. Geological Society,
Care of Charles Knight Esq,
Bookseller,
22 Ludgate Street,
London.

Sir George Mackenzie presents his Compts to Mr De la Beche and begs to thank him for the pleasure and instruction he has derived from Mr De la B's Theoretical Researches in Geology. Sir G. ought to have read the work long ago, as one of, he believes, the only two disciples of the old Huttonian School still alive, he felt a peculiar delight in observing, since his visit to Iceland, the gradual approach of Geologists to the general principal of the Huttonian School which were long both misrepresented and misunderstood. Indeed they are now forgotten, tho' it was the Huttonians who established the igneous origins of Granite and trap, and the mechanical origin of other rocks. — The cause of Sir G. giving Mr De la B. this trouble, is to inform him that the old school arranged tabular rocks in a different manner from

what is stated by him. What Mr De la B. seems disinclined to call stratified rocks, never received that name from the Huttonians, altho' in some instances Professor Playfair spoke of Stratified Granite, and on his return from the continent insisted with Sir G. he had seen it.[4] Sir G. and others always held tabular masses of granite, trap, porphyry etc as Beds in contradistinction to strata. The latter were distinguished not more by their tabular masses, than by their internal structure, and their exhibiting a disposition of parts in directions parallel to the separation of the strata. This disposition of parts is visible in Gneiss, which retains it even when altered by the contiguity of granite; and this indeed seems to make it, in some instances, more apparent. The distinction used by the old Huttonians might still be useful by applying the word Bed to igneous rocks, and stratum to the mechanically deposited rocks.

The Huttonians used to consider [attribute] all the displacements of the stratified rocks to the irruption of the igneous. But the present position of the rocky masses of the crust is demonstrably not the effect of the force which introduced granite and trap into fissures. Of a similar force it may be; but clearly not that application of it which forced up granite and subsequently trap. Sir G. does not recollect having seen the demonstration stated anywhere, but he will not trouble Mr De la B. with it just now. It is important however as settling an Epoch - the most recent of Geological revolutions. - To return to stratification - Sir G. has often observed a phenomenon that may go far to explain present appearances. Many years ago he had occasion to remove a large heap of rubbish that had remained untouched for several years. On cutting it, the materials appeared arranged in lines parallel to each other and horizontal. He has seen the same thing frequently since, and the analogy of chalk flints strikes us at once.[5] Vast heaps of rubbish are to be found in many parts of the country, and if this observation of Sir G's should appear new, it maybe worth while to have some of these heaps cut through. It appears that Geologists seem now to doubt that each tabular mass among stratified rocks is a separate deposition. Sir G. doubts this, except in cases when ripple is distinctly visible on the [surface]. He believes that vast masses have been deposited by one operation, which fully explains the facts, and among others the apparently hidden involvement of organised beings. The phenomenon presented by sections on a great scale seem to demonstrate a succession of such operations. But an explanation of Sir G's views would occupy too much paper, and in all probability tire Mr De la Beche. Sir G. will only add that it

is his opinion that the trap rocks of Greenland, Iceland, Faroe, the Hebrides, and north of Ireland; all belong to a system of Trappean rocks - that is, he conceives these rocks to be as well entitled to be called a system as any other assemblage, in as much as their similarity in all their localities is very remarkable; and this extends to the direction and dip of the beds. The island of St. Kilda is a link. This system of rocks has been, like others, disrupted, and it is more than probable they existed before the irruption of trap dykes among the recent rocks, as we find them cut by dykes, and in relation to them presenting the phenomena of the stratified rocks. It would be an interesting thing were some zealous Geologists to join in hiring a steamer and to visit the western range of trappean rocks. The occurrence of wood coal in every part of the range from Iceland to Fair Head inclusion, is a striking fact and not easily accounted for.[6] This system of rocks has not yet had a plan assigned it to indicate its relative age; and tho' it does indicate its origin to have been in a succession of submarine volcanic eruptions, the long continued succession of these, and their enormous amount, merit yet much more attention than they have received. The mere facts and not the relations have been described. It is in fact a new field; and no one appears more fitted to enter upon it than Mr De la Beche.

Coul, 11 April 1836

Dingwall N.B.

Thus, Mackenzie recommended to De la Beche that he consider retaining the old Huttonian terminology of calling layers of igneous rocks 'beds' and sedimentary ones 'strata'. Unlike Hutton, he also affirmed a series of distinct 'geological revolutions'. Though Mackenzie apparently had trouble coping with fossils (not a Huttonian topic), he correctly emphasised the volcanic origins and near-simultaneity of the 'trap rocks' (basalts) with which we are familiar. It is a matter of regret that he limited himself to so few reminiscences. There was much that Mackenzie could have told us about geology in Edinburgh during its most contentious years. Even so, this previously unknown letter is a poignant and highly interesting revelation, the last flickering of what was once a mighty blaze indeed.

Notes

1. Sir George Steuart Mackenzie (1780-1848), Huttonian compatriot; author of *Travels in the Island of Iceland, during the Summer of the Year MDCCCX* (Edinburgh, 1811 [reviewed by John Playfair in *Edinburgh Review*, 19 (1812), 416-435]) and *An Account of Some Geological Facts Observed in the Faroe*

Islands in the *Transactions of the Royal Society of Edinburgh*, 7 (1) (1815), 213-228. In 1824 Mackenzie had been visited by young Charles Lyell, his fellow Scot, who also dropped in on Sir James Hall (died 1832). The other disciple of the 'old Huttonian school still alive' was probably Professor Thomas Charles Hope (1766-1844).

2. Dennis R. Dean, 'Scott and Mackenzie: New Poems', *Philological Quarterly*, 52 (1973), 265-273. The new poems, by Walter Scott and Henry Mackenzie, were the prologue and epilogue of 'Helga', a failed play by George Mackenzie reputedly done in by his geological opponents.

3. Sir George Steuart Mackenzie to Henry De la Beche, 11 April 1836. National Museum of Wales NMW84.20G.D921. Transcribed by Tom Sharpe and published with permission. De la Beche (1796-1855) was, at this time, engaged in the Geological Survey of Cornwall.

4. John Playfair (1784-1819) stoutly defended most aspects of Hutton's geological theory and explicated it masterfully in his *Illustrations of the Huttonian Theory of the Earth* (Edinburgh, 1802). Once peace in continental Europe had been restored, after Waterloo, Playfair took an extended European tour in 1816-1817 with a view towards producing a second edition of his *Illustrations* that would bring its arguments up to date. The second edition never appeared. He had, however, already affirmed the existence of stratified granite in his original edition (pp. 82-89, 326-350, esp. p. 327).

5. For a reason not then understood, flints in chalk were known to occur in horizontal lines (perhaps indicative of former ocean bottoms).

6. Most of the basaltic rocks cited by Mackenzie are now regarded as Palaeogene in age. They represent a tremendous outpouring of lava. The occurrence of wood coal [lignite] among volcanic rocks was an unexplainable anomaly.

Dennis R. Dean is an Honorary Corresponding Fellow of the Edinburgh Geological Society. He is General Editor of *History of Earth Sciences Series of Scholars' Facsimiles & Reprints* and lives in Evanston, Illinois, U.S.A. Tom Sharpe is a curator in the Department of Geology of the National Museum of Wales. He is a graduate of Glasgow University and a member of the Glasgow Geological Society.

A catalogue of the papers of H.T. De la Beche in the National Museum of Wales by Tom Sharp and Paul J. McCartney was published by the Museum in 1998.

Views on Our Dynamic Earth

by friends of the Editor

I have asked several friends if they would like to write me a few words on their impressions of the Dynamic Earth exhibition, which opened in July of this year. The first impression comes from Society member, Norman Butcher, modified from a piece originally sent as a contribution to the Scottish Tourist Guides' Newsletter. The remainder are by a selection of rather younger reviewers and critics, whose opinions might be of value to anyone wishing to take their children to the experience.

For some time now, Edinburgh buses have been carrying high-tech advertisements for the first landmark Millennium Commission-funded project to be completed in Britain. The one I enjoyed most reads: 'The Biggest Thing to hit Scotland in 65 million years.' Does this mean that the well-known, well-dated volcanoes in the West of Scotland are now interpreted as impact craters?

But never mind the scientific truth. Our Dynamic Earth has been designed by Event Communications to both entertain and educate the public. Costing £34 million to build, £15 million provided from the National Lottery, the main sponsors are Lothian and Edinburgh Enterprise Limited (LEEL) with Scottish & Newcastle, British Gas and the Council of the City of Edinburgh. The architect, Sir Michael Hopkins, who cleverly rebuilt Glyndebourne, has imaginatively exploited the old derelict site underneath the Salisbury Crags to provide a magnificent platform from which to view the building of Scotland's New Parliament across Holyrood Road and underneath the profile of Calton Hill and Regent Terrace. William Playfair would surely approve.

What of the high-tech Exhibition underneath Sir Michael's superbly roofed platform? At the official Opening on Friday 2nd July, Chris Smith, the Culture Secretary, told the press: "As we approach the new millennium, it is important that we understand the origin of the Earth and how it will evolve in the future." The Queen was said to have found the exhibition "stunning." The report in *The Scotsman*, soon to be relocated next to Our Dynamic Earth, on the following day was pathetic, but *The Times* excelled itself with the headline: 'Mortals offered 90 minute tour of creation.' Not bad, you might think, for only £5.95 per adult.

To me, the best part by far is the low-level flight up a glacier in Norway, subtly switching to Scotland without you being able to see the join. The mortals are definitely processed, especially in the early parts and there are lots of messages. Will the public get them? Two key ones are, at the beginning: 'the present is the key to the past' and at the end: 'the past is the key to the future.' Unfortunately, in the science of geology, we are only wise after the event, so the answers, as John Major once famously said, are in the future which lies before us.

Norman Butcher (aged 71)

Dynamic Earth was good. I liked the clock showing the population. In the time machine lift, I couldn't really see half the stuff on the walls but I really liked the star effect at the end. The spaceship was OK.

The earthquake was very good, especially the moving earth. The glacier trip created an excellent effect that made you feel like you were tilting.

The primordial soup was good but smelt a bit. The rooms after that were too busy to get a good look at. The submarine was quite good. I really liked the big lump of ice. The forest was quite good and so was the dome, but I couldn't see everything.

The shop was quite good.

James McQueen (aged 11)

I thought Dynamic Earth was alright.

I liked the time machine, the shaking floor at the Volcano and the big block of ice. I made a faint hand print on it.

I didn't understand some of what the man was saying: it was too complicated.

There should have been more computers to play on - there were big queues to go on them.

James Hamilton (aged 10)

The first room was boring. The lift was good and I liked the stars and how you could look down. The spaceship was pretty boring.

The shoogly bit was VERY GOOD. Flying over the glacier was OK but not that good. The soup was very smelly.

In the room after the soup, the models of the animals were interesting. I quite liked the brains.

The iceberg was COOL!

In the forest, I liked how the crocodiles poked their heads up. I liked looking for things in the trees. I didn't think much of the dome.

Amy McQueen (aged 9)

I thought Dynamic Earth was brilliant. I liked the time machine.

I liked the room with the bacteria in the water and the dinosaurs' feet coming through the ceiling and the computers. I didn't get a shot on the computers; there should have been more.

I was a bit scared in the lift; it was a bit dark.

Joanna Hamilton (aged 8)

If any other young reviewers would like to write me something, either on OUR DYNAMIC EARTH, or on some other place visited during Scottish Geology Week, which has just finished as this issue goes to press, I should be glad to publish their contributions. The same goes for retired youngsters as well, of course!

Poet's Corner

The Appin Minibus Drivers' Song

by W.S. Gilbert arr. Rosalind Garton

Tune **— "The leader of the Queen's Naveee"**

When we were young we served our term
As students in a geologists' firm,
We studied minerals and rocks and fossils
And learned all things that were impossible.
We learned so little they rewarded us
By making us the drivers of the minibus.

All: *We learned so little they rewarded us*
By making us the drivers of the minibus.

So now we drive the others around
To see what minerals can be found,
Basalt sheets or witharnite,
Has anyone seen a peperite?
We found so little they rewarded us
By making us the drivers of the minibus.

All: *We found so little they rewarded us*
By making us the drivers of the minibus.




Poet's Corner

Now geologists all if you would see
How you can be as good as we,
If your soul isn't fettered to the stone
You too can occupy this throne.
Drive slowly round the corners and make no fuss
And you can be drivers of the minibus.

All: *Drive slowly round the corners and make no fuss*
And you can be drivers of the minibus.

Rosalind Garton is currently taking a rest from being a Long Excursion minibus driver. When not on Long Excursions, she is a freelance adult education tutor based in St. Andrews.

Rocksword Puzzle No. 2

Solution to puzzle on page 40

(Note: 17 across: DT = Du Toit 10 down: IW = I. Wilson)

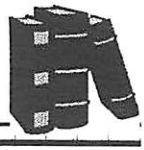
Clues across

1. MONOCLINIC
6. NATURAL GAS
8. ST
9. RHYOLITES
12. WIRY
13. LAHAR
16. CONE
17. DT
18. GRADED
20. FOLDED

Clues down

2. NET
3, 15. CORAL REEF
4. ILLITIC
5. CAST
7. ASSENT
10. IW
11. ERODED
14. HEAT
19. DO

BOOK REVIEWS



I am pleased to be able to print a book review this month for our Society's own publication, 'Building Stones of Edinburgh'. The book was launched on 20th July in the Song School of St. Mary's Cathedral, Edinburgh. The launch was well-attended, with representatives from the British Geological Survey, both current and retired, from the Grant Institute of Geology, and from Historic Scotland, as well as a good few Edinburgh Geological Society members.

The launch comprised a reception, a number of speeches by those involved in the publication of the book, and a splendid buffet lunch. David Land, the Society's Publications Secretary was doing a roaring trade, offering the book at a discount price for the day of the launch.

It seemed that I had to find someone who was not a member of the Society to review this particular publication, and its relevance to the non-geological world could be assessed at the same time. Audrey Dakin, an architect with Historic Scotland, agreed to take on this task.

BUILDING STONES OF EDINBURGH **Audrey Dakin**

I'll admit to being nervous when I was asked to review the new edition of 'Building Stones of Scotland'. The original edition is an Edinburgh architect's bible, and undoubtedly a hard act of follow. But the inclusion of many more illustrations, and additional information on the stone used in building and restoration projects over the past decade easily justify the purchase of this volume to sit beside its predecessor. The book serves not only as an indispensable reference book but also as an inspiration to go down to the city and look again at those well-known buildings with eyes open to the tell-tale signs that may indicate the source of a particular stone or why it may be performing well or poorly in a particular situation.

The performance of any building stone is determined by a combination of its geological character, the quarrying techniques used, its detailing and method of construction. This book concentrates on the first of these factors and provides valuable insights into each of the others. The technical details abundantly provided are leavened by the inclusion of historical anecdotes, for example, the passing mention of the death by drowning of one Kathryn Hunter in the Greyfriar's Port

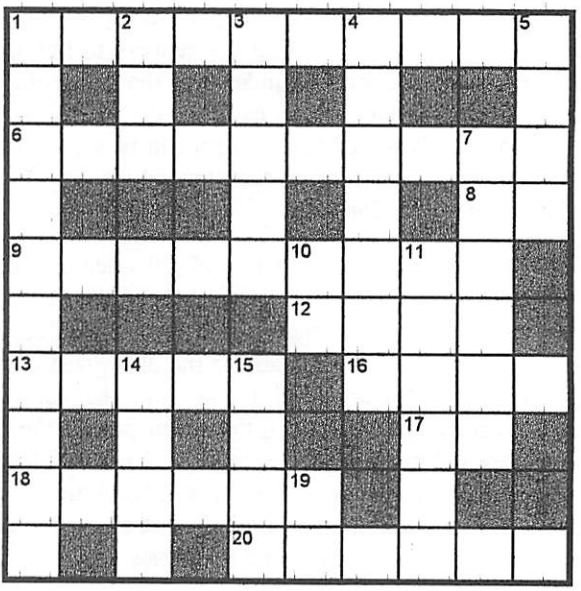
Quarries in 1530. This gory titbit is included as it serves as concrete evidence that the quarries were extant, and presumably working at this time. However such anecdotes also serve to bring the quarries to life, putting them in their historical context. Thus we come to understand that quarrying was formerly part of everyday life for city dwellers, mostly carried out at a small-scale and as a very local activity. The contrast is not laboured, but it can be seen that this historical pattern is quite distinct from our current situation where very few quarries, often the largest, remain in production.

The book is already the first port of call when considering the selection of stone for repairing an Edinburgh building, as data given on the properties of historically and currently available stones indicate which sources might be suitable. However, potentially even more valuable is the data given by including the stone types used for both construction and repair, and the dates for both activities for some buildings. In making this information public, the Edinburgh Geological Society have opened up to all interested persons a vast laboratory set up with long term experiments. I trust future editions of 'Building Stones of Edinburgh' will revisit some of these buildings to provide updates on the differential rates of weathering exhibited by adjacent new and old stones.

BUILDING STONES OF EDINBURGH
2nd Edition, 1999
Andrew A. McMillan, Richard J. Gillanders and John A. Fairhurst
Edinburgh Geological Society, Edinburgh, £9.50
ISBN 0 904440 10 9

Society members are entitled to purchase the book at the same discount price as was offered at the launch, £6.50 plus £1.30 postage and packing. For further details, readers should contact David Land on 0131-441 7559.

Rocksword Puzzle No. 2



compiled by Angela Anderson

Clues across

1. One-sided fold or crystal system (10 letters)
6. Puts the fizz into hydrocarbons (7,3)
8. Short stone (2)
9. Sir Tholey rocks (9)
12. Ideal shape for a high flier? (4)
13. Those playing hooplah are in a volcanic mud flow (5)
16. Volcanic ice cream (4)
17. Initially an exponent of continental drift theories in the 1930s (2)
18. Dedrag sorted bedding (6)
20. Solved the space problem in compression (6)

Clues down

1 A glory in me, a gem of a study (10)
2. Catch veins (3)
3,15. Free Claro for a carbonate builder (5,4)
4. Pertaining to a sickly pale clay mineral (7)
5. Throw off a load (4)
7. Classic Peach and Horne territory (6)
10. Initially a co-author with Hinxman of Mem Geol Surv Sheet 76, 1890 edition (2)
11. Worn down or deed (6)
14. She attended to the fire (4)
15. see 3 down
19. Singular dodo (2)

This is Angela's second puzzle and is possibly more tricky than the last. The answers (again only for readers who are absolutely stumped) are on page 37.

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