Mystery pictures decoded

Kevin Privett

Geology Today

• 'High-resolution images of the martian surface at scales of a few meters show ubiquitous erosional and depositional eolian landforms. Dunes, sandsheets, and drifts are prevalent and exhibit a range of morphology, composition (inferred from albedo), and age (as seen in occurrences of different dune orientations at the same location). Steep walls of topographic depressions such as canyons, valleys, and impact craters show the martian crust to be stratified at scales of a few tens of meters. The south polar layered terrain and superimposed permanent ice cap display diverse surface textures that may reflect the complex interplay of volatile and non-volatile components. Low resolution regional views of the planet provide synoptic observations of polar cap retreat, condensate clouds, and the lifecycle of local and regional dust storms.' – Malin and others, *Science*, v.279, p.1681, 1998.

Correspondence

Dinosaur tracks at Broome, Western Australia

Sirs: David Page has given an inaccurate and potentially damaging account of so-called 'stegosaur tracks' at Broome, in Western Australia (*Geology Today*, v.14, pp.75–77, 1998). Page agrees that vandalism or theft of such rare and important specimens is 'lamentable', and then proceeds to describe their exact location – presumably for the benefit of potential thieves and vandals. Fortunately, his account is completely wrong; the site he mentions has no 'stegosaur tracks', and the example he illustrates is merely a common type of sauropod track.

The diversity of dinosaur tracks in the Broome Sandstone is being documented elsewhere (see' 'Information', below), as part of a research programme begun in 1993 and currently supported by the Australian Research Council. That research has drawn on the encyclopaedic knowledge of a Broome naturalist and dinosaur-tracker, the late Paul Foulkes, and on generous help from leaders of the aboriginal community, whose knowledge of local dinosaur tracks extends back to the Dream Time. Last year, my research assistant Tim Hamley and I also welcomed the participation of Giuseppe Leonardi of Naples, one of the world's foremost experts on fossil tracks.

The existence of so-called 'stegosaur tracks' at Broome was first mentioned in the news media in 1991. These tracks were attributed to stegosaurs because they resembled *conjectural* illustrations of stegosaur tracks published the previous year in my book *Dinosaur Tracks*. As no bones or teeth of stegosaurs have ever been found in Australia, I prefer to be more circumspect and to identify the tracks as those of thyreophorans (i.e. ornithischian dinosaurs of the group that includes both stegosaurs and ankylosaurs). I know of fewer than a dozen such tracks, none of which resembles the footprints illustrated by David Page.

The finest example of such tracks is now lost forever. Although Tim Hamley and I secured an excellent cast of that specimen, with permission of the aboriginal custodial, we have refrained from publishing any photographs, locality data or detailed descriptions. We are reluctant to do so because that specimen – like various other fossils and geological features at Broome – is of profound cultural and religious significance to the aboriginal community. Some sites are off-limits to women and children, and some sacred items (including certain fossils) are to be seen only by initiated males. The publication of seemingly innocuous photographs and the broadcasting of video-footage in the news media may, in some instances, constitute serious affronts. The activities of fossil-collectors, journalists and other visitors (including some professional colleagues) have already provoked consternation, anger, threats of legal action and promises of physical violence. Such affronts to local sensibilities are not to be treated lightly; according to traditional law, serious infringements are punishable by death.

Each year, we seem to spend more and more time rebuilding bridges and apologizing for damage. done by others who 'borrow' or 'collect' specimens without permission, who publish photographs and film of sensitive items, and who desecrate sacred sites with hammer, chisel and rock-saw. Each year it becomes harder and harder to foster the goodwill and cooperation that advances our research. It would help immensely if David Page and other scientists were to acknowledge that the aboriginal residents are also major stakeholders in our heritage of dinosaur tracks at Broome.

Information on Broome dinosaur tracks

Thulborn, T., Hamley, T. & Foulkes, P. 1995. Preliminary report on sauropod dinosaur tracks in the Broome Sandstone (Lower Cretaceous) of Western Australia, *Gaia*, v.10, pp.85–94.

Thulborn, T. 1997. *Dinosaur Tracks of the Broome Sandstone.* Field-Guide for 7th Conference on Australasian Vertebrate Evolution, Palaeontology & Systematics, Perth, 28–29 June 1997, 16pp.

Thulborn T. 1997. *Broome Dinosaur Tracks*. Report on 1997 Fieldwork, accessible at http://www.cmnh.org/fun/dinosaur-archive/1997Aug/msg00778.html

TONY THULBORN
Vertebrate Palaeontology Laboratory,
Department of Zoology,
The University of Queensland,
Queensland 4072, Australia

* * *

Not only the end of geology

Sirs: I read with sadness the lines by Alec Smith (*Geology Today*, v.14, p.51, 1998) on the disappearance of the Department of Geology at the University of Aberystwyth, a feeling I have all too often these days as other departments of geology are snuffed out, all in the name of 'restructuring', 'economizing', 'rationalization', 'better efficiency', etc.

Now while it is true that the mandate of a university is to educate students and promote research, this is only part of the story. The university has – or should have – an important social role. It is to the academic world that the citizen and political bodies should be able to turn for information on almost everything – information derived from the work of academics, who should in turn be willing to share their

expertise. On matters geological, like slope-stability, earthquake risks, water conservation, nuclear waste disposal, climate variability, etc., involving political decisions, not to mention basic history of the Earth and the Earth as a thermal machine, this should be evident. And to whom are the biologists and geographers of a university to turn for cooperation on problems in which geology is involved, if there are no geologists at hand? This is certainly a weakening of the whole academic structure and an impoverishment of the relationship between university and society, which, after all, foots the bill!

And talking of bills, now that industry can lap up good researchers and good research facilities for not very much, and call the tune, has anyone really calculated the total cost of producing the latter from scratch – i.e. purchase of land, building, running the university, training of scientists, equipments of labs, etc.? Talk of bargains!

STEPHEN AYRTON
formerly of the University of Lausanne, Switzerland, 27 Av. Nestlé,
1800 Vevey, Switzerland

* * *

Mussenden Temple cliff stabilization

Sirs: We write in reply to your article 'Irish folly compounded', which was published in *Geology Today* (v.14, p.48, 1998). It appears that the article was based upon a factually incorrect report from *The Guardian*, which had to issue a correction to their report a few days later. The facts of the matter are as follows.

Mussenden Temple is a Grade A listed building which is a recognized regional landmark. The National Trust wished to preserve the structure and a number of options were considered based upon recommendations from a wide variety of qualified sources. Options included moving the Temple inland at a cost of £1.5 million, securing the full height of the cliff with scaffolding from the base at a cost of £2.5 million, or securing the upper cliff using roped access techniques at a cost of £250k. Apart from the cost factors, and bearing in mind that moving the building would require strengthening of the cliff before jacking could take place, the chosen option was environmentally sensitive and maintained the spectacular position and visual impact of the structure at the cliff edge.

The adopted solution, with a 100-year design life, involved the following aspects: (1) installation of rock anchors, bolts and dowels within the cliff to secure unstable blocks in the upper cliff; (2) the replacement of weak palaeosol beds with pigmented reinforced concrete to prevent differential rates of erosion undercutting the upper cliff; (3) installation of monitoring points to determine the rate of very slow continuing erosion at the cliff base; and (4) the use, where practical, of recessed components, infilled with pigmented concrete to minimize the visual appearance on the cliff face. The work was carried out safely using industrial roped access techniques, including specially adapted drilling equipment for such work. These proven techniques are accepted worldwide as appropriate and cost-effective methods to stabilize rock slopes.

The work was awarded on the basis of an open competitive tender with the successful contractor appointing a specialist subcontractor for certain items of work. The contractor was appointed by The National Trust, and not the Department of the Environment as stated in your article. The Department of the Environment provided 50% of the funding (£125k) from public funds as an Historic Building Grant. There were indeed difficulties with the contractor, but these were beyond the control of the parties concerned and have been dealt with in strict accordance with the Laws of Contract. The original contract was determined with about 75% of the work complete; the balance of the work was re-tendered and has been successfully completed.

As regards your final comment, 'Who advises these people?', it should be noted that initial advice was obtained from a wide range of sources, including the geology departments of Queen's University of Belfast and the University of Ulster. The Regional Building Department and Regional Committee of The National Trust, which considered the scheme, also included the former Director of the Geological Survey of Northern Ireland. The local National Trust Director is also a geologist. Mott MacDonald, who were responsible for the design and construction supervision, are a leading international civil engineering consultant with about 70 geological and geotechnically qualified staff based in the UK. We have undertaken similar projects involving rock slope stabilization in countries worldwide and have the necessary specialist core skills to design and implement such schemes. Our engineer who was responsible for the design and supervision of construction has won the Geological Society's 1998 Glossop Award for young engineering geologists with a presentation paper on his work on the Temple.

In summary, the adopted solution was a cost-effective, environmentally sympathetic scheme designed to maintain the impressive position of the historical structure. Problems were encountered during construction, but the scheme has been successfully completed and should continue to provide a focal point for tourism in this area of Northern Ireland.

A. J. DAVIS
Mott MacDonald,
St Anne House,
Wellesley Road,
Croydon CR9 2UL

* * *

Mystery pictures decoded

Sirs: For what it is worth, my guestimates of the James Pickering photographs (*Geology Today*, v.14, p.87, 1998) to get the ball rolling:

Figure 5: looks like periglacial patterned ground, but the edges are very distinct, especially the transition between feature and no-feature in the foreground. Not overlapping, so nothing to do with shell craters, etc. Possibly man-made – some form of bell-pit mining to maximize extraction perhaps?
Figure 6: looks suspiciously cryogenic in origin – cryoturbation/involutions in a former active layer perhaps?
Figure 7: looks fluvial and reminds me of the former shorelines of Dungeness Point – possibly a similar effect, a delta or bar in a glacial lake perhaps, with shifting shorelines caused by wind or sediment input changes?
Figure 8: again, suspiciously cryogenic – what about fossil ice-wedge casts?

KEVIN PRIVETT
Samaras,
Llandough,
Cowbridge CF71 7LR

* * *

Fluoride view

In the most recent issue of *Geology Today* (v.14, p.104, 1998), the paper by Banks and others on Norwegian groundwater asserts that fluoride is an 'essential trace element'. I write to correct this, for as with most fluoride statements in all sorts of media, the number of people willing to stand up and question are few, and the pervasiveness of pro-fluoride lobbying is such that it is easy to excuse people for believing it as accepted fact. However, as yours is a reputable scientific publication, I feel sure you will air a matter which is far from reputable itself.

I could expound on the issues at great length, and would willingly do so if requested, but the fact of the matter is that fluoride is not an essential element, having no physiological function. It actually disrupts normal metabolic functions at low levels. At higher levels it is a highly toxic poison, used as rodenticide and insecticide. The small amount added to a tube of toothpaste could kill a small child if ingested in one go.

In terms of groundwater, many locations with high natural fluoride content have dental or skeletal fluorosis in subject populations. Banks and his colleagues perpetuate another lie in stating that 'lack of fluoride makes teeth more susceptible to dental caries'. No reliable studies have convincingly demonstrated any dental benefit to fluoride ingestion. This is conveniently ignored and denied by the promoters of fluoride, who have perpetuated 'the greatest medical fraud of the century'.

The real agenda is that by trickling a toxic poison into the public water supply of about 6% of Britain, some parts of the USA and much of Ireland, the suppliers make a tidy profit on a waste product they formerly had to pay to dispose of as a highly toxic waste. Fertilizer, steel and aluminium manufacture produces most of the fluoride we are being force-fed.

Whilst marginal to the main thrust of the paper, I felt I had to draw attention to these dangerous and misleading statements.

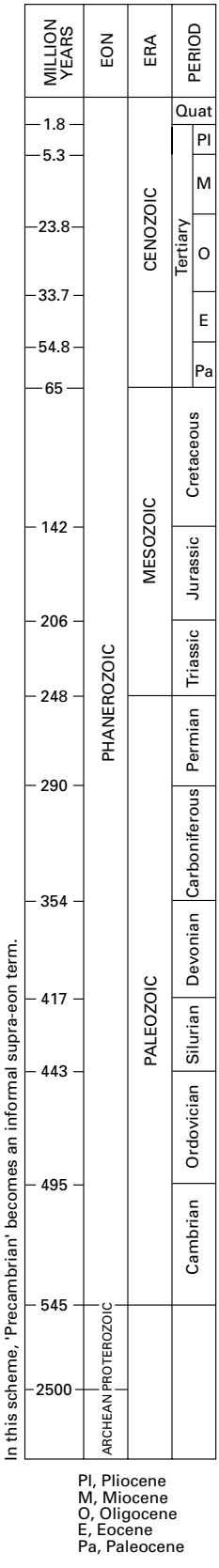
MATTHEW A. PARKES
3 Fontenoy Street,
Dublin 7, Ireland

* * *

GPS and the Greenwich Meridian(s)

Sirs: Your item in 'What the papers say' (*Geology Today*, v.14, p.6, 1998) about Greenwich Meridians proved useful for using a GPS in France. My GPS (Magellan Pioneer) had a bewildering array of co-ordinate system and map datums to choose from, but your article mentioned the ED50 datum, hopefully like the GPS's 'Europe 50' option, so I programmed it accordingly. Further, the French map (1:25 000) referred to 'Système géodésique Européen unifié', which sounded encouraging. The differences between the various Greenwich Meridians the article was the least of the (potential) problems as the GPS professed an accuracy of only about 40 m, and only the WGS84 datum was said to be significantly different from all the others.

A bigger problem was that most French maps have no grid lines! At least not as squares on the map itself. The IGN maps (equivalent to our OS) had no fewer than four differing reference systems in the form of ticks in the maps' margins, and I could (and did) spend about an hour drawing lines with a ruler connecting the ticks to get a 1-km grid of squares. But which of the four systems to choose? One, the UTM (Universal Transverse Mercator) grid, was an option on the GPS, and this was therefore the one I gridded on the map.



In this way, before leaving home I calculated the grid reference of the church at our destination town (Blain in Brittany) and put it into the GPS as a way-point, and when I arrived outside the church, the GPS reading agreed with reality. Home was then 452 km away on a heading of 359 degrees true, the GPS reckoned! Apart from using it for distances and bearings, the GPS can, of course, give grid references for plotting on the map. Instead of our own familiar 6-figure format the UTM grid had to be used in full co-ordinates, with spurious accuracy down to one metre!

All this doesn't sound very geological unless you want to plot quarries or other exposures in France while on holidays, but now you know what you are up against if using a GPS. It may be better to use good old-fashioned map reading unless you are in featureless conditions such as fog, mud flats or forest. Otherwise, there's always the fun of checking the ferry's speed (67 kph on our-high speed catamaran).

RICHARD GOSNELL
6 Vowley View,
Wootton Bassett,
Swindon,
Wiltshire SN4 8HT

* * *

BGS's 1:50 000 Memoir series to go

Sirs: The British Geological Survey (BGS) is shortly to discontinue 1:50 000 memoirs, which have been produced in one form or another since the early days of the Survey for over a hundred years. It would be very regrettable if the BGS were to drop this excellent and informative series of publications, which provide an authoritative and accessible geological overview of an area which cannot be given by papers in journals. I fear this is the result of accountants adding up the total coast of writing up the mapping of a sheet as the cost of producing a memoir when this work has to be done anyway, and the production of a final published account is a useful process in itself. The 1:10 000 mapping notes for an average sheet would be far more expensive and difficult to buy.

The BGS states that the series will be replaced by a series of regional memoirs, probably at a slightly more advanced level than the new regional guides, which have been dumbed down by removing references from the text. Thus it is now much harder to work out what is new material or quotes from published papers, as references on the page are now considered offputting to the intended readership (when I was young I simply ignored them). I hope that the BGS and its government paymasters will reconsider this matter considering how much of our nation's wealth is derived from geological resources.

DAVID NOWELL
2 Tudor Road,
New Barnet,
Herts. EN5 5PA

Taking advantage

'[The Eskimos] were right to be wary. Diseases introduced by the Kite [the sealing ship of Robert Peary, who reached the north pole in 1909] reduced their number from 238 to 158 within eight years. Peary also stole three enormous meteorites, which the Eskimos had used as a source of iron for tools, and sold them to a New York museum for $40,000.' – Nicholas Hellen, *The Sunday Times*, 26 April 1998.

Find fossilised dinosaur tracks. Download our app and get tracking.Â Discover the â€˜Dinosaur Coastâ€™ in the North West Kimberley Region of Western Australia. Get the Track Guide App. The Dinosaur Coast has more different types of dinosaur tracks than anywhere else in the world! Finding a fossilised track (the term used by scientists) made by a dinosaur 130 million years ago is a special experience. Thereâ€™s also no better place to search than Broome and the Dampier Peninsula DINOSAUR COAST in the Kimberley region of WA. Book a broome dinosaur school group excursion. View Excursion Details. PLAN A. Broome Dinosaur Adventures, Broome, Western Australia. 18 likes. Operating in Broome's magnificent Roebuck Bay for the last 21 years, our focus is on...Â Australia: Broome. Canada: Bay of Fundy. Tanzania: Zanzibar Beach. See more. Broome Dinosaur Adventures. 18 May Â·. +7. Visit Broome. 18 May Â·. ðŸŒ…Which is your favourite?ðŸª. A file image of a three-toed dinosaur footprint in Broome, Western Australia. (Getty Images). Tweet. Facebook. Mail. An "unprecedented" 21 different types of dinosaur tracks have been found on a stretch of Australia's remote coastline, with scientists dubbing it the nation's Jurassic Park. Palaeontologists from the University of Queensland and James Cook University said it was the most diverse such discovery in the world, unearthed in rocks up to 140 million years old in the Kimberley region of Western Australia. Steve Salisbury, lead author of a paper on the findings published in the Memoir o