SAHARA:
CROSSING THE WESTERN DESERT
REFERENCES

Richardson D. & Jacobs D. The Rough Guide To Egypt. Penguin. Current edition
Most general guides give scant attention to the Western Desert. This one has one hundred pages and is a good starting point.

Sampsell B. A Traveller's Guide to the Geology of Egypt. American University in Cairo Press. 2003. An very good introduction to the whole country.

Silliotti A. The Oases. American University in Cairo Press. 2007. A brief introduction to the main cultural features.

Vivian C The Western Desert of Egypt. The American University in Cairo Press. 6th printing 2007. An excellent and comprehensive record of all aspects of the Western Desert, both natural and cultural.

MAPS

Most maps ignore the Western Desert and concentrate on the Nile valley. Once again the Rough guide is the exception, producing an excellent general purpose map of the whole country. Scale 1:1.125,000 ;1 inch: 17.8 miles; 1cm: 11.25 Km

AFTERWORD

Herodotus was the first to tell of the Lost Army of Cambyses. A modern Herodotus is Wikipedia, both to be read with equal caution! Vivian, pp 148-9 has an authoritative account. She sorts fact from fiction and discusses options as to what may have happened.

Those still very young at heart should try 'Biggles Flies South' by Cpt. W.E.Johns

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90 YEARS OF GEOLOGY: COLLECTIONS and RECOLLECTIONS

Horace Sanders

The South Staffordshire coalfield is a horst, defined by two roughly parallel faults aligned N and S which brought up the Westphalian coal measures above the Trias on either side. It has an area of some 180 square miles extending from just west of Birmingham on the east, to Stourbridge on the west and reaching to Stafford and the Potteries in the north. It became known as The Black Country; deservedly from the grime and pollution of intense coal mining, iron smelting, forging and rolling in the late 18th and the 19th centuries.

At one time there were six huge blast furnaces producing cast iron from iron ore. At night the reflected glow on the clouds from them was spectacular. Although the name still persists, e.g. The Black Country Geological Society, the region is mainly one of commerce and medium to light industry, becoming almost as green as the surrounding areas on Triassic sands and clays.

I was born in 1910 just inside the eastern boundary fault not far from Birmingham and may therefore claim to be a Blackcountryman, especially as my working life has been with metallurgical processes. Geology determined the development of the area, providing iron ore, coal and clays suitable for the high temperature furnace linings, and limestone, essential in the blast furnace, where it combines with silicate impurities in the ore to form a slag. This floats on top of the molten iron and can be tapped off.

Geology for me began when I was eight, with my grandmother taking me to Dudley on the tram. In the castle grounds she showed me pieces of rock with impressions of shells, corals and other curious objects; explaining in simple terms what they were. I insisted on taking them home.

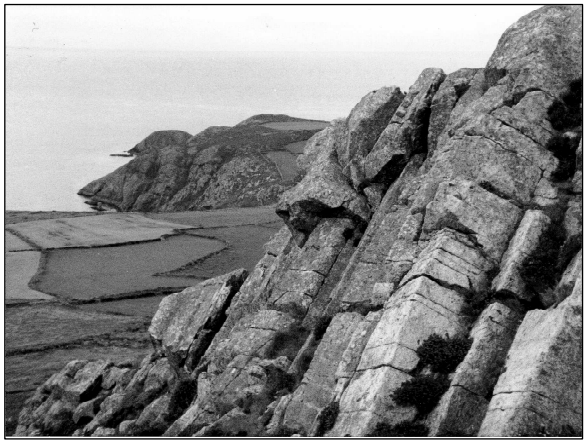
Subsequent visits extended to the Wrens Nest where I was overwhelmed by the cavernous workings and the massive supporting pillars of the roof.

My first bicycle, at the age of twelve, brought independence and a school friend and I cycled there from time to time and descended the steep rock face to reach the lowest part of the workings which were sometimes under water, We were never quite sure of our ability to climb back as there were few good handholds in the rock. It never occurred to us what would happen if we failed, as no one knew we were there, and shouting would not have been heard.

We knew that we were on the Wenlock limestone and collected extensively, including *Favosites* sp corals some of which appeared to be in their place of growth, the largest 11 inches in diameter; also the usual brachiopods *Leptaena depressa* and *Strophonella euglypha, crinoids* and, of course, the famous trilobite *Calymeni lumenbachi*, one of few fossils to earn a nickname, The Dudley locust (usually called Dudley Bug). One specimen had the multiple lenses of its eyes preserved as calcite: also, we found well preserved coiled gastropods *Euomphalus* sp.

Collecting did not suffice and a chance visit to a secondhand bookshop revealed a Murchison's "Siluria" priced at two shillings and sixpence-way beyond the limits of pocket money. I did however have a shilling which the owner accepted on deposit until capital built up over the next three weeks. At the age of 15 I used the Birmingham Reference Library, requesting works by Lyle, Jukes Brown, Lapworth and De La Beche. The unfortunate girl on duty disappeared up a spiral staircase to produce them, dropping them on the issue desk and raising a small cloud of dust, and looking at me with the unmistakable message "You are doing this just to annoy". Come closing time I was the only one still there, still scribbling away noting the half understood information I had read.

Family holidays in North Wales and the Lake District opened up new geological horizons for



Columns of intrusive dolerite on Garn Fawr Pwll Deri, Pembrokeshire Coast.

me and I chose Geol. Survey maps for these areas for school athletics prizes - never for academic achievement! Also at school it was the practice to give lectures once a month, after school hours, to all pupils interested. These were given by outsiders or by sixth formers. My first ever lecture was on fossils. There was no projector, just the blackboard and chalk. I had with me however about thirty fossils from my collection and these were handed on to everyone in turn as I described them. It seemed to work and questions included "How do you know they are as old as you say they are?"; “Why do they have such weird names?"; "When I am buried is it possible for me to become a fossil?" and lastly "How do you know so much?” This last one raised a wan smile from the masters present unmistakably implying "And why does he know so little of what we try to teach him?”. Not all of my fossils were returned to me, and I hope that the interest of their acquisitive possessors was stimulated by them.

At 17 I had good results in final examinations and hoped to take geology at university. This was not possible however, for financial reasons. In those days almost the entire cost was payable. I therefore decided to base my career on metallurgy, and this was at the right time and quickly opened up a position of responsibility. At 23 I was appointing graduates in engineering and chemistry to the staff of my department: a situation which could not apply today.

Birmingham University then offered extramural tuition in geology, including field work, the preparation of micro slides etc. I made full use of

this and found the staff very helpful and friendly. I recall one meeting to examine glacial clays in a terminal moraine at Bartley Green south west of Birmingham. We saw complex folding in the clays and many erratics, some too big to move, identified mainly as Arenig andesites from North Wales, as well as a mix of rocks from the Carboniferous of south Staffordshire, picked up en route by the ice. It was a sultry August day and we were plagued by insect bites, putting an end to activity. Three of us needed medical attention next day. The things we do for geology! The site is now a housing estate.

The Triassic of the Birmingham area included the Bunter pebble beds an exposure of which in gravel pits was within a mile of where my parents lived. Some pebbles were up to 16 inches in diameter and perfectly rounded, mainly in quartzite. Others were of igneous origin with geodes; rewarding when sectioned and polished. Explanations suggest they derived from denudation of mountains in what is now the English Channel. Even so I find it hard to accept that rivers could transport rocks of this size 150 miles wearing them almost spherical. However, one has to remember that the relative density of quartzite being only 2.5, some 40% of the weight is supported by buoyancy. The late professor L. J. Wills seemed convinced "One can picture rivers swollen by rains or melting snow, roaring down in flood through deep canyons to deliver their load onto the desert plains of the Midland cuvette."

During the war years I was occupied with the production of armaments, including metallurgical developments to the Rolls Royce Merlin engine which powered the Spitfire and the Lancaster bomber. The only activity relating to geology was the search for minerals from which to make high temperature refractories for special melting furnaces.

I joined The Geologists' Association in 1946, and am the only member to have attended both their 100th and 150th celebrations. Their Midland Group, of which I was one time president, was centered on Birmingham University Geology Faculty, under the late Professor Shotton who attended most of our meetings and persuaded his staff and students to do the same. This worked well. We grew in number and extended the range of both indoor and field meetings.

Geologists Association, West of England Group field meeting July 1992 near Tenby. Productive coal measures, the shore at Amroth. Boudinage structure in sandstones, with coal underneath.

In 1960, I ventured to lead a long weekend visit to N.W. Shropshire with emphasis on the Ordovician and the igneous exposures - this rather than the better known Ludlow and Church Stretton area. To make sure of access to exposures, walking distances etc I spent a weekend cycling over the terrain, and prepared map handouts. We were based on Bishops Castle, 38 members enjoyed the fine weather, the good company and the geology.

Following the retirement of Professor Shotton financial stringency prevailed and the University could no longer provide the facilities hitherto available. Eventually the Group declined and is no longer active.

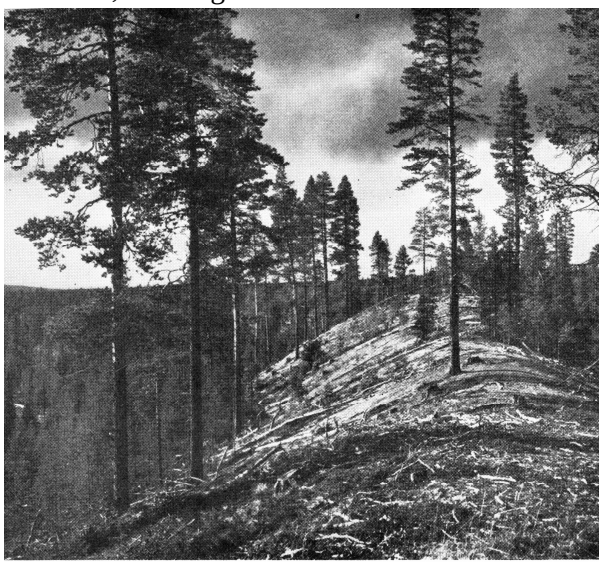
My work required me to travel from time to time, including to most European countries, the U.S.A. and India. Sometimes this gave me the chance to make brief visits to sites of geological interest, such as the Grand Canyon and the Himalayas.

In 1950 I was stationed in Sweden to extend the scope of my employer's Scandinavian branch. It was essential to use the language, however limited, and this gave me access to the Swedish Geological Survey publications. Now they are published in English, including their Atlas of the Geology of Sweden, a masterly work of 200 pages

of coloured maps, photos and diagrams, 50 of which are devoted to the Quaternary. This is appropriate as evidence of glaciation is all around.

Typical glacier - rounded and smoothed granites in the Stockholm Archipelago.

The Quaternary phases of the Baltic are complex but known in great detail. Owning a piece of land in the Stockholm district has its problems: the chances are that there will be a line of boulders roughly aligned east to west; some of them too big to move by hand. These are known as De Geer moraines, marking the winter arrests of the retreat

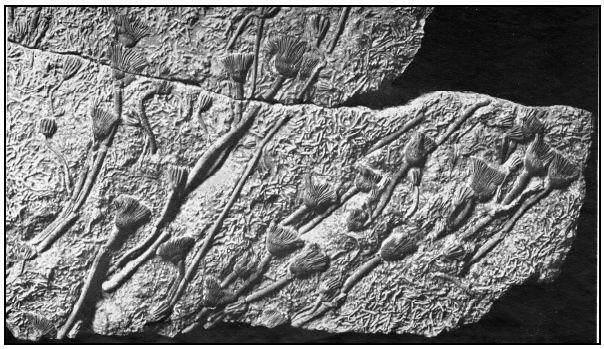


A small esker, aligned almost exactly N to S Just north of Stockholm

of the last glaciation. The solid geology is mainly igneous and metamorphics which have penetrated the Precambrian to Ordovician shield. Granites abound in wide variety, a challenge to petrologists. At Ytterby on the coast just north of Stockholm there are granite pegmatites and it was from minerals in these that the “rare earth" elements Yttrium and Ytterbium were discovered. Small quantities of these are now used in television screens. Also there are "Graphic Granites", in which quartz and pink orthoclase feldspar crystals have grown side by side, giving the impression of ancient script : hence the name. When polished it is very attractive.

After many weeks living in hotels in the capital, I rented a house on one of the many small islands not too far out in the Baltic, leaving my car on the mainland and rowing across. All went well until November when the Baltic began to freeze and the ice was too firm to row through, but too thin to walk upon. Soon after, I could walk or preferably skate across. “Put your skates on and get to work".

The family joined me at holiday times, by boat from Tilbury and Gothenburg. In August we were on the island of Gotland with its classical sea cliffs, 50 metres high in Silurian limestone.



Crinoids complete with crown, and bryozoa. Silurian (Wenlock) limestone Gotland, Sweden.

In 1966 my wife and I were in the Dolomites for two weeks, intrigued with the fascinating rock formations. These provide so many secure handholds that, with discretion, safe climbing is possible without ropes and tackle. What were the chemical and perhaps biochemical processes that produced dolomitisation on this scale?

In 1960 I joined the Geologists’ Association visit to the Lipari Islands. We made the usual late evening ascent of Stromboli to see the eruptions in darkness. They are intermittent on a cycle of twenty to thirty minutes; so with careful timing it

is safe to ascend to the crater rim. This we did, and then descended to a safe level to rest as best we could till dawn. Thinking it clever, I chose a place near a fumarole where the ground was warm. On waking I found that my trousers, of acrylic material had disintegrated: evidently sulphur dioxide and moisture had reacted effectively. To ensure decency on the descent, I wore a long waterproof, much to the amusement of the others, whose remarks are best left unrecorded.

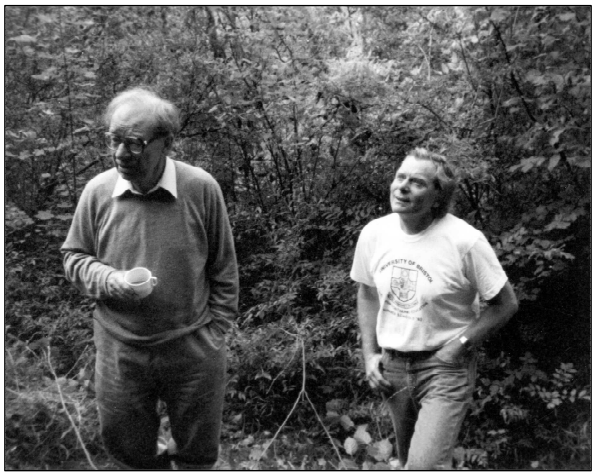
In 1967 I was on the Isle of Rum, being interested in the repetitive sequence of chromite-containing peridotites, alternating with gabbros on the sides of both Askival and Alival. Access to the island was then strictly limited and there was no accommodation at Kinloch Castle. My wife and I were however given permission to pitch our bell tent on the shore of Loch Scresort. One night during a severe rainstorm a young deer forced its way into the tent. The rock samples I collected, together with photographs were shown at a talk to the Midland Group of the Geologists' Association at Birmingham University. Some specimens were left with the university, at their request, for research.

As a member of The Glacialogical Society I took part in their meeting in Iceland in 1970 to continue research on the glaciers. The volcano Hekla was in eruption, and attention was diverted from ice to lava, one member approaching it sufficiently close to toast the bread of his sandwiches. Being the only one present with any experience, however slight of active volcanoes, I was urged to lead the party up as near to the crater as was safe. We took advantage of a temporary lull and came within about 400 feet of the summit before retreating.

On my retirement at 65 my wife and I decided to live in France, where we had spent several holidays cycling and motoring. All three of our daughters had exchange visits with three equivalents of a French family in Toulouse. Our close friendship has extended through four generations of our respective families and now includes great grandchildren. So we bought a neglected farmhouse in the Perigord, Dordogne for less than £7000 and spent the next 13 years there as permanent residents. With walls a metre thick in the local Oligocene limestone, restoration was hard but enjoyable work. Rock supplies were available in a nearby disused quarry. Barns were restored, including one which had an extension for drying prunes, and this was converted into en suite accommodation for guests. Plumbing and electrics were within our capability.

As my wife was an archaeologist - she began where I left off - the Dordogne with its many caves and exposures in Jurassic and Cretaceous limestones provided interest and challenges to us both. We integrated with the local French and were members of the Friendship Club of which my wife was soon appointed Treasurer. I asked her if she understood accounting in English, let alone French but all went well as usual. I was the "Mécanicien". We exchanged Sunday lunch visits, the meal lasting generally from 1.30 to 6pm and the French were greatly surprised to find that anyone English could cook! In addition to the splendid country and attractive old towns within easy reach we were within a 2 hour drive of Bordeaux and the Atlantic coast, and going south, to the Pyrenees and Spain.

On each of us approaching our 80th year our daughters said we were in open country dependent on cycling or driving for all services and that it was time to return. Reluctantly we eventually sold up in France and settled in Wiltshire in1988.

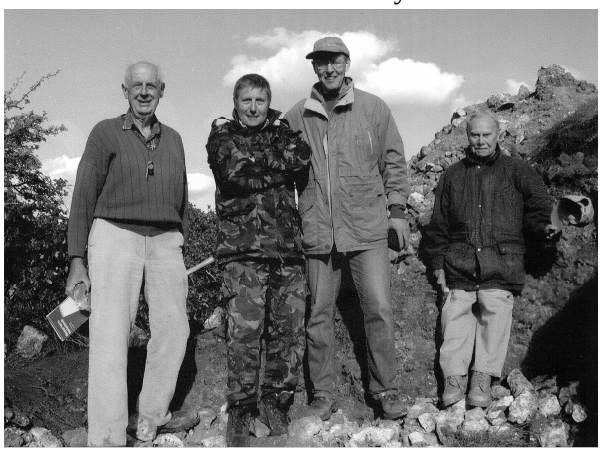


September 1993 at Brown's Folly. Bath Geol. Soc. clearing vegetation from rock exposures. L to R: The Late Ron Smith and Peter Hardy. Photograph: Horace Sanders

We joined the Bath French Society and the Chippenham Twinning Association and I was made welcome to the Bath Geological Society, membership of which has given me great satisfaction in my advancing years. Recently honorary membership has been conferred, recognition I greatly value, but perhaps do not entirely merit. Their meetings maintain a high standard and also serve as social occasions, and many friendships develop.

Combined meeting of Bath Geological Society and the Bristol Nats at Wick Quarry May 1997. Complex folding in Clifton Down (carboniferous) limestone.

Over the last five years I have been one of a small group, initiated by Robert Chandler and John Callomon, the purpose of which is to extend research into the biostratigraphy of the Jurassic, Bajocian Inferior Limestone. This is based on the ammonites which are carefully collected and



Four of the 'Cephalopodians' at Dundry Hill, May 2006. A JCB was used to remove the overburden to reach the strata in which we wanted to work about 4m below. The site was filled and levelled on completion. L to R: John H Callomon, Robert B Chandler, Volker Dietz and Horace Sanders. (See 'The Ovale Zone (Lower Bajocian, Middle Jurassic) at Littledown Wood, Dundry Hill, Somerset England' published, in English, by Stuttgarter Beiträge zur Naturkunde - Geologie und Paläontologie)

recorded, centimetre by centimetre. In this we have been assisted by English Nature, as it was then known, who have provided a JCB and operator. We have been reworking old quarries around Sherborne and at Dundry Hill, including opening up and replacing new excavations. We found that, over a weekend, it is possible to turn over some four to five cubic metres of rock, all of which is very carefully examined and recorded. Some of our work is already published (See Proceedings of the Geologists' Association vol.115 part 3 and vol. 117 part 4). We call ourselves The Cephalopodians. Having bent, and re-straightened a crowbar, when shifting massive rocks from the excavator, I am now known as Horace the Crowbar. It is good to be known by something, even if infamous.

What changes in the science of geology have I seen in my lifetime? The most outstanding perhaps is the acceptance of Continental Drift. In 1959 at a meeting of glaciologists an Australian maintained that in SE Australia there was definite evidence of glaciation such as moraines, drumlins etc. The suggestion was rejected outright and attempts were made to attribute these to enormous flash floods etc. Finally I said would it not make sense to assume that at one time Australia was nearer to the South Pole? This was received with almost derision and with the suggestion that I should use my critical faculties when reading all this nonsense by Alfred Wegener. It was not until 1970 when advances in Deep Ocean drilling and paleomagnetism were developed - proving mid-ocean rift opening and spreading - that continental drift (plate tectonics) became accepted. For geology that can be said to have been its Renaissance, allowing so many hitherto insoluble problems to fall into place.

When I first started analysing rocks it was by the wet process, first dissolving the sample in a chemical solvent, followed by a long succession of reactions with other chemicals: a long tedious and imprecise process. Now analysis is by

electron and ion probe onto the rock sample which can be microscopic in size. Results are recorded automatically with a high degree of accuracy. Also electron probe is now taking the place of the optical microscope and the need to prepare transparent sections on micro slides.

Continued refinement of the mass spectrograph now allows routine determination of the age of igneous rocks with increasing reliability. Especially useful are zircon crystals which retain the uranium disintegration chain of radioactive decay elements. X-ray computed tomography - hitherto applied only to medical diagnosis - can now be used on fossils, images of which can be taken from all angles revealing intricate internal structure, even the growth lines on teeth. Less technical, but of no less importance are the serious efforts now being applied to capture and sustain the interest of the young in the Earth sciences, giving them hands-on experience. Societies like ours, Rockwatch, The British Geological Survey and television are all effectively contributing.

Finally, geology has been important in my own life, not only as a fascinating scientific discipline, but also by the contacts and friendships it generates. I also believe that it has a stabilising influence on one's outlook and demeanour. Not least it takes one into the open air, often in pleasant countryside and demands physical effort.

Most of my collection of rocks, minerals and fossils was passed on to Birmingham University Geology Department in 1975 before leaving for France.

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Photographs and images supplied by Horace Sanders

ROCK BALLS

Bob Mustow

I've been walking the hills for many years now but it is only recently I have noticed a number of balls here and there in the scenery.

The first ones were at Osmington Mills on the Bath Geological Society's field trip in March this year. Obviously I would have noticed the huge ones at the foot of the cliff to the east of Osmington Mills if I had been that way before! (Fig 1). These are not rocks that have been deposited with the sand but have obviously formed in the Bencliff Grit sandstone after the material had been deposited because the strata continue through them. As the sand became sandstone by cementation of the grains by water-borne calcium carbonate, a process known as diagenesis, the calcite preferentially formed around some seed nucleus, such as a decayed ammonite or other material. I imagine this is similar to the way large crystals grow. It is interesting that the balls look 'newer' than the surrounding material: could it be the cementation has better preserved the original deposits?

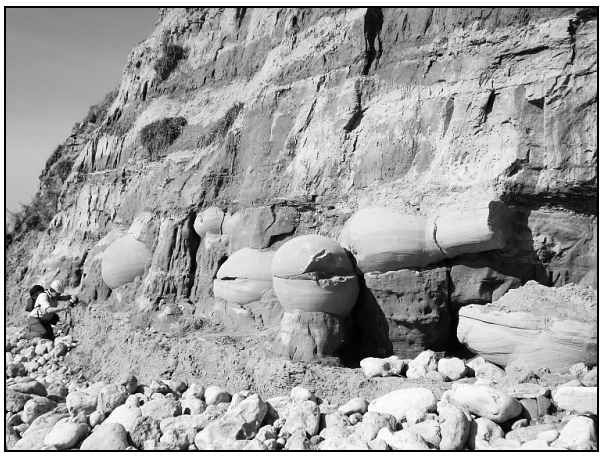

Fig 1: *Doggers near Osmington Mills, Dorset*

The next balls I came across were on Moel Hebog near Beddgelert in North Wales. This was not a complete surprise as I had read about them in an excellent book "Snowdonia Rocky Rambles" by Bryan Lynas (unfortunately out of print) and it was easy to seek them out, but only after I had climbed the 600 metres or so up the hillside. Figure 2 shows the most impressive outcrop with my rucksack (circled) for scale and figure 3 is