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Correspondence
The Secretary, E.M.G.S., 100 Main Street,
Long Whatton, Loughborough LE12 5DG
01509 843297 secretary@emgs.org.uk

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Front cover: Extraction of pure white calcite from a thick vertical vein in the Long Rake Mine, near Youlgreave, in the Derbyshire Peak District, has left this large open stope with ore-passes in its floor. See lecture report on page 211. Photo: Paul Deakin.

Contents

PROFILE

John Travis

I grew up in Nottingham near large clay quarries and smoky collieries that held a fascination in my young imagination, because the burning tips of coal waste looked and smelled like volcanoes. So started the road to becoming the Society's new president.

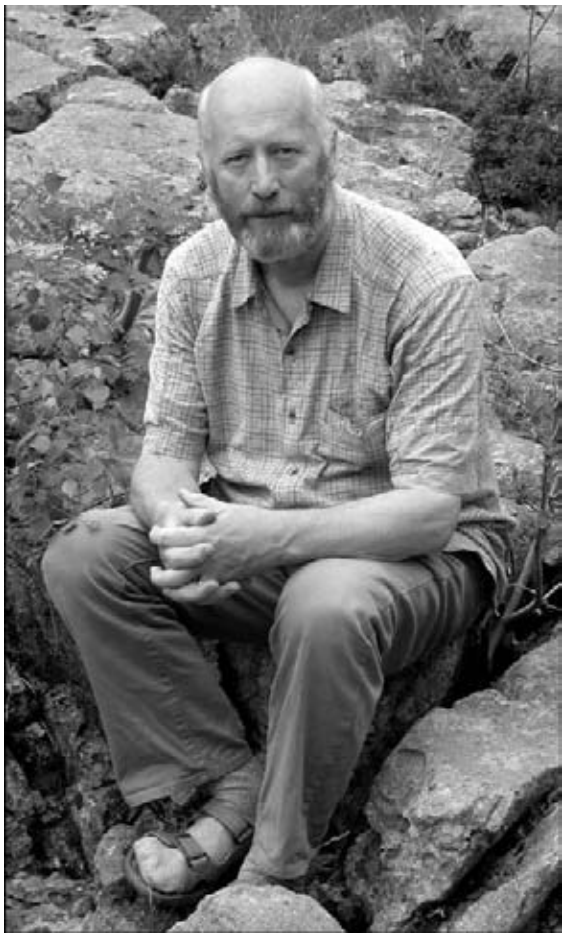
An early interest in landscape, geology and holes in the ground developed when an aunt took me walking in the Peak District, and I was intrigued by the minerals and crystals that we collected from lead mine dumps around open mine shafts. This interest in rocks, caves and mines was furthered on two school camps in the Peak District helped by the geography teacher Ron Disney, who had studied geology under H H Swinnerton at Nottingham University.

I started work on my 15th birthday for Boots, as an apprentice training in the chemical and pharmaceutical manufacturing departments. During my teenage years I spent hours reducing the family coal stocks to near-dust looking for fossils within the prized large lumps that were fashionable in those days of near-universal coal fires. Some lovely fossils were found, but they tended to be very friable and rarely survived long without treatment. Most of my geology was self-taught by reading until 1964, when I studied A-level geology at evening classes. In 1962, I moved to Nottingham University as a technician in the newly opened Chemical Engineering Department.

While working at Boots I met Josie, a keen and constant companion in the outdoor pursuits. We married in 1961, raising two daughters and a son. My walking, climbing and caving interests had meanwhile continued, first with the Scouts, and later with the newly-formed Four Ways Club (Caving, Climbing, Hiking and Camping). When the Derbyshire Caving Association was formed in 1960, I was elected as the representative for the Four Ways Club.

At the DCA I met people who helped to further my knowledge of geology and caves. Most notable was Trevor Ford, whom I assisted on some of the work on preparation for publication of the first edition of *Caves of Derbyshire*. I drove hundreds of miles on a scooter, checking locations and grid references, and correcting mismatches of old data and descriptions. I also joined Peak District Mines Historical Society in 1963, where I met Harold Sarjeant. He put me in touch with his son Bill in the Geology Department at Nottingham University. That friendship led, later that year to an invitation to a meeting to discuss the possible formation of a local geological society. From there the East Midlands Geological Society was born.

I served on the early council of the Society for two sessions, and on the editorial board for a spell. Josie was also active and supportive in the thankless tasks of those days such as regularly hand addressing hundreds of envelopes for the *Mercian*.



In 1973 I was head-hunted to work in Zürich for a researcher in chemical engineering going out from Nottingham University. For nearly two years, I was so busy at work that I saw little of the wonderful Alpine geology beyond some of the caves and karst.

In 1975 I returned to Britain, and immediately learned of a vacancy for a technician in the Geology Department at Nottingham University. With old friends still there, I was offered the job, and stayed for 11 enjoyable years, handling rocks from sources as diverse as meteorites and the deep-sea drilling project.

When the Geology Department closed, I returned to Chemical Engineering for another 11 years, and then jumped at a chance of early retirement. I had time to catch up on curating my mineral specimens, collecting ornaments made of stone and minerals, and pursuing interests in photography and natural history. Shortly after my retirement, Josie became seriously ill, but we managed a month's tour of Western Australia, visiting family and seeing some geology very different from that in Britain.

Among other trips overseas, NW USA was a highlight. The devastation by the Mt St Helen's 1980 eruption is unforgettable, and walking down a mile of lava cave was a novelty after 50 years of limestone caving.

My vision for the Society, like several of my predecessors, is to see younger members playing a greater role and moving us forward into the future.

FROM THE ARCHIVES

An archive photograph of East Midlands geology from the British Geological Survey collection

Ludlow Hill brick clay quarry

The clay pit lay close to the boundary between West Bridgford and Edwalton, adjacent to the former Nottingham to Melton railway line and is now accessible via Ludlow Hill Road, off the A606 Melton Road through West Bridgford. While it was being worked, the pit was photographed by the Geological Survey photographer T C Hall in 1908.

Excavation began around 1885, with the construction of a brickworks on the site by Messrs. Smart. Like numerous other brickworks in the area at this time, demand was fuelled by the rapid expansion of Nottingham's industry and population, and the need for construction materials for factories and dwellings. Smart's Brickworks mainly fed the demand for bricks for the growth of West Bridgford. Mudstones were initially exposed in the eastern wall of the railway cutting, and were then exploited by further excavation in an eastwards direction. Railway sidings were constructed in the quarry to load completed bricks for transport to West Bridgford and Nottingham, and to drop workers off at the brickworks, avoiding the walk from Edwalton Station 1 km to the south-east.

Brick clay in the Nottingham area has mainly been quarried either from the Permian Edlington Formation (formerly Middle Permian Marl) or the Triassic Mercia Mudstone Group. Much of the latter contains clays suitable for brick making, but the most commonly worked clays occur at two stratigraphical levels within the Gunthorpe Formation in the lower part of the Group. These beds were favoured mainly because of their association with overlying, resistant sandstone units (the Plains 'Skerry' and the Cotgrave Sandstone Member), which form prominent scarp slopes allowing the underlying clays to be quarried with ease. The Ludlow Hill Pit exploited the mudstones immediately below the Cotgrave Sandstone Member, a greenish-grey, calcareous and dolomitic sandstone, visible as a pale coloured series of beds towards the top of the quarry face in the photo. From its heyday in the mid to late 19th century, brick clay excavation in Nottingham has now declined to a single quarry at Dorket Head, Arnold, which exploits mudstone immediately below the Plains 'Skerry' sandstone bed.

Smart's Brickworks remained in production until its closure during the Second World War, supposedly to prevent the blackout being compromised by the glow from the open kilns. The site was sold and became an industrial estate; a warehouse on the site was used by the BGS in the 1980s as a store for core samples and publications prior to completion of purpose-built facilities at Keyworth. Parts of the site have recently been re-developed for residential use, but remnants of the quarry faces remain, including some very overgrown exposures of the Cotgrave Sandstone Member.

Andy Howard, British Geological Survey

Ludlow Hill brick clay quarry, in 1908 (BGS photograph # A00727 © NERC).

GEOBROWSER

Charnwood bricks for Eurohub

One of the most valuable UK brick contracts of the year has been awarded to the Charnwood Forest Brick Company. A national search for suitable matching materials has led to their quarry being chosen to supply the almost 700,000 bricks needed to restore the world-famous edifices of St Pancras station, and adjoining Midland Grand Hotel (at present known as St Pancras Chambers). This highly prestigious project is part of a massive redevelopment of the St Pancras and King's Cross stations, which will become the principal London terminus for Eurostar trains. The relatively unassuming brick pit nestles against the northern slopes of Charnwood Forest, close to Shepshed, and exploits Triassic 'red beds' of the Mercia Mudstone Group, just above the Precambrian unconformity surface. An historic cycle involving the movement of bricks from Nottinghamshire and Leicestershire to London has now come full-circle. It started back in the late nineteenth century, when the Midland Railway network to London was completed with the opening of St Pancras station in 1868 (only three years after the plans had been accepted!). All that remained was the construction of the Midland Grand Hotel, for which the stunning brick Gothic revival design of the architect George Gilbert Scott was chosen. Spurning the more local Oxford Clay resource, most of the bricks were manufactured from Mercia mudstones, from pits such as that at Mapperley, as well as Tucker's brickworks, which is now part of the Charnwood Water recreational area on the outskirts of Loughborough. That particular pit was opened immediately adjacent to the Midland Railway (later the Great Central Railway) line, not only ensuring the rapid and easy transport of bricks to the building site, but perhaps also safeguarding for the future the unique importance of this local resource.

St Pancras station frontage

Glaciers can melt rock

A valley or ice-cap glacier evokes pictures of a frozen wasteland with temperatures only occasionally rising above freezing point to form meltwater streams along the ice front. But the bases of glaciers are commonly 'armoured' by rock fragments, which grind against the underlying rock to produce the grooved and striated surfaces frequently seen in recently glaciated regions. These processes involve very significant friction, and when friction is present, heat is generated. We cannot directly observe it for modern glaciers, but observations on the basal contact of Precambrian (Marinoan) tillites in Norway (*Journal of the Geological Society,* 2006, p.417) have shown that where in contact with glacially-embedded rock fragments, the bedrock has developed a cataclastic foliation, with individual quartz grains 'healed' or sutured together – a type of fabric indicative of either melting or instantaneous recrystallization. In fact, the temperatures estimated for these rapidly transient, high friction episodes are around 2200ºC, which is well above the melting point of silica at around 1 kbar pressure. Computer modelling shows how stresses at the base of a glacier 1 km thick can be suddenly released, resulting in movements of 13 metres over 40 seconds, sufficient to cause the 'flash' temperatures demonstrated by the rock fabrics. Such 'stick-slip' events are analogous to those responsible for generating tectonic earthquakes and indeed 'glacial earthquakes' are commonly observed phenomena around the margins of the modern Greenland ice-cap.

More insights on K-T boundary extinction

The 'Great Chicxulub Debate' and its role in causing the extinction of dinosaurs 65 million years ago continues, and for those interested there is now a special website, www.geolsoc.org.uk/Chicxulub. The latest work, reviewed in *Geoscientist* (May, 2006, p.16), was carried out on spherules, or fragments of melted rock, ejected from the Yucatan Peninsula impact crater and it shows that the Chicxulub impactor struck the planet some time before dinosaur extinction. Thus the famous layer enriched in cosmically-sourced iridium – and the current marker for the K-T (Cretaceous/Tertiary) boundary – actually occurs above the spherule layer attributed to the Chicxulub strike. All of this points to a protracted, multicausal scenario of events, as noted in *Geobrowser* for 2004, with these themes emerging:

1. The Chicxulub impact was certainly catastrophic and can now be linked in time to the extinction of the ammonites, although this all happened 300,000 years before the dinosaurs died out.
2. As reviewed in *Geobrowser 2004*, the Chicxulub strike probably did not cause a significantly long 'impact winter', nor globally extensive wildfires (*Journal of the Geological Society*, 2005, p.591). It

could nevertheless have resulted in acid rains and high global sulphur dioxide contents, sufficient perhaps to seriously alter sea-water chemistry, thus affecting marine creatures such as ammonites.

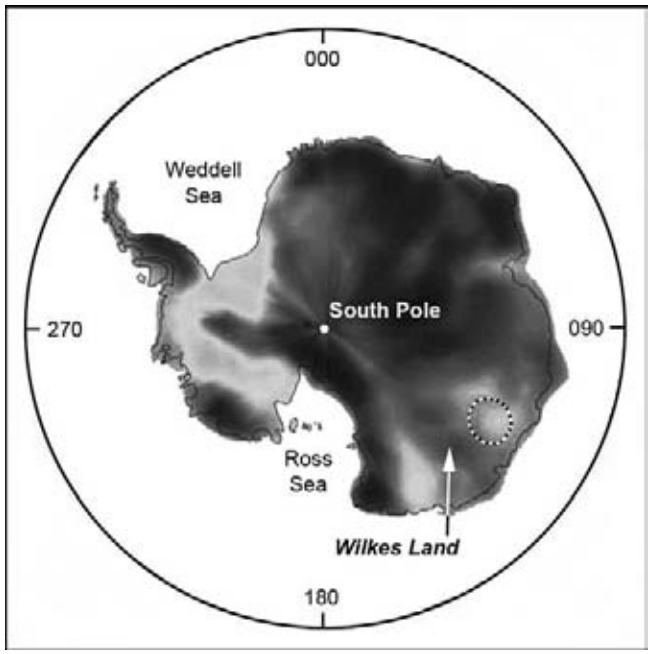
3. It now seems that the K-T boundary layer and the dinosaur death-beds probably do not reflect a single large impact, but point to a time when the Earth was passing through a layer of cosmic dust, laden with meteorites that broke up in the atmosphere and released iridium that was rained out and deposited in lakes and oceans. There is the intriguing possibility of other, as yet unknown, climatic consequences of this type of bombardment, which perhaps were exacerbated by the large amounts of carbon dioxide produced by the voluminous volcanic eruptions of that time (*Geobrowser*, 2001).

An even greater catastrophe

Theories implicating climatic factors, however caused, as the main trigger for mass extinctions have found support from a less well-known, but even more catastrophic episode than that defining the K-T boundary. About 250 million years ago, at the Permian-Triassic boundary, the biggest catastrophe to have affected the Earth killed off 96% of all marine creatures and 70% of land animals, possibly paving the way for the rise of the dinosaurs (*The Great Palaeozoic Crisis*; D H Erwin, Columbia University Press 1993). Up to now, little light has been thrown on the physical record of this event in terrestrial rock sequences, which are seldom greatly fossiliferous. However, these strata commonly contain fossil pollen, and a recent article in the *Journal of the Geological Society* (2005, p. 653) argues that pollen grains from two widely separated sequences straddling the Permian-Triassic boundary in China and Siberia show signs of stress. They exhibit significant defects, which could, it is argued, be attributable to the types of atmospheric pollution associated with acid rain and increased ultraviolet radiation. This in turn could be linked to voluminous basaltic eruptions that were occurring across Siberia and China at that time. The really big question, whether these effects were globally distributed, was not answered; however, a previous article (*Science, February 2005*), based on work done in the Karoo basin of South Africa, had presented evidence that the culprit for the end-Permian "Great Dying" was probably atmospheric warming due to greenhouse gas emissions from erupting volcanoes.

….And the world's largest impact?

The causes of the end-Permian disaster have been debated for some years, and as with the K-T boundary extinction a complex scenario of events has frequently been suggested - an unfortunate coincidence of several destructive factors such as volcanoes, climate change



Geophysical map of Antarctica showing crustal thickness based on gravity data, whereby dark equals thicker crust. The impact site in Wilkes Land shows as a pale area of thin crust, and the dotted circle traces the rim ridge mapped from radar profiles. (Image from Ohio State University)

caused by tectonic plate reorganizations and, perhaps inevitably, an asteroid impact. There has been little evidence for the extraterrestrial dimension to the problem, but this is set to change following the 'discovery' of a vast crater-like structure, possibly the 'scar' of a meteorite impact, concealed beneath the ice sheet in the Wilkes Land region of Antarctica (*New Scientist website*, 2006). This circular feature was revealed by a positive gravity anomaly on surveys by NASA satellites. It was then found to match a poorly defined circular ridge that could be seen on radar images of the rock surface beneath the ice. The feature is interpreted as a crater that overlies a post-impact upwelling of dense mantle material. It is estimated to be 500 km wide, and to have been caused by an impactor measuring 50 kilometres (30 miles) across, against which the Chicxulub body, with an estimated 9.5 km diameter, looks positively puny. So much for the hype, but there are still some serious points to be addressed: does the structure indeed have an impact origin or are other interpretations possible, and does the time of impact 'fit' that of the mass extinction? It seems unlikely that the researcher's wish to drill through the ice cap into this structure will readily be granted in such a region. Instead the evidence will probably have to come from studies of other less environmentally sensitive stratigraphical sections around the World. As some of these are already showing encouraging evidence for a discrete 'event layer', coinciding with the Permian-Triassic boundary extinction, we must expect many more articles, and much heated debate, in the forthcoming year.

Conservation of Nottingham's finest cave

The most spectacular of the many caves carved into the sandstone under Nottingham is Thomas Herbert's ornamental cave within The Park. Though rarely visited (as it lies beneath a private house) the life-size statues of "Daniel in the Lion's Den" are a treasured part of Nottingham's historical and geological heritage. They have however been suffering undue weathering, as their cave has open entrances in the hillside. Daily and seasonal changes in humidity and temperature break down the sandstone's weak clay cement, so that sand grains steadily fall away from the carved surfaces.

The features of the statues were slowly being lost, but the simple remedy was to build doors and shutters across the cave entrances, without damaging the rock structure. This was done, late in 2005, in a project funded entirely by the EMGS (appropriately enough, from income from sales of the Society's book, *Sandstone Caves of Nottingham*). This appears to have been very successful. Monitoring of the site is in progress, but preliminary results suggest that weathering of the cave walls has been reduced to less than 10% of its original decay rate; results will be reported in the next issue of *Mercian Geologist*.

Sandstone cave in Warwick

A cave carved into sandstone under Warwick is notably similar to the many that are well known under Nottingham. It was recently found beneath a public house, at the foot of a flight of stairs that reached deep enough to leave a solid rock roof over an almost traditional pub cellar, with barrel thralls along part of the walls. One section of roof is formed by masonry, but the rest is an almost flat surface cut in bedrock; masonry and brickwork of various structures and ages also form parts of the walls. The cave is cut into the Bromsgrove Sandstone Formation, slightly younger than the Nottingham Castle Sandstone, but also within the Sherwood Sandstone Group. It is a massive sandstone, buff and locally red in colour, with only widely spaced joints, and compares closely to the Nottingham rock as an ideal material for cave excavation.

Thank you to Patrick Mohan for this brief report.

Conservation of geological sites

The Department of the Environment, Food and Rural Affairs (Defra) has overall responsibility for the conservation of sites valuable to natural science and environmental diversity. It has now produced guidance to promote more transparent and consistent approaches in the operation of Local Sites systems across the country. This outlines the purposes of Local Sites systems, and proposes frameworks, standards and roles for their operation as well as for the selection, protection and management of the sites.

There are currently a number of different terms in use to describe sites of local importance, including Regionally Important Geological Sites (RIGS), and Defra recommends that the term Local Site should be used as a standard generic term, optionally distinguishing between Wildlife and Geological Sites.

Although no formal equivalent to Biodiversity Action Planning currently exists for geological sites, action for such sites is now being developed and promoted widely. Local Geodiversity Action Plans have been prepared in some areas, and these aim to set local objectives to deliver geological conservation that build on the nationally important Sites of Special Scientific Interest (SSSIs), the local RIGS and geology in the wider environment.

The Geological Conservation Review provides the documentation of the country's geological SSSIs. It has been developed for local application through the RIGS system, which also reflects the educational role of local geological sites. The Association of UKRIGS has produced a Field Record and Site Assessment form for recording site details for evaluation (available at www.ukrigs.org.uk).

Traditionally, partnerships supporting Local Sites systems have organised themselves in various ways. The new guidance draws together best practice from within existing systems. Its aim is to create a more consistent sense of the value and importance of Local Sites by securing broader awareness and support for their protection. The guidance is available on www.defra.gov.uk/wildlife-countryside/ewd/local-sites.pdf There are now more than 35,000 Local Sites in England, though geological sites are fewer than biological sites.

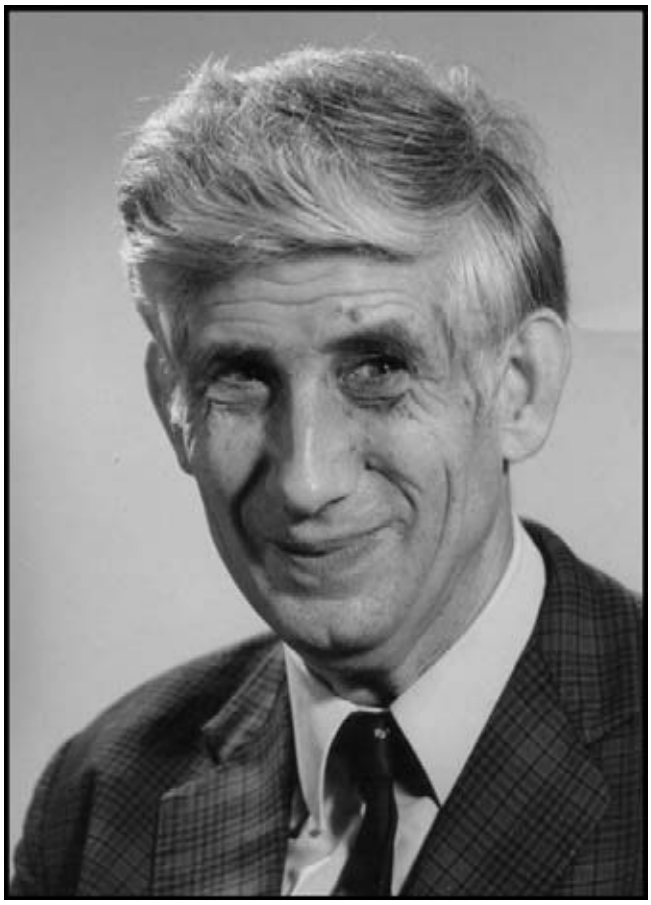
Geology Today

From its launch in 1985, *Geology Today* was intended to be the "popular" magazine for geologists both amateur and professional. Well illustrated and without heavy writing, it features up-to-date topics, explanatory series, overviews and locality reports. It was a great success for about 15 years, but then started to lose its edge. A new editor in 2003 generated its revival, and the magazine went into full colour printing at the start of 2006. It is now a really good geo-magazine. Published by Blackwells, along with their various academic journals, *Geology Today* does suffer from a rather high cover price. But starting in 2007, the subscription rate has been reduced for members of geological societies (including EMGS). Visit the website for subscriptions and for free downloads of various articles; "geology today" in Google (UK pages) is quicker than the cumbersome web address.

This may look a little like advertising, and the Editor of *Mercian Geologist* admits to being also on the Editorial Board of the magazine, but many members of EMGS could find the revamped *Geology Today* a very welcome resource of armchair geology.

VALE

Ron Firman 1929-2005



Born in Norfolk as an only child, Ronald John Firman overcame the severe handicap of cerebral palsy, to lead a very full and fruitful life. His early years in rural Norfolk had a great influence, and he was never more at home than when he was in the field, for either his first love of geology or other aspects of natural history.

Between 1940 and 1947, he attended the City of Norwich School, which had a strong tradition in the teaching of geology. By the time Ron entered the sixth form he had already had a taste of the subject, which he then pursued with great and lasting enthusiasm. The degree to which Ron ignored his physical problems was reflected in him being made captain of the school hockey team, a status he later equalled at his college in Durham. At university in Durham, Ron continued his study of geology under the direction of such notables as Professor Lawrence Wager and Professor Sir Kingsley Dunham. It was Wager who expressed his doubt about Ron's ability to carry out geological fieldwork by leaving him out of a departmental field trip to the Lake District. Eric Robinson, one of Ron's contemporaries at Durham, reflects how Wager tended to favour the type of student who was a potential candidate for the 1953 Everest expedition or who could roll kayaks under the cliffs of the Skaergaard intrusion. Following an animated discussion, Ron was allowed to join the Lake District trip, and the obvious success of it was that he participated in all subsequent departmental trips. Eric and his contemporaries had great admiration for Ron who even in his student days had severe physical problems. During his time as a student he also made private trips to Skye, North Wales and the Malverns.

Kingsley Dunham was a major influence in Ron's developing interests. Following graduation, Ron embarked on a PhD research study on the "Metamorphism and metasomatism around the Shap and Eskdale granites". At this time he was particularly interested in the origin of granites, a topic that provoked considerable interest and controversy. Under the supervision of Frederick Stewart he completed his thesis in just over two years. Before his thesis was completed Ron led a number of field trips, including one for the Yorkshire Geological Society to the Lake District; this was attended by Prof W D Evans, who later appointed him to a lectureship at Nottingham.

Following award of his PhD in 1953, Ron became a research assistant to Professor Deer at Manchester University. Although his stay in Manchester was short, it was significant, as it was there that he met Pat, who he married in 1955 after he was appointed to a lectureship at Nottingham University. They had three children, Rosemary, Hugh and Alison. Ron and Pat had many interests in common, and in particular a love of the Lake District where Ron continued his research activities. It was in the Duddon Valley that Ian Sutton assisted in the mapping of joint patterns in the glorious summer of 1958 - with wonderful memories of Pat in harness, dragging the baby Hugh in a box with wheels over the rough fells, Rosemary with her face covered in bilberry stains - and Ron ceaselessly mapping joints.

Although Ron was very much a field geologist he excelled in academic work. He gave a course on metamorphism and metamorphic petrology to the final-year students in Nottingham. It reflected so much of Ron's attitude to the subject, and also the great care that he took in everything he did. The lectures were superbly prepared, very much up-to-date with many of the references to current publications. The students did not fail to recognise the high quality of Ron's presentations, and many owe a great deal to him. Ron genuinely cared for his students' needs, and Phil Doughty was just one of those for ever grateful because Ron took them on for research projects when few others showed much interest.

Ron also enjoyed his teaching to engineering students. For many years Ron paid a weekly visit to Sutton Bonnington, to deliver lectures on mineralogy and pedology. He caught the train at Beeston and took his bicycle with him; his students at Sutton Bonnington were in full admiration of Ron's cycle ride from Beeston - they were never disabused.

Ron's work was recognised nationally and internationally. He was a fellow of the Geological

Society and a member of the Institute of Mining and Metallurgy. His work in the Lake District earned him the award of the moiety of the Lyell Fund in 1964.

Ron also did extensive geological consultancy. He was in great demand in the location of hydrothermal mineral deposits in the Peak District, and became an authority on the gypsum deposits and alabaster of the East Midlands. Perhaps some of his most important consultancy work was for Manchester Corporation Waterworks in the Lake District, where he advised during the construction of the Wet Sleddale Dam near Shap; he was solely responsible for geological advice on renovation of tunnels leading from Thirlmere reservoir and on many other projects in the region.

Ron's well-merited promotion to senior lecturer at Nottingham was in 1968. By 1984, his worsening speech impediment had made lecturing into a less appropriate occupation, and he was awarded the post of Senior Research Fellow. On closure of the Geology Department in 1989, he retained that position in the Archaeology Department. Ron already had natural links with archaeology, particularly his interests in bricks and other building materials.

A most important aspect of Ron's interest in geology was his desire to bring the subject to the non-geological world. This he did by offering and teaching a number of adult education courses, and also by being a very strong supporter of the EMGS. He was a major contributor to the health of the Society, being a founder member, a member of Council and for a long period Editor of the Mercian Geologist. These were only some among many diverse activities within and outside the geological world.

Ron was fully involved with the Spastics Society (now Scope), and in 1962 he helped to found the '62 Club as a social club run entirely by people with cerebral palsy. He was successively the Chairman, Secretary and President of the Nottingham '62 Club, and from 1973 to 1979 was President of the National Association of '62 Clubs. He was also directly involved in the establishment of the Portland Club for the disabled, for which he was the first President and Chairman. Ron inaugurated the Nottingham University society for disabled adults.

In spite of all his physical problems Ron was very much a happy man – he enjoyed life and he had a very strong sense of humour. In a most delightful way the humour was that of a rascal, but he was also quite happy to be the butt of some of his humour. Some will recall his story of him going to a meeting straight from field work at Manchester Corporation offices to be told by the lift attendant that if he wanted the job he should dress more appropriately.

Ron was a man of great dignity, of compassion and was a colleague held in high esteem. Mercia has lost one of its specialist geologists and one who perhaps was not given enough credit during his life in geology.