APPRECIATION

An Appreciation of R. E. Elliott, founder member of the East Midlands Geological Society

Compiled by R. E. Brown from information supplied by John H. Rippon, Maurice Lock, William A. Read, William A. S. Sargeant, Douglas E. Raisbeck, and from the Society's records.

R. E. (Dick) Elliott BSc, ARICS, FGS joined the East Midlands Geological Society (EMGS) as a founder member in February 1964. He was a Council member from 1964-1967, President from 1967-1970, and then Vice President until 1973. He contributed extensively to the early success of the EMGS not only by serving on Council, but also by publishing several papers in the *Mercian Geologist*, delivering lectures at indoor meetings and by leading a number of field excursions. Dick resigned from the EMGS in 1985 after moving to Islay in the Inner Hebrides following his retirement from the National Coal Board. He died whilst being transferred by air ambulance from Islay to Glasgow in April 1990. He was survived by his widow Cherry, who died in 1995.

In the mid 1940's, Dick Elliott was employed as an assistant colliery surveyor in the pre-Nationalisation coal industry of Nottinghamshire, having obtained a Home Office Mine Surveyors' Certificate. He is known to have had an insight into coal geology at that time, but his greatest interest was architecture and, with a view to pursuing an architectural career rather than mining surveying or geology, he took the final examinations of the Royal Institute of Chartered Surveyors. However, his interest in geology eventually became dominant and, after 1948, he pursued this with single-minded determination for the rest of his career, obtaining a geology degree in 1955 as an external student at the University of London. In 1959, Dick joined the National Coal Board's geological department in the former Bestwood No. 6 Area and then transferred to Divisional HQ at Sherwood Lodge. He became Divisional Geologist for the East Midlands Region (North Derbyshire and Nottinghamshire) in 1966.

Before Nationalisation in 1947, geological observations and interpretations in the British coal mines were essentially the combined efforts of mining surveyors and officers of the Geological Survey of Great Britain, together with coal-related work by the Coal Survey. The gradual growth of the industry's own internal geological service commenced in the early years of the National Coal Board (NCB), and by the early 1960's each major coalfield had its own Divisional Geologist. Historical precedent initially resulted in most of these positions being filled by transfer from the Geological Survey. However, Dick Elliott was one of the few Divisional Geologists at that time to have progressed from within the industry itself.

As a surveyor, he had already become interested and involved in the practical applications of geology and was beginning to formulate ideas relating geological variations to original depositional processes and environments. While working at Gedling Colliery, he became aware of the mis-identification of certain seams in the Westphalian B (Bolsovian),and was able to revise their correlation across the Nottinghamshire coalfield, notably using the recently recognised Two Foot (Maltby) Marine Band. Regional mapping of the thickness of these seams presented problems, however, particularly when interpreting the sometimes inaccurate results from borehole coring. In association with W. A. Chamberlain, a mechanical engineer, he developed a successful penetration recorder that allowed accurate assessment of drilled coal thickness based not on time, but on drill revolutions. This was a full-scale device using a 1,000,000:1 reduction gearbox. It was a very substantial advance on earlier devices and received a NCB inventions award. An early paper followed on the meaningful mapping of coal thickness variations (Elliott, 1953) and pointed the way towards which his professional life was to develop.

The 1950s were boom years for coalfield geology. Numerous deep exploration boreholes proved new reserves in all coalfields, and the Geological Survey and the early NCB geological service co-operated on logging and interpretation. The new breed of NCB Divisional Geologists saw a wide variety of rock sequences and needed to interpret many horizons and structures. By the early 1960s it was apparent that the emphasis in different coalfields was diverging, for example towards structural geology in South Wales. Dick Elliott's stamping ground was the East Midlands, i.e. North Derbyshire, Nottinghamshire and Leicestershire, an area with relatively thin coal seams and generally simple structure. Sedimentology was of primary importance in these circumstances, with seam variations profoundly influenced by depositional facies. There was also the opportunity to study some of the individual lithologies of potential value in correlation, such as tonsteins (Eden *et al.*, 1963).

Dick was already developing a considerable expertise in sedimentology by using the extensive borehole core sequences to identify bedforms and facies. This enabled the Coal Measures to be compared with other sequences, both ancient and modern. Previously, few geologists had considered coal-bearing strata in terms of a succession of palaeo-depositional environments with modern analogues. Dick's early ideas on bedform classification and interpretation (Elliott, 1964; 1965a) were published while sedimentology itself was still a recent development within academic research. This contribution was process-orientated as well as descriptive, and demonstrated the practical and economic benefits that could be gained by applying "pure" research concepts. With the realisation that original depositional environments could be recognised, the whole succession became relevant and vague qualitative concepts, such as the "ideal cyclothem" were, for a time, replaced by rigorous quantitative analysis of succession data.

The geological service grew through the 1960s; Eric Skipsey, Maurice Lock, Doug Raisbeck and Don Turner brought further geological and coal chemistry skills together from their own mining industry

backgrounds. Continuing mechanisation in the mines, with high capital coal faces, required the progessive recruitment, from 1969 to 1975, of a further tier of mining geologists in all active coalfields, specifically to carry out routine observations on the scale of a single coal face. These recruits largely met the staffing requirement of the geological service through to privatisation in 1995. These newcomers, many straight from university, viewed their seniors with suitable awe, especially in terms of their enormous experience of practical mining geology.

Dick set about training his new team of recruits in quite rigorous ways. A systematic method of describing and recording underground sedimentological and structural detail was established, with observations commonly required at spacings of 100 metres or less at critical localities. The entire East Midlands geological service was geared to sedimentological description and its practical application. Inevitably, some saw this as over-academic. However, Dick was convinced that the best practical forecasting should be based on combining observational detail with theoretical models, and the system bore fruit. By the mid 1970s, every major coal seam in the East Midlands was correlated, mapped and interpreted for mining and reserves purposes. This effort was backed up by a highly detailed database of borehole logs described in a standard lithological and sedimentological form, and by detailed assessments of mining risk posed by the geological conditions.

Dick had already established a sedimentological framework for these practical applications. Coal Measures rock types had previously been described and classified by various vernaculars peculiar to individual coalfields, while descriptions by the Geological Survey tended to reflect the units mapped at surface. Dick's lithofacies system allowed both efficient borehole core logging and the discrimination of different environments of deposition, enabling prediction of factors likely to affect adversely the mining of thin coal seams. Through the 1960s, a series of papers set out the descriptions, variations and applications of a theoretically sound lithofacies system (Elliott, 1965b; 1968; 1969; 1970), together with a paper (Elliott and Strauss, 1967) on the field recognition and significance of key grain sizes. This theoretical framework was validated by a subsequent 25 years of practical forecasting in the East Midlands mines (Elliott, 1979). The results were formalised for the mine planning process by the rigours of Geological Risk Reduction, with all potential geological hazards assessed for their likely effects (Elliott, 1973; 1974a).

Dick's academic leanings were developed by a close association with many researchers outside the coal industry, notably J. R. L. Allen at Reading University. In the socially robust world of coal mining, there were many opportunities for humourous criticism of his style, which was manifested at work by a certain shyness. However, his geological knowledge and professionalism made him a prominent figure in the mining scene, and he exerted wide influence over both the tactical and strategic forward planning of the industry, his talents leading eventually to his appointment in 1980 as the NCB's Chief Geologist. In this appointment he organised the production of the geological service's working manual (Elliott *et al.*, 1984), one of the few books on the coal geology of deep mines.

Although known mainly for his sedimentological work, Dick maintained keen interests in both structural geology and the mathematical modelling of Coal Measures deposition, the latter in collaboration with W. A. Read. However, his other main interest was the Triassic. Triassic rocks overlie much of the East Midlands Carboniferous, and are therefore relevant to various mining-related issues. By coring shallow boreholes in the Triassic cover, he established a highly detailed stratigraphy which was used to identify faults (Elliott, 1966); these could then be projected down into the underlying coal reserves. This proved a very valuable technique to assist with subsurface structural mapping in the days before high-resolution seismic surveys. The extensive database of Triassic borehole core gave Dick new insights into Triassic depositional settings and stratigraphy, leading to publications (notably Elliott, 1961; Ivimey-Cook and Elliott, 1969; Taylor and Elliott, 1971) and membership of the Geological Society's Triassic Group (Warrington *et al.*, 1980).

Latterly, his geological interests returned to peat as coal producer. An extensive personal library of peat-related papers, many very obscure, was built up and turned to use, especially to determine peat-to-coal compaction series and ratios, with a view to better appreciation of pre-compaction sedimentary geometries (Elliott, 1985a). The same year also saw publication (Elliott, 1985b) of a study of the trace fossil *Cochlichnus kochi*, an interest that had lain dormant for many years, never written up.

Dick's final main contribution to Coal Measures geology was a revised correlation of the Westphalian A to mid-C (Subcrenatum to Cambriense Marine Bands) for all the British coalfields. This arose through his promotion to Chief Geologist, which broadened his regional geological knowledge and enabled him to focus on the comparison of sequences in tectonically different settings. The extensive geological database was researched thoroughly for faunal and other stratigraphical indicators and the results were presented in a way that normalised faunal zone thickness to allow correlation between coalfields and analysis of depositional patterns.

Dick Elliott was not necessarily an easy person to work with. His high standards extended to all aspects of his professional life and he could take personal interest in the most routine report prepared by any of his staff (faults were not allowed to run across coal faces!). This was an irritant to many, but he always aimed high and assumed that there was always a better way of doing things if it was thought through.

Much recent geological literature may be criticised as essentially "model-driven" with a high speculation-to-observation ratio. Dick's advantage was that his job demanded detail; so his models could therefore be constrained by accurate observations. His key sedimentological papers from the 1960's continue to provide a well-researched and validated model for Westphalian depositional systems, and many would

undoubtedly be more widely known and quoted had they been published in international journals. Dick should perhaps be hailed as one of the leaders of the sedimentological revolution of the 1950's and 1960's. As commercial interest grows in the UK's offshore Carboniferous, a new generation of geologists, interested in the stratigraphical and sedimentological architecture of these rocks, would benefit from reference to Dick Elliott's publications and his legacy of comprehensive databases.

Outside mining and geology, Dick had been developing another interest, which may have lain dormant since a visit to Iceland in 1965. By the mid 1970s he had become a keen birdwatcher and, by 1980, he would be better described as an ornithologist, as he applied the same rigour of observation and recording to birds as he did to his geological work. Contributions to the ornithological literature inevitably followed, including a book about the birds of Islay, his Scottish retirement home. He did not, however, abandon geology in his retirement, publishing a guide to the geology of Islay. A second book on the geology of Islay was unfinished at the time of his death.

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