

THE TRIASSIC ROCKS OF ALDERLEY EDGE, CHESHIRE

Leaders : Dr. G. Warrington and Mr. D.B. Thompson.

Sunday, 6 September 1970

The purpose of the excursion was to examine the Triassic succession exposed at Alderley Edge, Cheshire. The sequence seen in the area is as follows (nomenclature from Warrington (1965) and Thompson, *in press*):

Waterstones	400 feet		
Nether Alderley Sandstones	130 feet	)	
West Mine Sandstones	55 - 60 feet	)	
Wood Mine Conglomerates	130 feet	)	"Keuper" Sandstone
Beacon Lodge Sandstones	40 feet	)	
Engine Vein Conglomerates	100 feet	)	
(laterally equivalent to		)	
Hayman's Farm Beds)		)	
Bunter Upper Mottled Sandstone up to 1200 feet			

Alderley Edge, a horst bounded by two powerful north-south trending faults, is an abrupt north-facing scarp capped by resistant conglomerates in the basal part of the "Keuper" Sandstone. The Edge reaches a height of 650 feet and is bounded to the east, north and west by a fairly level plain with an elevation of about 200 feet. The Alderley area is in the north-eastern part of the Cheshire Basin and lies on the south-eastern flank of a minor anticline which trends ENE-WSW on the south side of Wilmslow. The general dip in the Triassic rocks in the area varies between 10° and 14° to the south-west. The southern (dip-slope) side of Alderley Edge slopes gently down to merge with the general level of the Cheshire Plain in which Triassic deposits are mantled by glacial deposits representing the downwasting phase of the Weichselian ice sheet (c.24000 to 10000 years B.P.).

At a point about 1.5 miles north of Alderley Edge the coach was stopped while Mr. Thompson demonstrated, with the aid of maps, the regional geological setting of the area. The coach then proceeded to Kirkleyditch where the feature formed by the basal conglomerates of the Keuper Sandstone and the location of old opencast mining sites (now occupied by ornamental gardens SJ 87427844) were pointed out by Dr. Warrington. The Kirkleyditch area is on a narrow strip of Keuper Sandstone on the eastern side of the Kirkleyditch fault which bounds the eastern side of the Alderley Horst. Copper, lead and cobalt ores were mined at Kirkleyditch between 1807 and about 1870. The mine spoil heaps were pointed out to the south of the road as the coach proceeded along Mottram Road towards Alderley.

The party left the coach at the Alderley Red Moulding Sand Quarry (SJ 8610 7830) which exposes over 100 feet of Bunter Upper Mottled Sandstone. Here Mr. Thompson spoke of the existence of five soft red sandstone lithofacies in this formation at Alderley. These are represented in the quarry by (a) a large deformed cross-bedded unit in the S.W. face, which, by comparison with similar sandstones at Frodsham (Thompson, 1969), are probably of aeolian origin. (b) numerous trough, lenticular and tabular planar cross bedded sandstone sets (< 1m. thick); clay galls and mica in some of these indicate a fluvial origin but others, associated with (a) may be aeolian. Palaeocurrents in (b) are directed WNW (c), flat-bedded sandstones with mudstone laminae, asymmetric ripples and convolute structures; well seen to the east of the barytic fault zone which bisects the quarry (d) red mudstone bands which, with (c), are considered to be fluvial top stratium deposits (e) fine, ? structureless, sandstones which may include interdune accretion deposits. The sandstones are white in the region of joints and faults in the quarry; at these points much barytes occurs in the rock and occasionally foresets in the sandstones are mottled white with this mineral which was found occurring in a rosette habit.

The party climbed up to the Saddlebole (SJ 8601 7808) where a small outlier of basal "Keuper" conglomerate (part of the Engine Vein Conglomerates) was demonstrated and the sites of minor exploration adits in the topmost Bunter Upper Mottled Sandstone noted. Proceeding southwards the party crossed a small col and located the Bunter-'Keuper' junction on the south side. The junction at this point (SJ 8599 7798) being higher than that in the Saddlebole outlier it was deduced that a fault existed in the area of col. This fault downthrows to the NNE and was the first of five such normal faults, trending ESE-WNW, which were observed in the Alderley Horst during the excursion. Further south, at Twin Shafts Mine (SJ 8593 7793), the second of this group of ESE-WNW trending normal faults, the Stormy Point fault, was seen. This fault was traced eastwards to Devils Grave Mine (SJ 8601 7787) and, later, to the mines on the eastern side of Stormy Point. Lunch was taken at Devils Grave Mine and afterwards Mr. Thompson demonstrated the probable mode of origin of the fining-upwards sedimentary cycles which occur in the Keuper Sandstone. These deposits are of fluvial origin and were formed in rivers which had varying degrees of sinuosity. Cycles with little or no representative of the overbank deposits (mudstones) at their tops formed in a braided reaches of the river environment, whilst thicker sequences of interbedded mudstone and sandstone at the tops of cycles higher in the "Keuper" Sandstone represented rivers of more meandering type (Thompson 1970). At Alderley the rivers which deposited the Keuper Sandstone flowed northwestwards.

The party proceeded eastwards along the line of minor mine workings which mark the Stormy Point fault and collected specimens of barytes, galena, cerussite, pyromorphite, malachite, azurite, asbolite, etc., from the spoil heaps of the Doc and Pillar Mines (SJ 8612 7782). At this point Dr. Warrington briefly outlined the mineral suite known from the Alderley mines and described the nature of the mineworkings in the Stormy Point area. The main ores found at Alderley are those of copper and lead, which occur as sulphides in fault zones. Copper carbonates and other secondary minerals are found over a wider area but still show a relationship to certain faults in their distribution. Minor amounts of arsenic, silver, vanadium and molybdenum occur in a variety of minerals in combination with lead; sphalerite has been recorded and copper is found occasionally as the sulphide but is more common in combination with arsenic. Pyrite is known. Complex minerals containing manganese and cobalt with arsenic and nickel occur. Barytes is widespread as a gangue mineral and is found in both the Upper Mottled Sandstone and "Keuper" Sandstone. A full list of the mineral species known or recorded from the Alderley area is given in Broadhurst *et al* (1970, p.47). The metallic ores are restricted to the topmost part of the Upper Mottled Sandstone and to the "Keuper" Sandstone where they are concentrated at three main levels; in the Engine Vein Beds, the Wood Mine Beds and the West Mine Beds (Warrington, 1965).

Proceeding southwards the party crossed the line of a third ESE-WNW trending fault, which is slightly mineralized and traceable in a prominent openwork in the Engine Vein Conglomerates (SJ 8605 7775), and entered the Old Alderley Quarry (SJ 8605 7765) where a variant of the Engine Vein Conglomerates with few pebbles and a prominent shale band is exposed. Here, Mr. Thompson discussed a number of sedimentary features including sole marks, oriented in a direction contraposed to that of the palaeocurrent direction indicated by cross-bedding in the adjacent sandstones, and the gradual lateral thinning of the mudstone band due to penecontemporaneous erosion. Dr. Warrington demonstrated the palaeontology of the Triassic rocks in the Alderley area. A footprint of *Chirotherium* is known from the Upper Mottled Sandstone at Wilmslow (Alty, 1926). The Engine Vein Conglomerate has yielded *Euestheria minuta* at the Old Alderley Quarry (Brockbank, 1891) and this fossil has also been obtained from the laterally equivalent Hayman's Farm Beds at Engine Vein Mine (Warrington, 1963). Warrington also discovered a tridactyl reptilian footprint in the Engine Vein Conglomerates near Castle Rock (SJ 8556 7800), Alderley Edge and has obtained plant microfossils indicative of a late Scythian age from the same unit at Engine Vein Mine (Warrington 1970); *in press*). Footprints named *Rhynchosauroides* and other trace fossils have been obtained by Mr. Thompson from the Wood Mine Conglomerate Formation in the Hayman's Farm Borehole (SJ 8566 7635). Thompson (1966) has also discovered *Euestheria minuta* var. *brodieana* and an insect wing in a skerry sandstone in the lower part of the "Keuper" Marl near Styal, 4 miles NW of Alderley. The age relationships of the Trias sequence of the Alderley area to those of neighbouring regions, as deduced from palynological studies (Warrington, 1970), were described by Dr. Warrington.

At the Engine Vein Mine (SJ 8605 7750) Mr. Thompson described the stratigraphy visible in the openworks which were developed along the fourth of the series of important ESE-WNW faults. The Upper Mottled Sandstone and basal "Keuper" Engine Vein Conglomerates are visible. The extent and nature of the workings and the mineralisation were described by Dr. Warrington with the aid of a map and photographs. The mode of origin of the ores was also discussed at this point, Warrington favouring an epigenetic origin.

The party proceeded westwards towards Beacon Lodge where the soft sandstone unit of Beacon Lodge Beds and the continuation of the Engine Vein fault were demonstrated in path banks (SJ 8584 7753) by Mr. Thompson. The next highest formation, the Wood Mine Conglomerates, was examined in Church Quarry (SJ 8590 7738), where the basal part of the formation with a partially eroded mudstone band and a clay pellet horizon was demonstrated by Mr. Thompson. The party proceeded westwards to Brynlow Valley where, near an old shaft (SJ 8561 7725), a fifth ESE-WNW trending fault, the Southern Boundary fault of Wood Mine, was demonstrated. A short distance to NNW Wood Mine was developed in the Wood Mine Conglomerates between this fault and the almost parallel Engine Vein fault to the north. The complexity of the Wood Mine workings was demonstrated by Dr. Warrington with the aid of a map and photographs. Proceeding westwards down Brynlow Valley and onto Artists's Lane (SJ 8540 7721) the party noted exposures of the pale yellow West Mine Sandstones, in places composed entirely of haematite coated millet seed grains surrounded by barytes. These sandstones were once extensively worked for copper ores in the West Mine some 750 yds. NW of Brynlow Valley. Two small exploration adits were noted in the valley. In the banks of Artists Lane and in Brynlow Quarry (SJ 8513 7718) the lower members of the Nether Alderley Sandstones were briefly examined. Time did not permit a visit to the Butts Quarry (SJ 8475 7686) near which the Waterstones are exposed. The party briefly visited the site of the processing works situated between West Mine and Wood Mine (SJ 8518 7753) and the method of processing the arsenic rich copper carbonate ores was described by Dr. Warrington. The party returned to the coach over the Wood Mine workings in Windmill Wood. At the coach, parked in the car-park near "The Wizard" (SJ 8595 7725), a three dimensional model of Wood Mine was displayed.

G. Warrington, B.Sc., Ph.D., F.G.S.,  
Institute of Geological Sciences,  
Ring Road, Halton,  
Leeds LS15 8 TQ.

D.B. Thompson, B.A., M.Sc., F.G.S.,  
86 Craddock Road,  
Brooklands,  
Sale,  
Cheshire.

#### References

- ALTY, S.W. 1926. The Petrographic Features of Keuper Rocks from a Boring at Wilmslow, near Stockport, Cheshire. Proc. L'pool. geol. Soc., vol. 14, pp. 278-83.
- BROADHURST, F.M., *et al.* 1970. The Area around Manchester. Geologists Association Guide No.7. Benham & Co. 51 pp.
- BROCKBANK, W. 1891. On the discovery of *Estheria minuta* var. *brodieana* by Mr. C.E. de Rance in the Lower Keuper sandstone of Alderley Edge. Mem. Proc. Manchr. Lit. Phil. Soc., vol. 34, p.12.

- THOMPSON, D.B.      1966. The Occurrence of an Insect Wing and Branchiopods (*Euestheria*) in the Lower Keuper Marl at Styal, Cheshire. *Mercian Geologist*, Vol. 1, pp. 237-45.
- -                    1969. Dome-shaped aeolian dunes in the Frodsham Member of the so-called Keuper Sandstone Formation (Scythian - ? Anisian) at Frodsham, Cheshire (England). *Sediment Geol.*, vol. 3, pp. 263-89.
- -                    1970. Sedimentation of the Triassic (Scythian) Red Pebbly Sandstones in the Cheshire Basin and its margins. *Geol. J.*, vol. 7, pp. 183-216.
- -                    1970. The Stratigraphy of the so-called Keuper Sandstone Formation (Scythian-Anisian) in the Permo-Triassic Cheshire Basin. *Q. Jl. Geol. Soc. Lond.* vol. 126, pp. 151-181.
- WARRINGTON, G.      1963. The Occurrence of the Branchiopod Crustacean *Euestheria* in the Keuper Sandstone of Alderley Edge, Cheshire. *L'pool. Manchr. geol. J.* vol. 3, pp. 315-19.
- -                    1965. The Metalliferous Mining District of Alderley Edge, Cheshire. *Mercian Geologist*, vol. 1, pp. 111-31.
- -                    1970. The "Keuper" Series of the British Trias in the Northern Irish Sea and Neighbouring Areas. *Nature, Lond.*, vol. 226, pp. 254-56.
- -                    1970. The Stratigraphy and Palaeontology of the "Keuper" Series in the Central Midlands, England. *Q. Jl. Geol. Soc. Lond.* vol. 126, pp. 183-223.