per cm^2 of clay surface area/sec, assuming an external area of 42·4 m^2/g clay[3]. The sticking coefficient may be estimated in the usual way[4] as the ratio of the number of molecules sticking to those striking the adsorbent. The latter is approximately $1 \cdot 1 \times 10^{22}$ molecules/cm^2/sec, the kinetic theory estimate for water vapour at 25° C, indicating an average sticking coefficient of $3 \cdot 9 \times 10^{-6}$ for the first few msecs. Evidently, roughly all but about one water molecule in every 250,000 striking the clay surface are reflected.

The combination of equations (1) and (2), after differentiating the former with respect to time, leads to:

$$\frac{dm}{dt} = a(t) \exp\left(-0 \cdot 15 t^{0 \cdot 5}\right) \quad (3)$$

where $a(t) = 3 \cdot 76 \; c_p/q_{\text{diff}} \; t^{0 \cdot 5}$ and (after the first msec) is a slowly varying function of time. Here $\frac{dm}{dt}$ has the units g water/g clay/msec.

Equation (3), in some respects, bears a formal resemblance to the well-known Elovich–Taylor–Thon equation for the rate of chemisorption[5]. If the correspondence is more than coincidental, it suggests that the initial stage of adsorption of water vapour by bentonite (probably the hydration of the exchangeable cations[6]) is a chemisorption process. The high initial heat of adsorption (about 17 kcal/mole water) and the low sticking coefficient lend support to this hypothesis.

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Occurrence of Karroo System Sediments in Ethiopia

THE continental sediments which comprise the Karroo System of southern Africa are formed by thick, dominantly clastic rocks deposited throughout the Palæozoic–Mesozoic transition in a period of general epeirogenic uplift and accompanying cratonic subsidence. Sediments belonging to the Karroo System have previously been recognized as occurring as far north as coastal Kenya, where they are termed the Duruma Sandstone, an essentially continental series of shales and sandstones unconformably overlain by the Mesozoic transgressive marine sediments.

Sediments related to certain members of the Duruma Sandstone and with identical relationship to the Mesozoic marine formations have recently been discovered by Mr. D. H. Jepsen while mapping the geology of the Abbai (Blue Nile) basin for the joint Ethiopia–U.S. Water Resources Board. This information has generously been fully placed in the hands of the author for interpretation. A very brief summary is given here.

Various Italian surveys during the period 1936–40 have shown that previous ascriptions of the Adigrat Sandstone formation to the Karroo System were incorrect. The Adigrat Sandstone is a diachronous facies marking the initial sedimentation phase of the Mesozoic marine transgression from the south-east; although its basal members are not infrequently cross-bedded their conformity with the higher marine sands, mudstones, evaporites and limestones indicates an environment quite distinct from that of the Karroo sandstones.

The sediments discovered by Jepson form two irregularly elongated patches each approximately 5 km × 20 km exposed meridionally across the bottom of the Abbai canyon in the vicinity of the confluences with the Guder and Finchoa rivers. These sediments are overlain unconformably by the planar base of the Adigrat Sandstone and occur in pre-Adigrat valleys aligned north–south in Basement gneiss. These valleys were eroded to a depth of 300–400 m below the peneplained surface of the Basement rocks prior to filling by the pre-Adigrat phase of sedimentation. In the exposures at present known, the upper 150 m of the pre-Adigrat sediments have been removed by the denuding action of the Abbai river.

The remnant 200 m of sediments are composed of mostly thin-bedded bluish-grey calcareous mudstones overlain by massive dark grey sandstone beds. Down-warping of the sediments in the centres of the ancient valleys is considered due to gravitational compaction. The unconformably overlying Adigrat Sandstone, which can be continuously traced from Shoa (where it thickens as it plunges beneath the Rift Valley) to the Sudan border region, is a quite distinct facies; massive, fine to coarse grained, red or buff sandstones with some interbedded variegated shales and thin lenticular beds of conglomerate or pebbly cross-bedded sandstone.

The discovery of proved pre-Adigrat sediments lying on the Ethiopian Basement, a matter previously much disputed, has the following implications: (1) Towards the end of the Palæozoic, an era of peneplanation in the Horn of Africa, there was an uplift of the order of 400 m in central Ethiopia; (2) Consequent on this uplift was the erosion of broad river valleys which were formed meridionally, parallel to the tectonic grain of the foliated Basement rocks; (3) Gradual and accelerating subsidence of the central Ethiopian region enabled a filling of the eroded valleys with sediments derived from an unknown uplifted source, probably to the west; (4) These same epeirogenic tilting movements were perhaps responsible also for the ensuing initiation of the Mesozoic marine transgression north-westwards across Ethiopia, and which reached Shoa by the late Liassic or early Bajocian. The increased supply of sediments was now deposited in a marine environment to form the Adigrat Sandstone.

The occurrence of these pre-Adigrat sediments, probably of Permo-Triassic age considering their relations to the Palæozoic peneplanation and to the Adigrat Sandstone itself, is considered to suggest that Karroo-type sedimentation extended north into Ethiopia, though of restricted occurrence. It is now eminently desirable that these sediments be examined in more detail, particularly their petrography, and that search for fossils be made. It is also necessary that the Waju Sandstone of Chercher, similarly debated as of pre-Adigrat Sandstone age, be re-examined so that a regional knowledge of the existence of Karroo-type sediments over the whole of Ethiopia be obtained.

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CRYSTALLOGRAPHY

Structure of α-methyl D-galactoside 6-bromhydrin

As part of a crystallographic investigation of D-galactose and its derivatives, a determination of the structure of α-methyl D-galactoside 6-bromhydrin, $C_7H_{13}O_5Br$, has been carried out. The compound was prepared by Valentin[1] and the unit cell dimensions and symmetry were measured by Cox, Goodwin and Wagstaff[2].

Our measurements were made at 140° K, the crystal being cooled by a stream of dry, cold nitrogen gas provided by apparatus similar to that previously described[3]. The