Prehistoric Society of East Anglia.

RESEARCHES in East Anglia of considerable general importance were described at the summer meeting of the Prehistoric Society of East Anglia, held at the Royal Anthropological Institute in June last. The president, Mr. J. E. Sainty, of Norwich, gave an account of investigations undertaken by aid of the Sladen trust into the contents of the Stone bed beneath the Norwich Crag, the equivalent of the basement bed of the Red Crag in Suffolk. The conclusions were wholly in favour of the human origin of the flaking upon the flints, which, from the bold character of the work upon a hand-axe from Whitlingham, was considered to date from the Early Chellean period. It appears probable that there is little difference in geological age between the Norwich Crags and the deposits of the Cromer Forest bed.

Mr. J. Reid Moir showed black unrolled hand-axes of Combe Capelle, Early Mousterian type, which with numerous flakes and remains of mammoth and reindeer, and also fine Early Solutrean flint blades, were recovered from below thick deposits of gravel forming the flood plain of the River Gipping, near Ipswich. The Solutrean implements come from a clay at the base of the gravel which is here ten to eighteen feet thick, and the Early Mousterian hand-axes from a peaty loam beneath. In the Orwell estuary, the tidal part of the same valley, below Ipswich, peat occurs at a depth of thirty feet below high-water mark, and numerous teeth of the mammoth have been dredged from it. This peat is covered by gravel and grey alluvial mud, and may possibly be the equivalent of the peaty loam of the Early Mousterian horizon farther up the valley. It is seen, therefore, that a date much older than that usually assumed must be assigned to the greater part of the deposits filling the deep channels beneath the river valleys of the east of England, as the Neolithic layer appears to be only about four feet from the surface in the Orwell alluvium.

In the discussion, in which Messrs. R. A. Smith, H. Dewey, and Henry Bury took part, it was recalled that black unrolled hand-axes have been dredged up at Erith, which may indicate a horizon in the bed of the Thames equivalent to that in the buried channel of the Gipping. Another significant fact was that on the south coast the 'Coombe Rock' deposit is known to pass below sea-level. The new evidence was unexpected, and as it points to an order of events different from that assumed for the formation of the deposits of the lower Thames valley, it is important that investigations in that area should be commenced.

In reply, Mr. Moir stated that the trend of the evidence suggested to him that the buried channels beneath the river valleys of the east of England were excavated so early as the second interglacial period.

The discovery of thin ovate palæoliths in a clay deposit at Denham, Bucks, at 214 feet, O.D., and covered by gravel, hitherto classed and mapped as glacial, was reported by Mr. J. G. Marsden, and Mr. E. J. Guerrard Piffard exhibited microliths from the Horsham district showing a considerable amount of wear.

Scientific Utilisation of Coal.

THREE Cantor Lectures on the "Treatment of Coal" were delivered last winter before the Royal Society of Arts by Dr. C. H. Lander, Director of Fuel Research; these have been printed in the Society's *Journal* of Aug. 9, 16, and 23. The first lecture details steps taken in Great Britain to standardise methods of sampling and analysis—a task long overdue and of great importance to those engaged in buying and selling fuel and also in the testing of fuel-using appliances.

Recent work on the constitution of coal is surveyed and the problem of burning coal in large and small particles is subjected to a critical analysis. The combustion of gaseous fuel is so rapid that it is merely a question of bringing air and gas into intimate mixture. With solids, even the smallest solid particles in practice are gross compared with simple gaseous molecules, and the rate of supplying oxygen to the surface of the fuel becomes the dominating factor. A rapid velocity of air-flow relative to the coal is essential to facilitate the supply of oxygen and removal of products from the surface of the fuel. In modern practice this is attempted by the use of 'turbulent' burners.

Successful as this has been, Dr. Lander believes that it will be preferable to obtain a stable and streamline motion of air and induce the particles of fuel to move from one stream-line to another in controlled manner. By facilitating the supply of air to the coal dust, it has become possible to reduce the 'combustion volume' considerably until the properties of the refractories have become a limiting factor. It has also become possible to burn pulverised coal in the Scotch marine boiler, and Dr. Lander considers that eventually this will be done in the locomotive boiler.

The importance of these developments to the British coal industry is obvious. Encouraging results have been obtained with ships adapted to use pulverised fuel, and recently a new vessel, the *Berwindlea*, specially constructed for this purpose, made its first voyage, apparently with complete success.

In the second lecture, Dr. Lander traversed briefly the methods and results of chemical investigations of the structure and composition of coal, of which a great volume has been made in recent years. The replacement of cruder methods of fuel use by more refined treatment necessitates an investigation of these fundamentals.

So far as standard practice of carbonisation at high temperature is concerned, there is no prospect of any revolutionary improvements in efficiency, although advances in technique in recent years have been made which, reckoned on such large industries, amount in the aggregate to very considerable financial savings. The recent technical history of the gas and coke industries is traversed in an informative manner, and some indication is made of problems under investigation and of topical interest.

The third lecture deals with the attainments and prospects of processes of low temperature carbonisation. Much money has been squandered on this subject owing to the earlier methods of 'research by catastrophe'. More recently the extensive investigations of many serious workers have placed the subject on a more certain basis, and one can justifiably say that there are processes which are technically satisfactory. It is emphasised that the ultimate test, namely, whether the processes can produce dividends on invested capital, is not yet answered with certainty. In order to secure answers to these questions the Government has made technical trials of processes, cost free, and reports of these have been from time to time referred to in the columns of NATURE. In

addition, it has entered into an arrangement with the Gas Light and Coke Company, whereby the latter operates the Fuel Research Board process under commercial conditions at its Richmond works. The results are to be published, and should give a good idea of the commercial status of such processes.

Other processes which have reached a working scale in Great Britain were discussed by Dr. Lander. Experience with the process of coal hydrogenation was discussed, but the results do not suggest any immediate possibility of competing with mineral oil at present prices. A most interesting discovery is the possibility of converting a non-coking coal into a strongly coking product by the addition of less than 1 per cent of hydrogen.

Processes for the synthesis of fuels from water-gas do not seem to have any immediate commercial possibilities, although high-priced products such as methyl alcohol are already being made by such methods.

The three lectures give a concise amount of the scientific and technical work on the treatment of coal and the nature of the problems under investigation and awaiting solution in Great Britain.

H. J. H.

Ventilation.

IN a recent lecture before the London and South-Eastern Counties Section of the Institute of Chemistry, R. C. Frederick discussed some of the problems involved in securing adequate ventilation under various conditions. He also reviewed some of the work (to which he has himself contributed) which has already been carried out towards their elucidation.

Air is vitiated by abstraction of oxygen and by the addition of carbon dioxide, aqueous vapour, heat and bacteria, when human beings are congregated in an environment with poor ventilation. The most useful index of inadequate ventilation is the percentage of carbon dioxide present; but the discomfort experienced is not due to accumulation of this gas or to decrease in the oxygen since the greatest changes found are entirely without physiological influence. A poison in expired air has never been demonstrated; so that it is to the physical conditions of the atmosphere that one must turn for an explanation of the stuffiness of a confined environment.

Temperature, especially that registered by the wet bulb, humidity and air movement are the important factors. In estimating the degree of comfort to be expected, the cooling power of the atmosphere is of great importance: for its estimation Hill's kata-thermometer may be used. In America, Yaglou and his co-workers have developed the idea of 'effective temperature': with varying combinations of temperature, humidity, and velocity of air movement there is the same effect on the rate of heat loss from the body, and therefore the same sensation of comfort, or the reverse, and the same physiological response. The 'comfort' zone extends between 63 and 71 effective temperature. The results are not strictly applicable to conditions in Britain, since we are accustomed to somewhat lower temperatures.

Finally, there is the psychological or personal factor to be considered: if an occupant of a space believes the ventilation to be unsatisfactory he will suffer discomfort. Again, fresh air appears to exert a tonic effect as compared with washed and filtered air, and also to lower the incidence of minor respiratory disease. The reason for this effect is at present unknown and should form the subject of future research.

Calendar of Patent Records.

September 22, 1856.—The invention for which a patent was granted to Robert F. Mushet on Sept. 22, 1856, was very largely responsible for the immediate success of the Bessemer steel process. By the addition of from one to five per cent of molten spiegeleisen to the iron treated by the Bessemer process, Mushet regulated the supply of carbon and restored the small amount necessary for the production of steel. Mushet received little recognition at the time, and his patent did not run its full course. He was awarded the Bessemer gold medal of the Iron and Steel Institute in 1875.

September 24, 1921.—An important patent for the indiarubber industry was that granted to Paul Schidrowitz on Sept. 24, 1921, for the direct vulcanisation of rubber latex without coagulation, which enabled a vulcanised rubber in liquid form to be obtained without the necessity of a costly series of operations and expensive solvents.

September 25, 1791.—Cheap soda, for which many industries were waiting, was first produced under the process invented by Nicholas Leblanc and patented by him in France on Sept. 25, 1791. The manufacture did not become established in Great Britain until the repeal of the Salt Tax in 1823 reduced the price of salt (cf. Calendar of Patent Records, July 31).

September 26, 1836.—One of the inventors who contributed to the success of the Birmingham papier-mâché industry introduced by Henry Clay in the second half of the eighteenth century was William Brindley, paper maker. His invention for making papier-mâché articles in dies, of which the patent specification was enrolled on Sept. 26, 1836, received an award at the Great Exhibition of 1851.

September 26, 1867.—The first publication of the modern dry 'contact' process of filtering and deodorising mineral oils in which finely divided fuller's earth is mixed with the oil and the mixture subjected to constant agitation and heat, appears in the provisional specification of John Fordred, a London chemist, filed with his application for a patent for bleaching and purifying paraffin, dated Sept. 26, 1867. The patent was not sealed, but Fordred obtained later grants in which the process was applied not only to paraffin, but also to hydrocarbon oils and animal and vegetable oils and fats.

September 27, 1822.—One of the earliest improvements on the stop-watch—the construction of which in those days necessitated the stopping and restarting of the whole mechanism—was that patented by Frederick Louis Fatton, of London, a pupil of Breguet, on Sept. 27, 1822. Fatton's watch had a centre seconds hand working on a dial at the back of the case and having mounted on it apparatus capable of making a distinct mark, in ink or pencil, on the dial at any required moment, a button on the case serving to operate the mechanism without interfering with the going of the watch.

September 28, 1836.—One of the first-fruits of the introduction of the hot-blast for iron smelting was the solution of the problem of the use on a commercial scale of anthracite in the blast-furnace. The first successful production of pig-iron with anthracite was made at Yniscedwin, in South Wales, by George Crane in 1837, and the process was rapidly adopted both in Great Britain and in America. Crane's English patent for the use of anthracite with the hot-blast is dated Sept. 28, 1836. A United States patent for the same process had been granted to Dr. Geissenhainer in 1833, but no large-scale production there was made until Crane bought the patent rights and improved the process.