of the combustible or metal with oxygen, found much opposition among the older and more conservative chemists in all countries, but after the publication of his "Traité" in 1789, it quickly gained acceptance everywhere, no less rapidly in Germany, the home of the phlogiston theory, than elsewhere. This was, however, only a part of the story. The appearance of heat and light, or fire, in combustion also required explanation, and Lavoisier did this by assuming the existence of imponderable elements, caloric (the matter of heat) and light, which in their way bore a strong resemblance to the old phlogiston.

This work began in 1772, and after the discovery of oxygen by Priestley in 1774 it proceeded apace, a large number of memoirs being published by Lavoisier after presentation to the Royal Academy of Sciences. The experiments of Cavendish on the formation of water from hydrogen and oxygen, published in 1784, enabled Lavoisier to complete his so-called Anti-phlogistic Theory, and they played a decisive part in leading to its acceptance. The assumption made by Lavoisier that all acids contain oxygen was an error which was not rooted out until after 1810, but his surmise that the earths are oxides of unknown metals received a brilliant confirmation in Davy's isolation of the alkali and alkaline earth metals in 1807-8. The alkalis themselves were not regarded by Lavoisier as oxides of metals, although he was convinced that they were not true elements.

A great service given to chemistry by Lavoisier was the institution, with his colleagues, at the instigation of Guyton de Morveau, of a scientific nomenclature, published in 1787. The principles laid down are still in use.

The same year, 1789, which saw the publication of Lavoisier's revolutionary "Traité de Chimie" witnessed also the outbreak of the French Revolution. During its earlier stages Lavoisier continued to carry out work for the State, but he was soon singled out for attack. The impulse came from Marat, whose theory of fire had been unfavourably criticized by Lavoisier. The series of pretexts by which he was brought into popular discredit cannot be detailed; in the final phase nothing worse could be brought against him than a charge that he had, as a *fermier*, adulterated tobacco with water. In his trial, in which the president of the court was Coffinhal, the plea that his scientific services had been valuable to the State was rejected in the words: "The Republic has no need of savants; justice must take its course" Although Lavoisier's association with the *Ferme* was the real reason for his downfall, this could not legally be brought against him, since the Tribunal had no power to deal with crimes of the pre-Revolutionary period. With a will, however, a way can be found, and on the petty accusation mentioned the great Frenchman was condemned, and on May 8, 1794, he suffered the penalty of death by the guillotine.

In 1795 his property, previously confiscated, was restored to Madame Lavoisier, who lived until 1836; in 1806 she published some memoirs of her husband. His complete works were, as mentioned, published under the auspices of the Royal Academy of Sciences in the period 1864-93. The general contributions of Lavoisier to chemistry are well known, and he has received an ample and generous recognition and admiration, which are well deserved. It is fitting, however, on the date of the bicentenary of the birth of this distinguished man, once more to pay a tribute to his great and enduring services to science in general, and particularly to chemistry.

ARCHÆOLOGY AND ANTHROPOLOGY IN INDIA

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IT is just about a hundred years since an association began to be formed between archaeology and anthropology which has proved very fruitful to both these branches of human knowledge. So necessary are they one to another that no general course of instruction in one can well afford to ignore the other, and the union of the two in a common tripos in the University of Cambridge, due no doubt in the first instance to the foresight and influence of Haddon and Ridgeway, has proved incontestably satisfactory. But this association between archaeology and anthropology has been generally limited to prehistoric archaeology on one hand, and on the other to the more or less historic schools of anthropological thought; for the more extreme, at any rate, of the so-called functionalist anthropologists profess to repudiate inquiry into the past history of the societies and institutions which they study. In his presidential address to the Section of Anthropology and Archaeology at the thirtieth Indian Science Congress held in Calcutta in January of this year, Dr. N. P. Chakravarti, of the Archaeological Survey of India, seeks to extend this association by turning epigraphy to the service of anthropological inquiry.

The period of Indian history from the third century B.C. to the sixth century A.D. is indeed obscure enough. It was a period of minor immigrations between that of the Rigvedic 'Aryans' in the second millennium B.C., and the influxes of Islamic conquistadors which started about the ninth century A.D. with the Arab incursions into Sind, and continued until the establishment of the Mogul Empire. It was the period of the Yavanas, Pahlavas, Sakas, Kushāns and Huns, and inscriptions can at least throw some light on the areas that these invaders occupied, and, in the case of the Kushāns, at any rate, whence they came. Further, the way in which they adopted the religion of the country they settled in is clearly indicated by their votive inscriptions. Thus a pillar in Gwalior State records the dedication of a shrine to Krishna by Heliodorus son of Dion, ambassador of Antialcidas, the Hellenic king of Taxila, and describes the dedicator as a 'follower of Vishnu'. In a similar way one of the Kushān rulers is shown by his coins to have been a Shaiva.

Inscriptions of the same period likewise throw light on peoples long settled in India, such as the Andhras, whose rulers can be shown to have intermarried with Saka invaders, and Dr. Chakravarti mentions inscriptions of the Ishvaku family of southern India which show clearly that, although it is prohibited by the strict Hindu law, cross-cousin marriage was practised even in ruling families. Other inscriptions perhaps go to indicate an identity of race between ruling families at this period in Assam and in Gilgit, a point which calls up the reflexion that the game of polo was first known to us in Gilgit and in the distant State of Manipur on the eastern frontier of Assam, whence it was introduced into British athletics, though it is the Balti and not the Manipuri name for it which we use. The sum total of information available to ethnographers from inscriptions may not be great, but such as it is, it is likely to be useful and suggestive.

Dr. Chakravarti also dwells on the subject of

writing in general. He describes four stages, the first three of which he calls mnemonic, pictorial, and ideographic, while by the fourth the alphabetic is clearly intended. But he is not justified in describing them as successive evolutionary stages. The first two may no doubt be regarded as both contributing to the invention of writing, but there is no evolutionary series here. The alphabet, again, for all true alphabets seem to have a single source, though it has a pictographic origin, does not by any means evolve from an ideographic form of writing. On the contrary, though the Japanese in adopting the Chinese script may tend to give some of its ideograms a purely alphabetic value, Chinese, which is ideographic, has no alphabet. The nature of the Mohenjodaro script is still undetermined, and it is probably impossible to say whether it is pictographic or ideographic. It seems limited to seals, and may have been a purely commercial device for marking goods. Dr. Chakravarti mentions that many theories of its interpretation have been put forward without carrying conviction, but he does not mention specifically Hevesy's association of it with the Easter Island script. Hevesy's view has been severely criticized by Dr. Métraux of the Bernice P. Bishop Museum; but Heine-Geldern has found equally remarkable parallels between both the Mohenjodaro and the Easter Island symbols and those used in one of the earliest forms of Chinese. If he and Hevesy are right—a view not very easy to accept—it is possible that the language of Mohenjodaro may prove to have belonged not to the Dravidian but to the Austric family, and so to have affinities with the Munda tongues.

Dr. Chakravarti's address has been taken in reverse order. It remains to mention a subject that he touched upon at the start: that is, the losses suffered by anthropology in India during the past year through death. Of the names he mentions, only two are Indians, one an anthropologist, the other an archaeologist. Rai Bahadur Sarat Chandra Roy was well known to anthropologists outside India as a pioneer in Indian ethnography. His monographs on various tribes of Chota Nagpur were among the first of their kind and have contributed very greatly to our knowledge, and understanding, of those tribes, to the promotion of whose welfare he gave so much of his life. It was the oppressions and hardships suffered by the Munda tribe at the hands of aliens that first moved him, as a young lawyer, to study their language and customs the better to sponsor their causes. Furthermore, he founded and edited *Man in India*, which is still the only periodical in the British Empire, probably, given exclusively to anthropology, but without the backing of any scientific or educational body behind it. Roy was also something of an archaeologist, and excavated a number of prehistoric sites in Chota Nagpur, particularly sites associated with the Asurs. Rai Bahadur Ramaprasad Chanda was probably more of an anthropologist than Roy was of an archaeologist, for he started as an anthropologist before he gave himself to archaeology, working on anthropometry and on physical data as well as on cultural. He was an early critic of Risley's theories of brachycephaly in India, but probably his most important contribution to anthropology came from his profound knowledge of early Sanskrit literature, which he applied to the interpretation of cultural problems of prehistoric India. Indian anthropology is indeed unfortunate in losing both Sarat Chandra Roy and Ramaprasad Chanda in the same year.

OBITUARIES

Baron Gerard de Geer, For.Mem.R.S.

BARON GERARD JACOB DE GEER, whose death occurred on July 24, was born in Stockholm on October 2, 1858. Professor of geology at the University of Stockholm from 1897 until 1924, he ended his days as founder-director of the University's Geochronological Institute. There is more than one Baron de Geer in Europe. The originator of the branch of the family from which the famous geologist arose went to Sweden from what is now Belgium at the request of King Gustavus Adolphus early in the seventeenth century, and there started a large iron and steel industry. In after years successive de Geers played a great part, not only in the industry of Sweden, but also in her science and politics. Gerard's father, Louis, was Prime Minister for twelve years, and Gerard himself was a member of Parliament from 1900 until 1905. Recognition in Great Britain of his scientific eminence has been shown by award of the Wollaston Medal of the Geological Society in 1920, and by election to the foreign membership of the Royal Society in 1930.

De Geer's great achievement, according to very general acceptance, has been his deciphering of a year-chronology "backwards into a part of the earlier or Palaeolithic Stone Age". We have here something much more precise than any chronology so far based upon the erosion-rate of Niagara, or the decay-rate of uranium. The time unit employed is the year, just the same as that which figures so prominently in our school history books.

Recognition of annual rings of growth in trees of temperate regions is an old, old discovery; but realization of similar annual layers of growth in certain favourably situated outer portions of the earth's mineral fabric was little more than a dream, until, in 1878, it came independently into the mind of de Geer. This happened during his first geological field work in the Stockholm region. From then onwards to the end of his life, during the greater part of which time he was helped by assiduous collaborators, de Geer strove to confirm the annual nature of the layering of the varved clays of the Baltic; and thereafter to derive from the chronometer thus afforded a maximum of information regarding dates of events which had happened during Late Glacial and Post-Glacial times in Sweden and elsewhere.

The term 'varve' means a cycle. The varved clays, in large measure of somewhat sandy character, are laminated deposits, in which each full layer has a more sandy basal portion merging upwards into a skin of pure clay—which latter is followed abruptly by the sandy base of the next succeeding varve. The Baltic varved deposits were formed in a freshwater portion of the Baltic Sea, deeper and more extensive than to-day owing to submergence, into which the Scandinavian ice-sheet still projected during a retreat determined by frontal and other melting. Almost any observer would be prepared to admit that individual varves record rhythmic repetitions of some melt plus non-melt episode, which affected the neighbouring ice-sheet. He would also recognize an inherent probability that in each episode the melt portion covered a whole summer and the non-melt a whole winter, because, where flood waters are provided by melting of large expanses of snow and ice, rather than by rainfall, they tend to adopt a seasonal duration. To turn this probability into something