

EXCAVATIONS AT HARAPPA*

THE pre-historic mounds of Harappa are situated in the vicinity of the modern town of Harappa about fifteen miles from Montgomery in the Punjab. These mounds were known to antiquarians since 1826 and were officially reported on by Cunningham in 1873. The ruins had already been exploited for providing brick ballast for about a hundred miles of the Lahore-Multan railway and for bricks for the large number of houses of Harappa town. Steps were taken only in 1920 to protect the site under the Ancient Monuments Preservation Act, but by this time the vandalism of railway contractors had made a mess of the whole site. Systematic excavation of the mounds was begun and continued for three seasons by the late Rai Bahadur D. R. Sahni and afterwards from 1926 to 1934 by Mr. M. S. Vats, Deputy Director-General of Archæology in India, who has now published a most thorough, painstaking, and profusely illustrated monograph on the work done by the Department at Harappa.

Though Harappa lacked the affluence of Mohenjo-daro and its structural remains had been very much disturbed, the excavators were able to dig deeper at Harappa than at the other site, and discover lower strata that contained relics of the early centuries of the fourth millennium B.C. The most interesting of the antiquities from Harappa are the tiny seals and sealings of a very archaic character, from which the animal seals of the Indus civilization are believed to have evolved. Next to them in importance is the great state granary where grain received as taxes was probably stored up. Relics were also found of some palatial houses, with a frontage of over a hundred feet, designed "so as to separate the female apartments from the rest of the house". Wells were rare at Harappa, the inhabitants probably depending mostly on the river for their supply of drinking water. Drainage and conservancy arrangements were throughout the same as at Mohenjo-daro.

In addition to the usual chert implements known at Mohenjo-daro, from one of the early strata of Harappa came a granite celt which showed evidence of having been used.

The copper tools were identical with those of Mohenjo-daro. A miniature copper chariot with gabled roof from another early stratum is considered by Mr. Vats to be the first example of a covered chariot from the Indus valley sites "antedating the earliest use of a wheeled vehicle in Egypt by several centuries".

Readers of *Current Science* will be specially interested in the report on the sixteen furnaces discovered at Harappa. None of them is complete, but enough remains to enable the excavator to form an idea of their shape, etc. One furnace was made of a cylindrical pottery jar imbedded in the earth. Others were round or pear-shaped and lined with bricks-on-edge and had vaulted roofs, and there is evidence to show that the ancient metallurgists of Harappa were able to maintain a very high temperature in their furnaces for casting their bronze and copper tools, for firing faience objects and for glazing their steatite seals and vessels. Khan Bahadur Sana Ullah has an interesting chapter on "the sources, composition and technique of copper and its alloys", and from a comparative study of the impurities in them he is able to establish definitely the sources of the metals used at Harappa.

Another outstanding discovery from the point of view of the history of science, is that of a graduated measuring rod of bronze with the divisions averaging about 0.934 cm. From a metric study of the structural remains Mr. Vats comes to the very interesting conclusion that the "Royal Cubit" of 20.7 inches and the foot of 13.2 inches were in vogue at Harappa.

It is of interest to note in passing that Harappa had about seven types of pottery lamps one of which is of the closed Roman type.

In the field of plastic art Harappa has a sensational item for the sceptically minded. It is a small statuette of a nude male, in red sandstone, from stratum III of Mound F. It recalls to mind the art of the Greek sculptors on account of its "wonderfully truthful modelling of the fleshy parts", but Mr. Vats shows very conclusively and beyond any possibility of doubt that this figure is Indian and pre-historic.

The excavators of Mohenjo-daro were regretful that they did not come across any

* *Excavations at Harappa*. By Madho Sarup Vats, M.A. In two volumes with plans and plates. Vol. I.—Text, Vol. II.—139 Plates (Manager of Publications, Delhi) 1940. Price Rs. 50-6 or 77s., inclusive of Volume II.

extensive burials at that prehistoric city, for, burials are always psychologically revealing and give us, moderns an inkling into the faiths and beliefs of the dim distant past. Fortunately Mr. Vats discovered an extensive cemetery at Harappa with burials belonging to two distinct types, the earlier ones

being what he has termed "earth burials" and the later ones "pot burials". In the mythological scenes painted on the burial jars, Mr. Vats finds many items of Indian beliefs, echoes of which are heard in the Vedas.

A. A.

LORD RUTHERFORD

Rutherford, being the Life and Letters of Lord Rutherford, O.M. By A. S. Eve, with a Foreword by Earl Baldwin of Bewdley. (Cambridge University Press, London), 1939. Pp. 451. Price 21s.

THE Cavendish Professorship of experimental physics at Cambridge was occupied in succession by four outstanding men of genius and worldwide fame, namely, Clerk-Maxwell, Rayleigh, J. J. Thomson and Rutherford, whose work made an uneffaceable impression on science. Clerk-Maxwell was the first incumbent of the chair from 1871 to 1879, but his principal contributions to science were made at an earlier period. Rayleigh who succeeded him resigned in 1884 after a brief tenure of five years. He was succeeded by J. J. Thomson, then a young man only twenty-eight years of age. Both Clerk-Maxwell and Rayleigh were essentially individualists. The fame of the Cavendish Laboratory as a great centre of experimental research really dates from the year 1894 when J. J. Thomson turned his attention to the study of the discharge of electricity in gases. About this time, the University instituted a research degree open to any one who resided for two years and did an original investigation which received the approval of the examiners. The first research student to work under J. J. Thomson under this scheme was a young man from New Zealand who came to England with an 1851 Exhibition scholarship. That young student was Ernest Rutherford, who fittingly enough, succeeded J. J. Thomson twenty-four years later when the latter retired from the Cavendish Professorship in 1919. J. J. Thomson received the Nobel Prize for Physics in 1906, and Rutherford, the Nobel Prize for Chemistry in 1908. Their mortal remains now rest side by side at the Westminster Abbey in London where Britain's greatest men lie buried.

The fascinating story of Rutherford's re-

markable life and career is well told in the biography which has been published by the Cambridge University Press. The book has been compiled by a friend and fellow-physicist in the person of Prof. A. S. Eve, F.R.S., who had been associated with Rutherford in the days of his earliest scientific triumphs at the McGill University in Canada and continued in close touch with him till the end. Much of the most interesting part of the book consists of extracts from the letters written by Rutherford himself to his wife and to his numerous friends and collaborators over a period of forty years. The care of Lady Rutherford in having preserved her husband's letters was indeed most fortunate, as they reveal Rutherford's personality in a remarkable way and tell the story of his life far more intimately and vividly than any biographer could have done.

The writer of this review well remembers his meeting Rutherford at the Cavendish Laboratory on the occasion of his first visit to England in 1921, and again on various occasions in 1924 and in 1929. He takes the opportunity of referring with pleasure and gratitude to the generous and friendly spirit manifested by Rutherford in his contacts with the writer. Many of Rutherford's letters to his friends were in his well-known and characteristic handwriting. It was the magnificent personality of Rutherford and his readiness to help the cause of science in every way, quite as much as the greatness of his own scientific work, which evoked the enthusiastic admiration of his colleagues and made him the towering figure he was in the world of science. The story of Rutherford's life and career cannot fail to be an inspiration to all students of science. The volume under review is one which may be heartily commended to every one who is interested in the triumphs of the human spirit in the world of Knowledge.

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