infection cage, is only one-fifth of the virulence characterising the corresponding area at Jawlagiri. In the case of the Denkanikota cage, the insect collections had to be transported over a distance of four miles and were not therefore in as "*nascent*" a condition as those of Jawlagiri. These are possibly the causes for the negative results obtained so far at Denkanikota.

The remarkably high percentage of successful transmissions (43·2%) obtained at Jawlagiri in the mass infection cage, constitute a fundamental advance in the problem of spike disease investigation. The experiments establish that (1) the disease is insect-borne, (2) the insect-vectors occur during the nights, (3) that the vector responsible for disease transmission belongs to one of the 265 types introduced into the cage. On the basis of the frequency of occurrence, seasonal and regional distribution, numerical strength, their morphological characteristics and their reputation as vectors of allied diseases, a large number of groups and individuals have been eliminated, and the scope of our transmission studies with individual species has accordingly been restricted for the present, to three types of *pentatomidæ*, two of *jassidæ* and three of *fulgoridæ*. Transmission studies with these eight insects are now in progress.

Our best thanks are due to Mr. Dyson, D.F.O., North Salem, for his keen interest, constant encouragement and helpful criticisms during the entire course of these investigations, and to Mr. M. V. Laurie, Provincial Sylviculturist, for his many constructive suggestions. Our grateful thanks are also due to Sir C. V. Raman, KT., F.R.S., N.L., and Dr. V. Subrahmanyan for their kind and continued interest in the investigation.

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The Science of Rubber.*

AMONG the natural products which have influenced the progress of modern civilization, rubber occupies a pre-eminent position. The discovery of vulcanisation in the middle of the last century marks the beginning of its technological development while the advent of the pneumatic tyre, the increasing employment of power vehicles and the air craft paved the way for the utilisation of rubber on a gigantic scale. The special and exclusive properties of this raw material, more particularly, its elasticity, high impermeability to gases and liquids, resistance to shock and sound, electrical insulation and a marked resistance to chemical attack, properties which characterise no other single individual material of construction, have been exploited to the fullest advantage by technologists and in this endeavour, they have been assisted by an army of investigators who have contributed to the fundamental aspects of the science of rubber which constitutes the main thesis of the book under review.

The author who was entrusted with the responsible task of solving the problem of war time rubber emergency in Germany had a very enviable opportunity of enriching his experience and this fortunate circumstance has secured for the volume a prestige and authority which none will grudge. The diffcult situation was successfully met by the author and his colleagues whose strenuous efforts in perfecting the process are still being continued. The personal touch of the author is refreshingly perceivable as one goes through the pages of the book.

In this short review it is not possible to do justice by referring to all the excellent aspects of this book, but it is sufficient if attention is called to a few of the most notable features of this volume and indicate the comprehensive and thorough manner in which the subject has been approached. Such a fine production has been made possible through the combined efforts of

* *The Science of Rubber*, edited by Prof. Dipl.-Ing. K. Memmler. Authorised English Translation Edited by R. F. Dunbrook and V. N. Morris. (Reinhold Publishing Corporation, New York, 1934.) $ 15.00.

several experts who are entitled to speak with authority in their respective fields. The editors of the English translation have maintained the same ideal in view and have selected translators from among the Firestone Research staff, who are best qualified to translate the section of the book apportioned to them. The translators' notes and comments, which appear as footnotes, constitute a valuable feature of the English translation since they amplify, corroborate or supplement the information and thus furnish the reader with an enlarged and extended experience covering the newer developments since the German original was written.

The chapter on the Chemistry of rubber has an added interest since it includes a résumé of the work on the synthesis of rubber conducted in Germany under the stress of war, in the course of which a number of normal and abnormal types of artificial rubber were produced. It is not improbable, that in the near future, most of these will find an appropriate use in industry.

The chapter on vulcanisation, the fundamental process responsible for the phenomenal development of rubber industry, treats with all the latest theories of vulcanisation and accelerator action and indicates the future lines of development. To those interested in the physical properties of rubber, the chapter on the physics of rubber will offer the most interesting and stimulating reading. The colloid chemist in particular will welcome this chapter since it deals with the swelling and solution of rubber and provides him with an array of problems requiring elucidation. It may, however, be mentioned that in the course of reading the book one gets the impression that the pure research that has been conducted on the various aspects of rubber have an intimate bearing on the industrial application. For example, the results on the permeability of rubber to gases in the relation to the quality and treatment of rubber, which has been investigated so thoroughly have been exploited in the development of æronautics. The optical and electrical properties of rubber and its solution, which are of great technical importance, have also been treated.

For the first time, the physical methods of testing rubber have been brought together in a single chapter and this constitutes a very valuable contribution from the point of view of a technologist since most of these methods suggest possibilities of application in other fields of technology, more particularly in the fields of resins and plastics.

The chapter on the microscopy of technical vulcanizates, describes methods by which rubber can be investigated by reflected and transmitted lights as also by the dark field illumination, and these observations are illustrated by a series of faithfully and beautifully reproduced colour plates.

The fact that the Firestone Tyre and Rubber Company have permitted the members of their technical staff to engage themselves in this work of translation not only speaks of their progressive ideas but also of the high esteem in which Memmler's book is held by rubber technologists. This treatise on the science of rubber will be gratefully welcomed not only by those interested in the science and technology of rubber, but also by those interested in allied fields. It is hoped that the enterprising publishers who deserve to be congratulated in publishing this volume, will soon bring out an equally authoritative and comprehensive companion volume on the technology of rubber.

M. S.

Archæological Discoveries at Narunjadharao.

CONSIDERABLE importance is attached to the discoveries of Mr. U. T. Thakur, a young Sindhi Scholar at Narunjadharao, in Khairpur State. Experimental excavations have yielded interesting relics such as shells, bangles, images of Buddha, gold and copper, skeletons and pottery. It is anticipated that these discoveries will throw considerable light on the Mohenjadharao civilisation and the site will be revealed to the world as a centre of pre-Aryan culture. It is reported that Professor Ghory of Bombay has supported the claims of the discoverer. The State authorities have reserved the sites for further excavation and further work will be started in the coming winter.