of the region resorted, as in South Africa at the present time herds of ungulates resort to such places. . . . At these pools the beasts, which roamed over the wide plain, came to drink, and here they died, as the result of age, or as they fell under the teeth and claws of carnivora. It may also have been . . . that at this particular point there was a ford, or crossing of the river, much resorted to by migrating herds of animals, and here many, especially younger animals, were mired in quicksands, and drowned."

Chapter I. defines the Chalicotheroidea, sketches briefly the literary history of the group, and names and defines the three subfamilies, Schizotheriinæ, Moropodinæ and Macrotheriinæ; while Chapter II. characterizes the various genera included under each subfamily, both the American and Old World forms, as well as several genera formerly included under the Chalicotheroidea but now referred to other orders and suborders.

In Chapter III. a résumé of the species is given, although, with the Old World types especially, a thorough revision other than of the genotypes was not practicable; at the same time the comprehensive list is of great value for future work. Chapter IV. treats very fully each species of the genus *Moropus,* discussing each one under the several headings of name and synonyms, of what the type consists and its whereabouts, the geological horizon, and the specific characters. The last named includes not only the original description quoted in full, but an adequate supplemental description as well.

Chapter V., embracing as it does 143 pages, is really the *pièce de résistance* of the entire volume, and presents an elaborate morphological study of *Moropus,* based very largely upon the skeleton of *M. elatus* already referred to, which has been mounted in the Carnegie Museum. The assembled skeleton shows certain horse-, rhinoceros- and titanothere-like features, while the feet are so like those of the Edentata as to have been the cause of the inclusion of *Moropus* in that order before the association with other anatomical features was known. The restoration of *Moropus* based upon the articulated skeleton is given in the form of a statuette prepared by Theodore A. Mills under the supervision of the authors, and presents a curious admixture of horse-like head, tapir-like body, and leonine feet. Of its probable habits and the meaning of the peculiar adaptive features the authors are perhaps wisely silent, though a host of questions present themselves upon viewing this grotesque re-creation.

Chapter VI. gives an elaborately studied bibliography, in which the essential facts of each paper are analyzed, showing a very intimate knowledge of the literature of the subject on the part of the authors.

This work, on the whole, is entitled to the highest commendation as an elaborate, painstaking piece of research which will prove of the greatest value to future students of the group, and the fine appearance of the volume is fully commensurate with its importance.

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Atlas und Lehrbuch wichtiger tierischer Parasiten und ihrer Ueberträger mit besonderer Berücksichtigung der Tropenpathologie. By Prof. Dr. R. O. Neumann (Bonn) and Dr. Martin Mayer (Hamburg). Lehmann's Medizinische Atlanten. J. F. Lehmann's Verlag in München. Bd. XI., vi + 580 + 93 pp., 45 colored plates with 1,300 figures and 237 figs. in text, 1914. Geb. M. 40.

The high standard of excellence established in the previous volumes of Lehmann's series of atlases, which includes, among other well-known texts, Sobotta's superb work on anatomy and histology, is well maintained in Neumann and Mayer's recently published "Atlas und Lehrbuch wichtiger tierischer Parasiten." The rapid growth of interest in tropical diseases, the recent expansion of the sciences of protozoology and parasitology, the increasing number of institutions devoted to research in these fields, and the rapid rise of applied hygiene and preventive medicine, have created both the possibility and the need for such a work as this. One has but to glance through the group

of lesser texts which have been issued of late to meet the growing demand for a usable summary for purposes of instruction, to see how large a use has been made in them of old figures which have done duty for decades in older texts, and to be impressed with the wealth of unutilized materials when reference is made to original sources. The time and care needed in the preparation of new illustrations and publishers' reluctance to risk the expense of new cliches and of colored plates is doubtless responsible in part for this situation.

The atlas in hand is far removed from any such criticism, for the thirteen hundred figures on the forty-five colored lithographed plates are from original colored drawings by Professor Neumann, and the publisher has spared neither pains nor expense to insure adequate reproduction, more than twenty colors being employed in some of the plates to bring out satisfactory results. The extensive collections of the Institut für Schiffs- und Tropenkrankheiten at Hamburg have furnished much of the original material upon which the work is founded. Authors have also contributed their original preparations for the preparation of the illustrations. For example, Looss, of Cairo, has contributed hookworm and *Schistosomum* material, Manson filaria, Prowazek trachoma, and Chagas his Brazilian *Schizotrypanum,* the causative agent of the South American "sleeping sickness." Japan, Ceylon, Cairo, Congo, Nigeria, Brazil, the Schools of Tropical Medicine in Hamburg, Liverpool and their outposts in the tropics have contributed richly to the resources utilized in this work.

It has been the aim of the authors to include all forms of clinical importance and such other related forms as are of theoretical interest. The work was instituted in 1905, but the growth of the subject has been so rapid that its publication has been delayed, with the result that the work has been greatly enriched by recent discoveries. Obviously no book of even the sumptuous form of this atlas could be expected to be encyclopedic. A vast deal of elimination of detail, of selection of material which has passed to the stage of reasonable certainty, and the omission of that of more problematical status has been essential. The authors have been very skilful in this respect, though one questions their inclusion of Prowazek's figure of "conjugation" in *Trypanosoma,* for it would seem that the evidence for sexual reproduction in the trypanosomes is as yet inconclusive.

The book unites the fields of zoology and medicine and has been written with both in view, though naturally many details of systematic, cytological and anatomical nature are eliminated, or presented only in condensed form. On the other hand, life-histories of the parasite and its carrier-host, and the pathological conditions which it induces, are subject to both discussion and illustration.

The structure of the elements of normal blood is very fully illustrated and the technique of hematology is elaborated and methods of staining, preservation, culture, collecting and sending parasitological material are detailed, usually with figures illustrative of apparatus and method. References to literature are well chosen and ample. Considerably more than half of the work is given to the Protozoa and to their invertebrate hosts, the flies, mosquitoes, bugs and ticks, five plates being devoted to trypanosomes and no less than five to the malarial parasite. It is perhaps because of this wealth of protozoological illustration that one gets the impression that the parasites belonging to the higher phyla, the worms and arthopods, have received, relatively to their importance, less ample treatment. But to have done more would have inevitably necessitated a second volume. It also seems that the parasitic flagellates, other than trypanosomes, and ciliates call for fuller treatment than has been accorded them.

While the emphasis is placed upon human parasites, the treatment is not restricted to them; the additions, however, are more by way of biological inclusiveness than for the purposes of comparative medicine. The work can hardly serve the purposes of the veterinarian, though indispensable in all fields of parasitology.

The authoritative character of the work, the

accuracy, completeness and utility of the illustrations to the clinician and practitioner, the broad biological conception underlying the treatment, combine to characterize the work as the best iconography of parasitology as yet published.

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THE RELATION BETWEEN LIZARDS AND PHLEBOTOMUS VERRUCARUM AS INDICATING THE RESERVOIR OF VERRUGA

It affords the writer much satisfaction to record another confirmation of the intimate relation which exists between *Phlebotomus* and lizards or other reptiles the world over. Many cases of this relation have been recorded in the recent literature, and the same appears to hold good in Peru.

Numerous blood smears made during the past two or three months from small rock lizards of several species collected at Verrugas Canyon, Surco, San Bartholomé and Chosica Canyon all show rod and granule bodies which exhibit the identical morphology of the bodies that have been named *Bartonia bacilliformis*. Their agreement with the latter in shapes, sizes, colors and apparent structure is so faithful as to defy distinction. The lizards concerned have been sent in for identification.

It is to be noted that the first three localities above mentioned are well within the limits of the verruga zone of the Rimac Valley, while Chosica Canyon is just outside that zone. Lizard blood smears made in Chosica Canyon in June, 1913, and again recently all show these bodies, but the granules seem to predominate greatly in the blood of the lizards from outside the verruga zone and from points within the zone where the lizards are not exposed to the constant attacks of the *Phlebotomus*.

In Verrugas Canyon there are, close to the house, many large walls built of loose rock wherein the *Phlebotomus* hide in swarms during the day, issuing in the evening to enter the house and bite the inmates. These rock walls are also inhabited by the small lizards in question. Smears of blood made from lizards from these walls show a great predominance of the rods over the granules. These lizards are exposed to the constant attacks of the *Phlebotomus* every day in the year.

The writer has found the same bodies in smears made from the *Phlebotomus* at Verrugas Canyon, which also show the nucleated red corpuscles of the lizards as well as mammalian erythrocytes. The same rods and granules have furthermore been found by the writer in microtome sections of human verruga papules, in similar sections of papules produced in his laboratory animals by injections of the *Phlebotomus,* and in the blood of these animals prior to the eruption.

Blood smears of a young guinea-pig taken 63½ hours, and later, after injection subcutaneously with a very small quantity of citrated lizard blood from Chosica Canyon have shown the typical granules and Bartonia rods in the disks of the erythrocytes. This pig died nine days after injection, after irregular rises of temperature, and its autopsy blood and femoral marrow showed a large increase of the bodies, principally granules but also short rods.

Subcutaneous injection of a second young guinea-pig with a larger quantity of citrated lizard blood from Surco proved fatal within ten hours, liver smears showing the rods and granules, but blood, marrow and spleen smears proving practically negative. Further experiments of a similar nature are under way. The three-cornered connection, however, between lizards, *Phlebotomus* and verruga appears to be already well established by these data.

It is seen from the results that this possible reservoir of verruga in the lizards is not confined to the verruga zones, which are limited by the occurrence of the *Phlebotomus,* but may exceed the latter in range. This explains how fluctuations in occurrence of the *Phlebotomus* may result in extensions or retractions of the verruga zones, the gnats finding the infection at hand on gaining a new locality.

It also seems indicated by the above results that the verruga organism must exist in the infective stage in the lizard blood and does not apparently demand the medium of the *Phlebo-*