on prehistoric problems and to make the archeologist more geologically minded. But the cases cited are exceptions rather than the general rule. In reality we are far from taking this cooperation very seriously. How often does it not occur that an archeologist returns from South America, Alaska or India without even troubling to call on a geologist for help in clearing up problems of stratification, paleoclimatology or paleogeography? If one takes a brief look at the histories of the more important archeological excavations, such as those at Ur and Babylon, Yukatan or Mohenjo Daro in India, one is struck by the lack of accurate geological information concerning these sites which is in our possession. It would have been a matter of small expense to have a geologist study the physiographic and stratigraphic records from which the archeologist could have obtained information of a paleogeographical nature. Such neglect has already caused great opportunities to be lost, particularly in Central Asia and Asia Minor, where the sedimentary records of climatic oscillations and of physiographic changes are frequently in a very complete state of preservation. In a very recent case of cave excavations in Asia Minor where unrivalled prehistoric treasures were brought to light with the greatest skill, no geologist was at hand to keep a detailed record of the Pleistocene sediments. And yet here was a great opportunity to link the culture sequences of the older Stone Age with eustatic changes of the Mediterranean sea level which seem to have left clear traces along the coastal plain. In this case much emphasis was placed on the paleontological record, but very frequently the paleontological record in an implementiferous deposit is too incomplete to enable us to reconstruct climatic or geographic changes. Sediments very often prove to be more reliable indicators. In any case more attention should be given to the possibilities of complementing the paleontological records by detailed geological observations. How stimulating such multiple approaches can be may be learned from the work on the history of Lake Lahonton in Nevada.

Judging from my own experience it seems to me that the neglected state of this border science is in large part to blame for the very slow progress which we have made in bringing about a clearer understanding of the involved history of the Pleistocene period and of its hominid records. I even venture to say that the present dearth of knowledge concerning Paleolithic man in North America may be due in no small part to inadequate information regarding primitive human cultures on the part of the geologist. The obvious remedy for this state of affairs appears to be to place greater emphasis on the knowledge of prehistoric artifacts, particularly of the more primitive cultures. These latter, which may be conveniently grouped together as pre-Chellean industries, are rather difficult to identify as human tools, when, as so frequently happens, they occur in a gravel deposit, and it requires some acquaintance with type examples before one can identify the unmistakable marks of human manufacture. Should opportunity to study artifacts be lacking, despite the fact that all our larger museums of natural history are provided with standard sets from Europe, there is always the literary approach, either through G. G. MacCurdy's textbook or through a more recent, very stimulating book by L. S. B. Leakey, "Adam's Ancestors" (London, 1934). The latter gives a fascinating review of the geology of ancient man and serves as a vivid introduction into the various techniques of stone manufacture. So much for the geologist. If he does his part a great advance in the study of primitive man will have been made, and one can only hope that the digging archeologist will meet him half way and will no longer be satisfied to bring a few inadequate rock specimens from his site but will become conscious of the value of geology as a border science to archeology.

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PERFORATED FIBER-TRACHEIDS IN THE PASSION FLOWERS

THE stem anatomy of *Passiflora vitifolia* H.B.K. from the Canal Zone has proved to be as interesting as its scarlet flowers are striking. This plant may run as a small vine through the undershrubs or on occasion it may become a liana reaching far up into the top of the forest.

As is the usual case in such plants the vessel elements are large, measuring up to 0.5 mm in diameter. Other cells in the xylem are fiber-tracheids, septate fiber-tracheids, libriform fibers and ray cells. The fiber-tracheids vary in length from 1 mm to 2 mm, the average width being 0.03 mm. The pointed ends are long and tapering, occasionally forked at one end or at both ends. The walls have numerous bordered pits with lenticular apertures. A large proportion of these cells have perforations. In most cases they are two in number, situated near the ends. Fiber-tracheids ending in extreme points, wherein the lumen is almost non-existent, have the perforations in the wider parts of the cell from one fifth to one third of the cell length from the end. The perforations establish unobstructed passages from one fiber-tracheid to another, never apparently to a vessel element nor to a ray cell. A small percentage of these perforated fiber-tracheids have but one perforation. Probably they are the end cells in the series. Their frequency suggests the average vertical extent of these cells in series to be five cells.

The cells in question are not to be confused with the long and narrow vessel elements of some woods nor with those vessel members which bear flap-like prolongations extending far beyond the perforation plate. Except for their perforations these cells differ not at all from the typical imperforate fiber-tracheids all about them. Since the xylem is well supplied with huge vessels it is improbable that these short series of perforated cells whose lumens are only as wide as the walls are thick would aid water transport materially.

Subsequent examination has shown similar cells to exist in all other species in our collections of the genus *Passiflora,* as follows: *P. menispermifolia* H.B.K., *P. seemanni* Griseb., *P. biflora* Lam., *P. misera* H.B.K., *P. punctata* H.B.K., *P. auriculata* H.B.K. and *P. coriacea* Juss.

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A POSSIBLE RELATION OF VITAMIN E TO UNRESTRICTED CELL DIVISION

As a result of a long series of experiments which have been carried out by the writer in collaboration with Drs. Card and Sloan, of the department of poultry husbandry of the University of Illinois, a large mass of evidence has been obtained which goes to show that vitamin E is very intimately associated with, and probably exerts an indirect controlling influence over, the nucleus of the cell during cell division.

In earlier experiments on the effects of vitamin E deficiency on the developing chick embryo, using a modification of the Waddell-Steenbock method of destruction of this vitamin by treating food with ferric chloride, remarkable conditions of tissue proliferation were encountered. It was also found that somewhat similar effects could be established in older birds under these conditions.

With this clue as a basis for further work, prolonged feeding of the treated food to chicks has resulted in the development of characteristic pathological lesions affecting the visceral organs. Histologically, these are found to represent foci of degeneration and destruction of normal tissues accompanied by replacement and invasion by new cell growths, which, in turn, appear to be derived from an undifferentiated type of tissue having the form of a delicate reticular syncytium. The whole series of effects are apparently due to a phenomenon of uncontrolled and unrestricted cell growth simulating malignancy.

A complete account of the results of this work and a possible theoretical explanation of the relation of vitamin E to unrestricted tissue growth, which will serve as a working hypothesis, will be presented in a separate article in the near future.

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SEPT. 19, 1934

THE CHEMICAL TRANSMISSION OF NERVE IMPULSES

MY address at Indianapolis on "Chemical Ideas in Medicine and Biology" (SCIENCE, Vol. 80, p. 343) was published so promptly that I had no opportunity of correcting a rather serious error in my statement dealing with recent work on the chemical transmission of nerve impulses. I stated (p. 347) that the weight of acetylcholine required to transmit the effect of a single nerve impulse to a single ganglion cell was of the order of 10^{-21} gram; and, as Mr. Watson Davis reports under "Science News" in the same number, I verbally emphasized this estimate before a great and distinguished audience by stating that it represented about 3 molecules of the substance. Dr. Langmuir had, in fact, had the kindly interest to make this last calculation for me just before the meeting. Not till my arrival in London did I make the humiliating discovery that the distractions of a brilliant occasion had led me into the promulgation of a gross numerical error. An important factor of 10^6 had slipped out of the calculation. The figure should have been 10^{-15} in place of 10^{-21}, and from this correct value the calculated number of molecules would have been three million, not three. The incorrect statement, as I made it, may cause some theoretical pangs to physiologists who read it, and I wish to relieve their bewilderment as promptly as possible.

H. H. DALE

NATIONAL INSTITUTE FOR MEDICAL RESEARCH
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SCIENTIFIC BOOKS

PARASITISM AND DISEASE

Parasitism and Disease. By THEOBALD SMITH. 196 pp. Princeton: Princeton University Press. $2.00.

FORMER students of Theobald Smith and medical men in general will welcome his book on "Parasitism and Disease." This work, based on his Vanuxen lectures, but expanded and with additional chapters, is presented as his "final attempt at showing the relation between disease and parasitism in its broadest manifestations." Read critically, some of the material