terest. One of these, by E. Pfizenmayer, deals with the northern mammoth and while very interesting, contains what I believe to be two very serious errors. The first one of these relates to the shape of the tusks, which are discussed at considerable length, the author concluding that the tips pointed forwards and downwards and were used in digging. To support this contention we are given figures of several tusks and a copy of a drawing in a cave at La Mouthe.

It seems a sufficient reply to this last bit of testimony to note that there are many other figures of the mammoth in existence, including various carvings, and in none of these are the tusks depicted as shown in the cave of La Mouthe.

Tusks of the mammoth exist in Alaska in large numbers and many have been brought from there during the past few years. None of them shows the great spiral twist and final downward curvature of the tusks figured by Dr. Pfizenmayer. Tusks of the mammoth, like those of the mastodon, vary very greatly in the amount of curvature and of their spiral twist. As a general rule the curvature is at first downwards and outwards, and then upwards and inwards. The tusks figured by Dr. Pfizenmayer are very evidently those of old individuals and are abnormal in shape. The tusks of the Beresovka mammoth do not exhibit the great spiral curvature of the specimen from Cracow and there is no reason to believe that, *as a rule,* the tusks of the mammoth pointed downwards and forwards. When in exceptional cases they did, it would be quite natural to use them for digging.

The second error is in ascribing to the northern mammoth a greater size than that of existing elephants. Unless I am mistaken, no Siberian mammoth has yet been found having greater height at the shoulders than nine feet six inches, a height occasionally equalled by the Indian elephant and exceeded by the African species, which stands eleven feet high and occasionally slightly more at the shoulders. Dr. Swanton, indeed, has recently recorded a specimen of the Indian elephant having a height of eleven feet, but this seems somewhat questionable. It must not be forgotten, however, that few elephants are allowed to reach their full age and size, much less to develop tusks of the greatest possible length, and this partly accounts for the comparatively small size of the tusks of modern elephants.

There is no tusk of the northern mammoth in existence so heavy as the heaviest examples of tusks of the African elephants and there are few tusks much longer than the greatest recorded length found among this species. The tusks of the northern mammoth average somewhat longer than those of either of the existing species of elephants, but they did not reach so great a diameter as the best specimens of tusks of the African elephant which measure from nine feet to eleven feet six inches long and weigh from 125 to 239 pounds for a single tusk.

It has frequently been shown that the northern mammoth was no larger than existing elephants, as a matter of fact it did not stand so tall as the Soudan elephant, but it seems difficult to effectually dispose of the belief that it was a creature of gigantic size.

The true giants among fossil elephants are *Elephas meridionalis* of southern Europe and *E. imperator* of our western and southwestern states, which stood from twelve feet six inches to possibly thirteen feet six inches high.

F. A. LUCAS

CURRENT NOTES ON LAND FORMS

A PENEPLAIN IN THE GRAND CANYON DISTRICT

THE existence of an uplifted and dissected peneplain in the Grand Canyon district of Arizona has been recognized for some years, and its relation to the great folds and faults of the region has afforded a subject for interesting discussions. Little has been known in detail, however, regarding the peneplain remnants. Dr. H. H. Robinson, of Yale University, recently offered a contribution to this subject in an account of "The Tertiary peneplain of the Plateau district, and adjacent country, in Arizona and New Mexico" (*Amer. Journ. Science,* XXIV., 1907, 109–129). He concludes that after the occurrence of the principal displacements the greater part of the region was reduced to a peneplain "of practically no relief." The broad uplift of

this peneplain has given opportunity for the deep erosion of the Colorado canyon, and for a moderate dissection of the weaker parts of the uplifted area. Presumably before the time of uplift, wide-spead eruptions of basalt occurred in the southern part of the area; it is to the capping of lava thus supplied that remnants of the peneplain are preserved in the localities studied by the author. At Black point in the Little Colorado valley, a monoclinal fold involving compact sandstone and weak marls is bevelled across by a very perfect plain of erosion, upon which the basaltic cover rests. In Anderson mesa, southeast of Flagstaff, Arizona, a lava cap rests upon a similar smooth surface, which bevels across slightly inclined beds of resistant Upper Aubrey limestones and weak overlying shales. The lava sheet of Black mesa rests upon Upper Aubrey limestones and sandstones along the western border of the mesa, but upon the overlying red beds farther east, thus indicating a bevelling similar to that of the other examples. Other localities afford evidence of the same kind. The several peneplain remnants thus identified are believed to represent parts of a once continuous and extensive peneplain. Lava-capped baselevelled surfaces in the Mt. Taylor district of New Mexico farther east and in the Basin region of Arizona farther west, are correlated with the great peneplain of the Grand Canyon district.

The latter part of the paper is concerned with a discussion of the drainage system of the plateau district, with the conclusion against the antecedent origin of the Colorado River. There is much to be said in favor of this conclusion, but the author's arguments for it appear much less cogent than those already cited regarding the peneplain.

D. W. J.

THE ISTRIAN PENINSULA

An elaborate study of the Istrian peninsula at the head of the Adriatic by Dr. Norbert Krebs of Vienna ("Die Halbinsel Instrien: Landeskundliche Studie." Geogr. Abhandlungen herausg. von Professor Dr. A. Penck in Berlin—formerly Vienna—Band IX., heft 2, 1907) shows that it is a good-sized block broken out of a well-worn-down mountain system of close-folded Mesozoic limestones and Tertiary sandstones with northwest-southeast trend. A pretty good peneplain was formed on the limestones, while the sandstones were reduced to low rounded hills and ridges; then the Istrian block was uplifted and tilted westward, with a strong fault along the eastern (Quarnero) border; and in this position it was submaturely or maturely dissected in later Tertiary time, with abundant development of karst features on the limestone areas; recently the dissected block has been somewhat depressed, so that the sea now enters its lower valleys in river-like bays.

To European geographers, who are already familiar with these facts, Krebs' essay will be easy and profitable reading, by reason of the great body of pertinent details that it presents concerning matters of structure and form. But to more distant readers, many of whom must be unacquainted with the local names and the physiographic history of the peninsula, the essay will be difficult reading, because the explanatory descriptions of the larger features are almost lost in the wealth of details concerning the minor features. Only after reading nineteen pages, most of which are given to geological matters, does this geographical essay state the elementary and essential fact that the surface of the peninsula is not a structural ("geological") surface, but the final work of a process of abrasion (das Endergebnis eines Abrasionsvorganges); not until the twentieth page is the inner and higher part of the peninsula explicitly described as a monotonous plateau, surmounted by rounded and isolated hills and ridges; and not until the thirty-fourth page is the lower western part of the peninsula stated to be a slightly arched abrasion surface, which may be regarded as a less elevated extension of the higher eastern part.

W. M. D.

STRUCTURE, PROCESS AND STAGE

It would be an immense assistance to the distant reader—and perhaps an aid to some nearer readers as well—if substantial physio-

graphical essays were opened with a brief general statement, giving the essence of the whole story in terms of structure, process and stage of development; and if the later pages then proceeded, following the scheme and the sequence thus outlined at the beginning, to present the details. The Istrian peninsula would seem to lend itself admirably to such treatment. Its larger structures are reducible to a very simple statement, upon which all sorts of details as to pitching folds and overthrusts may be afterwards embroidered. The deformed mass without question reached well-advanced old age in the first recognizable cycle of erosion, as is clearly indicated by the even surfaces which transect the folded strata over large areas. It is equally evident that irregular movements of faulting and tilting interrupted the first cycle before the more resistant strata were completely worn down. In the new cycle thus introduced revived erosion gained a good advance, with characteristic development of karst features on the limestones, before a moderate submergence drowned the borders of the dissected block at so recent a date that the present shore line is still very young. Upon the framework of such a statement all details can be most conveniently placed in good order for easy understanding; but if no general framework is presented at the beginning, the reader must be embarrassed as he comes on page after page of unrelated details.

There is, however, a certain unevenness of treatment in Krebs' essay on the Istrian peninsula which seems to indicate that the author is perhaps not yet ready to adopt the concise scheme of "structure, process and stage," above suggested. The even uplands are repeatedly spoken of as the work of "abrasion," thus implying that the first cycle of erosion was accomplished chiefly by marine processes; yet there is no discussion of this debatable point; it appears to be accepted as a traditional truth; and this in spite of the frequent occurrence of rounded residual reliefs which surmount the uplands and which are much more suggestive of subaerial than of marine erosion in the first cycle. Furthermore, while no sufficient space is given to an adequate discussion of the origin of the chief features of the peninsula, space is allowed (p. 66) for a brief refutation of the obsolete ideas that the typical drowned valleys on the west and south (Canali di Leme and dell' Arsa) are due to (marine) abrasion or to faulting. There is no need of such a refutation; but there is much need of a critical consideration of the postulated marine planation of the district.

W. M. D.

THE TWENTY-FIRST SESSION OF THE MARINE BIOLOGICAL LABORATORY, JUNE 1 TO OCTOBER 1, 1908. PRELIMINARY ANNOUNCEMENT

ON account of considerable changes proposed for the season of 1908, the following preliminary announcement is made. Attention is directed particularly to the statements concerning the addition of the Wistar Institute of Anatomy and Biology to the list of cooperating institutions, to the change of personnel in the staff of instruction in zoology, to the reinstatement of the course in embryology and to the introduction of a new course in the general morphology of plants. The final announcement will be ready in March or April, 1908, and will be sent on request to all desiring it.

The Marine Biological Laboratory is an institution for the promotion of research in biology by the cooperative endeavors of biologists from all parts of the country. The laboratory is a national institution on an absolutely independent foundation, and it solicits the cooperation of all students of biology.

I. *Research.*—The laboratory will be open for research from June 1 to October 1, 1908. Facilities for research are offered in zoology, embryology, physiology and botany. Fifty-five private rooms are reserved for investigators, and those assigned to such rooms are supplied with reagents, glassware and service in the collection of material. The majority of these rooms are reserved for members of the staff and for subscribing institutions. The charge for the remaining rooms is $100 per season and applicants should state the time of desired occupancy and any special needs;