diversions of its waters at points now indicated by abandoned gaps in Crowley's Ridge were brought about, not by capture of the river by southward flowing streams, as has been supposed, but by overflow at a time, late in the Pleistocene epoch, when the Mississippi had aggraded its valley with silt derived from the continental ice sheet to a level about 50 feet above the present flood plain. Numerous terraces composed of glacial outwash material afford the principal evidence. The Ohio River also played a part in connection with the diversion of the Mississippi River. It flowed at that time across southern Illinois, through the valley now occupied by Cache River. By paring away the southeastern edge of Crowley's Ridge it beheaded several northwestward draining valleys and thereby created spillways at fairly low levels.

Archean formations of the Grand Canyon: IAN CAMPBELL and JOHN H. MAXSON (introduced by John C. Merriam). The oldest rocks exposed in the Inner Gorge of the Grand Canyon comprise a thick and varied metamorphic series (Vishnu schist). These rocks are invaded by granitic intrusives (phantom granite). So complex and so intimate are the relations between the metamorphic series and the igneous rocks that in many instances the resulting formation can only be described as a migmatite. The original sedimentary nature of the schists is shown by the occurrence of quartzite, calcareous members, iron formations and sandstone lentile in slightly altered schists. It is also indicated by retention of such characteristic sedimentary structure, as stratification and cross-bedding. Following the regional metamorphism of the sediments, the phantom granite was emplaced by processes of assimilation and granitization. Different facies of the granite and its associated pegmatites resulted from differing character and intensity of deuteric alteration.

Some features of flowers and fruit of a new Cordaites: DAVID WHITE. Fossil plant fragments of Pottsville age discovered in southeastern Illinois by the State Geological Survey disclose leaves, flowers and seeds of a single species of *Cordaites*. Male and female flowers, *Cordaianthus*, are small, bud-shaped and nearly alike. The young seed in the midst of the flower is narrow, soft and is deficient in wing. Stamens, protected like the ovules, by bracts when young, are numerous in the upper part of male flowers, protruding beyond the bracts and arching bouquet-like when mature, with oblong pollen sacs strewn along the upper ends. The base of the stamen seems exactly axillary. The small seeds (*Cardiocarpon*) are longitudinally oval-rhomboidal, with spinose glandular sarcotest, widely dilated as wing and narrow cordate-oval acute "hard" coat. No clearly defined pollen character is noted in the material, consisting of impressions and carbonized residues only. The micropylar canal is distinct, even in immature seeds. In some large seeds, structures, apparently tubular and seemingly continuous with the micropyle, extend, while dilating somewhat, far down into the interior of the endosperm. These structures, which the author is unable to regard as fungal, are interpreted as indicating a stage of development at which the archegonial wall and part of the endospermic center had broken down. No embryo has definitely been recognized in any Paleozoic seed.

Primitive cephalopods: AUG. F. FOERSTE (introduced by David White).

Metaxenia and neophosis, two forms of morphogenetic influence exerted by the generation-complex of the embryo sac apparatus in higher plants: WALTER T. SWINGLE (introduced by R. A. Harper). [To be printed in SCIENCE.]

The effect of alternation from spores to vegetative cells on the growth and activity of certain anaerobic bacteria: E. B. FRED and E. MCCOY. In a study of the factors that govern the growth and activity of bacteria, little consideration has been given to the effect of periodic changes from the spore to vegetative stage. Occasional statements have been made that the spore stage represents a regenerative phase of the cycle and that vegetative cells immediately following germination are of greater vigor and activity. The anaerobic bacteria represented by *Cl. acetobutylicum* and *B. amylobacter* (Bredemann) were chosen for the study of the effect of serial transfer involving periodic change from spores to vegetative cells. At regular intervals of four to five days the cultures were subjected to heat treatment of 1.5 minutes at 90° C. and were then used for subcultures in the usual way. All tests were made in 2 per cent. corn mash, a medium known to be suitable for the growth and sporulation of these organisms. At the present time the experiment has been carried to the one hundred and tenth transfer. Results of the comparison of the first and the one hundredth transfer are now available. The fermentation products of these culture generations have been determined, both as to quantity and ratio of products, but no significant difference has appeared. Vigor of growth has been maintained and, if anything, has become more regular with successive transfers. Comparisons of spore formation of the first and the one-hundredth culture generations seem to indicate an increase in the number of spores produced. This increase may account for the consistent activity which has been obtained. During this long period of time no culture has dropped out of this series because of failure to grow. This is an unusual record for an experiment with an obligate anaerobe.

(To be continued)

BOOKS RECEIVED

ADKINS, HOMER and S. M. MCELVAIN. *An Introduction to the Practice of Organic Chemistry.* Pp. ix + 224. Illustrated. McGraw-Hill. $2.25.

BEEBE, WILLIAM and JOHN TEE-VAN. *Field Book of the Shore Fishes of Bermuda.* Pp. xiv + 337. 300 illustrations. Putnam's. $3.50.

COLBERT, J. C. *Laboratory Technique of Organic Chemistry.* Pp. ix + 341. Illustrated. Century. $2.50.

EHRET, WILLIAM F. *Laboratory Studies in General Chemistry.* Pp. viii + 312. 21 figures. Century. $1.50.

NAYLOR, NELLIE M. and AMY LE VESCONTE. *Introductory Chemistry with Household Applications.* Pp. x + 367. 41 figures. Century. $2.60.

PARSHLEY, H. M. *The Science of Human Reproduction.* Pp. xv + 319. 66 figures. Norton. $3.50.