

moid curve, the halves of which are from one-half to three-fourths of a mile in diameter. The rock neck of land between the two ends of the closer curve is less than a hundred yards in width and rises about seventy feet above the stream.

Along Platte, Little Platte, Grant and Pecatonica rivers, larger streams than Fever river, the meanders are slightly larger on the average than along the smaller streams. Both open and close curves occur. Rock salients between 100 and 200 feet high project into the bow of each meander. Almost as complete a series of meander types can be found among the curves of the rock valleys of these rivers as along the broad flood-plains of other streams. Indeed, the small meanders of these rivers in their present flood-plains can readily be duplicated by the wider curves of the rock valley. There can be no reasonable doubt but that the meanders of these valleys are an inheritance from meanders developed on broad flood-plains in a previous cycle of erosion. So far as could be made out, these meanders are not due to difference in hardness or structure of the rocks of the region. The limestone does not present sufficiently marked differences of structure to account for these curves upon a theory of readjustment of courses due to the contrasts between hard and soft beds. Whatever differences exist are not distinctly such as to modify the courses of rivers, particularly in a manner such as to resemble so closely flood-plain meanders. Nor does it seem to be admissible to suppose that these curves are the perpetuation of meandering courses taken when the land first emerged from the sea bottom. Such a supposition presupposes too constant and stable a relationship, through an enormous lapse of time between all the forces which control erosion and determine the position of streams.

The sinuosities of these meanders may have been somewhat changed since the ele-

vation of the peneplain. In places the increased velocity may have straightened the curves to some extent. In other instances the meanders have been somewhat increased. Such seems to have been the case near Benton, where the stream is now undercutting the narrow strip of land separating two parts of the curve. If this process continues, a cut-off will result.

In comparison with the Osage river, these streams are small and their meanders insignificant. But apart from size, the analogy between them is complete. They must be added to the growing list of streams known to be persisting in habits acquired under conditions which have long since disappeared.

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MISSOURI BOTANICAL GARDEN.

THE attention of botanists is called to the facilities afforded for research at the Missouri Botanical Garden. In establishing and endowing the Garden, its founder, Henry Shaw, desired not only to afford the general public pleasure, and information concerning decorative plants and their best use, and to provide for beginners the means of obtaining good training in botany and horticulture, but also to provide facilities for advanced research in botany and cognate sciences. For this purpose, additions are being made constantly to the number of species cultivated in the grounds and plant houses, and to the library and herbarium, and, as rapidly as it can be utilized, it is proposed to secure apparatus for work in vegetable physiology, etc., the policy being to secure a good general equipment in all lines of pure and applied botany, and to make this equipment as complete as possible for any special subject on which original work is undertaken by competent students.

A very large number of species, both

native and exotic, and of horticulturists' varieties, are cultivated in the Garden and Arboretum and the adjoining park, and the native flora easily accessible from St. Louis is large and varied. The herbarium, which includes nearly 250,000 specimens, is fairly representative of the vegetable life of Europe and the United States, and also contains a great many specimens from less accessible regions. It is especially rich in material illustrative of *Cuscuta*, *Quercus*, *Coniferae*, *Vitis*, *Juncus*, *Agave*, *Yucca*, *Sagittaria*, *Epilobium*, *Rumex*, *Rhamnaceæ* and other groups monographed by the late Dr. Engelmann or by attachés of the Garden. The herbarium is supplemented by a large collection of woods, including veneer transparencies and slides for the microscope. The library, containing about 8,000 volumes and 10,000 pamphlets, includes most of the standard periodicals and proceedings of learned bodies, a good collection of morphological and physiological works, nearly 500 carefully selected botanical volumes published before the period of Linnæus, an unusually large number of monographs of groups of cryptogams and flowering plants, and the entire manuscript notes and sketches representing the painstaking work of Engelmann.

The great variety of living plants represented in the Garden, and the large herbarium, including the collections of Bernhardt and Engelmann, render the Garden facilities exceptionally good for research in systematic botany, in which direction the library also is especially strong. The living collections and library likewise afford unusual opportunity for morphological, anatomical and physiological studies, while the plant house facilities for experimental work are steadily increasing. The E. Lewis Sturtevant Prelinnean library, in connection with the opportunity afforded for the cultivation of vegetables and other useful plants, is favorable also for the study of cultivated

plants and the modifications they have undergone.

These facilities are freely placed at the disposal of professors of botany and other persons competent to carry on research work of value in botany or horticulture, subject only to such simple restrictions as are necessary to protect the property of the Garden from injury or loss. Persons who wish to make use of them are invited to correspond with the undersigned, outlining with as much detail as possible the work they desire to do at the Garden, and giving timely notice so that provision may be made for the study of special subjects. Those who have not published the results of original work are requested to state their preparation for the investigation they propose to undertake.

Under the rules of Washington University, persons entitled to candidacy in that institution for the Master's or Doctor's degree may elect botanical research work as a principal study for such degrees, if they can devote the requisite time to resident study.

WILLIAM TRELEASE,

ST. LOUIS, MO.

Director.

#### SCIENTIFIC LITERATURE.

##### THE GEOLOGY OF THE SIERRA NEVADA.

*Geologic Atlas of the United States.* U. S. Geological Survey; J. W. POWELL, Director. *Sacramento Folio*, Geology by W. LINDGREN. *Placerville Folio*, Geology by W. LINDGREN and H. W. TURNER. *Jackson Folio*, Geology by H. W. TURNER. Washington, D. C. 1894.

These three sheets are the first installment of a series covering the gold belt of California which has been in course of preparation for several years by the officers of the Geological Survey. It is needless to say that they form a very important and welcome contribution to our knowledge of the geology of California. Since the collapse of the old State Survey under Whitney,