

# Leaves Older Than Grand Canyon Found

Paleontology

## Fossil Ferns Tell of Weather in Permian Age

Dr. David White and Dr. John C. Merriam, at a quarry in the Grand Canyon which yielded numbers of leaf-prints in mud that had hardened into stone. A specimen of *Supaia* is leaning against Dr. White's foot.



**F**OSSIL remains of plants found in the walls of the Grand Canyon show that many millions of years ago stunted vegetation of very singular aspect grew in a great red sandy floodplain under a semi-arid climate in northern Arizona. This great red land has been found by Dr. David White of the U. S. Geological Survey, who has been studying the deposits and their remains of extinct plants for the Carnegie Institution, to have continued a long time before the region sank beneath the sea and was covered with the seashell-bearing limestones hundreds of feet in thickness which form the upper part of the walls of the Canyon. These limestones pave the high plateau through which the Canyon was and is still being cut, and they underlie the foundations of the hotels and camps on both sides of the great abyss.

Most of the newly discovered relics of this ancient growth represent seed-ferns. These were fernlike plants that bore real seeds instead of spores. The rocks that contain them, known geologically as the Hermit shale, were laid down as fine-grained river silts long before the Grand Canyon was even a crease on the surface of the desert plateau. They date from the Permian, the period immediately following the Coal Age.

Some of the plants are found in beds of the same geological epoch in eastern North America and in Europe as far east as the Ural Mountains. One unique group of forms is most closely connected with a flora that covered the region of tremendous glaciers in ancient times which spread over portions of India, Australia, South Africa and of South America. Remnants of this flora should be among the specimens of fossil plants which Professor Gould of the Byrd Antarctic Expedition may have found in the Queen Maud Range which he explored in Antarctica.

The thick layers of ripple-marked silt indicate that the rivers of the region at that time carried considerable volumes of water, at least part of the time. Some of them are marked with deep "suncracks" telling of the exposure of the mud to intense heat and rapid evaporation. The molds of salt crystals testify to seasons of intense drought, while, in addition to the impressions of raindrops, the deep pits and pockmarks on the surface of some of the shales bear record of hailstorms. All this argues a fairly dry though not necessarily arid region, visited by occasional though short-lived periods of rainfall, followed by "fair and warmer." The droughtiness of the ancient climate is also argued from the character of the leaves. Though most of these are fernlike, they are severely simple in outline, lacking the fine feathery subdivisions that mark such leaves when they grow in a moist climate. Many of them are fuzzy and their stems are covered with scales or fine spines, suggestive of desert growth. Some of them have thickened blades, and at least one species appears to have had the habit of curling into quills when it dried. All these characters earmark the plants of dry-air habitats.

Besides the fernlike plants, there are several curious forms of branches with twigs of stunted coniferous

trees. All the different kinds found in the deposits became extinct many millions of years ago. Some of the genera and species have never been found in any other region. With the remains of plants are associated wings of insects, trails of worms, and large numbers of remarkably distinct footprints of different primitive amphibia, suggestive of the living "mud-puppy," and of reptiles. Some of the footprints are of rather large size; others are very small and delicate.

In naming his new species and genera, Dr. White has given recognition to local place-names and to persons associated with the Grand Canyon. The principal new genus is a seed-fern which he has called *Supaia*, from Supai, an old Indian name which has been applied to one of the rock formations in the Canyon wall. One species of this new genus, shown on the cover of this issue, has been named *Supaia merriami* in honor of Dr. John C. Merriam, president of the Carnegie Institution of Washington, and another has been called *Supaia sturdevantii*, in memory of a former park naturalist who was drowned in the river while on an exploring trip through the Canyon.

Two other new genera have been named *Yakia*, from an Indian place-name, and *Eltovaria*, in memory of a Spanish explorer of the Southwest.

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