

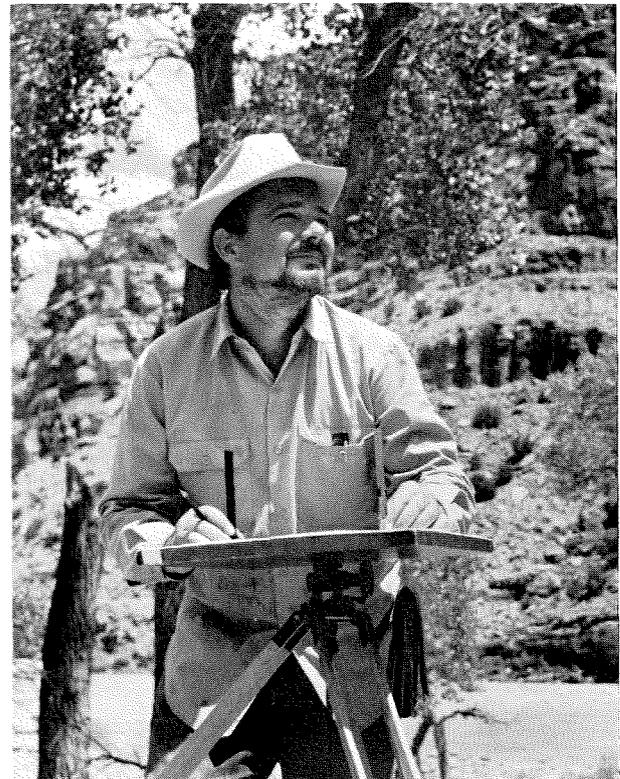
# RE-EXPLORING THE COLORADO

A group of geologists match  
footprints with the men who made  
the first trip down the river  
a century ago.

*In Utah's Desolation Canyon, Eugene Shoemaker, chairman of Caltech's division of geological sciences, uses topographic maps to match a camera site with that used by photographers on the Powell expedition of 1871. In all, about 150 of the original sites were rephotographed in 1968.*

In 1869 the canyons of the Green and Colorado Rivers were the last major sections of the United States still untraveled and unknown. In many places the raging water flowed between canyon walls as high as a mile on each side, and it was questionable whether anyone could safely travel the length of the rivers. But in that year geologist John Wesley Powell did just that, and revealed this magnificent canyon country to the world. The record of the 1869 expedition and another in 1871 and 1872 includes his remarkable journals (*Exploration of the Colorado River of the West and its Tributaries*) and several hundred photographs.

What changes have those powerful rivers made along their banks in 100 years? To find out, Eugene Shoemaker, chairman of Caltech's division of geological sciences and long-time student of the canyon country, took three months in the summer of 1968 to retrace Powell's 900-mile route. The purposes of Powell's expeditions were to map and photograph. Shoemaker's objectives were to identify



the landscape in the Powell pictures, to locate the sites where Powell's photographers took their pictures, and to determine how, and how fast, the canyons have eroded.

The exploring, mapping, and photographing of the Green and Colorado were done by Powell and his group in two trips. They traveled in wooden boats with enclosed compartments designed to withstand the buffeting of rocks in the many rapids. The boats were lowered into the river by ropes from the Union Pacific railroad bridge at Green River Station, Wyoming.

The first expedition took three months, down the Green to its confluence with the Colorado, and from there on down the Colorado through Cataract Canyon, through the canyons of what is now 165-mile-long Lake Powell, and into the Grand Canyon. On the 1871 expedition the canyons were mapped and photographed, and their geology studied over a period of a year and a half.

Early in July Shoemaker set out with geologist-photographer Hal Stephens in neoprene rubber boats from

“August 15 [near Sockdologer Rapid]—  
It rains! Rapidly little rills are formed above,  
and these soon grow into brooks, and  
the brooks grow into creeks, and tumble over  
the walls in innumerable cascades, adding  
their wild music to the roar of the river.  
When the rain ceases, the rills, brooks, and  
creeks run dry. The waters that fall, during  
a rain, on these steep rocks, are gathered at  
once into the river; they could scarcely be  
poured in more suddenly, if some vast spout  
ran from the clouds to the stream itself.”

—J. W. Powell, 1869

Powell's starting point—Green River, Wyoming. As they moved downstream Shoemaker located the camera sites using the Powell photographs as guides. In his pictures photographer Stephens of the U.S. Geological Survey framed the same topographical features that had appeared in the early pictures.

After comparing the old photographs with those taken by Stephens, Shoemaker concludes that the canyons were carved largely by catastrophes such as cloudbursts and floods rather than by the gradual erosion of rain and river. In most places there is no apparent change in topography. Often, even sandbars along the river banks are unchanged from a century ago. Where topographical changes have occurred, however, they are dramatic.



Sections of cliff have collapsed or sometimes sections of the riverbank have been washed away or replaced with new deposits of boulders.

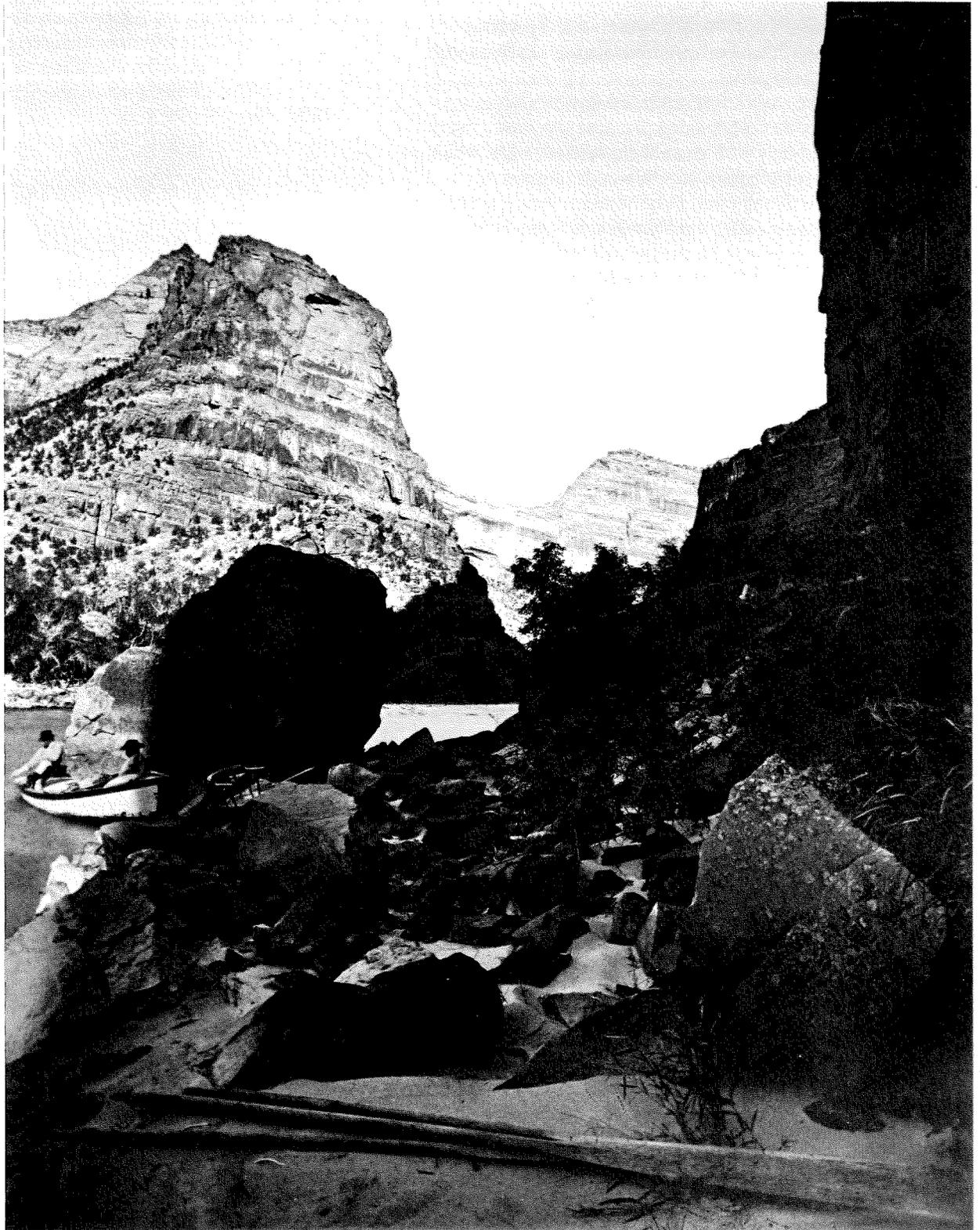
Locating the exact camera sites of Powell's photographers was challenging, because the photographs were identified only with general captions, some of which were wrong—placing the sites hundreds of miles off or even on the wrong river. (The captions were written more than 25 years after the photographs were taken.)

Shoemaker is now preparing an extensively annotated album of the Powell Expedition photographs to be published as a Professional Paper of the U.S. Geological Survey. Shoemaker's trip was supported by the Geological Survey, which had Powell as its second director.

*The striking similarity of these two identically framed photographs (old one on the left) in the Grand Canyon at the head of Sockdolager Rapid shows how little change the river has wrought in many locations. Powell's photographers spent at least an hour taking a photograph. For each one they had to coat a glass plate with emulsion, then develop it right after making the exposure. Six pictures a day were considered very productive.*



*The topography here on the Yampa River in Colorado's Canyon of Lodore was dramatically changed by a flash flood in 1965 (which happened to be witnessed by Caltech graduate student Bruce Julian, who was camped there). As a result, all the foreground rocks shown in the old photograph (left) are gone, including the huge one behind Powell's chair. The two photographs are not framed identically because the original camera site is now about 10 feet out in the river.*



“June 17.—We run down to the mouth of Yampa River. This has been a chapter of disasters and toils, notwithstanding which the canon of Ladore was not devoid of scenic interest, even beyond the power of pen to tell. The roar of its waters was heard unceasingly from the hour we entered it until we landed here. No quiet in all that time. But its walls and cliffs, its peaks and crags, its amphitheatres and alcoves, tell a story of beauty and grandeur that I hear yet—and shall hear.”

—J. W. Powell, 1869

