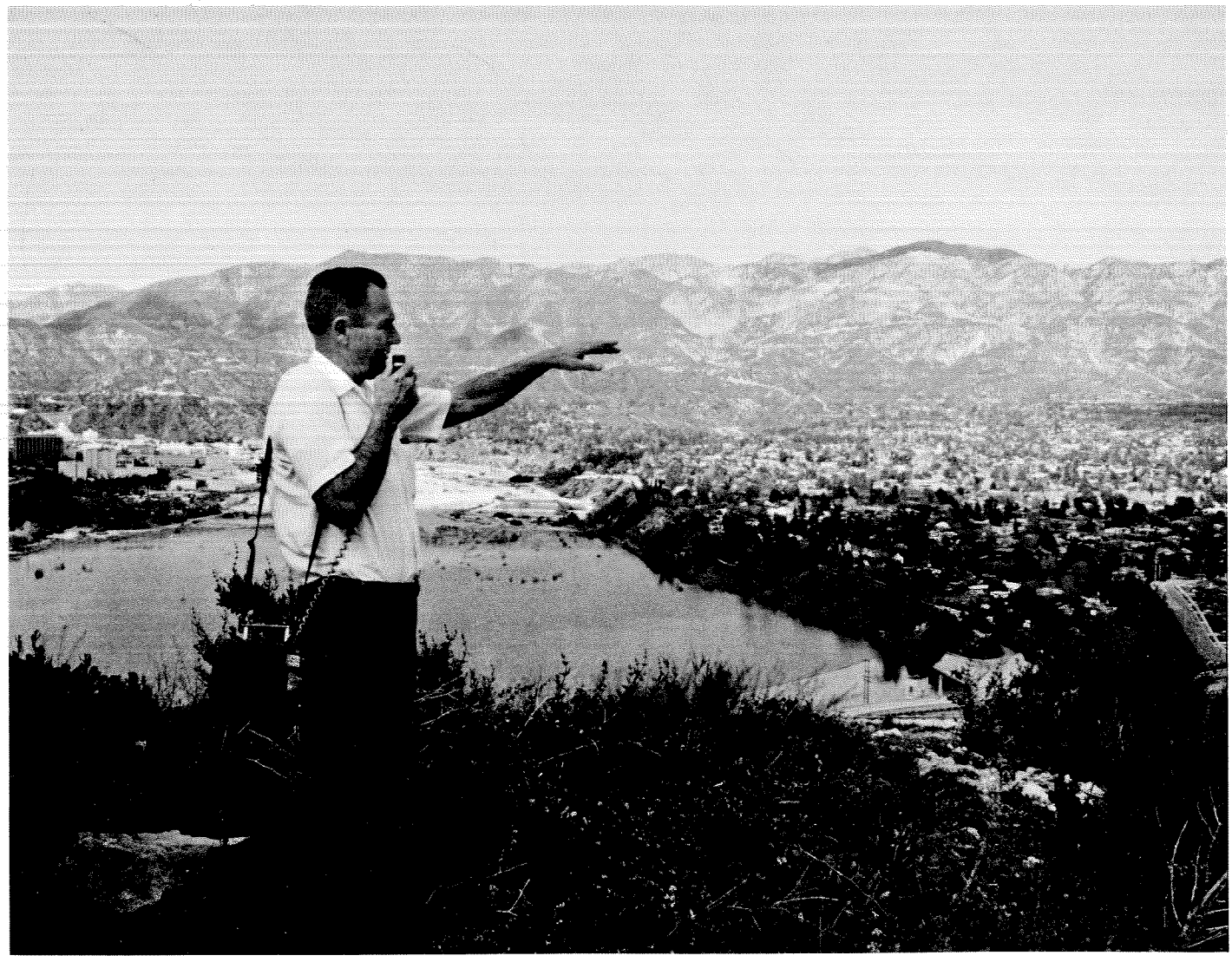


Geologist Robert Sharp and a sunny hill above Devils Gate Dam are the right combination for learning about Pasadena's geological setting.

Do You Know Where You Are?

If you subscribe to the belief that even your own backyard can be full of fascination when you know a little about its basic geology, one man to help you learn about southern California is Robert Sharp, professor of geology. Sharp has been hiking over, observing and interpreting, and writing and talking about it for years. So, when we presented him with a panorama of Pasadena (which you'll find on the next four pages), he produced this instantaneous description.

The eight photos that make up the panorama were assembled from a series taken recently by campus photographer Floyd Clark from a spot in the Flintridge Hills above Devils Gate Dam. Beginning by pointing his camera almost due north, Clark swung it clockwise in stages for approximately 160 degrees until the last photo is south-southeast.

Gould Mesa

Jet Propulsion Laboratory

Devils Gate Reservoir

Arroyo Seco Canyon

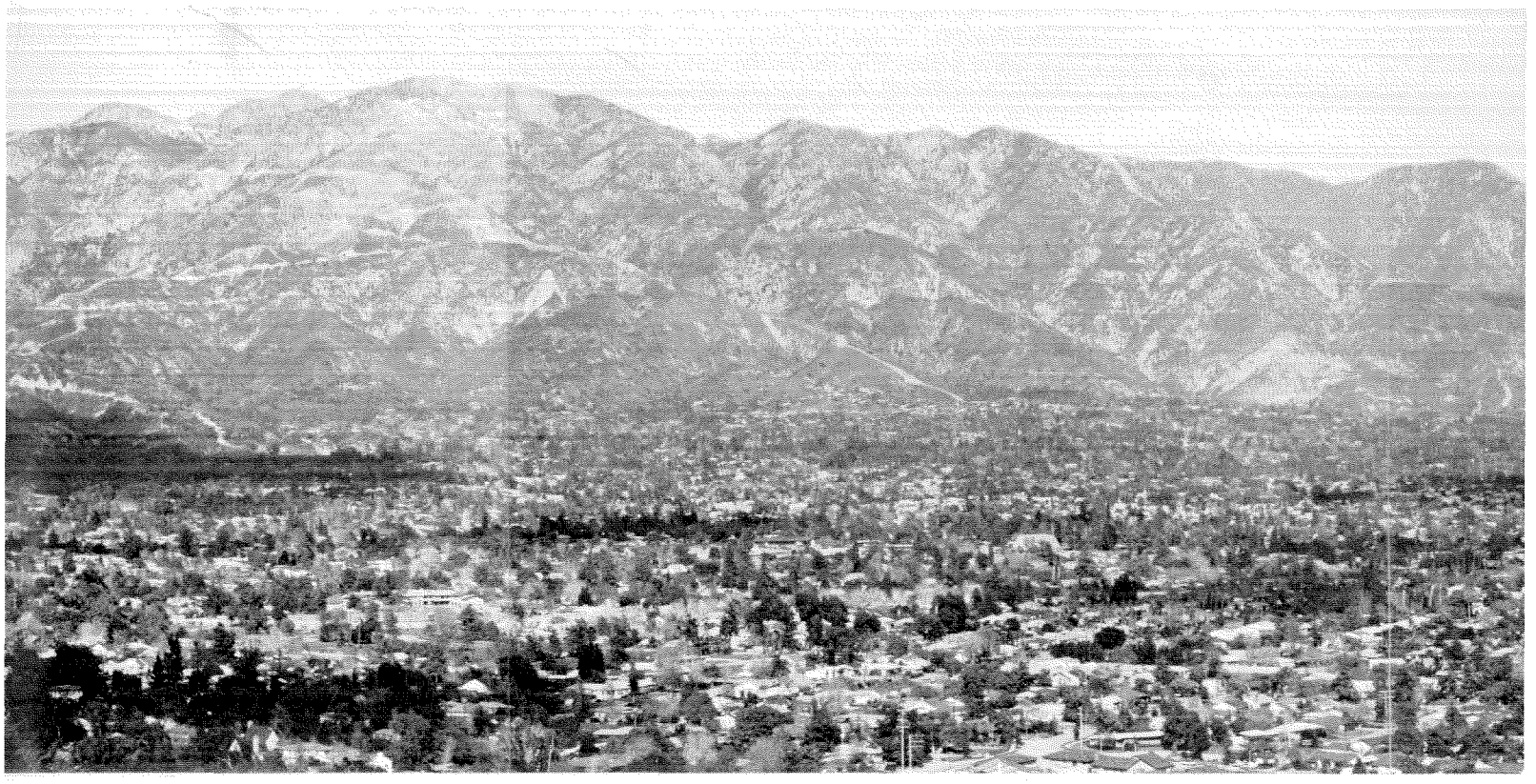
Millard Canyon

The first thing to remember is that the geology of any small area is something like a single piece of a jigsaw puzzle—hard to understand if you don't have the whole picture in mind. But a few key pieces of information can help to clarify Pasadena's place in the larger geologic scheme. Speaking in global terms, Pasadena is on the Pacific Plate, as is all of California west of the San Andreas fault, which both divides it from and sutures it to the North American Plate.

Though it is at the north edge of the Los Angeles Basin, geologically Pasadena is not a part of the basin. The basin is a part of the Peninsular Ranges that rise in Baja California and run in a generally northwesterly direction along the coastal area. Pasadena belongs to the Transverse Ranges, a 300-mile-long, east-west topographical province that lies crosswise to the general northwest grain of southern California.

Another important aspect of the Pasadena area is its location in a region that is crisscrossed with a network of faults. These many fault lines not only define distinct large and small areas, but they are both sources and expressions of southern California's restless, complex, and youthful geology. Pasadena sits in the Raymond Basin, bounded on the south by the Raymond fault and on the north by the Foothill fault. At least two or three smaller faults run through the city proper.

The backdrop for the Pasadena scene is the magnificent fault scarp of the Sierra Madres, the front range of the San Gabriel Mountains. Rising about 3,000 to 3,500 feet above the San Gabriel Valley, the scarp is the result of repeated displacements along the Foothill fault. The motion has thrust the ancient crystalline rocks, of which the mountains are made, up and over the rounded boulders, gravel, and sand deposited on the valley floor by mountain streams.



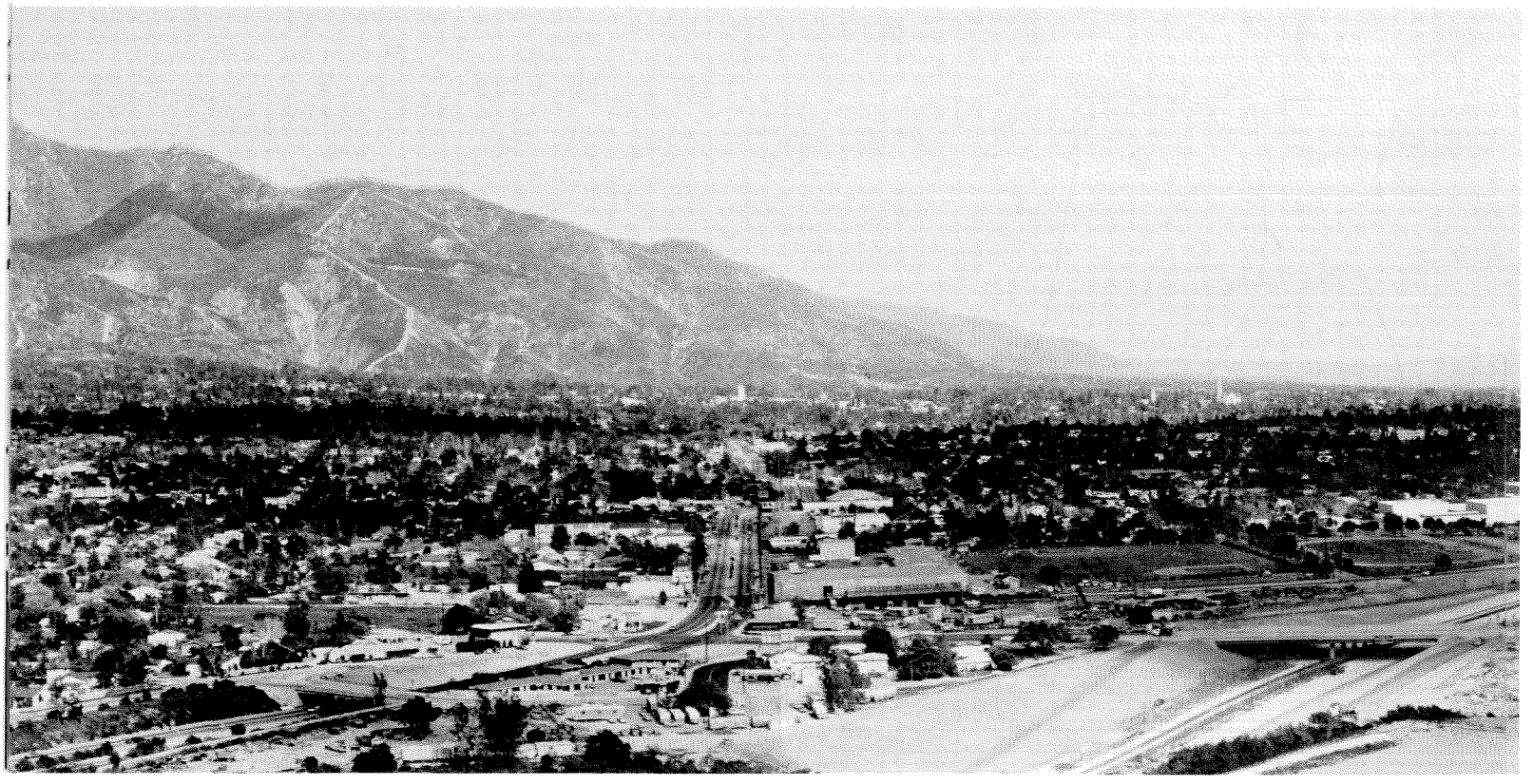
Those streams pouring out of mountain canyons have also built the alluvial surface on which Pasadena sits. At first the streams simply deposited their debris as "fans" at the canyon mouths. But the continuation of this process over at least 100,000 years (and it is still going on) has thickened, widened, and extended the fans until they now form a continuous gently sloping "apron" about 1,000 feet thick and four to five miles broad.

Three kinds of rocks lie beneath and around Pasadena. At the lowest level is the crystalline basement, which is made up of igneous and metamorphic rock 80 million to 1,800 million years old. The road cuts shown at the extreme right on page 27 expose some of the crystalline basement rocks, here deeply decomposed by weathering. Pasadena's Washington Junior High School on North Raymond Avenue is built on a large protruding island of crystalline rock known as Monk's Hill. Though darkened by cloud shadows, it can be seen on page 27.

Covering the crystalline basement is a thick layer of sedimentary rock, largely composed of shales, sandstones, and conglomerates and known locally as the Topanga Formation, about 15 million years old. Rocks of this formation are exposed here and there along the west side of the Arroyo Seco south of Colorado Boulevard, and the local landmark "Eagle Rock" is made up of a mass of this rock formation.

The third and much the youngest of the local rock formations is the 1,000-foot-thick blanket of alluvial deposits spreading out across the valley from the base of the mountains.

continued on page 26



Ages ago many of the streams that ran out of mountain canyons simply spread out and disappeared on the fan surface—and most of these streams still do just that though they have flowed farther and farther out as the slope of the alluvial deposits has become gradually steeper. The unique exception is the Arroyo Seco, which flows in an entrenched course all the way across the alluvial fan. Beginning just above the Jet Propulsion Laboratory, shown on page 24, the Arroyo Seco runs southward, sculpturing a canyon, which in plan view is somewhat like a series of free-form hourglasses along the west side of Pasadena; it then turns more westerly and provides the present route of the Pasadena Freeway to Los Angeles.

At one time the Arroyo Seco, like the streams from all the other canyons in the Pasadena area, wound its way across the surface of the alluvial apron. It eventually ran south-southeastward (perhaps by way of the Alhambra Wash) into the Rio Hondo, as the other drainage lines still do, through the Whittier Narrows and thence southwestward into the Los Angeles River. Then some kind of historical accident changed its course and its character. What probably happened is that an upstream tributary of the Los Angeles River working headward from Elysian Park found its way to the Arroyo Seco and captured the stream, diverting it into a shorter and more direct course to the Los Angeles River. This shorter route made it possible for the Arroyo Seco to lower its stream bed, thus entrenching the Pasadena alluvial apron.

Washington Junior High (Monk's Hill)

Downtown Pasadena

John Muir High School

Foothill Freeway

Road Cuts on Devon Road

As the waters of the Arroyo Seco flowed along cutting through the alluvial deposits, the ease of the lateral erosion created the wide areas that we know in today's Arroyo Seco—Oak Grove Park, Brookside Park, and the Rose Bowl area, for example. But every now and then in its downcutting, the stream met buried spurs of hard crystalline rock jutting eastward from the San Rafael Hills, making erosion a much harder task and restricting lateral cutting. The results are the hourglass waistlines of the waterway, which today are spanned by bridges.

As important in Pasadena's geology as the scarp of the Sierra Madres to the north or the Arroyo Seco to the west is the Raymond fault to the south. The Huntington Library and Huntington Hotel perch on the brink of the scarp that marks the trace of this fault through the Pasadena-San Marino area, and Lacey Park is at its base.

What is really important overall to remember about Pasadena's geological backyard, Sharp says, is that it is young, varied, and active—characteristics that are typical of our way of life. "We live," he says in his book Geology Field Guide to Southern California, *"in a geologically dynamic area, and it shows. In subtle psychological ways our youthful geology may be partly responsible for the high basal metabolism and mobility of our west-coast culture."* □