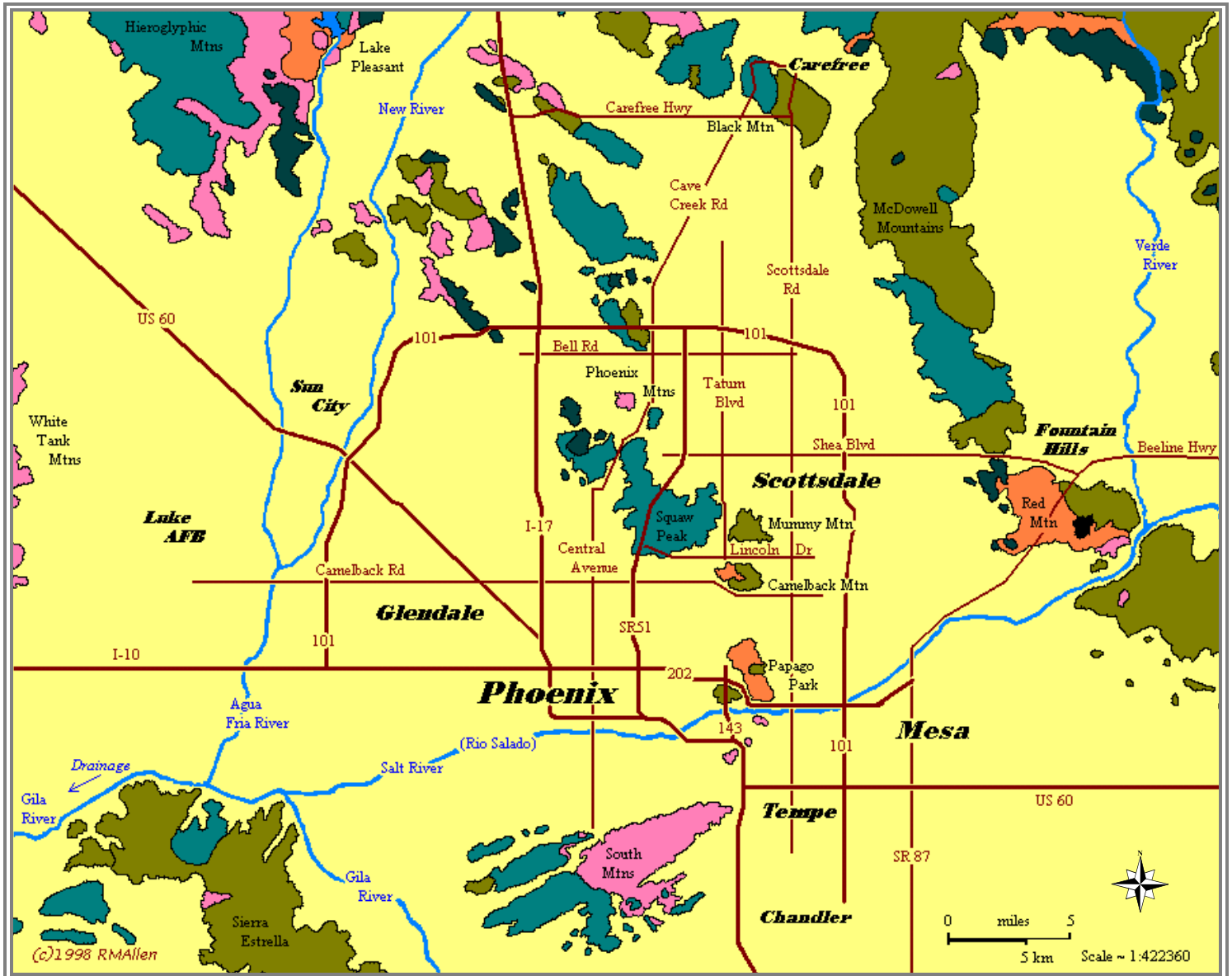


# The Rocks of the Valley of the Sun



- Surface gravel, sand, silt, clay layers, some very soft rock. Mostly less than several million years old. (Quaternary & late Tertiary deposits)
- Young **lava flows** (easily seen from the road as black rock and rubble). 8 million to 16 million years old. (Quaternary & late Tertiary basalt)
- Young igneous rocks: flows, volcanic ash, & intrusive rock masses. Mostly between 15 - 40 million years old. (Tertiary & some late Cretaceous formations)
- Young sedimentary rocks: sandstone, siltstone, conglomerate. Between 15 million - 40 million years old. (Tertiary sedimentary deposits)
- Very ancient igneous rocks: intrusive molten rock formations. **Approximately 1.4 - 1.7 billion years old!** (Precambrian igneous units)
- Very ancient metamorphosed rocks: schist, gneiss, other deformed sedimentary rocks. **Approximately 1.7 - 1.8 billion years old!** (Precambrian metamorphic units)

- Rivers & dry washes
- Freeways & significant roads

**see next page for GeoHistory**

# The ruins are all around you ...

Imagine that while out exploring the desert one day, you come across the ruins of an ancient city. You walk around, observing carefully, and do a little digging. There are blocks of old building stone here, an old foundation there, a lot of rubble. Slowly it becomes apparent to you that your discovery is not just one old city, but a whole series of cities, one built on top of another. Not only that, the building blocks of the first city you found turn out to have been expropriated from the ruins preceding it. Its buildings and foundations were made of pieces of the structures that existed before them! And besides that, you find that whole millenniums passed quietly between – periods when someone else like yourself might have wandered into the desolate site, paused, and reflected on whatever catastrophes befell each civilization.

Such is the way geologists have come to understand our valley, and indeed, the rest of the world's rocks.

**If you have trouble conceiving of the following spans of “deep time”, you are not alone.**

Many of the rocks surrounding the Valley of the Sun are very, very old. They date from nearly 2 billion years ago, from what geologists call the Precambrian Era. (If the history of the earth, some 4½ billion years old is compared to our calendar year, these rocks formed in late July!) Prior to that, our planet was a fiery, violent, almost lifeless ball of rock, finally having cooled enough to form thin crustal layers. These rocks developed from a great basin of sediment – there was liquid water by then – and life was just getting started. Small, simple organisms lived and died in hostile oceans.

At times, until around 1.4 billion years ago, molten rock from deeper in the earth intruded into these formations and then cooled. Both rock types created mountains and valleys, all part of an ancient continent. Among other places, its remains are to be seen at Squaw Peak, Black Mountain, and the majority of the rock forming Camelback Mountain.

A thickness of over eight miles of rock then eroded away to flatness! Oceans came and went across its remnants, and subsequent highlands did not rise again until dinosaurs roamed a different landscape, 1200 million years later and on through the Triassic, the Jurassic, and the Cretaceous Periods. (It is now mid-December on our calendar, plants and animals have evolved and have moved onto the land. The land has begun to break up into the continental shapes we see today.)

The Rocky Mountains began their birth far to the northeast about 75 million years ago, and the future Arizona in turn experienced the forces of strong geological unrest for the next 25 million years! Twenty million years of quiet times then passed, before more mountain masses began their violent growth.

In places they became so steep that mud and rock and even catastrophic landslides rushed from their slopes. The evidence of these is the fragment-laden reddish rocks of Papago Park, Red Mountain, and the west end of Camelback Mountain. The original mountains themselves are mostly gone.

Great volcanic calderas soon exploded from the crust of the earth. Their thick, layered ash deposits form the famed Superstition Mountains, which pierce the skyline east of Phoenix.

For reasons not yet well understood, large domes of young molten rock in turn pushed upwards through the surface rocks, throughout the new continent from northern Mexico to southern Canada.

A number of these domes are prominent in Arizona. One of the classic structures, studied by geologists from around the world, is South Mountain at the end of Central Avenue! Geologists call them “metamorphic core” complexes, and what caused them is still a mystery. (It is now December 27 on our calendar.)

The crust of the earth around us began to rip apart in a roughly east-west direction about 15 million years ago. In this torn fabric, from Montana to Mexico, blocks of crustal rock started to settle downward and form vast valleys – the Valley of the Sun is one. Among the mountains left to stand between them are what we see today as the Phoenix Mountains and the Sierra Estrella. Geologists call this immense zone the Basin and Range province.

In Arizona, the edge of the great tear is the Mogollon Rim, north and east of Phoenix. Beyond it lays the still relatively undisturbed Colorado Plateau. Also, during this time, disturbances let loose the relatively recent dark lava flows we see north of Phoenix, along the Black Canyon Freeway (I-17). Basin and Range faulting continues today, though its effects are diminished now in the Phoenix area, making for low earthquake potential. Its activity is much stronger, however, to our north in Nevada and Utah.

Finally, the valleys began to fill with layer upon layer of sediment, giving them the flat nature we see today. (It is now about 9 PM on December 31, and humans have yet to enter the picture!) In places, near Luke Air Force Base, for example, these deposits total about 2 miles in depth. Phoenix, Scottsdale, Mesa, and most of the other cities of the Valley are sitting on thousands of feet of fill.

Think of digging straight down for a mile or two, through an ocean of sand and gravel, before you hit bedrock!

**The mountains we see now will erode away. Their substance will be added to the valley fill beneath us over future millions of years.**

**That ground will in turn become rock, and become new building blocks for civilizations and landscapes yet to come.**

----- Richard Allen

**Note: colors are coded to map on previous page**

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