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Road log for Rincon Mountains field trip

by

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Handout for Arizona Geological Society

1971

The plan: The Rincon Mountains field trip is planned to take place on 2 days, probably the second and third Sundays of November 1971. Also, a geologic talk on the Rincons is scheduled to be held at the usual meeting place on the intervening Tuesday.

Field trip vehicle needs: We will travel by car caravan, which should be kept as short as possible. On the first day of the trip extra cars can be left at our meeting place. Small field vehicles are most suitable, but all cars can make it except for the last mile. On the second day of the trip all cars are usable, except for short detours for which any field car will do.

Other needs: Bring lunches and water, hiking boots, copies of the Happy Valley quad (first day) and Rincon Valley and Bellota Ranch quads (second day). Hunting season may be on; although we will be in open country, take your usual precautions.

Meeting places: We will meet in the field at conspicuous locations, rather than in Tucson. Please make arrangements for sharing rides, and allow adequate time to drive to meeting places. On the first day we will meet at the Mescal-J-6 Ranch Road interchange on Interstate Highway 10 (about 8 miles west of Benson). Allow about 1 hour driving time beyond the Tucson City limits. See Stop 1 for further details. On the second day we will meet at the parking lot of Colossal Cave. Allow about 40 minutes driving time from Tucson. See Stop 7.

Meeting time: Let's meet at 8:30 a.m. on both days.

Note: All road log mileages are scaled from the topo sheets. I will try to provide better ones later, or you may add them yourselves as we go along.

The road log is designed to provide some flexibility. Depending on the size of the group and their particular interest, we can either see additional instructive areas or, with some additional walking, we can see more ideal exposures.

First day

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- 0 STOP 1 (Meeting place, first day) Interstate Highway 10 interchange at the Mescal-J-6 Ranch Road, about 8 miles west of Benson. Meet immediately north of overpass. Unneeded cars may be left here.

Review of the major topographic and geologic features of the Rincon Mountains. The Rincons lie to the north-northwest and are about 8,500 feet high. The Little Rincon Mountains lie to the north and are only about 5,000 feet high. The San Pedro Valley, at about 3,300 feet, lies to the east and northeast. Today we shall concentrate on the geology of the northern part of the Little Rincons, which probably reflects what the rocks were like on top of the main Rincons in Pliocene-Pleistocene time.

The Rincons and Little Rincons are much alike geologically; they are parts of a single large gneiss dome. The rocks of the core of the dome are a gneissic complex of Precambrian intrusive and sedimentary rocks; those of the carapace are mainly of Paleozoic age but also include Precambrian granitoid rocks and Apache Group and Mesozoic sedimentary rocks. The carapace rocks are everywhere allochthonous; the core rocks are autochthonous or para-autochthonous. The allochthonous rocks consist of three main thrust plates. The lowest plate consists mainly of metamorphosed Paleozoic rocks, the middle plate is of granodiorite (Rincon Valley Granite of Acker, 1958), and the upper plate consists mainly of unmetamorphosed Paleozoic rocks.

A large north-trending normal fault of Miocene(?) to Pleistocene age separates the Rincon block from the Little Rincon block. Since Miocene (?) time, the allochthonous carapace has been eroded from the uplifted Rincons; however, it is still preserved in the Little Rincons, where we shall see it today. Immediately east of the San Pedro Valley, most of the rocks are of the carapace, but some of them appear to be autochthonous.

Proceed by car northward toward Mescal and Happy Valley.

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- 2.0 Turn west (left) along railroad.
- 2.5 Cross S.P. RR tracks, turn west (left) and, about 100 yards beyond crossing, turn north (right), following main road.
- 3.0 Junction. Turn east (right) toward Happy Valley.
- 4.0 To west (left) is movie set, last used for filming parts of "Dirty Little Willie." Cross extensive area underlain by basin-fill gravel, of Pliocene-Pleistocene age, capped by a well-developed red soil.
- 7.0 Ash Creek to northeast (right). One mile down the canyon there is an inferred thrust fault within Precambrian rocks of the core of the gneiss dome; hence the use of the term "para-autochthonous" for these rocks.
- 8.0 STOP 2 Road cut to west (left). Two components of the gneiss dome complex are exposed here. The oldest component is the Pinal Schist, here with a gently southeastward-dipping foliation. It is cut by numerous small lit-par-lit sheets of aplite, which are probably related to a 2-mica quartz monzonite, to be seen at the next stop.
- 8.4 Mac Kenzie Ranch. A string of small tectonic slivers lies within the Precambrian rocks about a mile northeast of the ranch. Across the mountains to the east a small plate of Paleozoic rocks also lies faulted within the gneiss complex.
- 10.5 STOP 3 Road cut to east (right). The youngest component of this part of the gneiss complex is exposed here. A sample from the gully to the southwest is dated by the K-Ar method as by R.F. Marvin, H.H. Mehnert, and Violet Merritt, U.S. Geological Survey (1971, written commun.). Along the road for the next mile to the north, the quartz monzonite contains many inclusions of a coarsely crystalline gray porphyritic granodiorite, which are assimilated to various degrees. We shall see this rock again in better preserved condition at the next stop.
- 12.5 Enter into Happy Valley. Note exposures of basin-fill gravel above road level. Descent into Happy Valley is on a younger terrace gravel. The basin-fill gravel is faulted against the Rincon Mountains to the west and in places its clasts include rocks of the carapace. The terrace gravel laps across the fault and consists entirely of rocks derived from the gneiss complex of the core.

Mile

- 15.5 Turkey Creek to left (north). Note on passing the gentle westward dip of the basin-fill gravel, which is related to the normal faulting between the two halves of the gneiss dome.
- 16.5 STOP 4 Watkins Ranch (as shown on Happy Valley quad). Park at gate at end of graded county road, near ford across Paige Canyon. Walk south to tributary gully southeast of Paige Canyon, to outcrops of nearly massive, virtually unaltered biotite granodiorite, dated by the K-Ar method at _____ m.y. by R.F. Marvin, H.H. Mehnert, and Violet Merritt (1971, written commun.). A few hundred feet north of the tributary canyon, this granodiorite intrudes the Continental Granodiorite, here a coarsely porphyritic, strongly foliated and lineated, dark-gray metagranodiorite. It is the third major component of the gneiss complex.

From some suitable vantage point we can see that much of the lowland to the west is underlain by basin-fill gravel. An older gravel unit is exposed along the north edge of the lowlands, extending almost to Paige Canyon. It is reddish gray and finer grained than the younger gravel. It contains mainly clasts derived from the allochthonous plates, and it is correlated with the Pantano Formation of Oligocene to Miocene age. The low rolling hills 1-2 miles north of the ranch are underlain by granodiorite of Rincon Valley, and the higher hills to the northwest are underlain mainly by rocks ranging from Cambrian (Bolsa Quartzite) to Permian (Concha Limestone) age; the hills also include some Cretaceous rocks (Bisbee Formation). Together, these sedimentary rocks and the granodiorite of Rincon Valley constitute a zone of allochthonous rocks that is separated from the para-autochthonous rocks on which we are standing by a normal fault of mid-Tertiary (and younger?) age.

Return to cars; leave behind all unessential ones, particularly all wide or long field cars, and proceed northeastward through gate.

- 17.3 Junction. Bear right (east) on main track. Road beyond the small grade is narrow and contains a tight corner that requires caution to pass.
- 18.0 Junction. Turn left (northeast) across wash.
- 18.1 STOP 5 Park near ruined adobe cabin and walk westward, across Paige Canyon and up a small knoll. Review carapace geology.

Examine remnants of metamorphosed Bolsa Quartzite (south and west of knoll), Abrigo Formation (north, and nearby to the south, of knoll), and Martin Formation and Escabrosa Limestone (the brown and white marble underfoot). These remnants are part of the lower, or metamorphosed, thrust plate of the carapace. This plate gradually wedges out a mile to the south; to the north it thickens and includes much Horquilla Limestone (Pennsylvanian) and some rocks as young as Scherrer Formation (Permian).

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Across Paige Canyon to the east are seen the capping bold outcrops of the upper, or unmetamorphosed, plate, made up of sedimentary rocks ranging in age from Precambrian Pioneer Shale to Mississippian Escabrosa Limestone. The lowest part of the slope, beneath the reddish-brown outcrops of the Pioneer, is underlain by the middle plate, of granodiorite of Rincon Valley, which is dated nearby by the K-Ar method as 1540 ± 60 m.y., by R.F. Marvin, H.H. Mehnert, and Violet Merritt (1969, written commun.).

Return to cars and continue northeastward through the gate or gates.

- 18.3 STOP 6 Leave cars in last grove of sycamore trees and walk about 0.2 mile northeastward along the track to a saddle area. Review the local geology and indicate the three options that are available on the following walking tour. The group may wish to split up.

Option 1: The most significant area lies about a mile to the northeast, not far from a trail, and at about the elevation of the saddle. In this area the thrust fault beneath the granodiorite of Rincon Valley of the middle plate is well exposed and the sheared surface on metamorphosed Horquilla Limestone of the lower plate is extensively stripped. Axial planes of drag folds in the limestone near the fault dip northeastward.

Option 2: A modest climb up the ridge to the southeast will provide exposures of unmetamorphosed rocks of the upper plate, equivalent to some of the metamorphosed ones seen at Stop 5. Although the contact beneath the unmetamorphosed plate is concealed in this area, the variety of formations that immediately overlie the contact and are seen to the east of the spur indicates that the contact is a fault, and the distribution of outcrops of granodiorite of Rincon Valley require that that fault be only very gently dipping.

Option 3: A walk down Paige Canyon toward the Hells Gate takes one through the lower, or metamorphosed, plate to the underlying Pinal Schist and a diabase sill. The critical contact is concealed here and several local normal faults complicate the picture, but the exposures of the several rock types are excellent.

Return to saddle area and to the cars and assess the available time and inclination of the participants. Supplementary stops may be offered in the Happy Valley area or near the Martinez Ranch at the southeastern tip of the Rincon Mountains. Retrace the route to the Mescal-J-6 Ranch Road interchange

Second day

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- 0 STOP 7 (Meeting place, second day) Parking lot at Colossal Cave.

The structure of the rocks in this area has long been recognized as complex and has frequently been studied by students and geologists of the Tucson area. A brief review of the visible formations and structural features will be made to contrast the style of deformation within the unmetamorphosed upper plate here (many normal faults, some thrust faults, and open folds) with the style of deformation seen within the same rocks of the metamorphosed lower plate at Stops 5 and 6 (strong plastic deformation). A third style of deformation is shown by the Pantano Formation (widely spaced normal faults in semiconsolidated clay, sand, and gravel), exposed in the valley west and southwest of the parking lot.

Proceed out of parking lot by car.

- 0.2 Junction. Turn left (south) toward Vail.
- 0.3 Junction. Turn left again (east) up Posta Quemada Canyon and past the picnic areas.
- 1.0 Note the open folds in unmetamorphosed Horquilla Limestone high on the hill ahead (east) of us, and on the south side of the canyon.
- 1.5 Locked gate to private road. Note: This leg of our trip may depend on obtaining permission to enter (thus far always granted).
- 2.6 STOP 8 Park cars at ranch and proceed on ^{foot} fc along trail up the canyon about 0.3 mile, continuing up the wash another 0.2 mile.

A low-angle fault separates the Earp Formation and Epitaph Dolomite of the unmetamorphosed upper plate from rocks of the gneiss complex. A vantage point on the north side of the canyon provides a view of a ledge of granodiorite of Rincon Valley, high on the opposite side of the canyon to the southeast, that constitutes the middle plate and is tectonically intercalated between the gneissic rock and the upper plate of Paleozoic rocks.

Return to cars and retrace route to paved road.

- 4.9 Junction with paved road. Turn north (right).
- 5.0 Junction with Colossal Cave entrance road. Bear left on main road (northwest).

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- 6.2 Crossroad. Turn right (northeast) toward Madrona Ranger Station.
- 7.8 Junction with obscure track to right (east). Turn right toward Papago Springs. Leave unessential cars here; the track is suitable for pickups and field cars.
- 8.3 STOP 9 Park near wash and walk to low outcrops east of wash and north of track. Rocks of the gneiss dome complex (para-autochthon) have been stripped of a relatively thick sheet of the middle plate of granodiorite of Rincon Valley, which is exposed west of the wash. Note the mullion structures and slickensides, and the lineation and foliation in the gneissic rock.
- Return to cars and drive back to gravel road. Unessential cars should continue to be left here.
- 8.8 Junction with gravel road. Turn northeast (right) toward Madrona Ranger Station.
- 9.9 Junction. Bear northeast (right) on road to Ranger Station.
- 10.9 Locked gate. Knob to north is a klippe of Dripping Spring Formation (Precambrian) and of Bolsa Quartzite and Abrigo Formation (both Cambrian) of the unmetamorphosed upper plate, lying on the middle plate of granodiorite of Rincon Valley.
- 11.3 Basin-fill gravel to east contains clasts derived from the upper two plates to the east (probably once up on the Rincon Mountains).
- 11.6 Junction at ford across Rincon Creek. Turn ^{north} north (right) across ford.
- 12.4 Junction. Turn east (right) leaving main road to Ranger Station.
- 13.1 STOP 10 Near windmill. Examine metamorphosed Horquilla Limestone (marble) of the lower plate north of the road and fossiliferous Abrigo Formation of the upper plate on the low rise west of the curve in the road west of the windmill. Check sliver of granodiorite of Rincon Valley of middle plate and the underlying exposed thrust fault at the windmill.

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off Drive back to where unnecessary cars were left and proceed with all cars to paved road and back to the edge of Tucson. The car caravan need not hold together here, but will reassemble at the junction of the Redington Pass Road (an extension of the Tanque Verde Road) with the road to the Bellota Ranch. My somewhat dated road map of Tucson shows that one cutoff between the Old Spanish Trail-Pistol Hill Road and Tanque Verde Road is via Harrison Road (northward) and Wrightstown Road (westward). Perhaps Freeman Road offers a shorter cutoff. The Bellota Ranch junction is about 7 map miles east of the end of the paved part of Tanque Verde Road, where it starts up the grade. The Bellota Ranch junction is plainly marked. A reassembly time should be set before we separate.

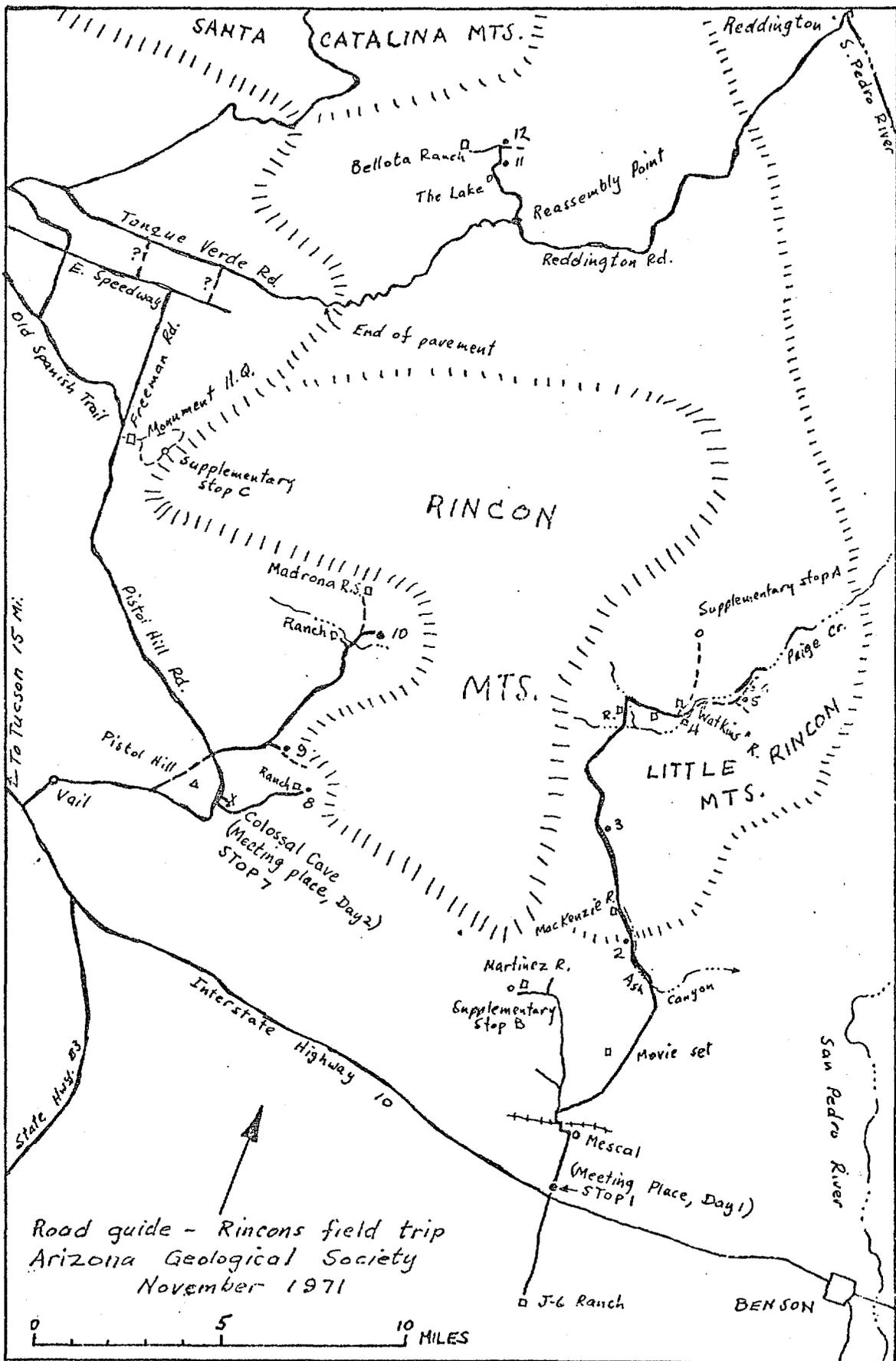
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- 0 Junction of Bellota Ranch Road and Redington Road. Proceed north toward ranch, through terrane underlain by rocks of the gneiss complex.
- 2.0 Near junction of track to The Lake, we cross an ill-defined contact between Precambrian 2-mica quartz monzonite and slightly altered gougy granodiorite of Rincon Valley.
- 2.5 STOP 11 At gap in quartzite ridge. Visit outcrops of shattered granodiorite of the middle thrust plate and of overlying klippe of Escabrosa Limestone (at gap and to east) and Bolsa Quartzite (to west) of the upper plate. A little Bisbee (?) Formation occurs north of the ridge, and the structural continuation of the ridge to the northeast contains Colina (?) Limestone and Scherrer Formation.
- 3.0 STOP 12 At sharp bend in road near junction with jeep road from the east. Walk up hill to north of junction to see metamorphosed Horquilla Limestone of the lower plate. Return down hill toward southeast, near Government Tank, to see poorly exposed Pantano Formation along jeep road. Farther east, the Pantano Formation is associated with volcanic rocks. Review the significance of the three styles of deformation seen in the allochthonous plates plus that of the Pantano Formation.
- Return to Redington Road.
- 6.0 Junction at Redington Road. Turn west (right) to Tucson. Reconvene at Pinnacle Pete's for supper and further discussion, if desired.

END OF TRIP

Reference cited:

Acker, C.J., 1958, Geologic interpretations of a siliceous breccia in the Colossal Cave area, Pima County, Arizona: Arizona Geol. Soc. Digest [1st Annual], p. 47.



Road guide - Rincons field trip
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