

# Mojave Rainbow: Rocks on the Edge Field Geology of Plate Boundaries



Camellid footprint for scale

# Elephant Rock, Valley of Fire



<http://www.planetware.com/picture/overton-valley-of-fire-state-park-us-nv/v212.htm>

No rain? No worry..  
The rainbow is within the rocks!



[http://www.weddingslasvegas.com/valley\\_of\\_fire](http://www.weddingslasvegas.com/valley_of_fire)

Yes! Some couples do find happiness on these trips. Just ask Chris and Leandra!



# Valley of Fire



# Entrance to Rainbow Basin

More exposure in 1000 m than the entire state of New York!



Image courtesy of Eugene Carsey

# What tourists say...

“a small park listed on the map called Rainbow Basin. After a day of scenic freeway driving, we arrived at 5pm (my favorite hour) to our choice of 80 campsites. Mimi discovered a nice unlisted trail and the next morning we were off. This was an amazing canyon and we only wish we had more time to explore.”



# Rainbow Basin



# Rainbow Basin







<http://davelandart.blogspot.com/2007/12/calico-ghost-town.html>

# Entrance Wall Street, CA style



Makes you want to smile too



# Cima Volcanic Field: Climb on a volcano!

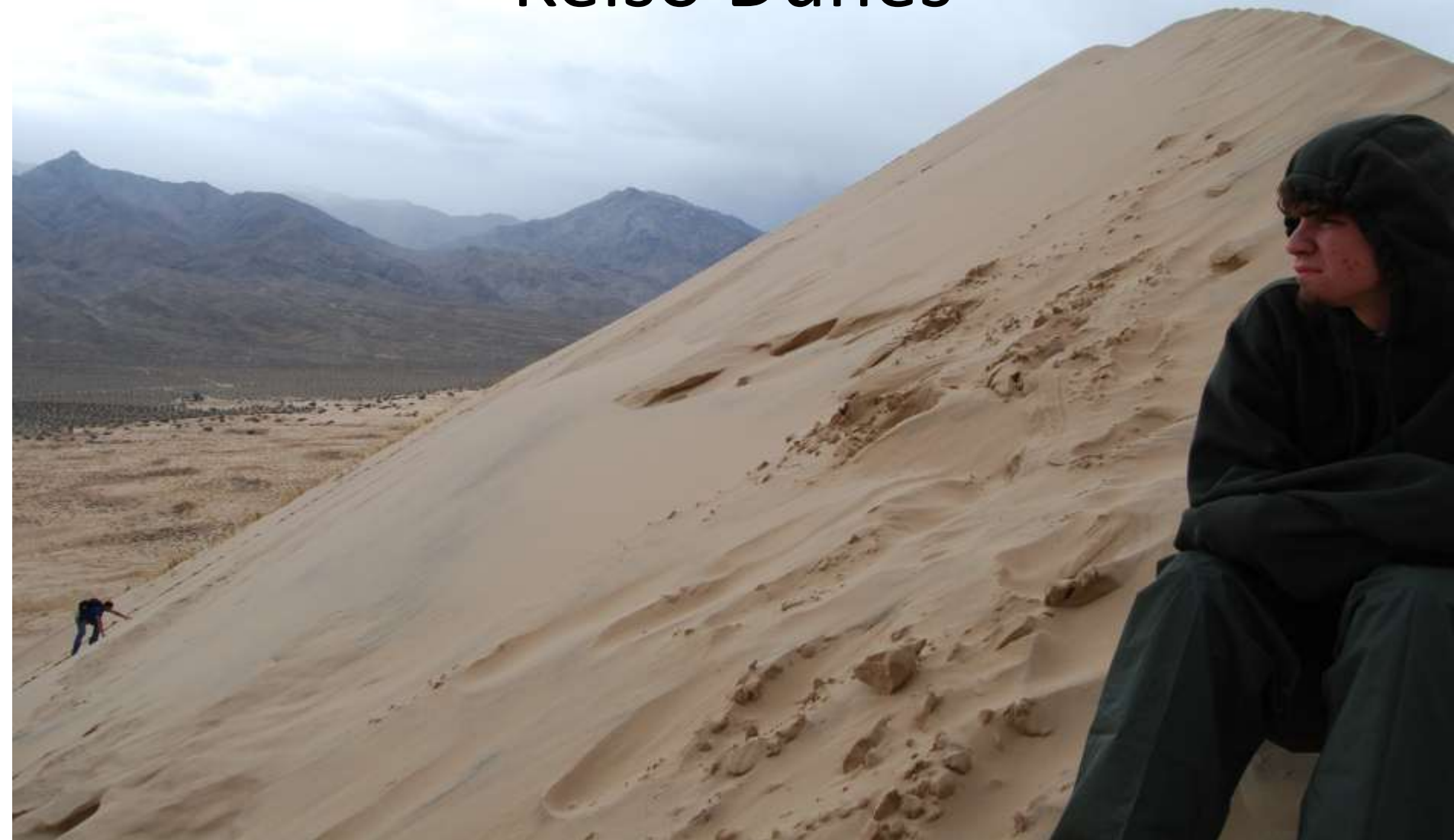


<http://www.panoramio.com/photo/8152902>

# Entrance to Vulcan's World: Climb IN a Volcano!!



# Kelso Dunes



A photograph of a narrow, rocky canyon. The rock walls are dark and jagged, with some patches of green and yellow vegetation. A large opening in the rock wall, known as 'Hole in the Wall', provides a view of a valley below. The sky is clear and blue.

# Hole in the Wall

## Mojave National Preserve

[http://www.desertusa.com/mnp/mnp\\_hole.html](http://www.desertusa.com/mnp/mnp_hole.html)

View from the Boulevard of Dreams

*Zzyzx*





# The Itinerary

Date	Week Day	Day	Activity	Camp site
22-Mar	Friday	Day 1	Travel/Valley of Fire, Las Vegas, NV	Valley of Fire SP
23-Mar	Saturday	Day 2	Hike Valley of Fire/Drive to Calico, CA	Calico, CA
24-Mar	Sunday	Day 3	Rainbow Basin, map east/north	Calico, CA
25-Mar	Monday	Day 4	Rainbow Basin, map west/south	Calico, CA
26-Mar	Tuesday	Day 5	Calico, map Wall Street Canyon	Calico, CA
27-Mar	Wednesday	Day 6	Calico, map Wall Street Canyon	Calico, CA
28-Mar	Thursday	Day 7	Calico, map Mule Cyn	Calico, CA
29-Mar	Friday	Day 8	Landers, Blackhawk, San Bernardino Mtns	Calico, CA
30-Mar	Saturday	Day 9	Kelso Volcanic Field	Zzyzx, CA
31-Mar	Sunday	Day 10	Kelso Dunes/Hole in the Wall	Zzyzx, CA
1-Apr	Monday	Day 11	Travel	Home, NY
2-Apr	Tuesday		School Starts	

Students will be evaluated based on

- **Participation (5%)** on the Field Trip
- **Field Notes (40%)**
- **Geologic Maps (30%)**
- **Geologic Cross Sections (15%),** and
- **A Presentation (10%)** [pre-trip]

## Key Themes

### Tectonics

Transtension  
Transpression  
Pull-apart basins  
Strike slip faults  
Thrust faults  
Normal faults  
Restraining bends  
Releasing bends  
Chevron folds  
Thin skinned deformation  
Plate boundary  
Transform boundary  
Collisional boundary  
Earthquake  
Seismogenic zone

### Geomorphology

Mountains  
Lakes  
Streams  
Arroyos  
Washes  
Slot canyons  
Alluvial fans  
Dissected fans  
Springs  
Oases  
Deltas  
Scarps (erosional and fault)  
Playas  
Pavement  
Ventifacts  
Wind gaps  
Dunes  
Stream evolution  
Badlands  
Landslides  
Debris flows

### Intrusive rocks

Granite

Granodiorite  
Pegmatite dikes  
Mafic dikes  
Felsite dikes  
Xenoliths  
Hydrothermal alteration

### Sedimentary rocks

Sed. structures  
Sedimentary Basins from  
Miocene to Pleistocene  
Lacustrine  
Deltaic  
Fluvial  
Evaporite  
Fanglomerate  
Transgressive sequence  
Regressive sequence  
Walther's law

### Extrusive rocks

Lava flow  
Tuff  
Ash  
Welded tuff  
Pyroclastic flow  
Dacite  
Rhyolite  
Andesite  
Plugs  
Caldera

### Metamorphic rocks

Gneiss  
Schist  
Marble  
Quartzite  
Hornfels

### Minerals

Barite  
Orthoclase  
Plagioclase  
Quartz

Biotite  
Chlorite  
Muscovite  
Magnetite  
Tourmaline  
Hornblende  
Pyroxene  
Olivine  
Pyrite  
Gypsum  
Anhydrite  
Calcite  
Halite  
Kaolinite  
Illite

### Cultural

Mines  
Artifacts (morteros,  
geoglyphs,  
petroglyphs, fish traps)  
Trails and roads

### Environmental

Energy resources  
(geothermal, wind,  
solar)  
Water usage  
Climatic changes  
Microclimates  
Diurnal air movement  
Environmental lapse rate  
Sky islands  
Rain shadows

### Mapping Places

Mule Canyon (Calico)  
Wall Street Cyn (Calico)  
Rainbow Basin  
Pisgah Crater

## Check list of Useful Items (Think Christmas Wish List!)

- \_\_\_\_\_ Hat—preferably wide brim to shade the ears/neck
- \_\_\_\_\_ Sunglasses
- \_\_\_\_\_ Hiking shoes
- \_\_\_\_\_ Sunscreen
- \_\_\_\_\_ Warm jacket
- \_\_\_\_\_ Gloves
- \_\_\_\_\_ Rain jacket
- \_\_\_\_\_ Undergarments
- \_\_\_\_\_ Long johns
- \_\_\_\_\_ Long-sleeved and short-sleeved shirt
- \_\_\_\_\_ Several pair of socks
- \_\_\_\_\_ A pair of long pants and shorts
- \_\_\_\_\_ Toiletries (check with airlines for permissible container sizes)
- \_\_\_\_\_ Towel
- \_\_\_\_\_ Flipflops or shower sandals
- \_\_\_\_\_ Sleeping bag (to 25°F) and small pillow
- \_\_\_\_\_ Sleeping mattress
- \_\_\_\_\_ Flashlight/headlamp
- \_\_\_\_\_ Eating utensils (fork, spoon, knife, plate/bowl, cup)
- \_\_\_\_\_ Water bottle (just make sure it's plane transport friendly; or buy water bottles in CA)
- \_\_\_\_\_ Camera (optional, but really helpful!)
- \_\_\_\_\_ Field book (with water resistant paper, such as Rite in the Rain)
- \_\_\_\_\_ \*Compass with azimuth and inclinometer
- \_\_\_\_\_ Hand lens (see Geo-Tools for geology hardware: <http://www.geo-tools.com/index.htm>)
- \_\_\_\_\_ \*Rock hammer (protective eye wear/goggles are a good idea)
- \_\_\_\_\_ Calculator
- \_\_\_\_\_ Whistle (in case you get lost)
- \_\_\_\_\_ Clipboard and/or map case (you can make your own with a clear plastic cover)
- \_\_\_\_\_ Pencils (mechanical pencils, or wood pencils with sharpener)
- \_\_\_\_\_ Pens and Permanent Marker
- \_\_\_\_\_ Protractor/6" ruler
- \_\_\_\_\_ \*GPS unit
- \_\_\_\_\_ Charger for cell phone/electronic devices
- \_\_\_\_\_ Medium size duffel bag for clothes, sleeping bag, mattress, and personal items (choose a size within airline guidelines)
- \_\_\_\_\_ Day pack for lunch/snack items, pockets for water bottles, room for rain jacket, misc. tools
- \_\_\_\_\_ \*Hard hat for caving

\* Indicates item can be checked out from Earth & Atmospheric Sciences Dept