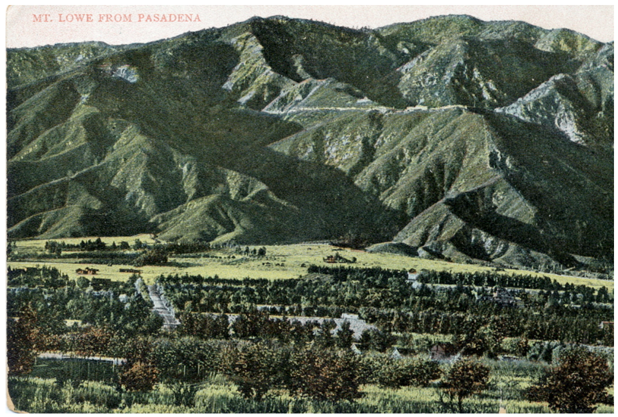
San Gabriel Mountains - Field Trip

Geography & Topography



- Tour - The route of the field trip
- GPS Activity
- HIstory of the San Gabriels
- Photos of field trip

Geology of the San Gabriel Mountains

- Plate Tectonics, Faults, Earthquakes
- Rocks, Minerals, Geological Features
- Big Tujunga Canyon
- Faults of Southern California
- Gneiss | Schist | Granite | Quartz

Ecology of the San Gabriel Mountains

- Plant communities
- Animal communities
- Fire in the San Gabriel Mountains
- Human impact

Meteorology, Climate & Weather

- Inversion Layer
- Los Angeles air pollution. Åir Now - EPA reports.
- Climate
- Southern Calfifornia Climate
- United States Air Quality blog

Science Teaching Series

The Sourcebook for Teaching Science
Hands-On Physics Activities
Hands-On Chemistry Activities

Internet Resources

I. Developing Scientific Literacy

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4 - Science, Technology & Society

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12 - Structure and Function in Science
13 - Games for Learning Science

IV. Developing Scientific Problem Solving

14 - Science Word Problems
15 - Geometric Principles in Science
16 - Visualizing Problems in Science

Astronomy

- 100 inch Mount Wilson telescope
- Solar Observatory
- Carnegie Telescopes

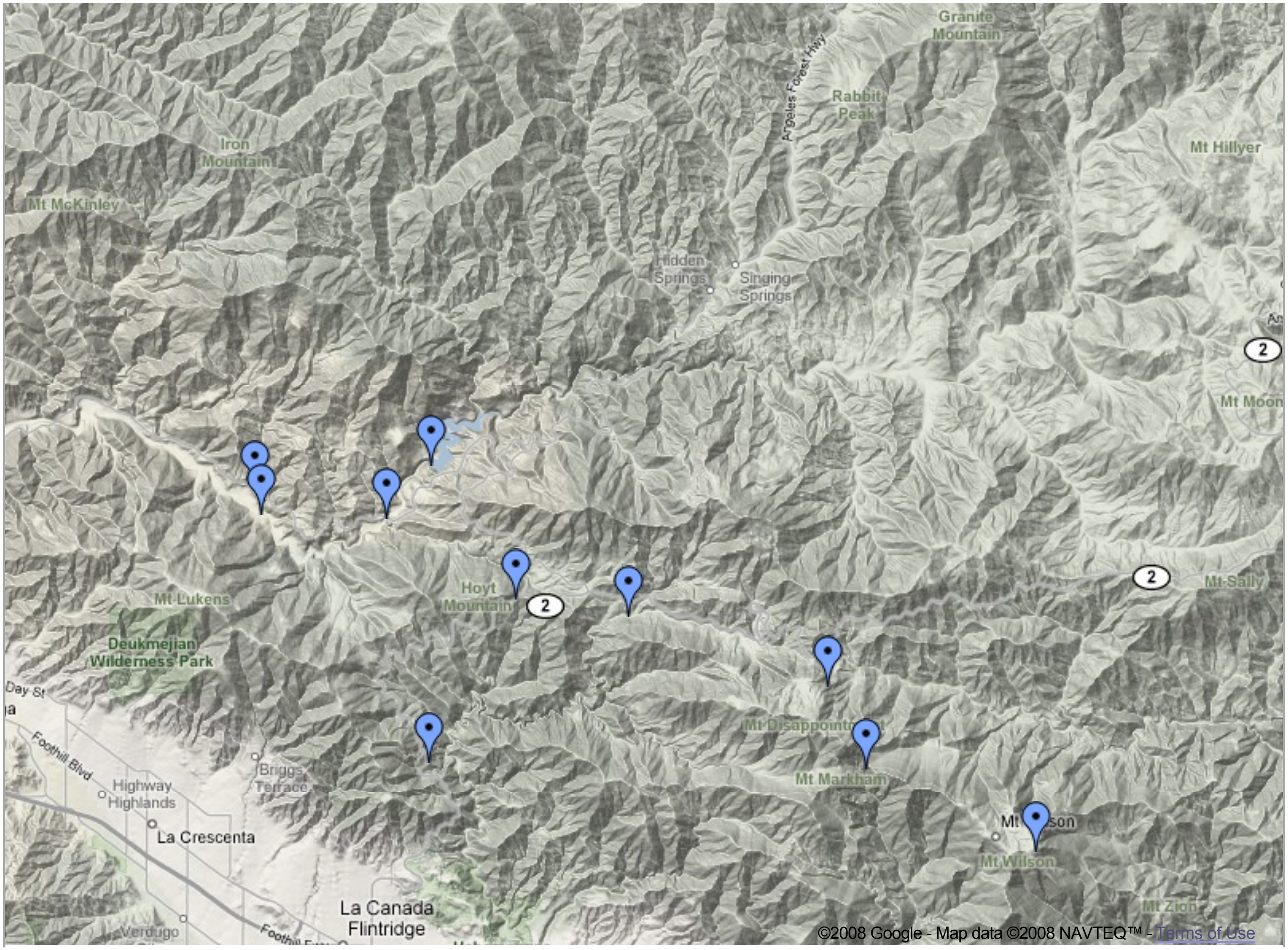
Photographs

- San Gabriel Mountains (Herr)
- Mount Wilson

Making your own web-based photo gallery

- Sample photos

Google Maps


Granite Mountain
Angeles Forest Hwy
Rabbit Peak
Iron Mountain
Mt Hillyer
Mt McKinley
Hidden Springs
Singing Springs
2
Mt Moon
Mt Sally
Hoyt Mountain
Mt Lukens
Deukmejian Wilderness Park
Day St
Foothill Blvd
Highway Highlands
Briggs Terrace
La Crescenta
Mt Markham
Mt Wilson
Mt Zion
La Canada Flintridge
Verdugo
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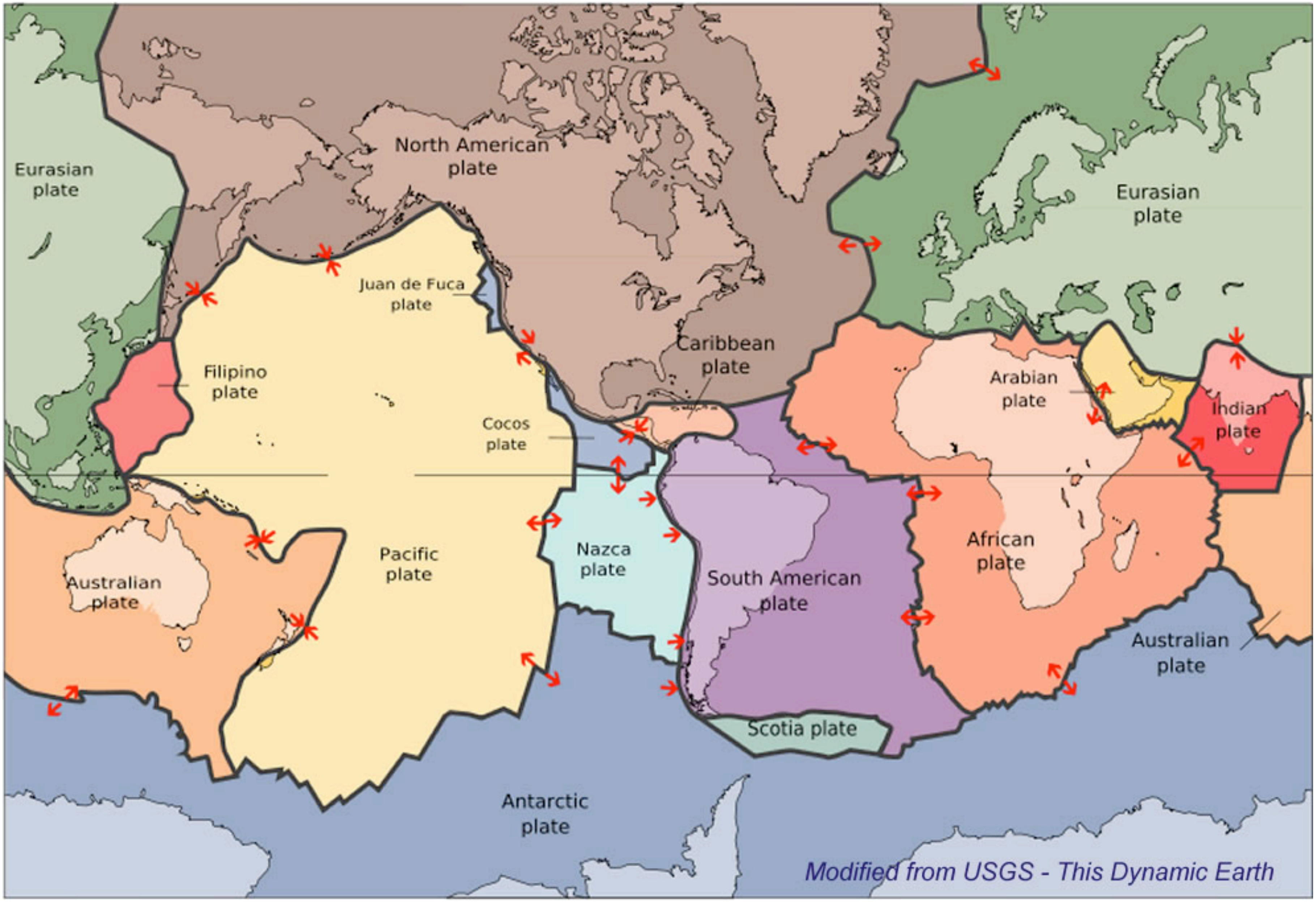
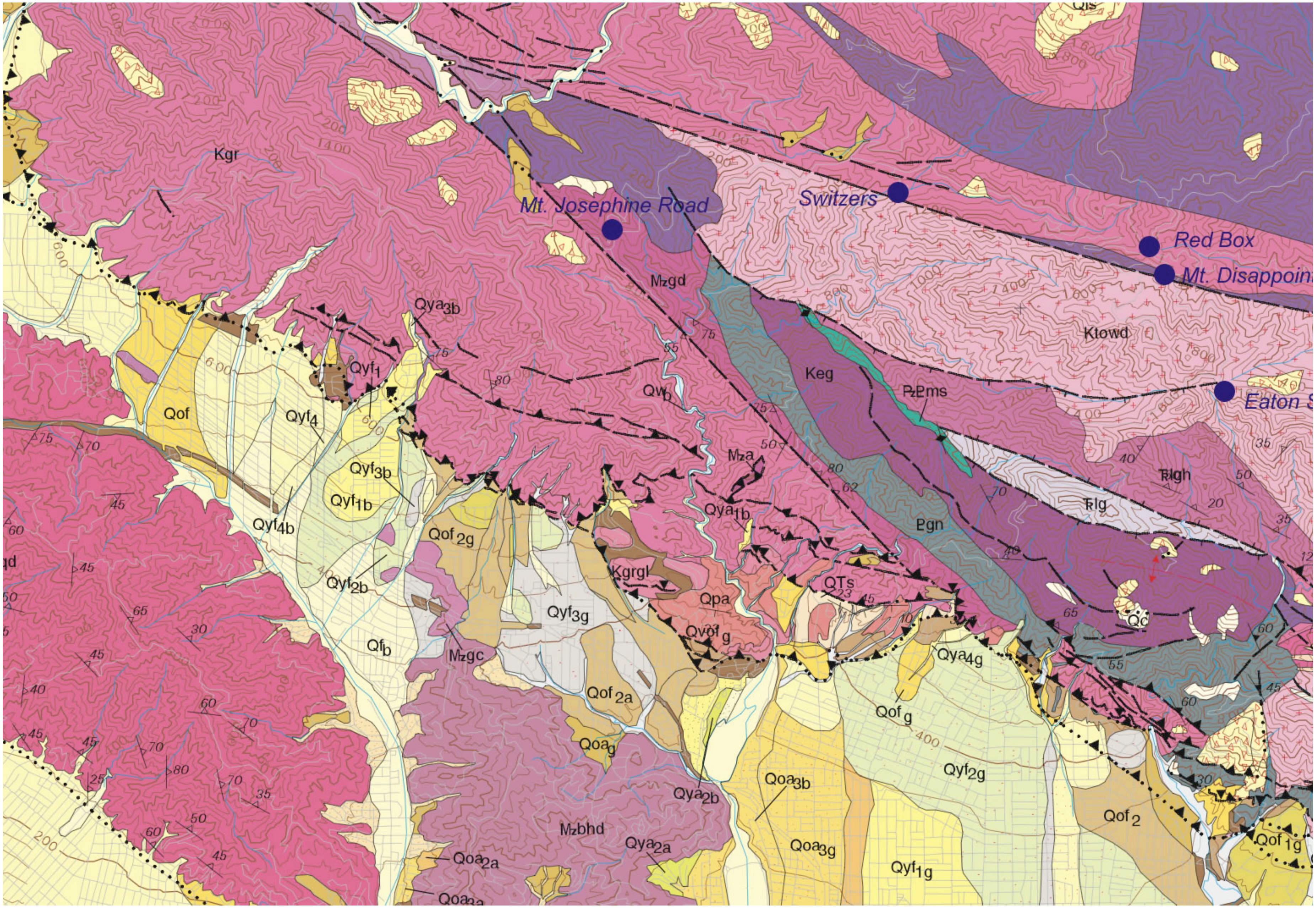


Eurasian plate
North American plate
Eurasian plate
Juan de Fuca plate
Filipino plate
Caribbean plate
Arabian plate
Cocos plate
Indian plate
Nazca plate
Pacific plate
African plate
Australian plate
South American plate
Australian plate
Scotia plate
Antarctic plate
Modified from USGS - This Dynamic Earth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Qof 2
Qof 1g
Mzbhd
Qya2a
Qoa3g
Qyf1g
Qoa2a

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GPS Activity - Mount Wilson

Locating places with GPS

Mount Wilson is located at latitude - longitude coordinates (also called lat - long coordinates or GPS coordinates) of N 34.223893 and W -118.061179.

Record the GPS coordinates of the following locations. Take photographs at each location, and connect the photographs with the locations using Picasa or Google Maps.

Location	Latitude	Longitude	Elevation	Observation
Georges Gap				
Colby Canyon				
Red Box				

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Mt. Disaapointment Road				
Eaton Saddle				
Mount Wilson Museum				
150' Solar Telescope				
100" Hooker Telescope				
Paviliion				
Big Tujunga Dam				

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Plant Communities in the San Gabriel Mountains

Valley & Foothill Woodland

- coast live oak *Quercus agrifolia*
- interior live oak *Quercus wislizenii*
- Englemann oak *Quercus engelmannii*
- valley oak - *Quercus lobata*
- Southern California black walnut *Juglans californica*
- California buckeye *Aesculus californica*

Hard Chaparral

- Chamise *Adenostoma fasciculatum*
- Manzanita *Arctostaphylos spp.*
- Ceanothus spp.
- Mountain mahogany *Cercocarpus betuloides*
- Yucca *Yucca whipplei*

Riparian

- white alder *Alnus rhombifolia*
- California sycamore *Platanus racemosa*
- bigleaf maple *Acer macrophyllum*
- Fremont cottonwood *Populus fremontii*
- willows *Salix spp.*

Montane Forests

- low elevation:
  - bigcone Douglas fir - *Pseudotsuga macrocarpa*
  - canyon oak- *Quercus chysopelis*

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- middle elevation:
  - Ponderosa pine - *Ponderosa Pine*
  - Coulter pine - *Pinus coulteri*
  - canyon oak - *Quercus chysopelis*
  - incense cedar - *Calocedrus decurrens*
- high country:
  - Jeffrey pine - Pinus jeffreyi
  - sugar pine - *Sugar Pine*
  - white fir - *Abies concolor*
  - incense cedar - *Calocedrus decurrens*
  - black oak
- 8000'+ lodgepole pine, limber pine

Pinyon-Juniper Woodlands

- Pinyon pine *Pinus monophyllum*
- junipers *Juniperus spp.*

Transverse Ranges

From Wikipedia, the free encyclopedia
(Redirected from Transverse Range)

The **Transverse Ranges** (or more accurately, the **Los Angeles Ranges**) are a group of mountain ranges of southern California, one of the various North American Coast Ranges that run along the Pacific coast from Alaska to Mexico. They begin at the southern end of the California Coast Ranges and lie between Santa Barbara and San Diego counties. They derive the name Transverse Ranges due to their East-West orientation, as opposed to the general North-South orientation of most of California's coastal mountains, thereby transversing them.[1][2]

Contents

Geology

The Transverse Ranges represent a complex of tectonic forces stemming from the interaction of the Pacific Plate and the North American Plate along the San Andreas Fault system. Their orientation along an east-west axis as opposed to the general southeast-northwest trend of most California ranges results from a pronounced bend in the San Andreas Fault, the cause of which is a subject of intensive ongoing study. Their elevation is somewhat better understood as a consequence of this bend. The crust atop the Pacific Plate south of the ranges does not easily make the turn westward as the entire plate moves northwestward, forcing pieces of the crust to compress and lift.

The crust which comprises the Transverse Ranges is part of what is known as the Salinian Block, originally a piece of the North American Plate which was broken off what is now northwestern Mexico as the Gulf of California rifted open.

Physiographically, the Tranverse Ranges are a distinct physiographic section of the larger Pacific Border province, which in turn is part of the larger Pacific Mountain System.[3] They exhibit extreme differences in geologic age and composition, varying from sedimentary rocks in the western Santa Ynez and Santa Monica mountains to primarily granitic and metamorphic rock in the eastern regions, where they terminate abruptly in the San Gabriel and San Bernadino mountains.[2]

Geography

The Transverse ranges run predominantly east-west, while the other coast ranges tend north-south, including the Central Coast Ranges to the north and the Peninsular Ranges to the south. They begin at Point Conception in Santa Barbara County, and include the Santa Ynez Mountains that run parallel to the coast behind Santa Barbara. Also in Santa Barbara County, they include the San Rafael Mountains and the Sierra Madre Mountains, both of which extend approximately to the Ventura County line. The Transverse Ranges also include the Topatopa Mountains and the Santa Susana Mountains of Ventura County and Los Angeles County, the Simi Hills, the Santa Monica Mountains that run along the Pacific coast behind Malibu, and whose eastern portion are known as the Hollywood Hills, the steep San Gabriel Mountains northeast of Los Angeles, the Puente Hills and Chino Hills, and the San Bernardino Mountains. To the north of the Transverse ranges are the Central Coast Ranges, The Central Valley, and the Tehachapi Mountains, which separate the Central Valley from the Mojave Desert to the east, and link the Transverse ranges to the Sierra Nevada. The Mojave Desert and California's low desert, including the Coachella Valley, are at the eastern end of the ranges. The northern Channel Islands of California are also part of the Transverse Ranges; San Miguel, Santa Rosa, Santa Cruz and Anacapa Islands are a westward extension of the Santa Monica Mountains.

Notable mountains in the Transverse Ranges:

- Mount San Gorgonio, 11,499 ft (3,505 m), San Bernardino Mountains
- San Bernardino Peak, 10,649 ft (3,246 m), San Bernardino Mountains
- Mount San Antonio (Old Baldy), 10,064 ft (3,068 m), San Gabriel Mountains
- Mount Wilson, 5,710 ft (1,742 m) San Gabriel Mountains
- Mount Pinos, 8,831 ft (2,692 m) San Emigdio Mountains
- Frazier Mountain, 8,026 ft (2,446 m) San Emigdio Mountains
- Reyes Peak, 7,510 ft (2,289 m), Pine Mountain

Transportation

There are a number of important freeways that cross the Transverse Ranges, like (from west to east) I-5 at Tejon Pass, SR 14 at Soledad Pass, and I-15 at Cajon Pass. These highways link Southern California with places to the north and northeast like San Francisco and Las Vegas, respectively With the exception of several high passes on less-traveled SR 33, SR 2, SR 330. SR 18 and SR 38, none of these passes are at high elevations, with Cajon Pass being at a modest 4,190 ft. (1,277 m) above mean sea level; this means that snow is less of a factor here than in the moderate to high mountain passes to the north like Donner Pass. Still sometimes, heavy snowfall can snarl traffic on Tejon and Cajon Pass, the higher two of the three freeway passes. I-5 and I-15 commonly experience heavy traffic over their mountainous route across these mountains.

Ecology

The native plant communities of the Transverse ranges include coastal sage scrub, chaparral (lower chaparral, upper chaparral, and desert chaparral), oak woodland and savanna, and pinyon-juniper woodland at lower elevations, and yellow pine forest, Lodgepole Pine forest, and subalpine forest at higher elevations.[4] The Angeles and Los Padres National Forests cover portions of the Transverse ranges. The ranges are part of the California chaparral and woodlands ecoregion, but the eastern ends of the range touch two desert ecoregions, the Mojave desert and the Sonoran desert. The Carrizo Plain adjoins the northern edge of the Transverse Range.

Urban impact

A number of densely populated coastal plains and interior valleys lie between the mountain ranges, including the Oxnard Plain of coastal Ventura County, the Santa Clarita Valley north of Los Angeles, the San Fernando Valley, which is mostly included in the City of Los Angeles. The Los Angeles Basin, which includes the portion of Los Angeles County south of the Santa Monica Mountains and most of Orange County, and the Inland Empire basin, which includes the cities of San Bernardino and Riverside, lie between the Transverse Ranges and the Peninsular Ranges to the south.

References

1. ^ Ingram, Scott (2002). *California: The Golden State*. Gareth Stevens, 21. ISBN 0836852826.
2. ^*a b* "California's Coastal Mountains (http://ceres.ca.gov/ceres/calweb/coastal/mountains.html) ". California Coastal Commission. Retrieved on 2007-12-25.
3. ^ "Physiographic divisions of the conterminous U. S. (http://water.usgs.gov/GIS/metadata/usgswrd/XML/physio.xml) ". U.S. Geological Survey. Retrieved on 2007-12-06.
4. ^ Schoenherr, Allan A. (1992). A Natural History of California. Berkeley, CA: University of California Press.

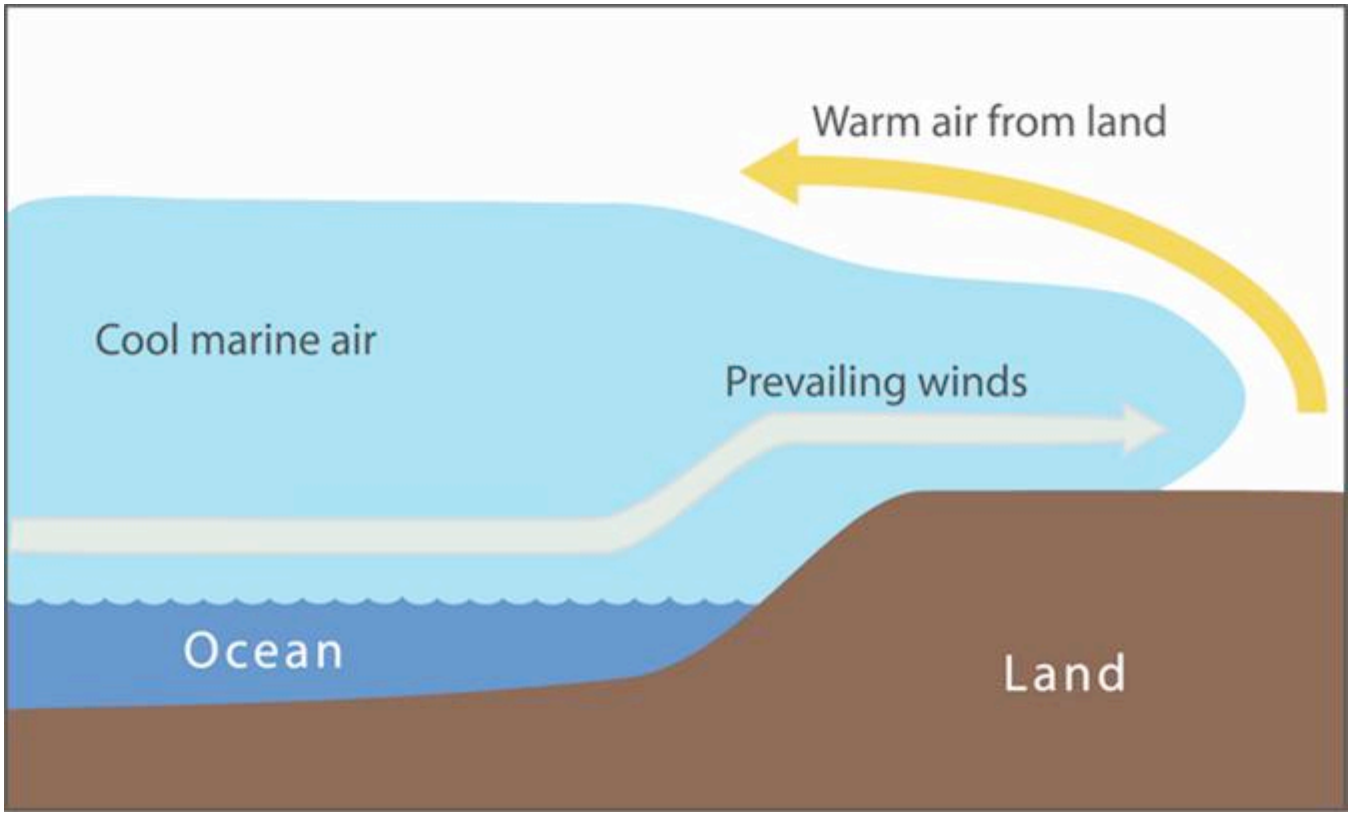


Fig. 1.

The second diagram (Fig. 2) shows a Regional Subsidence Inversion. This occurs when air flows down from a higher location to a lower elevation. As air sinks, or descends, it's warmed because of the compression it undergoes. Typically, this air is also dry. Not only has it originated over a dry land mass, but any moisture it may have contained at one time was likely condensed and precipitated out as it rose over our local mountains prior to its descent into the basin. Mixing of the air masses can occur on occasion, but once the warm, dry air (appearing in L.A. as Santa Ana winds) meets the cooler ocean air, it typically slides over the top of it to create a temperature inversion. The Angeles Crest mountains to the north and the San Bernardino mountains to the east of us make this scenario possible.

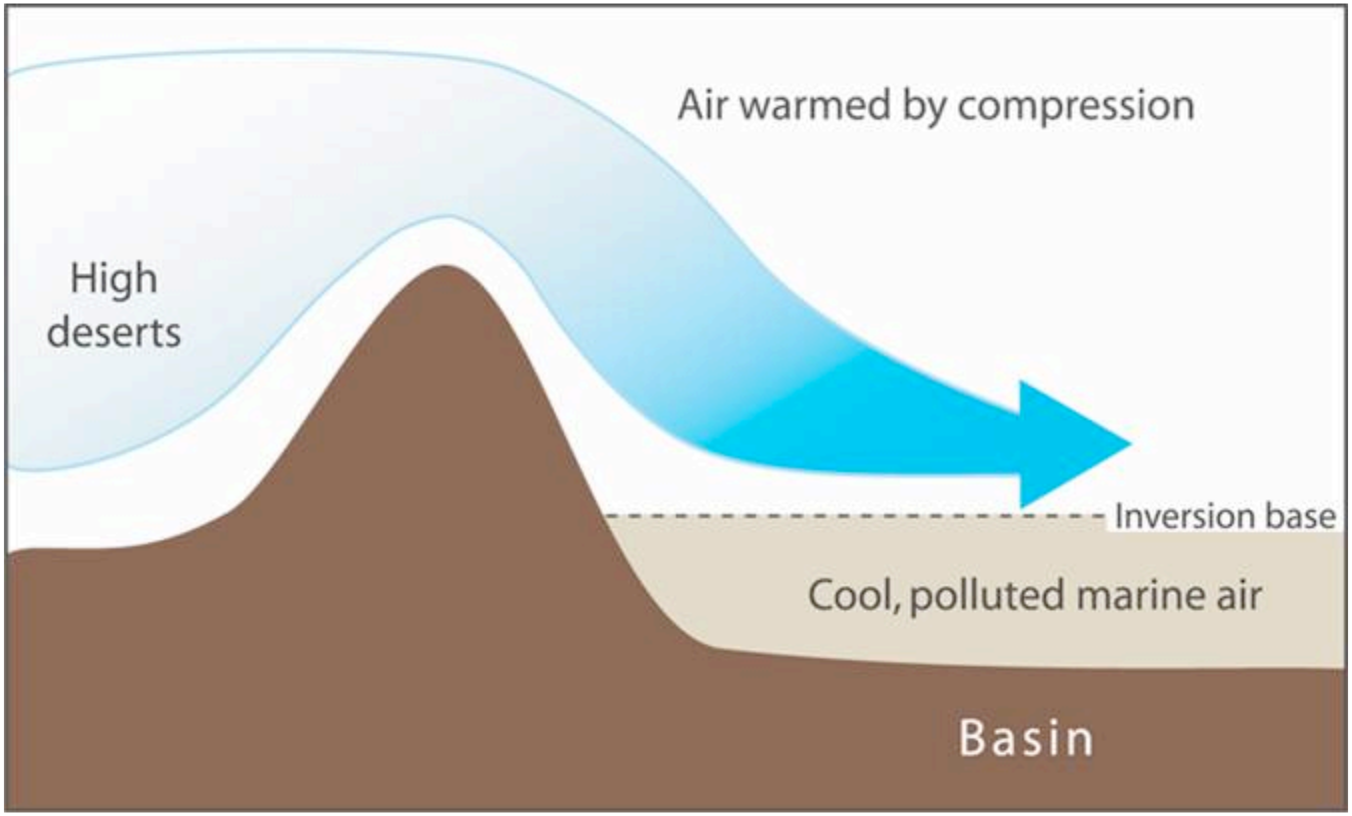


Fig. 2

The third diagram (Fig. 3) shows a High Pressure Inversion. Because high pressure systems are a function of descending air, we again see a situation of warm, dry air sinking to act as a cap over our cooler marine air. This is a regular occurrence for Southern California in the summer as we are located near the eastern edge of the Pacific High, which is a component of the Hadley global circulation cell.

WELCOME TO THE MOUNT WILSON OBSERVATORY

The most scientifically productive astronomical observatory in history, this was the preeminent facility in the world in both stellar and solar studies during the first half of the twentieth century.

Modern instrumentation has enabled both the original superb telescopes and more-recently- built facilities here to continue Mount Wilson's pioneering heritage in new fields of study.

VISITING HOURS

DURING MOST OF THE YEAR, THE MUSEUM, THE 100-INCH VISITOR'S GALLERY, AND MUCH OF THE OBSERVATORY GROUNDS IS OPEN TO THE PUBLIC DAILY FROM 10:00 A.M.TO 4:00 P.M. (WEATHER PERMITTING).

BETWEEN DEC. 1 AND APRIL 1, THE OBSERVATORY MAY BE CLOSED TO THE PUBLIC. CHECK WITH www.mtwilson.edu UNDER "VISITING INFORMATION"

TOURS

FROM APRIL THROUGH NOVEMBER, FREE GUIDED TOURS BEGIN AT 1:00 P.M., ON SATURDAYS AND SUNDAYS, IN THE PAVILION AREA.

SPECIAL FREE GROUP TOURS MAY BE SCHEDULED BY MR. GALE GANT AT galeg@mwoa.org

VISITORS:

PLEASE OBSERVE THE **"PRIVATE AREA"** SIGNS. MANY OF THE ASTRONOMERS AND STAFF LIVE HERE AND SLEEP DURING THE DAY.

FOR MORE INFORMATION:

MOUNT WILSON INSTITUTE: .... www.mtwilson.edu

MOUNT WILSON OBSERVATORY ASSOCIATION: ...... www.mwoa.org

60-FOOT SOLAR TOWER: .... physics.usc.edu/solar

150-FOOT SOLAR TOWER: .... www.astro.ucla.edu/~obs

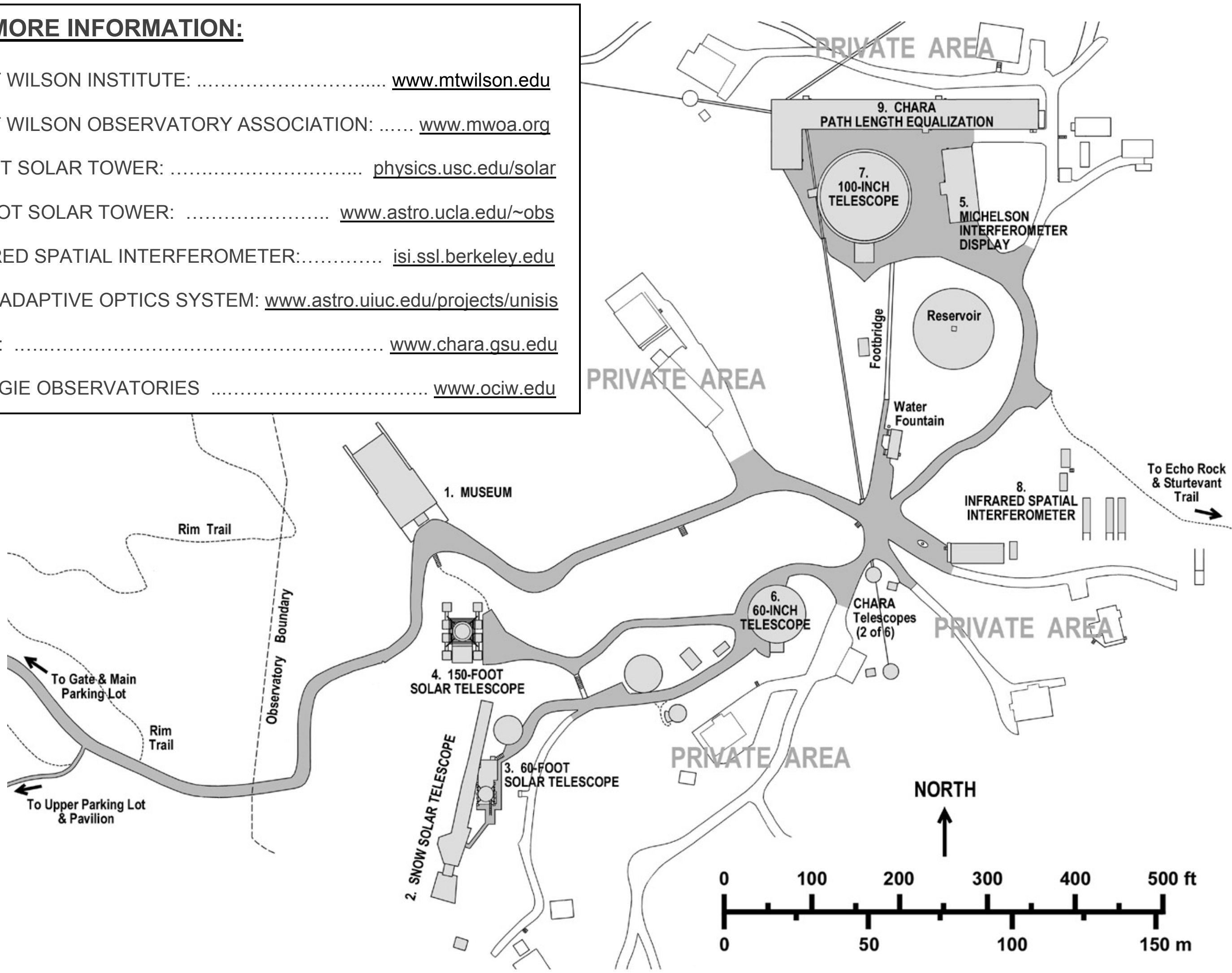
INFRARED SPATIAL INTERFEROMETER:............. isi.ssl.berkeley.edu

LASER ADAPTIVE OPTICS SYSTEM: www.astro.uiuc.edu/projects/unisis

CHARA: .... www.chara.gsu.edu

CARNEGIE OBSERVATORIES .... www.ociw.edu

Numbered locations on the map below are described on the following pages:



Published by the Mount Wilson Observatory Association

OBSERVATORY HISTORY

The Mount Wilson Observatory was founded in 1904 by the newly established Carnegie Institution of Washington (D.C.), under the leadership of George Ellery Hale, who had previously founded the Yerkes Observatory in Wisconsin. He was later largely responsible for Caltech, Palomar Observatory, the Huntington Library, and the Pasadena Civic Center.

Hale was a pioneer in the “new astronomy” of astrophysics, in which the latest discoveries in physics are applied to studies of the Sun, planets, stars, and Universe. He was especially interested in the Sun, since it is the closest star and by far the easiest to study. The site was originally (until 1919) known as the Mount Wilson Solar Observatory

The observatory was built on this site because of the superb “seeing” here, the best in North America. Good seeing means low levels of the image-smearing atmospheric turbulence that also causes stars to appear to twinkle. On a typical night here the stars overhead appear steady, allowing high magnification by the large telescopes. This seeing is not affected by light pollution from the nearby cities.

The Mount Wilson Institute, a non-profit organization, now operates the observatory under an agreement with the Carnegie Observatories, Pasadena, which still owns the observatory.

All the components for the original telescopes were laboriously hauled 9 miles from the valley floor, up a narrow, winding dirt road, initially on mule-drawn wagons. That road can still be seen cutting across Mt. Harvard, directly south of the observatory. (Angeles Crest Highway was not built until 1935.)

1. ASTRONOMICAL MUSEUM

The present museum was built in 1937, replacing an earlier, smaller structure. On display are many of the early high-quality photographs taken through the observatory’s telescopes. Note the scale model of the observatory made in the 1920s. Also shown are a fly-ball governor originally used in the clockwork drive that guided one of the telescopes, one of the original mirror-polishing tools, and more. Various diagrams and brochures describe the current activities.

2. THE SNOW SOLAR TELESCOPE

Originally donated by Helen Snow to the Yerkes Observatory, this horizontal telescope was moved here in 1904. It became the first permanent instrument on Mt. Wilson, and gave the best solar images and spectrographic data up to that time. It is used now primarily for astronomical education.

3. THE 60-FOOT SOLAR TOWER

Built in 1908, this instrument pioneered vertical telescope layout and was immediately put to good use, when Hale discovered magnetic fields in sunspots (the first magnetic fields found outside the Earth). It is operated today by the University of Southern California (USC) for studies of helioseismology, improving our understanding of the interior of the Sun.

4. THE 150-FOOT SOLAR TOWER

Built in 1910, this remained the largest such instrument in the world until 1962. It uses a novel tower-within-a-tower construction to minimize wind-caused vibration. Many types of solar research have been conducted here. Daily hand drawings of sunspots and their magnetic fields began in 1917 and continue to this day, providing a valuable uninterrupted record for solar researchers. The instrument, now operated by the University of California, Los Angeles (UCLA), is used primarily for complete magnetic field measurements of the Sun’s face.

5. THE MICHELSON 20-FOOT STELLAR INTERFEROMETER

Albert Michelson, the Nobel-Prize-winning physicist, developed this new type of astronomical instrument in the 1920s and used it to measure the diameters of several stars. This device consisted of a 20-foot steel beam, four flat mirrors (two of which were movable), and drive mechanisms all mounted atop the 100-inch telescope. Although limited to bright objects, it gave the resolving power of a 20-foot (240-inch) telescope.

Michelson observed the patterns resulting when the light from a single star was picked up by the two widely separated mirrors, reflected to the same point, and allowed to “interfere” with itself. Done carefully, with the two light paths precisely equal in length, this resulted in “fringe” patterns containing information on the star’s size. This instrument, the predecessor to modern stellar interferometers such as CHARA and ISI, is mounted in the CHARA exhibit room.

6. THE 60-INCH TELESCOPE

This revolutionary telescope was completed in 1908. It quickly showed that large silver-on-glass reflectors were practical, establishing the basic design for future observatory telescopes. Its 5-foot-diameter mirror made it the largest telescope in the world until 1917.

Designed to operate in several different optical configurations to allow various types of research, it was the first telescope built primarily for photographic and spectrographic use. One early accomplishment among many was the first measurement of the Milky Way galaxy’s size and our position in it.

Currently the 60-inch is used by private groups such as astronomy clubs. Full nights or half nights may be scheduled through the Mount Wilson Institute.

16-INCH TELESCOPE

The newest telescope on the mountain is this 16-inch instrument of Schmidt-Cassegrain design. It can be used for direct viewing but is also equipped with a high-quality CCD camera for photography. Intended primarily for use by small groups of high school or college students, free of charge, it is also available to private individuals for a fee. Trained volunteer operators are included. Full nights or half nights may be scheduled through the Mount Wilson Institute.

7. THE HOOKER 100-INCH TELESCOPE

Named for the industrialist friend of Hale who funded the mirror, this instrument was completed in 1917. The largest telescope in the world until 1948, it has been used in every kind of nighttime astronomical research, including studies of stars, nebulae, galaxies, planets and their satellites, and much more. Many new observing techniques were developed here.

The best-known discoveries made with this telescope were those of Edwin Hubble in the 1920s proving that spiral nebulae are distant galaxies outside the Milky Way, and that the Universe is expanding. These discoveries laid the foundations for modern cosmology and led to the present Big Bang theory.

The 100-inch is kept modern by using the latest instruments. Studies continue, using computers and two state-of-the-art adaptive optics systems that compensate for most of the already-low atmospheric turbulence. One, operated by the University of Illinois, uses a laser to determine the degree of turbulence; the other uses the observed object itself. The 100-inch thus can see small astronomical details that rival those seen by the Hubble Space Telescope, which is itself named for Mount Wilson's Edwin Hubble.

8. THE BERKELEY INFRARED SPATIAL INTERFEROMETER

This unique instrument consists of three telescopes, each mounted in a truck trailer, for making measurements of stars at mid-infrared wavelengths with high angular resolution. It has been in use here since 1988, determining diameters of stars and the properties of the surrounding materials, such as composition, temperature, density, and distribution.

The ISI uses the microwave-signal-mixing principles common with radio telescopes but applies them at the much shorter wavelengths of thermal infrared radiation. It was built and is operated by the University of California, Berkeley, under the direction of Charles Townes, co-inventor of the laser and Nobel Prize winner.

9. THE CHARA ARRAY

This is a six-telescope interferometer array built and operated by Georgia State University's Center for High Angular Resolution Astronomy. Its 40-inch mirrors and 1100-foot maximum separation make it the largest such device in the world operating at visible wavelengths. The detail-resolving ability of interferometer arrays (and telescopes in general) depends on their diameter, so the CHARA array will be able to see details of stars and the regions near them better than any previous instrument.

The six telescopes are arranged in a "Y" configuration, with two on each "arm". The two telescope domes of the south arm are visible near the 60-inch dome, as are the 8-inch-diameter vacuum pipes that carry the starlight from the telescopes to a central beam-combining building near the 100-inch dome.

Here the beam lengths are first equalized to one-millionth of an inch while compensating for the apparent motion of the stars and the spacing between the telescopes. This is done with a system of computer-controlled mirrors on precision motorized carts. These move on straight tracks 200 feet long in a room with extremely stable air held at a constant temperature. Next the beams are brought together and allowed to "interfere", producing "fringe" patterns unique to each observed object. Finally, computer processing can extract image details from the fringe patterns.