The Power of 10:

All 10 University of California campuses use White Mountain Research Station in 2006 alone... and that's only half the story!

*climate-change-related projects noted with an asterisk
UC San Diego

• Aerosol monitoring at Barcroft – Anthony Fry (Mark Thiemens, physics)*
• Deep Springs Valley Fault motions Roi Granot (Lisa Touxe, geosciences))
• Correlates of Acute Mt. Sickness public survey Nic Kanaan (Frank Powell, physiology)
• Computationally mediated artistic walking performance class. (Brett Stalbaum, art)
• Earthscope and US Array Survey, installations at Crooked Creek and Barcroft. IGPP/SIO
The Transient Rotor Experiment (T-REX) is an interdisciplinary field expedition to study transient weather phenomena originating over the Sierra Nevada. The field expedition took place in spring 2006 and involved multiple institutions including SIO, Univ. of Nevada, Reno, the National Center for Atmospheric Research, and others.

**UC San Diego, SIO**
(Scripps Institution of Oceanography)

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Mountain Climate Monitoring Network
Dan Cayan and Douglas Alden, Scripps Institution of Oceanography*

<table>
<thead>
<tr>
<th>#</th>
<th>Site name</th>
<th>Nominal elevation</th>
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<tr>
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<td>4000</td>
</tr>
<tr>
<td>2</td>
<td>Sore Thumb</td>
<td>5000</td>
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<tr>
<td>3</td>
<td>Over the Hill</td>
<td>6000</td>
</tr>
<tr>
<td>4</td>
<td>Piute Creek Overlook</td>
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<tr>
<td>5</td>
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<td>8000</td>
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<td>6</td>
<td>Beer Can</td>
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<td>7</td>
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<tr>
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</table>

Legend
White Mountains
- < 5000'
- 5000' - 6000'
- 6000' - 7000'
- 7000' - 8000'
- 8000' - 9000'
- 9000' - 10,000'
- 10,000' - 11,000'
- 11,000' - 12,000'
- 12,000' - 13,000'
- 13,000' - 14,000'
- > 14,000'
UC Irvine

• White Mountain Energy Project: bringing 21st century energy technology to Barcroft and creating a test bed for high elevation fuel cells. (Scott Samuelsen. Advanced Power and Energy Program) NSF funding
• Large volume air sample, used as standard in analysis of atmospheric gases around the world. Collected at Crooked Creek every summer. Kevin Gervais, Angela Baker (Don Blake, Chemistry) NSF, NASA, California Air Resources Board funding*
• Annual Physiology Conference. (Jim Hicks, Biology)
• Hybrid zone ecology and evolution Sarah Kimball (Diane Campbell, Ecology and Evolutionary Biology)*

Collecting large volume air sample at Crooked Creek

Installing monitoring equipment

Pumping and flushing air sample canisters and standard cylinder
Carbon cycling in Owens Valley soils.
Mariah Carbone (Susan Trumbore)*

Isotopic tracer containment

Understanding the influence of climate and depth to groundwater on plant water use. Christine Goedhart (Diane Pataki, Earth Systems Science and Ecology and Evolutionary Biology) Funded by UC Center for Water Resources*

CO2 flux measurement apparatus

Measuring pre-dawn water potential
UC Riverside

• Adaptation to high elevation in deermice
  Greg Russell, Matt van Sant, Sonia Ortiz
  (Kim Hammond, Mark Chappel, Biology) NSF funding
• Precambrian-Cambrian transition and the origin of complex life. (Mary Droser and Martin Kennedy, Earth Sciences). NASA funding*
• Geo 250 class field trip (Mary Droser, Earth Sciences)
• Granite weathering processes and microbes Ann Rossi (Robert Graham, Soil Sciences)

Global and environmental change field trip
Deermouse treadmill measures performance
Physiology lab set-up at Barcroft
UCLA

• Center for Embedded Network Sensing (CENS) project: robotic ground monitoring apparatus field testing. (Phil Rundel, Biology & Computer Science) NSF funding*
• Effects of hypoxia on fetal lambs. (Yuangsheng Gao, Neonatology) NIH funding
• Social evolution in Marmots. Thea Wang (Peter Nonacs, Biology)
• Advanced remote sensing class field trip. (ESS 162-262). Gilles Peltzer*

Field testing of robotic shuttle at Barcroft

Capturing Barcroft Marmots...

and then watching them interact in different social situations
UC Santa Barbara

• Polarization of the Cosmic Background Radiation. Brian Williams, Alan Levy, Nate Stebor, Jeff Childers, Hugh Oneill, Rodrigo Leonardi, Josh Marvil, Doron Halevi (Peter Meinhold and Phil Lubin, Physics). Winner of 2006 Gruber cosmology prize. NSF funding.
• Summer Geology Field School (every summer at Crooked Creek). (Cathy Busby, Geology)
• Environmental Studies class field trip (ESS 119) (Carla D’Antonio, Environmental Studies)*
• Geology field trip Geo 6 (Brad Hacker, Geology)
• Course development for Mountains, Boots and Backpacks. Colin Amos (Doug Burbank and Brad Hacker, Geology)

Barcroft observatory

MPOL telescope

BEAST telescope
Rod Bale, a colleague from the Univ. of Wales, sampling a tree for isotopic reconstruction of climate over the last 1000 years.

Abundant dead wood like this leaves precise records of how trees responded to past climates and where they lived.

Adelia and Dan looking over snowy sites in May of 2006.

UC Santa Cruz

- Geology summer field school Hilde Schwartz (Earth Sciences)
- Demography and longevity of Bristlecone Pines. Adelia Barber (Dan Doak, Ecology and Evolutionary Biology)*
- Advanced photography workshops at Crooked Creek. Stuart Scofield, UC Extension Art and Design.
UC Merced

- Survey of alpine soils at GLORIA sites (Jessica Green, Natural Sciences)*
- Willow beetle food web networks and analysis. (Eric Berlow, Sierra Nevada Research Institute)*
UC San Francisco

• Ultrasound and echo doppler imaging of human subjects with/without acute mountain sickness. Gerald Dubowitz (Anesthesiology)
• fMRI imaging of brain function under hypoxia (Gerald Dubowitz (Anesthesiology). (NIH funding pending)
• Planning for full-scale fMRI imaging project based at Barcroft. Gerald Dubowitz, Frank Powell, Philip Bickler, Richard Buxton, UCSF and UCSD. (NIH)
• Sense of place and rural physician retention. Christine Hancock, Joint Medical Program (Alan Steinbach)
UC Berkeley

• 2006 Nobel Prize in Physics, for measurements of cosmic background radiation. George Smoot worked at WMRS for over 10 years 1981-92.
• Terrain-induced rotor experiment (T-REX); fluid dynamics Tina Katapodes,* Environmental Engineering
• Mammal resurvey of “Grinnell sites” in the White Mountains. Jim Patton, Craig Moritz, Museum of Vertebrate Zoology. NSF funding*
• Jepson Herbarium Workshops held at WMRS every year. Cynthia Perrine
• Rural physician retention survey. Christine Hancock (Alan Steinbach, Public Health)

The “sense of place” and its role in rural physician retention in the Owens Valley

Jim Patton in the field

George Smoot receives Nobel Prize in Physics

Radiosonde launching

HIAPER aircraft sampling atmospheric turbulence

T-REX

Graduate students taking core samples and downloading data
UC Davis

• Effect of hypoxia-induced elevation in lung vascular endothelial growth factor (VEGF) using rats at Barcroft. (William Walby, Veterinary Medicine)
• Summer geology field school (Jim McClain, Geology)
• Geological field methods field trip (Charles Lesher, Geology)
• Alpine community ecology and terrestrial-aquatic trophic links. Pete Epanchin (Sharon Lawler, Entomology)*
• Principles of Ecology all-student orientation field trip. every September (Sylvia Hillyer, Graduate Program in Ecology)

Grey-crowned Rosy Finches eat aquatic insects that emerge from alpine lakes.

Ecology graduate group looks at endemic fish habitat

Aquatic insect emergence traps are used to sample the timing and abundance of the mayflies and midge hatch.
WMRS

The Global Observation Research Initiative in Alpine Environments (GLORIA) is a worldwide program to monitor climate change effects on alpine vegetation. (CIRMOUNT, USFS, CalFlora, CNPS, WMRS)

Century- and Millennial-scale Response of Limber Pine to Historic Climate Change. Connie Millar, Bob Westfall, Diane Delany, John King, USFS Pacific Southwest Research Station

Recruitment of Subalpine Conifers in Response to Changing Climates. (see right)

Right: Limber Pine expanding above upper Bristlecone Pine treeline, on dolomitic soils in the upper Cottonwood drainage
Genetics and conservation of Bighorn Sheep. John Wehausen, WMRS. CDFG funding

Insect communities in mountain meadows. Jeff Holmquist, WMRS. NPS funding

WMRS, continued.

Announcing a regional research conference:
• plenary sessions
• keynote speakers
• concurrent thematic sessions
• invited talks
• contributed talks
• poster session
• field trips
The other half of the story: non-UC campus research in 2006 (a selection):

*GLORIA (Global Research Initiative in Alpine Environments), ecosystem effects of climate change in alpine regions. CIRUMOUNT, USFS, CalFlora, CNPS, WMRS

*Century- and Millennial-scale Response of Limber Pine to Historic Climate Change. Connie Millar, Bob Westfall, Diane Delany, John King, USFS Pacific Southwest Research Station*

*Recruitment of Subalpine Conifers in Response to Changing Climates. (see above*)

Lung development in guinea pigs and dogs. Connie Hsia, Univ. of Texas Southwestern Medical Center. NIH

Effects of hypoxia on neonatal sheep. Lawrence Longo and Charles Ducsay, Loma Linda Univ. NIH

*Hibernation physiology of ground squirrels. Craig Frank, Fordham University. NSF*

*Physiology of C4 grasses at high elevation. Archie Meyer (John Skillman), California State University San Bernardino *

*Ecology, evolution and physiology of willow leaf beetles. Nathan Rank, Sonoma State University, Elizabeth Dahlhoff, Santa Clara University, and John Smiley, WMRS*

The physiology and performance in the western fence lizard. David McMillan (Duncan Irschick), U Mass

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*Chrysomela aeneicollis* adults (A) and larvae (B)

Hover fly larva

Guinea pigs running on treadmill, for measurements of aerobic capacity

Hover fly larva

Hole-nesting wasp
Selected non-UC research, continued.

• Collaborative Research: Quantifying feedbacks between groundwater decline, wind erosion, and ecological change in desert vegetation. Andrew Elmore, University of Maryland Center for Environmental Science. NSF funding

*Remote sensing and plant responses to climate change. Gary Ernst, Stanford University, Stuart Weiss, consulting ecologist and Chris Vandeven, Albion College*

Rates and processes of granite emplacement in the Sierra Nevada. Allan Glazner and Drew Coleman, Univ. of North Carolina. NSF funding

Effect of bosentan on human subjects during exercise. Roger Seheult, Loma Linda University. NIH funding

Intracranial pressure (ICP) changes and extravascular lung water in high altitude illness. Peter Fagenholz, Harvard General Hospital

*Origins of Reed Dolomite breccia. Nathaniel Lowrentz, Univ. Southern California NASA funding

Seismic reflection and ground-penetrating radar surveys. Michael Christie (George Tsoflias), Univ. Kansas

…and many, many non-UC classes (30 total; over 20 geoscience classes)