Phy-Sci Review

Vol. 1 – May 2006

Newsletter of the Physical Sciences at Solano Community College
• GEOLOGY • GEOGRAPHY/GIS • PHYSICS/ENGINEERING • ASTRONOMY •

Welcome to Phy-Sci Review

Welcome to our first edition of Phy-Sci Review. The purpose of this newsletter is to provide the campus community with news and articles concerning the Physical Science programs at Solano. We would like to share with you our scientific interests along with some of the special research projects of our students. For additional information and photos, please visit our website:

http://mathsci.solano.edu/users/mfeighne/phy-sci.htm

Thank you and enjoy!

Mark Feighner, Editor
Geology/Physics

Petrographic Thin-Section Laboratory at Solano

Can light pass through solid rock?! You bet! That is the nature of petrographic thin-section research.

At Solano, we were very fortunate to receive a donation of $65k worth of university-quality petrographic equipment from Chevron Research. This included a thin-section saw and microscope.

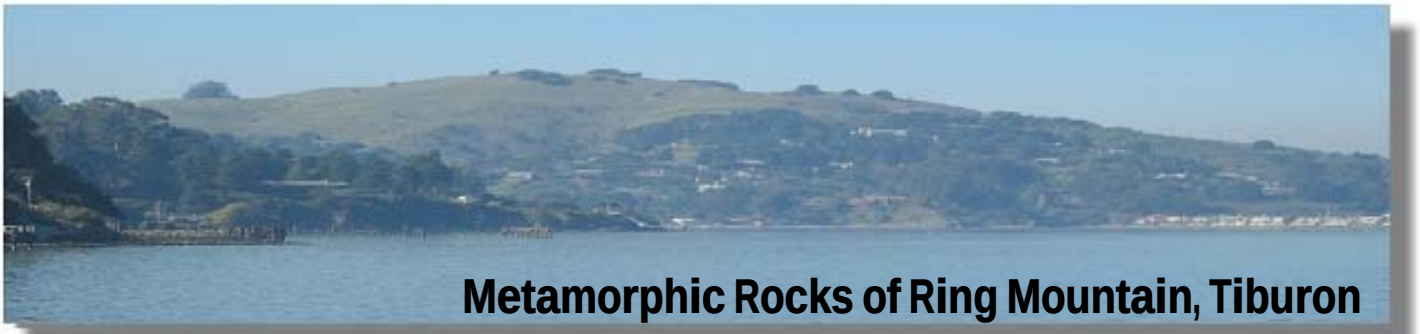
Over the past two years, we have completed the thin-section lab with a polisher/grinder and a digital camera. Solano is the only community college in Northern California with such equipment.

The first step in making a thin-section is to use a rough-cut saw to slice a rock sample to a thickness of one-half inch. One side of the sample is polished and mounted to a glass slide with epoxy. A cut-off saw is then used to slice the sample to about 1 millimeter (mm) thickness. A diamond grinder finally reduces the thickness to 0.03 mm – about 10 times thinner than a human hair.

Under the microscope, various polarizers and filters help identify minerals by their optical properties. The following two articles will highlight the use of petrographic thin-sections in geologic research.

-Article and Photos by Mark Feighner

Petrographic microscope with attached laptop computer and digital camera.



Metamorphic Rocks of Ring Mountain, Tiburon

At only 602 feet in elevation, Ring Mountain is hardly a mountain. But it is well known to geologist and biologist alike because of its unusual geology and the unique plants that grow in the serpentine soils on the Tiburon peninsula.

Serpentine is a metamorphic rock: a rock changed by heat and pressure. The high concentration of magnesium and calcium in the soils is usually toxic to plants, but some rare plants thrive [see: http://www.marin.cc.ca.us/~jim/ring/rplant.html].

In Spring '05, Geology Honors student **Warren Gray** collected and produced thin-sections of a variety of metamorphic rocks.

The metamorphic rocks in this area were produced by a collision of two tectonic plates: an ancient oceanic plate subducting beneath the North American continent. Such a process produced many types of metamorphic rocks, depending on the type of parent rock as well as the varying degrees of temperature and pressure.

One unusual rock that was found at Ring Mountain was the blueschist. As the name implies, the coloring of the rock is blue due to a rare type of blue mineral called glaucophane.

Glaucophane is only produced at subduction zones under very special conditions of low temperature and high pressure. The oceanic plate subducts so quickly that the temperature of the rocks remains fairly low while the depth (pressure) increases substantially.

Other types of metamorphic rocks that were collected and viewed under the microscope where: serpentinite, amphibolite, and metasediments – each corresponding to different temperature and pressure regimes.

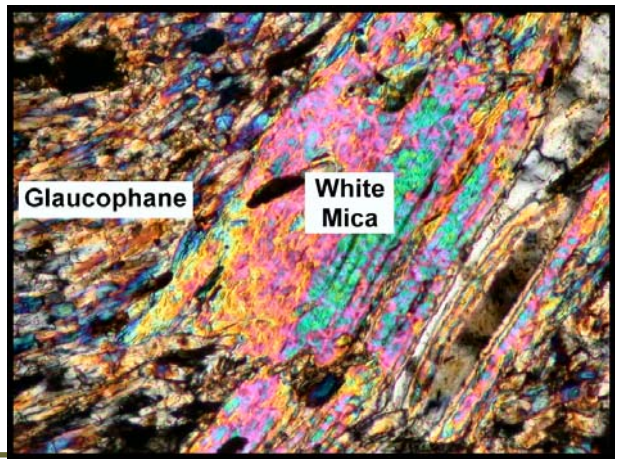
Hand samples and thin-sections were taken to UC Davis for detailed analysis with **Prof. Howard Day**, a specialist in igneous and metamorphic petrology. Using his digital camera, Warren took several photomicrographs of the samples collected and we studied in detail the processes involved in creating each of the rocks.

Warren is finishing his AA degree Spring '06 and will take a year off before continuing with his education.

-Article and Photos by Mark Feighner

[For more detailed photos, see: http://mathsci.solano.edu/users/mfeighne/phy-sci.htm].

*Geology Honors student **Warren Gray** at UC Davis Petrographic Laboratory taking digital photos of thin-sections [one photo at right].*



The rare and beautiful blueschist under the microscope with two identified minerals [Photo: Warren Gray].

Volcanics of Napa Valley

The success of the wine industry in Napa is largely due to the variety of soils created from weathering of different types of rocks in the valley, especially volcanic rocks.

The volcanics of the Napa Valley are the Sonoma Volcanics and were erupted over a period of 5 to 3 million years ago. New interpretations by the US Geological Survey have indicated the presence of a volcanic caldera in East Napa.

A caldera is a large circular depression which forms when a volcano violently erupts and collapses into its own magma chamber. The semi-circular basin is about 7 km (4.4 miles) in diameter with downtown Napa roughly on the western edge.

In Spring '06, Geology 10 student **Kris Kuehnert** investigated this caldera and collected volcanic rocks for thin-section analysis. Samples were taken from Skyline Park along the eastern flank of the caldera.

The volcanoes of Napa are called composite cone or stratovolcanoes. The eruptions follow a two stage process: the first stage is a violent explosion with many rock fragments and ash thrown in the air (pyroclastic); the second stage consists of lava flows on top of the pyroclastic flows. In cross-section, this creates a stratified layering to the volcano with repeated eruptions.

Some types of pyroclastic rocks found in Napa include volcanic breccias (a welded rock with large angular rock fragments, indicating a violent eruption) and volcanic tuffs (a welded ash flow with smaller inclusions).

The types of lava flows found in Napa vary from the very black basaltic lavas to the very light-colored dacites and rhyolites. The basaltic flows contain large amounts of iron and when iron weathers it oxidizes to produce a red-colored soil. Many other types of geologic units weather and mix to create as many as 30 different soil types throughout the valley.

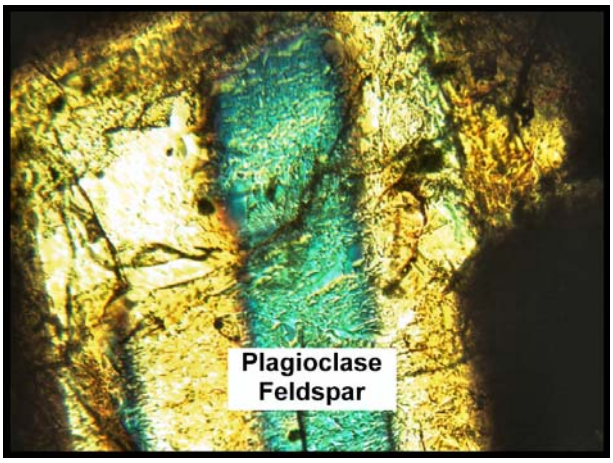
The unique mineral content of each of the soils impart characteristics of taste and aroma to the grapes that grow in that particular region. Along with the soils, the temperate climate of the valley is also critical in producing world-class wines.

Kris is working on his AA degree and plans to major in geology at the University of Nevada at Reno or Sacramento State.

-Article and Photos by Mark Feighner

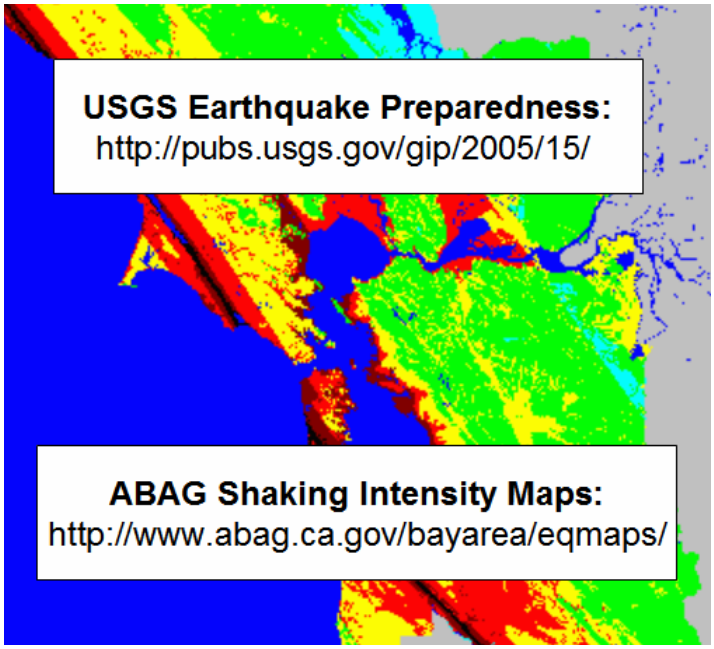
[For more detailed photos, see: http://mathsci.solano.edu/users/mfeighne/phy-sci.htm].

*Geology 10 student **Kris Kuehnert** preparing thin-sections in the geology laboratory.*



Under the microscope, the mineral plagioclase feldspar can be identified from its banded appearance (twinning) as seen in this lava flow.

1906 Earthquake Centennial – Preparing for the Next Big one



The last great earthquake in the Bay Area was the April 18, 1906 San Francisco Earthquake. These large earthquakes happen in cycles: the fault becomes locked and does not move for a period of about 150 years on average and then breaks in a catastrophic earthquake.

The San Andreas Fault has not moved since 1906 and the Hayward Fault since 1868. We are approaching the end of cycle and the probability increases every year that a large earthquake will occur.

The question is not IF the next big one will occur, but WHEN. The probability is 62% for a magnitude 6.7 or greater earthquake occurring in the Bay Area in the next 30 years.

The USGS [http://pubs.usgs.gov/gip/2005/15/] offers an excellent pamphlet on how to prepare for the next big one. Please take the time to review it and prepare.

The Association of Bay Area Governments (ABAG) [http://www.abag.ca.gov/bayarea/eqmaps/] provides shaking intensity maps with enough detail to determine how well your neighborhood will do during the next big one.

-Mark Feighner

Google Earth

Have you seen Google Earth? With this program, you have the world at your fingertips. Type in your street address and the program will zoom from space to your house. You may even be able to see your car parked in the driveway!

The program seamlessly combines air and satellite photos and allows you to zoom to any feature on the earth. The photo at right is the Solano campus from Google Earth.

The program also combines elevation data to give perspective 3-D views of the photos. To download the program, go to:

http://earth.google.com

To take a flyby tour of the Hayward Fault as it cuts through the East Bay, go to this USGS site:

http://quake.wr.usgs.gov/research/geology/hf_map/GE_helicopter.htm

Enjoy seeing our world with new eyes!

-Mark Feighner

Two New Geography Learning Community Classes

Michael Wyly and **Danielle Widemann** will be offering a Learning Communities course in Spring '07 entitled: "**English 2 and Geology 1: Earth Voices, the Earth and Our Human Experience**."

How do humans define their roles in contrast to environmental considerations? Robinson Jeffers's poetry explores the human animal as an element of the natural world. In so doing, he puts in perspective our lifetime with processes of geologic time.

Gretel Ehrlich humanizes the experience of losing our cold climate areas of the world. Edward Abbey's *Desert Solitaire* explores what exists and what has been lost in the North American desert. Our theme will include the human impacts on the Earth as far as mining, resources, water control, global warming, and other related topics.

Josh Stein and **Danielle Widemann** are also in the process of creating a Learning Communities course for Fall '07 tentatively titled: "**English 1 and Geography 1: Mother Nature in the Left Corner, Humans in the Right Corner, Where will we go from here?"**

The course's main focus will be content from the Physical Geography course with the English Composition course's topics drawn from the students' studies in the science class. The idea is to show students that scientific inquiry and the argument process have much more in common than is usually understood.

The wider goal is to give students insight into the application of their writing in a field other than English. In addition, the students will develop a deeper learning of the science through the process of writing and making arguments about physical geography.

In the Control of Nature by John McPhee, he writes about the Mississippi River and man's attempts to control and prevent the natural processes of the river. In Geography and Geology, we learn about river systems and consider the pros and cons of controlling rivers via extensive levee systems, channelization and dams. In McPhee's book, *Encounters with the Archdruid*, we will read the dialogue between David Brower (Sierra Club) and Charles Parks (Mining Geologist) while they debate the issues of open pit mining while they hike through Plummer Mountain.

In Earth Science courses, students learn basic concepts without the in-depth connection to their everyday life, the choices they make, the history of these choices, and how they will affect and determine the human condition. Literary selections will therefore focus on giving a face and a voice via the integration of the human experience.

-Article by Josh Stein, Danielle Widemann, and Michael Wyly

I sadly smiling remember
that the flower fades to
make fruit, the fruit rots to
make earth.
Out of the mother; and
through the spring
exultances, ripeness and
decadence; and home to
the mother.

-Shine, Perishing Republic
by Robinson Jeffers

Owens River, Los Angeles Diversion Water [Photo: Danielle Widemann].

"I only went out for a walk and finally concluded to stay out 'til sundown, for going out, I found, was really going in."

-John Muir

Mono Lake on the eastern side of the Sierras.

New Proposed Field Study Course

As an Earth Science Instructor, I dream of my students leaving our classroom with the quest to see the world around them with a whole new set of eyes. In the classroom, my students can only learn so much before we need to go outdoors. In the field, their appreciation and depth of understanding come to life. They return to class with more interest and more questions than ever before.

First on my plate for department courses is the creation of a one unit Field Study Course to go along with or after the Introductory Physical Geography or Geology Course.

The plan for one of the field courses consists of spending several 3-hour evening sessions working with topographic, geologic and fault maps. We would look at the area's dam placements and create questions to solve before we travel down the nearby South Fork American River. The river carves canyons providing an excellent way to see an Ophiolite Complex (cross-section of the seafloor).

A plan for a second field course includes studying the East Side of the Sierras. After many hours with maps, we would travel to Mono Lake and Rock Creek to investigate the unique ecosystem and history of the Owens River. In addition, we would also be able to map the volcanic flows of Rock Creek and determine the chronology of the flow events.

The field course location and study will change from spring to fall semesters and year-to-year depending on the conditions.

-Article and Photo by Danielle Widemann

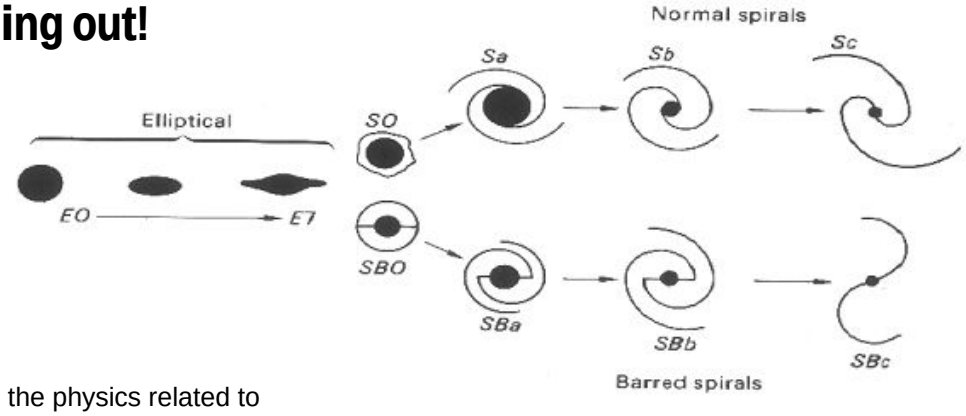
Astronomy is branching out!

New Classes in Fall '06:

Students will have the opportunity to learn more about their favorite branch of astronomy!

Astronomy 30 – The Solar System: An introductory study of solar system astronomy, the physics related to that astronomy, the planets and their moons, the sun, solar system debris, and the possibility of extraterrestrial life.

Astronomy 40 – Stars, Galaxies, and Cosmology: An introductory study of stars, galaxies, the universe, and the physics related to these topics. This includes an examination of the facts relating to the sun, stellar lifetimes, supernovae, black holes, and cosmology.



Recent additions:

Astronomy 10 – General Astronomy: New Online sections have been added. An introductory study of the universe, including the properties and evolution of galaxies, stars, pulsars, black holes, quasars, the sun, planets and life in the universe.

Astronomy 20 – Astronomy Laboratory: Students will gain familiarity with the sky, telescopes, and other astronomical equipment. They will do experiments in physics related to astronomy. Topics will cover the moon, planets, stars, galaxies, and cosmology.

-Philip Petersen

Phy-Sci Technician wins Classified Employee of the Year Award!

The entire Physical Sciences Department would like to congratulate technician **Richard Crapuchettes** for being awarded the "Classified Employee of the Year" award for 2005. This award is given each year to the non-faculty employee at SCC who makes a special contribution to the college.

As most of you know, Richard is a technician in the Physical Sciences Department, where he supports the physics, engineering, geology and astronomy staff. Richard's background is in chemistry, and he has been at SCC since 1986. Due to the fact that the Chemistry Department has often been left without a technician, Richard has frequently helped out there.

Richard grew up with a father who was a prominent engineer, and who helped him develop a very intuitive insight into all sorts of technical issues. He has a deep knowledge of all aspects of physics, chemistry and engineering, and his advice and insight has been a tremendous asset to the department. Without him, the laboratories would surely grind to a halt. Richard has the knowledge and expertise with equipment to provide the hands-on experience that community college students desperately need.

Richard continuously contributes far beyond the job description for his position. For example, he has designed his own machine to test the work-hardening of metals. Last fall, he worked all semester to develop a new astronomy lab for our school, often purchasing needed equipment out of his own pocket. Outside of work, Richard volunteers as a tutor in mathematics to high school students, where he puts his great ability to explain difficult concepts to very good use.

Last fall on Flex Day, other staff members were treated to Richard's entertaining and informative lecturing style. He gave a demonstration on the biomechanics of the human ear, and showed how sounds that are too loud can break the fine hairs in the ear, causing permanent hearing loss. To show this, he constructed an apparatus that oscillated spaghetti strands at different frequencies and amplitudes. When the amplitude becomes too large, the strands break.

The point of the demonstration was that not only are loud noises temporarily annoying, they can have permanent consequences! This is but one example of Richard's ability to build experiments that help students gain a real feeling for the importance of physical science in our lives.

So, congratulations again to Richard, and let's hope that he will be with us for another 20 years!

-Article and Photo by Melanie Lutz

2005 Classified Employee of the Year: Richard Crapuchettes.

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See more photos and information on the web!

Visit the Phy-Sci Homepage at:

http://mathsci.solano.edu/users/mfeighne/phy-sci.htm

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