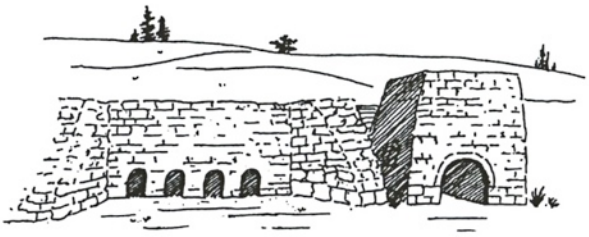

LIME KILN CHRONICLES

Newsletter of the Friends of the Cowell Lime Works Historic District
University of California, Santa Cruz

Hay Barn to be Restored!

Hay Barn framing model by Dos Osos Timberworks.

Wow! What an incredible year it has been—and we are only up to April. A couple of weeks ago the University announced a $5 million gift from the Helen and Will Webster Foundation for restoration of the historic hay barn for use by UCSC's environmental sustainability programs. We share some quotes from the announcement:

Chancellor George Blumenthal: "UC Santa Cruz is a pioneer in the fields of environmental stewardship and agroecology. This very generous gift enables us to continue to build on these programs. Even the process of rehabilitation epitomizes UCSC's focus on sustainability, environmental stewardship, and hands-on learning. I want to thank the Webster Foundation for its vision and generosity."

"The hay barn renovation is an opportunity to do several things all at once," said Daniel Press, UCSC environmental studies professor and executive director of the campus's Center for Agroecology and Sustainable Food Systems, who is overseeing the project. "It's an opportunity to honor a historic construction method and provide an attractive, well-situated welcome to the

(Continued on p. 3)

Lime's Sister Industry: Bituminous Rock

By Frank Perry

Now nearly forgotten, it was once one of this region's major industries. Bituminous rock is a naturally occurring mixture of sand and bitumen (natural asphalt) that occurs at several locations in the Santa Cruz north coast region. From the 1880s through the 1940s vast quantities of this material were excavated and used to pave streets, in much the same way that blacktop is used today. "The mining of this bituminous rock, and the transporting it to market, form one of the prominent industries of this county," said an account in 1890. "Four hundred to six hundred tons of it are mined weekly."

There are some remarkable similarities between the lime and bituminous rock industries. Both were mineral resources exploited by multiple companies, and both materials were shipped to cities up and down the West Coast, especially to San Francisco. Both lime and bitumen

(Continued on p. 4)

Bituminous rock (presumably from the Cowell mine) was used for pavement under the Cooperage.

A Model Home

Friends member Jill Perry designed this paper model of Cabin B. It can be downloaded from the Friends website with instructions, printed on sturdy paper, cut out, and assembled with glue. At the website, select “History” and then “Hands on History.”

The New Old Fence

Many thanks to Boy Scout Jonathan Chaney for rebuilding part of the fence around the cabin area. Jonathan chose this for his Eagle Scout project and worked on it over several months. The posts and rails came from trees cut down several years ago for new buildings on campus. Some of the pickets were recycled from the previous fence. Others were cut from old grape stakes donated by Ken Christopher.

District Doings

New Signs Greet Visitors

The last of the six interpretive signs were installed early this year. At last, visitors to the district will know what those “old buildings and stone things” are. We extend a special thanks to Redtree Partners L.P. for funding this project and Orin Hutchinson for installation. The signs were manufactured by the UCSC sign shop.

Spring Archaeological Excavation

Thanks to the many people who generously responded to our year-end appeal, UCSC students will get hands-on experience this Spring Quarter doing archaeology in the Historic District. The interns will learn how to lay out a grid, do excavating, and process the artifacts they discover —all under the expert guidance of archaeologist Pat Paramoure. What will they find? Check the Friends Facebook page for updates.

Lecture . . .

"Redwood, Whitewash, and Rusty Nails: The Resurrection of Cabin B"

Join Friends President Frank Perry as he takes us on a restoration odyssey. Built in the late 1800s, Cabin B was once home to some of the many workers who toiled at the nearby lime kilns. The Friends began restoration of Cabin B in 2009, eliciting assistance from UCSC students, staff, alumni, and people in the community. Frank will bring us up to date on this project and some of the long-hidden secrets revealed by the venerable structure.

The talk is hosted by the
Santa Cruz Archaeological Society.

Date: Thursday, April 18, 2013
Time: 7:30 p.m.
Location: Sesnon House, Cabrillo College
Cost: Free, public welcome

Branding Iron

The Friends thank Mr. Les Strong for making and donating this exact replica of the Davis and Jordan branding iron. The original was used in the 1850s and 1860s on what is now the UCSC campus. Mr. Strong herded cattle on the Cowell Ranch in the 1950s.

(**Barn**: from page 1)

campus, the farm, and historic district," he said. "It can become a focal point for the thousands of students who visit the farm every year."

Webster Foundation Trustee Alec Webster, a UCSC alumnus, said, "The Farm and the entire south campus complex of historic buildings is the gem of the UC system. We see it as a place for people to gather, celebrate, learn, and hope it will inspire other private donors to join the project."

Many people helped make this dream a reality. Members of the Friends can be justly proud of being among them. The Friends' educational programs (tours, events, signs), our funding for documenting the Hay Barn (with contributions from members and the National Trust for Historic Preservation), and our sponsoring of the timber-framing lecture and demonstration last Spring have generated increased appreciation for the District's heritage, both on campus and in the community.

Stay tuned as we continue on this journey together.

IRA Charitable Rollover Program Reauthorized for 2013

You may be eligible to make a special gift to the Friends of Cowell Lime Works and reduce your 2013 income taxes. Congress recently passed legislation to extend the IRA charitable rollover throughout this year. The law allows individuals who are over 70 1/2 years old or older to make gifts directly to charity. Although you are not able to receive a charitable deduction, your gift will not be taxable.

Contact Virginia Rivera, Office of Gift Planning at (831) 459-5227 or vvrivera@ucsc.edu to learn more about how you can convert your taxable IRA distribution and potentially reduce your taxes. You may also visit the Office's website (plannedgifts.ucsc.edu) for resources that can help you create your estate plan.

Frank Perry

A lovely sample of bituminous rock.

Mine or Quarry?

What is the difference between a mine and a quarry? Both are excavations from which mineral resources are extracted, but "mine" is generally used for more valuable mineral commodities such as coal, gemstones, and precious metals such as copper, gold, and silver. The word "quarry" is generally reserved for the extraction of less valuable commodities such as sand, gravel, and building stone. Historical accounts primarily use the term "mine" for our bituminous rock—testimony to its value as a resource.

(Continued from p. 1)

were used during the Spanish and Mexican periods, but large-scale exporting came later: lime beginning in the 1850s, bituminous rock in the 1880s. Like the local lime, the bituminous rock was of very high quality and promoted in advertisements as being from Santa Cruz. In the early 1900s, the City Street Improvement Company of San Francisco had "Santa Cruz Bitumen" and a picture of a steam roller on its logo.

Not surprisingly, lime-maker Henry Cowell, who had his hands in many local enterprises, also had a finger in the bitumen business. Cowell opened his mine in about 1889.

North Coast resident Tom Majors described the beginnings of the Cowell operation in a 1965 interview for the UCSC Oral History Project. "My older brother opened up the bitumen mines for Cowell." (This would have been Henry J. Majors, who was still in his teens at the time.) "Henry was a good miner; he understood the rock, you know, and handling it, blasting it out of the quarry," said Majors. He also described Cowell: "a very conservative man, and a man with few words when you done any business with him." Presumably the pavement under the Cooperage and in front of the kilns came from the Cowell mine.

An 1896 promotional book about Santa Cruz proclaimed the bituminous rock on Cowell's property "inexhaustible," and with "superior quality . . . so generally recognized that it is shipped to all parts of the Pacific Coast, and even beyond." Indeed, bituminous rock from Santa Cruz paved streets in Seattle, Tacoma, Honolulu, Salt Lake City, Phoenix, and even Chicago.

Early companies included the Consolidated Bituminous Rock Company, City Street Improvement Company, and later the Calrock Asphalt Company. The Henry Cowell Lime and Cement Company was king when it came to lime, but was one of the smaller bituminous rock producers.

There has been considerable disagreement over nomenclature. The material has been called tar sand, asphaltum, petroleum, bitumen, bituminous sand, bituminous rock, and bituminous sand-rock. Of these, bituminous rock was the term most commonly used at the height of the industry.

This odd mixture of sand and asphalt has fascinated geologists for over a century. The source rock for the hydrocarbons is uncertain, but may have been the Monterey Formation—an oil-rich unit common in the coast ranges of central and southern California. While the rock was still buried deep underground, the oil

Santa Cruz Museum of Art & History

Foreman William Majors (left, and brother of Thomas and Henry) at the City Street Improvement Company mine, 1914.

migrated into the overlying sand, known as the Santa Margarita Formation. The oil-saturated sand then intruded fractures in the overlying Santa Cruz Mudstone. Later, the lighter fractions of the oil evaporated, leaving behind the viscous bitumen, and the sand hardened into sandstone. The bitumen content of the rock ranges from 10 to 18 percent by weight.

In 1995 UCSC graduate student Brian Thompson conducted a detailed investigation into how the deposits formed. He found evidence that some of the sand was saturated with water when it intruded the mudstone and that the oil later replaced the water.

There are vertical intrusions of the bituminous rock that cut across sedimentary bedding (called dikes) and horizontal intrusions parallel to bedding (called sills) which are up to 35 feet thick. Dikes and sills are geologic terms more often applied to intrusions of molten magma. To have such features made of sandstone is unusual.

The process of mining and hauling the rock changed through the years with advances in technology. At first, most of the work was done by hand, and the rock was carted to the railroad by horse and wagon. Later, a steam tractor pulled the wagons. Trucks came after that.

It was strenuous, backbreaking work according to Domenic DeLuca, who worked at the mines in 1913-1914. The crews worked ten-hour days, using sharpened iron bars to break the boulders into smaller chunks. They then loaded the chunks into wagons. Rock for ocean shipment was packed in burlap sacks. "I felt like a prisoner working on the rock pile," he said in a 1966 interview with the late Margaret Koch. "I did not like it. I got other work as soon as I could find something."

Santa Cruzan Isaac Thurber perfected the paving process during the early 1880s, using Santa Cruz streets and walkways for practice. He received a patent on it in 1885. Following the paving of Cooper Street in November, 1883, the local newspaper proclaimed the pavement "something remarkable" and predicted that it would lead to a new and profitable local industry. Indeed, just a few years later there were three companies exporting a combined total of over 10,000 tons of the rock annually. Production peaked in 1896-1898, surpassing 40,000 tons (and over $100,000) in each of those years.

The *Santa Cruz Surf* of November 19, 1883, described the steps in applying the pavement. (Note that this type of pavement and modern day blacktop are technically called "asphaltic concrete." This article calls the material concrete.)

> The *modus operandi* of applying this material to pavements is to first cover the street or walk with broken stone in the same manner as for ordinary macadamizing, the last layer of stone being broken fine enough so that after rolling a tolerably smooth surface is obtained. It is then ready for the concrete.
>
> This is broken up with iron beetles or cut with axes into small pieces and thrown into huge caldrons containing a quantity of water about equal to the amount of concrete used. The mass is then heated and stirred with huge ladles until the lumps are all pliable. It is then immediately removed and placed on the macadam when with trowels the workmen spread it like mortar. The trowels are followed by a huge sad iron, or iron roller, which gives the concrete a smooth surface, and the work is done. For a temporary protection, a coating of fine sand is spread over the new pavement, but the hardening process is rapid. Skill and experience

Continued on p. 6.

A Crash Course in Terminology

Asphalt. A highly viscous or semisolid form of petroleum.
Asphalt (or asphaltic) concrete. The technical term for what most people call **blacktop**. The term is often avoided due to the public's principal association of the word "concrete" with Portland cement concrete. Blacktop came into widespread use in the 1920s.
Asphaltum. An archaic term for asphalt.
Bitumen. Naturally occurring asphalt. Pronounced bi-TOO-men. Note spelling: bitu**men**, but bitu**min**ous.
Bituminous coal. Coal containing bitumen (also known as soft coal).
Bituminous rock. Rock impregnated with bitumen.
Concrete. This term is usually applied to a mixture of Portland cement and aggregate (sand, gravel, or crushed rock). Technically, however, the word concrete can be used for aggregate held together by any of a number of binding agents, including asphalt (see Asphalt Concrete).
Hydrocarbons. Compounds made of hydrogen and carbon atoms strung together. Petroleum and natural gas are composed chiefly of hydrocarbons.
Macadam. A street pavement made of broken stone, sorted by size and applied in layers, with the larger pieces at the bottom. It was sometimes used as a foundation for bituminous rock pavement.
Natural asphalt. Also known as bitumen, it is asphalt that occurs naturally such as that in bituminous rock.
Petroleum asphalt. Asphalt manufactured from oil. Gasoline, kerosene, diesel oil, and lubricating oil are extracted during the refining process, leaving behind a residue of asphalt.
Tar. As used here, it is the same as asphalt. The term is also used for the black, sticky material derived from the destructive distillation of coal or plant material (ie. coal tar, pine tar).

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San Francisco Call, 1897

are required in heating; as if the concrete is subjected to too high a temperature, the cohesion is destroyed, the sand is precipitated to the bottom, and the crude oil floats to the top.

Besides streets, the pavement was also used for sidewalks and for the floors of barns, warehouses, and basements. It was also heated and molded into tiles and paving bricks.

Production and prices fluctuated over the next two decades—and took a decided dip after 1915—but not before some 614,000 tons had been removed with a value of $2,352,300. By 1930 most of the mines were idle. A few years later, however, they were reactivated by the Calrock Asphalt Company. It pulverized the rock, added additional ingredients, and pressed the mixture into tiles. Quarrying finally ground to a halt around 1949.

As a road pavement, the natural mixture of asphalt and sand could not compete with artificial mixtures of petroleum asphalt and crushed rock, whose formula could be more precisely controlled. The proliferation of automobiles in the early 1900s led to a need for well-paved roads, but bituminous rock did not hold up as well to automobile traffic as did artificial "blacktop." In what has to be one of the great coincidences of technological advancement, asphalt is a byproduct of making gasoline out of petroleum. Consequently, the industry that fueled the automobile also helped pave our highways.

In the 1950s the Husky Oil Company experimented with extracting crude oil from the rock, but this proved uneconomical. Although the bituminous rock industry has been relegated to days long past, it is more than a historical curiosity. With the advent of the controversial process known as "fracking," Santa Cruz County's hydrocarbon deposits could, conceivably, come back into the news.

Mark Hylkema, district archaeologist for California State Parks, reports that the Native Americans utilized local asphalt deposits long before the arrival of Europeans. He kindly provided the following: "As evidenced by finds at Año Nuevo State Park, naturally occurring tar nodules that washed ashore were collected and stored in abalone shells and exported to interior tribes. The shells functioned as palettes that could be heated and thus restore the hardened asphaltum into a viscous form that was useful for tasks such as:

Binding chipped stone points to shafts in preparation for wrapping with sinew threads to haft them.
Stoppers for bird bone whistles (one end of tube closed with asphaltum and a single dab used inside below the whistle aperture to make sound).
An adhesive for shell ornament inlays on ritual objects.
Binding fishing line to shell or bone hooks (tar made water resistant protection for knots).
Decorative black line texture on clapper sticks and other objects.
Adhering hopper baskets to shallow mortars for acorn pounding."

Hylkema says that the North Coast tar seeps that were later mined for pavement were also utilized by Native Americans.

The ***Lime Kiln Chronicles*** is published twice each year (April 1 and October 1) by the Friends of the Cowell Lime Works Historic District

Lime and Fingerprints

By Frank Perry

We all know lime is caustic, but just how caustic is it? A recent article in *Scientific American* sheds some light on this. According to Kasey Wertheim, who has done forensic and biometric work of the Department of Defense, people who handle lime can loose their fingerprints. "It's really basic and dissolves the layers of the skin." Needless to say, security officials get very nervous when they encounter a person with no fingerprints.

While whitewashing Cabin B, we wore gloves and tried not to get the whitewash (a dilute solution of lime and water) on our skin. But in handling and cleaning tools, I invariable got some on my hands. There was no long term effect, but I noticed that my hands felt very dry for the rest of the day.

Another clue to lime's causticity can be found on the instructions for hydrated lime (lime putty) for plastering walls. Some of these putties contain animal hair. This is the traditional method of adding tensile strength to plaster. The putty comes with a warning, however. It should be used within six months before the moist lime dissolves the hair. Yikes!

Portland cement, which includes calcined limestone as a major constituent, is also harsh to the skin. I recently spoke with a cement contractor who, as a young man, thought little of dipping his hands in wet cement. Now, he has what he calls "cement poisoning." His hands have become supersensitive to cement. If he gets cement on them, the cracks in his skin open up, and it is very painful.

Not surprisingly, archaeologists unearthed fragments of Vaseline jars during excavations at Cabin B. The lime workers probably used the petroleum product to soothe their skin and treat various topical skin maladies according to archaeologist Pat Paramoure.

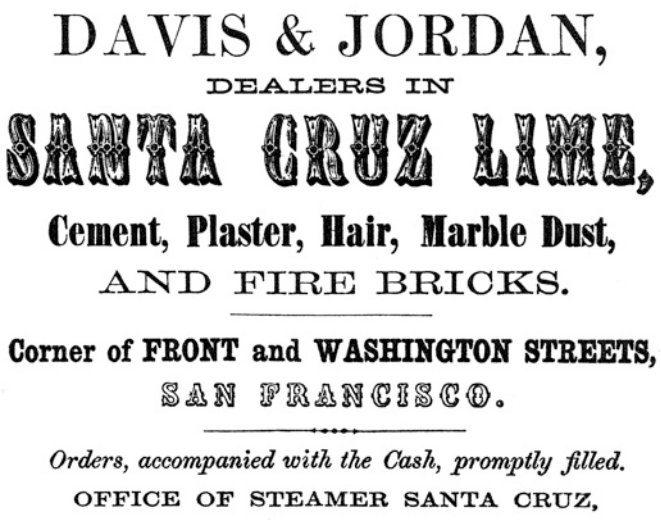
In summary, occasional brief exposure of the skin to hydrated lime, while not highly toxic, is certainly irritating. Repeated exposure is unwise, unless you plan to commit a crime and don't want to leave fingerprints. It is always better to wear gloves—both in lime and crime.

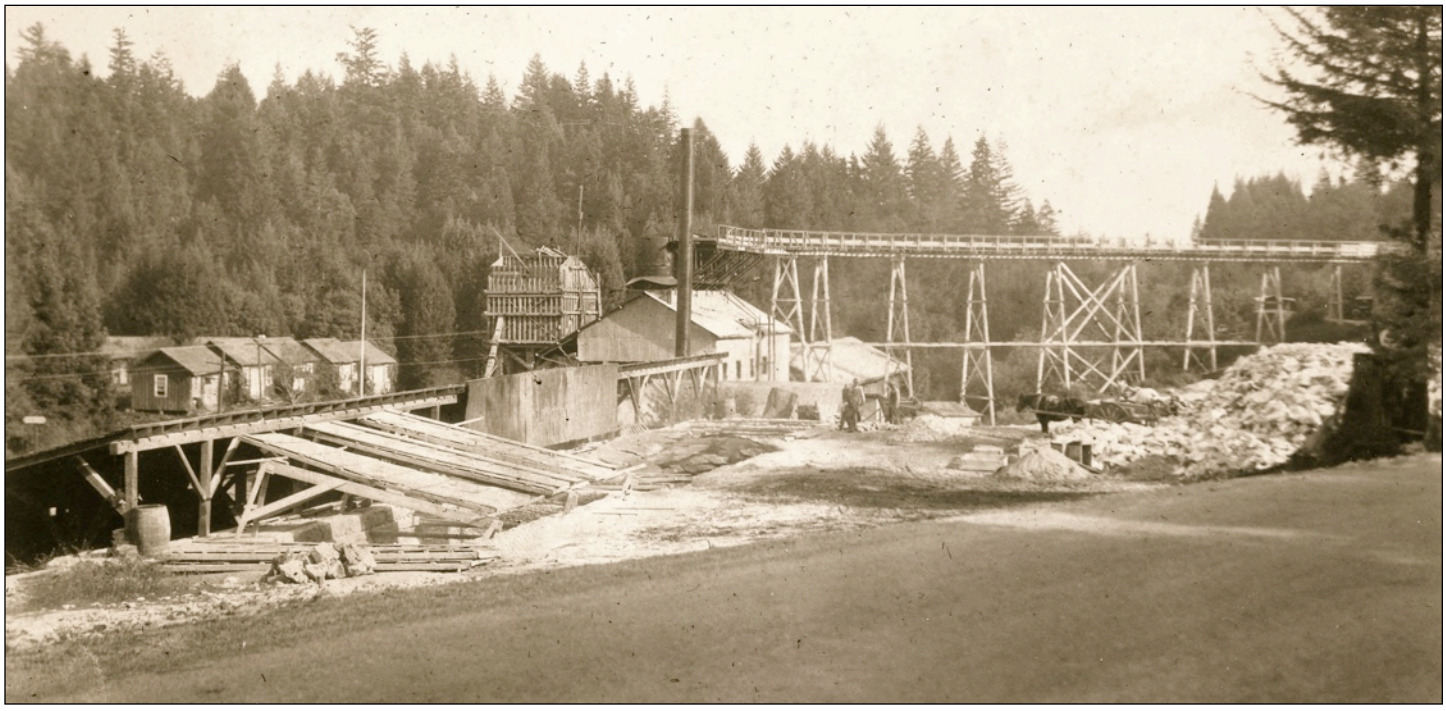
Isaac Davis Quasquicentennial

The year 2013 marks the 125th anniversary of the death of Isaac Elphinstone Davis, Henry Cowell's long-time business partner in the lime trade. Davis first teamed up with Albion P. Jordan, and the two set up a lime business here in 1853. In 1865 Henry Cowell replaced Jordan, and the firm of Davis and Jordan became Davis and Cowell. It remained so until after Davis's passing in 1888 at age sixty-four. During both partnerships, Davis ran the operations in San Francisco (warehouse and sales) while the other partner oversaw the lime manufacturing in Santa Cruz.

The *San Francisco Call* of Sept. 26, 1888, heaped praise upon the pioneer industrialist:

"In the death of Mr. Davis, San Francisco has lost one of its best citizens. He was a man of sterling integrity, courageous and irreproachable in all the relations of life, kind to everybody and especially affectionate in his family. Few men have commanded the esteem of their fellow-citizens to the extent he did. He was honored by all who knew him, and having always taken an active part in the interest of good government, his aid and counsel were sought by those who also had that interest at heart. He had been solicited to run for the office of Mayor of San Francisco, and also for Governor, but his retiring and unobtrusive disposition prompted him to decline political honors, although he was a prominent member of the Citizens' Committee and stood alongside of William T. Coleman in the days when decent and honest manhood was compelled to assert itself in this city against high-handed villainy."





Cowell's lime works at Rincon (view looking south), probably 1920s. Ernest Cowell established the Rincon plant in 1907. It was located at what is today the south boundary of Henry Cowell Redwoods State Park along Highway 9. Rock for making the lime came from the Rincon Quarry (upper quarry at UCSC). The trestle was for hauling rock to the top of the continuous kilns (center building). The tops of three pot kilns are in the foreground on the left. At the far left are the worker cabins. (Photo from the Conde / Lorenzana family collection)

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