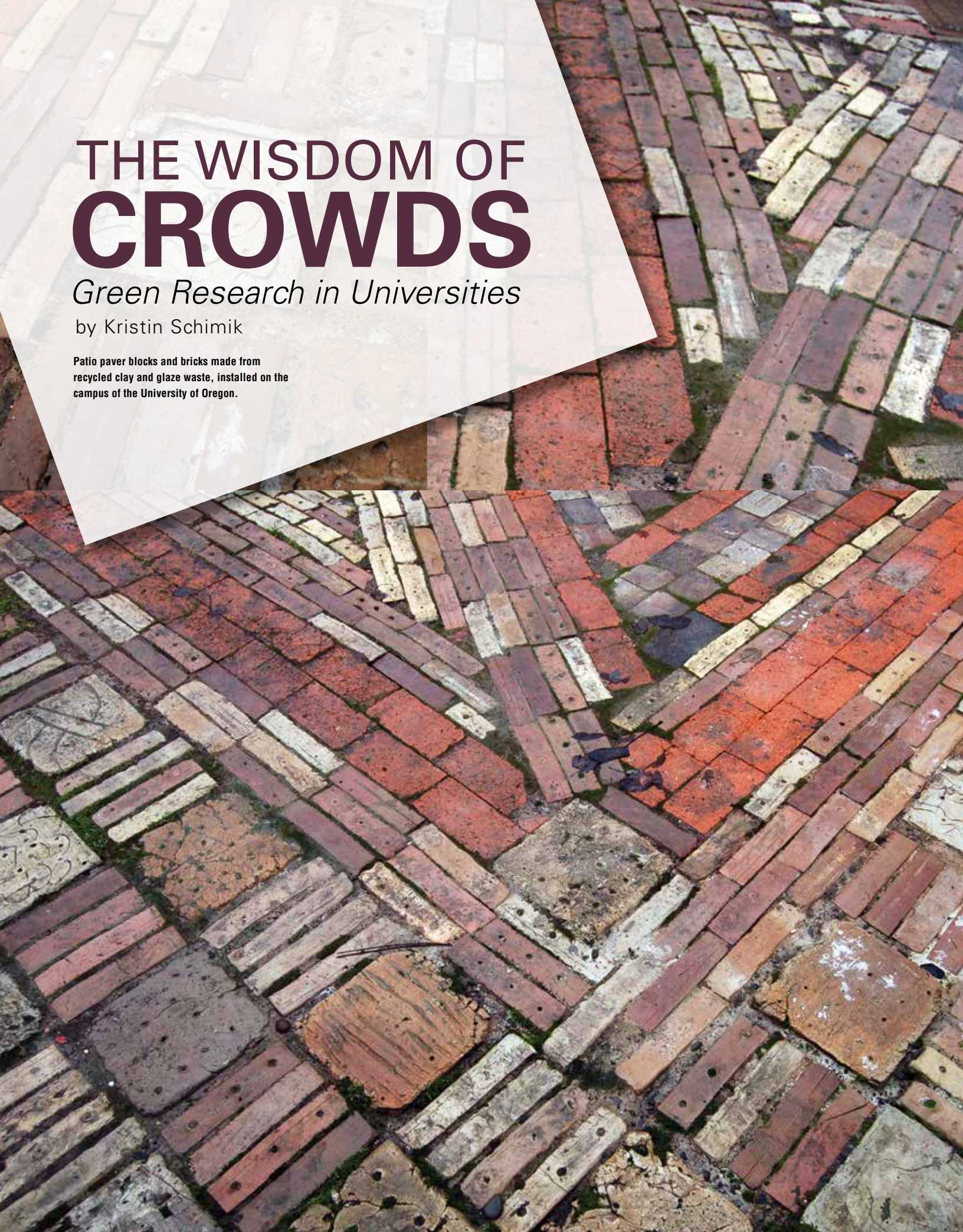
THE WISDOM OF CROWDS

Green Research in Universities

by Kristin Schimik



Patio paver blocks and bricks made from recycled clay and glaze waste, installed on the campus of the University of Oregon.

There is growing recognition of the need to align our studio practice with an awareness of environmental sustainability. Individuals and groups are already engaging with green issues in studio ceramics and are devising, enacting, and posting solutions. The National Council on Education for the Ceramic Arts (NCECA) Green Task Force has been working for the past two years towards oversight of practical stewardship at the annual conference and to assist in the overall exchange of ideas and information that minimize the global impact of our field. The discussion must involve the entire community, including the perspectives of individuals, educators, students, and manufacturers. This article takes a look at three examples of sustainable ceramic practice in university ceramic programs.

The University of Oregon

The University of Oregon (UO) in Eugene has a long history of engaging in environmentally responsible ceramic studio practice. For more than ten years, students in the ceramics department have been participating in a system set up to capture glaze waste, including heavy metal colorants, combine them with recycled clay, form this into paver blocks, and fire them to cone 1. The glaze waste recycling system grew out of dialog between faculty, staff, and community about ways to reduce the environmental impacts of the art program. The work began in the mid-1990s as a result of the efforts of Professor Sana Krusoe and then graduate student Nancy Frazier. Krusoe stated that she "learned about waste conservation from Gordon Ward, a local potter, who used one glaze, kept all his rinse water, and converted it back to glaze." Initially, glaze waste was consolidated, tested, and donated for use in area public schools. However, an excess of glaze waste remained. Faculty, staff, and graduate students at the University of Oregon had been contemplating ways to work towards reducing waste. When the task of recycling a backlog of glaze waste was given to Frazier, she began the process of making usable paver brick and recruited student volunteers to dehydrate, mix, shape, and test fire different ratios of clay to glaze waste.

There is no running water in the glaze room at the University of Oregon. Instead, the students are required to wear gloves and utilize a series of four rinse buckets, with each in the sequence cleaner than the last. There is a primary system set up to collect standard glaze materials and a secondary series of receptacles to collect the soluble glaze materials. The insoluble glaze materials are allowed to settle, and then the water is siphoned off. The resulting glaze slurry is combined with waste clay at a 1:1 ratio. The smaller quantity of

This four-bucket system at the University of Oregon is designed for capturing all glaze waste, which is then used, along with recycled clay, to make paver bricks.

Shippensburg University's drip feed system for Waste Vegetable Oil (WVO) is fed by a barrel placed several feet above the burner height to allow for a gravity feed.

The biodiesel burner and blast tube for vegetable fuel kiln at Shippensburg University (see diagram to the right).

material collected in the soluble bins is allowed to dehydrate back into salts and then it also is added to the mix. The "brick mix" is formed into perforated blocks and fired to cone 1 for use as pavers. Heavy rainfall common during winter in the Oregon valley makes the paver blocks highly desirable, and the first blocks were immediately put to use around the facility. The pavers are about 10 inches square and 2 inches thick and usually fire to a strong apricot.

Today, the blocks are donated to members of the larger community in and around the university. The students learn about the importance of environmental stewardship and generosity as part of the total curricula. Professor Krusoe's class in glaze chemistry participates in the waste reclamation process from start to finish. Often, the first objects that beginning ceramics students fire in the UO program are the paver blocks. This allows new students to quickly get involved and learn about the firing process while simultaneously recycling the glaze waste. The graduate studio technician and work-study students are also involved in processing the materials in order to maintain the efficiency of the system.

For those interested in establishing a glaze waste recycling program, Krusoe advises removing or boarding up the sink and putting up clear signage for the new recycling network. Users will adapt to the system. The ceramics department conserves all glaze waste, including mop water. Krusoe states: "We model a way of behaving around glaze materials that they can easily replicate in personal studios or introduce in a workplace. It has been valuable to us to offer an encyclopedic array of glazes and materials in an environment of rigorous safety and environmental protocols."

Humboldt State University

Since 2008, Humboldt State University (HSU) in Arcata, California, has been collecting the fired ceramic waste generated by students at the end of each semester for recycling. T.C. Comet,

the sustainability coordinator at HSU, saw the opportunity to divert masonry compatible ceramic and sculpture waste for use in general construction. Their system is set up with several 55-gallon collection barrels, themselves recycled from previous use on campus, to collect the ceramic and sculpture waste. The masonry waste is then taken to Kernen Construction, a local company that accepts concrete and masonry debris on an ongoing basis from the community. The company crushes and grinds masonry waste, including old sinks and toilets, for use in building foundations and as road aggregate. Crushing occurs whenever the debris pile grows large enough—usually two to three times each year.

Overall, the university saves money with this system, as solid waste disposal rates per ton far exceed the cost of transporting the masonry debris to the recycling site. State universities in California fall under the Integrated Waste Management Act, which requires all large state agencies to divert a minimum of 50 percent of solid waste from disposal facilities since January of 2004. Many universities in California have a sustainability coordinator to aid in making connections toward greening the campus. Strong student support for progressive environmental policy has been instrumental in meeting the mandate.

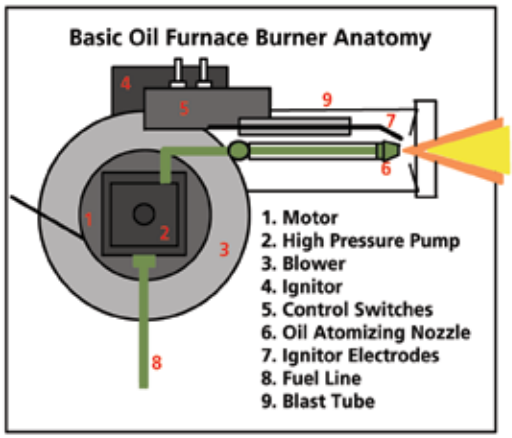
Shippensburg University

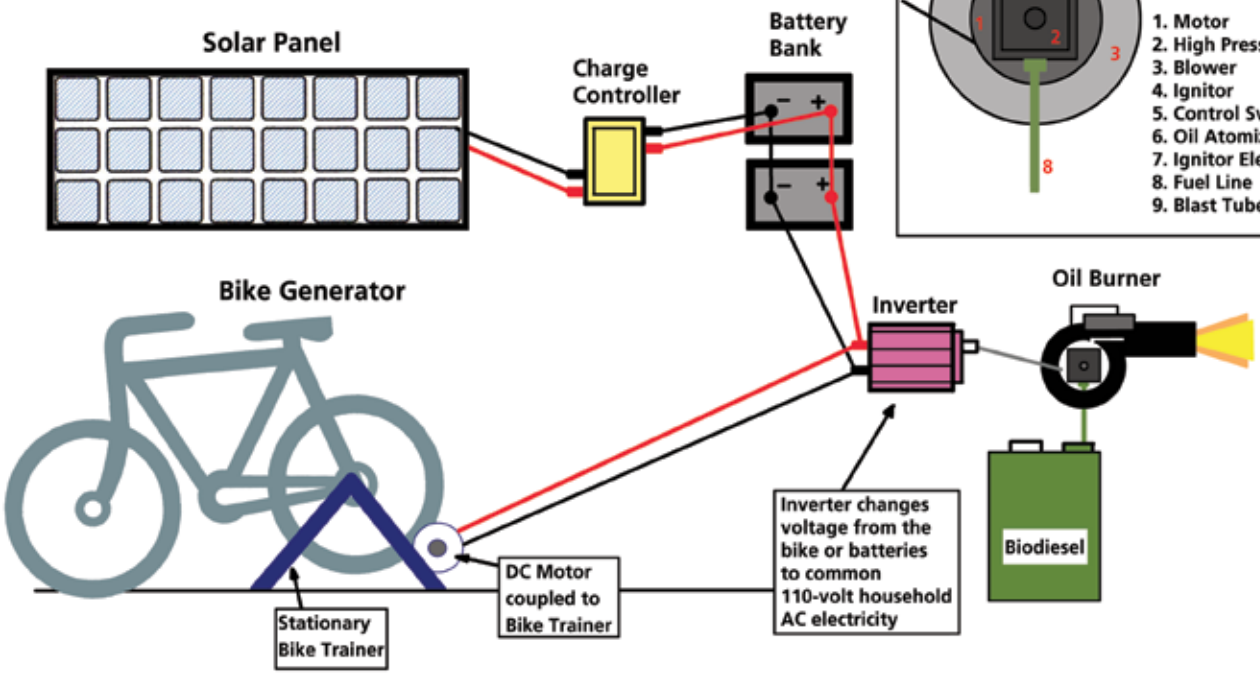
Ben Culbertson, professor at Shippensburg University in Pennsylvania, has been working to create a system that utilizes renewable fuels to fire a kiln from start to finish. After observing a wood/vegetable oil firing at the Archie Bray Foundation for the Ceramic Arts during a workshop by Allegheny Meadows and Michael Connelly in 2004, Culbertson began processing waste vegetable oil from the Shippensburg campus food service into biodiesel fuel for vehicles, home heating, and experimental firing. He received a grant in 2009 from the University Foundation at Shippensburg to continue to conduct research on burner systems for use with vegetable-oil-based fuels for kiln firing and BNZ Materials generously donated firebrick seconds to the project for kiln construction.

Currently, research and development continue in the test chamber and the 30-cubic-foot cross-chamber kiln with multi-fuel burner system built by Culbertson and his students. Vegetable oil, biodiesel, and glycerin are being tested for use as the primary fuel. The kiln was engineered to work with several different burner types. Thus far, the kiln has been successfully fired in less than eight hours to cone 10 on approximately 20 gallons of biodiesel using modified oil burners. In the next round of tests, Culbertson expects fuel require-

Alternative Electrical Sources for Vegetable Fuel Oil Burner

With the help of a few basic electrical devices and some ingenuity, Ben Culbertson and the students at Shippensburg University can use either human power or solar power to run the pump and blower for the two oil burners that fire one of their kilns.





ments will be further reduced by the utilization of a recuperative air system that was designed into the kiln in order to harvest heat around the chimney pipe for use to preheat intake air.

Additional exploration is ongoing with a drip-plate burner system and also a basic Babington burner setup that utilizes an integral combustion chamber with a source of forced air. Perhaps most inspiring is the work Culbertson is doing exploring the use of solar cells to charge a small battery bank and human bicycle power for a small DC motor to support the secondary power needs for blowers and burners, thus completely eliminating the need for grid-based power and fossil fuels. The oil burners have an oil pump, blower, and igniter that require electricity to run. For solar, a two-part system consisting of a 12-volt battery and an inverter to convert to 110-volt alternating current will allow the burners to operate. Culbertson's team has successfully tested the 12-volt battery to run the burners. Preliminary testing has begun with a bicycle-powered generator using a small Ametek DC motor, conventionally used in wind-power generation, that has been shown to produce adequate wattage and amperage to run the pumps and blowers. Two students exercising on the bikes during the maximum three hour kiln preheat period would meet all energy needs before the vegetable-oil drip-plate system, with no electricity requirements, would take over to complete the rest of the firing. Culbertson will be presenting his extensive research at the lecture entitled "Vegetable Oil Based Alternative Fuel Burner Systems" on April 2, 2010 at the NCECA conference in Philadelphia.

For students, faculty, and individuals interested in researching and developing alternative energy sources for firing, Culbertson offers this advice: "There are several phases in the process and it is often hard work. You will need people driven by purpose. While fossil fuels remain relatively cheap, all the work on alternative fuel will be rendered novel or lose its luster without the commitment that what we are doing is a sacred task. It is not hyperbole to say the earth is at stake. This purpose will help you endure the indignities of grease stained clothing and its commensurate odors."

The recuperative chimney on one of Shippensburg University's kilns reclaims heat from the exterior of the chimney and the warm air is used with the drip plate burner system to enhance fuel combustion.

University educators and students have the opportunity to work together to innovate on current policies and generate new solutions as to how we conduct ourselves in the world. The University of Oregon, Humboldt State University, and Shippensburg University provide examples through current practice of some concrete actions that we can take today in order to change our collective behavior. It is necessary at all levels of society that we continually engage in this conversation and put the best solutions to work for us.

the author *Kristin Schimik is a graduate student at the University of Florida in Gainesville, and has been serving as the NCECA Green Task Force Student Representative since 2008. At NCECA Philadelphia, she and other members of the Green Task Force will be gathering solutions and ideas from members for a future NCECA publication. Take a moment to stop by the NCECA booth at the conference to contribute your green suggestions, research, and practice for the NCECA Green Resource Guide or join the conversation online at www.ncecagtf.com.*

SUSTAINABLE CERAMIC PRACTICE

by Brian Kluge

Ceramics Monthly *and the National Council on Education for the Ceramic Arts' Green Task Force present the winner of the NCECA Green Task Force Student Writing Competition. Student members of NCECA were invited to submit entries focused on sustainable practice in the ceramic arts. Brian Kluge, a graduate student at the University of Nevada, Lincoln, received a cash prize for his entry, as well as publication of his winning entry here. Thanks to all the students who entered, and thanks to the NCECA Green Task Force for providing Brian a few bucks to buy some (local) studio supplies.*

In any study of sustainability, one is likely to come across the phrase "the triple bottom line." John Elkington named this concept in his 1994 book *Towards the Sustainable Corporation: Win-Win-Win Business Strategies for Sustainable Development*. In it, he asserts that, in addition to being fiscally sound, a sustainable business must be socially and environmentally sound. This may sound like a tall order for the studio artists who may already be struggling to run a profitable studio. However, despite the challenges associated with broadening one's measure of success, the current political, social, and economic landscape is ripe with opportunity for those committed to sustainable development.

It should not be difficult to recognize the mining of raw materials and the firing of kilns as two of the most environmentally costly aspects of making ceramics. The various raw materials commonly used in ceramics have sources that span the globe and often involve large-scale, ecologically destructive mining operations.

The local impacts of mining are subsequently compounded with the global impact of shipping the material—sometimes at distances literally halfway around the world. In this regard, efforts can be made to gather materials locally. I am reminded of the model provided by Marguerite Wildenhain at Pond Farm where she gathered what clay and glaze material was present on or near her property. The same could be done in an urban landscape by developing relationships with local construction businesses to mine clay from their excavation refuse. Additionally, as is briefly mentioned in Robin Hopper's book *The Ceramic Spectrum*, it is possible to develop glazes from locally found natural materials. Another approach is to use materials that are locally mined on a smaller scale, as I have done with my own clay body in which half of the clay comes from a nearby brick factory. Perhaps one of the easiest conservation methods is to reclaim all clay scraps and reprocess them into new clay. Mining and processing your own clay and glaze materials or finding local sources is certain to be time-consuming, but must be undertaken to some degree if ceramics is ever going to be sustainable. When this occurs, it will be a great opportunity for ceramic artists to gain increasing regional distinction in their work based on what is predominant in their locale.

Firing a kiln, another studio activity with a hefty environmental impact, is obviously an integral part of ceramics. However, steps can be taken to mitigate this impact by reducing greenhouse gas emissions and fossil fuel consumption. One simple way to conserve energy, strongly suggested by professor Pete Pinnell to his students at the University of Nebraska, Lincoln (UNL), is to dry work thoroughly with an electric fan rather than using costly kiln preheats. Another conservation method in line with the Leach/Hamada tradition, also championed at UNL by professor Gail Kendall, encourages students not to fire sub-par work, but rather to reuse the clay in a more satisfactory piece. Developing clay and glazes that favor once-firing would also significantly cut energy consumption. In using an already efficient computerized electric kiln, additional energy savings are likely possible by customizing firing schedules to the clay and glazes used in your studio. Greenhouse gases from electric kilns could be offset entirely by buying wind or solar electricity where available.

With regard to atmospheric firing, I worked in a studio that used an Olsen Fast-Fire wood kiln. While the results were not superlative by wood-firing standards, it did fire a nice cone 10 reduction. It seems plausible that a quick-firing wood kiln or a gas-assisted wood kiln could be adapted for reduction, soda, or salt firing. By using wood from the scraps generated at a lumberyard or mill (they even delivered them to the studio I worked in), waste from a renewable resource is repurposed while reducing reliance on fossil fuels. If you are fortunate enough to own wooded property or have access to a school forest, it may even be possible to harvest trees in a manner that increases the health of the forest while providing fuel for your kiln. This same forest could offset the emissions produced by firing kilns.

Perhaps because they are so glaring, it is easy to become preoccupied with the environmental impacts of making ceramics. Yet, in terms of sustainability, it is important not to overlook the social bottom line. In the words of Laury Hammel and Gun Denhart in their book *Growing Local Value*: "Growing a successful business is about meeting the needs of customers—and, by extension, the needs of an entire community. By turning your business into a good citizen and weaving it into the fabric of your community, you can help ensure your company's profitability and long-term success. A mutually beneficial relationship of this sort will give your business a competitive edge while simultaneously growing local value." This could be achieved in a variety of fashions, including—but not limited to—working in a community studio, donating work to community-based fund raisers, applying for local commissions, volunteering for career day in local schools, volunteering in art classrooms, selling work within the community, and in turn supporting other local businesses. It is through a local commitment that one is likely to develop the relationships necessary to find sources of local clay and kiln fuel in addition to reducing the environmental and economic impacts of sending work great distances.

Any change to your ceramic practice is not sustainable if it becomes economically untenable to make ceramics. A sustainable approach must include a combination of practices specific to your resources and needs, and should lead to a simultaneous enrichment of all three aspects of the triple bottom line. A shift to sustainability should be expected to take time, but opportunity abounds. Furthermore, once you start looking I'm sure you will find other artists and businesses already committed to sustainability (perhaps even in your community) whose practices may be adapted to suit your needs.