THE CHEMISTRY DEPARTMENT'S SKILLED CRAFTSMAN MAY DENY THAT HIS WORK CAN BE CALLED ART, BUT SCIENTIFIC RESEARCHERS WHO BRING HIM THEIR PROBLEMS TO SOLVE MIGHT BEG TO DIFFER.

Jim Cornell: GLASSBLOWER

By Debra Levy Martinelli

Photos by Robert Taylor

continued

Jim Cornell is no Dale Chihuly. He certainly does not claim to be anything like the internationally acclaimed contemporary glass artist. He does not even claim to be an artist. He will, however, say his vocation—scientific glassblowing—is a craft, and one that requires practice, practice and more practice.

Cornell has honed his craft as the University of Oklahoma's sole scientific glassblower over the past decade. Housed on the third floor of the chemistry annex that connects the Chemistry Building to the Physical Sciences Center, his lab looks just like you would expect: work tables covered by glass tubing of all lengths and diameters; two giant lathes in the center of the room (one operational and one down for the count); an industrial oven; a well-used sink; and various torches, including what he calls "a four-headed monster torch," clamped to surfaces around the room's perimeter.

He is a craftsman, all right. And, despite his contentions to the contrary, he is a bit of an artist as well. A tower of books on the art of glassblowing teeters precariously on the edge of his well-worn, paper-strewn desk, and shelves above hold the most whimsical of glass critters, holiday ornaments, flowers and even a wine glass or two. Like the creations of Geppetto in *Pinocchio*, some of the pieces have lost an arm or a wing or simply are works in progress.

Cornell plans to get around to fixing or finishing them someday. His projects range from the seemingly simple to the indisputably complex. His "customers" are researchers and scientists across campus whose work requires apparatus that only a glass craftsman can make.

He works almost exclusively with borosilicate, which is made of silica and boron oxide, and quartz. Both are stronger and harder to break than the so-called "soft glass," used for such everyday applications as beer bottles and decorative beads.

"A professor or grad student may come to me with an idea of what they want. Sometimes they have a diagram with dimensions. I show them what I can do, and we come up with a design," Cornell explains.

One of his best customers is Daniel Resasco, Douglas and Hilda Bourne Chair and George Lynn Cross Professor in the School of Chemical, Biological and Materials Engineering, who developed the first proven commercial method for producing single-wall carbon nanotubes.

"Our research involves high-temperature catalytic reactions, and the design of the reactors where these reactions take place is crucial to obtaining maximum performance. We constantly design and test new reactor geometries that must be constructed in materials that are thermally resistant and chemically inert. Quartz is the ideal material for this," states Resasco, who also is founder, director and chief scientist of Norman-based SouthWest NanoTechnologies Inc.

Cornell often uses a lathe to help turn and shape more complex projects. Here, he melts two pieces of glass together to form an hour-glass shaped vessel. The temperature of the liquid glass at the center will climb as high as 2900 degrees Fahrenheit.

"Only a person with Jim's skills and expertise is able to build in quartz the complicated geometries that we need. We are grateful for having Jim at OU and look forward to continue working with him and enjoying his elegant designs."

Cornell learned his trade from his predecessor, the late Ron Stermer, who was the University's glassblower for 29 years.

"I came to OU in 1991 as the stockroom supervisor in the chemistry department, and I got to know Ron well," Cornell relates. "He taught a glassblowing class, and I sat in on it one semester. I liked it but couldn't really get the hang of it at first. It took about three-quarters of the semester before my hands became trained enough to be somewhat proficient. I knew

Jim Cornell stands in his lab on the third floor of the chemistry annex. For more than a decade, OU researchers have turned to Cornell's expertise in glassblowing when they need one-of-a-kind glass vessels for use in experiments in their own laboratories.

Ron was going to retire in a couple of years and thought it would be neat to get more training and take over for him. When this was mentioned to Ron, he agreed to train me for up to two years, and we got permission to proceed from then-department chairman Glenn Dryhurst."

A typical glassblowing apprenticeship usually takes about four to six years, Cornell says. But in July 1998, after only 14 months, Stermer told him he was ready for just about anything.

Stermer was ready to retire, and Cornell was on his own.

Ten years later, he is definitely ready for just about anything, but he still practices twirling glass tubing over flames anytime he has a spare minute or two. He does most of his work by hand, rolling the glass pipe between his thumb on one side and forefinger and middle finger on the other, smoothly rotating it in the flame.

"Some people do everything on the lathe because they don't have good hand skills, while others do everything by hand because it's faster. Ron helped me develop good hand skills," Cornell explains. "You twirl the glass in the flame, and when it gets hot enough, it becomes liquid in the center—about 2250° F.—so you have to keep it in a straight line while you're twirling."

As the glass changes color from dark orange to white hot and starts to bubble, Cornell reaches for a second piece of tubing. He twirls the two, keeping them straight and even.

"It looks sort of easy right now, right? It really isn't. As the glass gets thinner, it's harder to keep in a straight line; if it gets too hot, it's harder to twirl. The hardest part is getting the hands to work like this," he says, expertly spinning, stretching and compressing to make the desired form.

And then there is the actual blowing of the glass. Removing the glass from the flame, Cornell puts one end to his lips and blows. "If you blow too hard, the glass will just pop like a bubble; if you don't blow hard enough, it collapses." Practice, practice and more practice.

He prefers to work bare-handed but wears Kevlar® sleeves when working on large pieces at the lathe, where the flame can reach 2900° C. He always wears special didymium safety glasses, which cuts out the "white light" and enables him to see the colors that tell him how hot the glass is.

Despite his heavy workload, every fall and spring semester Cornell offers the Laboratory Glassblowing course that Stermer developed.

Ben Vandaveer took the class three years ago. "I enjoyed it so much I asked if I could assist him in the lab the next semester, in exchange for some extra instruction and the use of his lab when I wanted. Jim was more than happy to accommodate and to have the help around the lab," Vandaveer reports.

Some of the artistic pieces on the shelf in Cornell's lab are the handiwork of former students. One of these days, he says, he will find the time to repair the broken ones.

Not today, though. Today, he has work orders to fill. Today, he will design something elegant yet utilitarian. Perhaps his creation will assist in a new scientific discovery. Undoubtedly it will make scientific research just a little bit easier.

Debra Levy Martinelli is director of marketing and corporate communications of SouthWest NanoTechnologies Inc. and is a freelance writer for Sooner Magazine.