
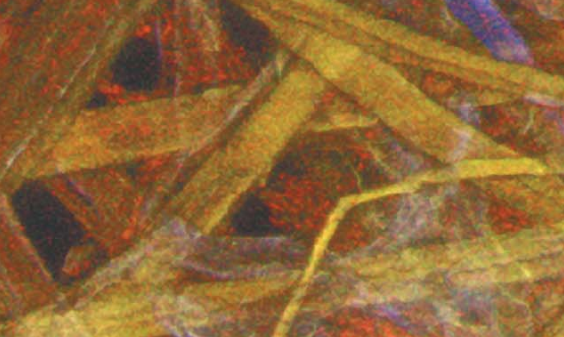


| p a p e r i n t e r i o r s |



Science can be magical, and magic can be art, says biologist Charles Kazilek. Kazilek is technical director of the W. M. Keck Bioimaging Laboratory at Arizona State University. As a scientist who also paints and sculpts, he can't resist bridging the two whenever possible. |

The comparison becomes eerily realistic for a small audience of 50 people sitting on bleachers in a darkened ASU dance studio. With 3-D glasses perched on their noses, they hunch forward like children in a 1950s movie theater, watching dancers who seem to glide and weave through otherworldly images projected on a screen. |

The images are of paper fibers, magnified thousands of times. Instead of wood pulp, the papers have been created from silk, cotton, flax, agave, yucca, cornhusks, and barrel cactus. The idea of putting them under a powerful microscope bloomed from the creative fancy of two bearded, sandal-clad teachers from divergent fields who struck up a friendship at a local camera department. |

Gene Valentine is an ASU professor of English. He frequently stopped in to buy film for his trips. Kazilek, then a fine arts undergraduate, worked as a store clerk and dreamed of traveling himself. Over the next 20 years the two kept in touch. Kazilek labored on his graduate degree in biology and eventually became a senior research professional at ASU. | Meanwhile, Valentine's love of words led him to develop a small printing business for limited edition works. He got swept up in the renaissance in paper-making, bought a paper mill and installed it on his patio. His wife, Communication Professor Kristin Valentine, couldn't object. She was busy doing sabbatical research in New Zealand. |

The English professor began experimenting with various plant fibers, scouring the desert, and haunting used clothing shops to find silk and linen.

One day he dropped off some samples of handmade silk paper for Kazilek to examine under a powerful confocal microscope. He was curious to learn what sort of atomic charges held the fibers together. Was it hydrogen bonding, as in cellulose, he wondered? What did it look like?

He was unprepared for Kazilek's reaction.

Kazilek was bowled over by the colors and shapes, the fluorescence of the fibers, and the delicate three-dimensional layers. The microscope revealed a world that invited a hand to reach inside the image. They were works of art.

"It was spectacular," says Kazilek, remembering that day a few years ago. "I could hardly wait to tell someone. I ran and called Gene at Almond Tree Press and said, 'This is phenomenal, it's so cool, you've got to come take a look.' And that started the whole thing."

The images were the genesis of the Paper Project, a series of exhibits that began on the Internet. They have since traveled to galleries at the ASU Computing Commons Gallery, the Arizona Science Center, and the University of Utah library. The magnified, enlarged slides became colorful artworks resembling abstract oil paintings. The tiny plant fibers mirrored delicate brushstrokes.

To create the images, the laser confocal microscope housed in ASU's Keck Bioimaging Lab scans successively deeper layers of the paper. A computer is used to assemble the various slices into a single image. The result is a sharp three-dimensional view all the way through the sheet of paper, and often a breathtaking composition.

Costume designers Jacqueline Benard and Galina Mihaleva saw the exhibit and took the art into the dance studio. They envisioned dancers interacting with the images, and gained the interest of choreographer Jennifer Tsukayama, along with Kazilek and Valentine. Funded with a grant from ASU's Institute for Studies in the Art, the four teamed with a group of talented artists and technologists from the Institute. Together, they created Paper Interiors, a "dance exploration of real and virtual dimensions" as part of the Southwest Region American College Dance Festival at ASU.

To incorporate the images into the dance piece on a large scale, a set of five computers is used to project them onto an 11-by-20 foot screen made of nylon and spandex. Dancers seem to interact with a virtual maze of fibers. They wear nylon and spandex costumes printed with the same fiber images. When viewed through 3-D glasses, the effect is striking.

"As a scientist, I didn't think I'd be sitting in a dance studio twice a week," says Kazilek at a rehearsal, blinking his eyes as he removes the glasses. "It's nice to have the human forms come in and interact with the images. It becomes completely heightened and changed, like an IMAX effect."

"Gene and I look at each other and are amazed at all the directions this project has traveled. It reaffirms my feeling

that science and art are so kindred, they will percolate in all directions if given half a chance."

Valentine's fascination with paper includes the history of the material, from the Egyptian sheets of papyrus, to the macerated fibers of hemp, bark, and fishnets the ancient Chinese used as a writing surface. During the 15th Century the printing of the Gutenberg Bible led to an insatiable demand for paper, hence the itinerant ragman.

When not involved in teaching linguistics, composition, and book history at ASU, Valentine becomes a ragman himself. He routinely sorts through the 25-cent rag barrel at Gracie's Cottage, a Tempe second-hand shop. Selecting by color, he gathers materials, boils them in lye, and feeds them into a four-foot-high paper mill that beats away loudly on his back patio. His wife has overcome her initial objections, patiently enduring the racket along with the neighbors.

Once he watched as a truck backed over some barrel cactuses on the Gila River Indian reservation. The resourceful professor asked for permission to take the destroyed plants home. He put them in a container to rot and reduced them further with lye before turning them into pulp in the mill. The resulting paper looks like a nest of slinky toys under the microscope, the fibers curling on themselves.

"I am fascinated by paper, what we can make it out of, what it can look like, and how we can use it," says Valentine. "We've returned to handmade papers for special uses like invitations, scrapbooks, and specialty books. Society is retreating from the commercial."

"The more I know about the interior structures of the papers I'm making, the more I like what comes out when I print on it."

Kazilek gets a kick out of seeing people interact with the slides at an exhibit. They reach out their hands to touch 3-D surfaces that are actually several feet away. They move their heads from side to side, closing one eye and then the other to see what drops away.

"These images engage people, young and old," says Kazilek. "From an artist's point of view, it's wonderful."

"Artists and scientists are very similar in their personalities and in the way they work. Science isn't boring; if it were, most of us wouldn't be doing it," he adds. "You have to be very creative in science. Both artists and scientists use creative methods and techniques to reach their goals. Only the product is different."

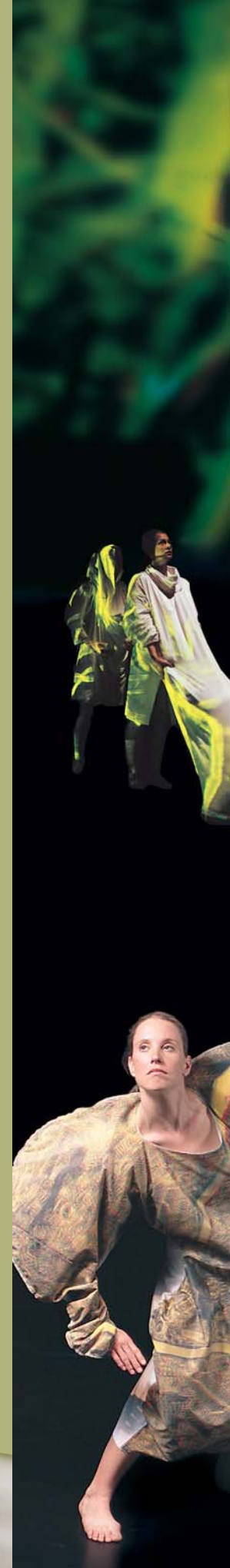
"At ASU I have the luxury of doing both. I get to spend time in the sciences, studying in areas that most people never get to see. I also get to create things of beauty. Discovery is part of magic."

FOR MORE INFORMATION, VISIT THE PAPER PROJECT'S INTERNET SITE AT

<http://lsvl.la.asu.edu/paperproject/>

CONTACT CHARLES KAZILEK AT THE DEPARTMENT OF BIOLOGY, 480.965.1710.

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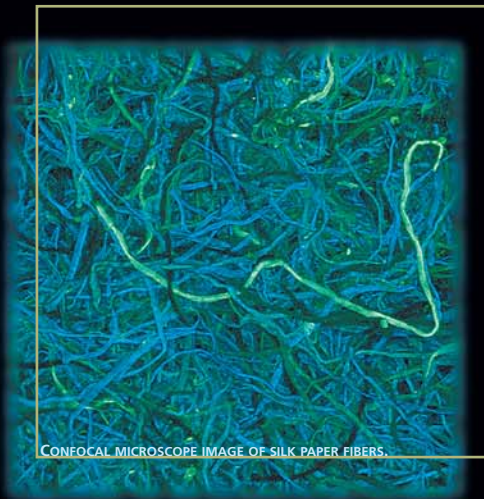


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“It started with a simple scientific question: is paper made from silk held together the same way as paper made from plant cellulose fiber?”



CONFOCAL MICROSCOPE IMAGE OF SILK PAPER FIBERS.

[c o s t u m e]

[p r o d u c t i o n]



Gene Valentine demonstrates papermaking. He separates fibers with a device called a “beater.” The slurry is checked for an even, milky translucence.



The pulp is dipped and settled onto a fine mesh screen.



The wet pulp clings together in a flat mat.



The mats are rolled onto wool or synthetic felts.



The stack of felt and pulp is squeezed in a hydraulic press. Sometimes several pressings alternate with drying periods.



DANCER AUTUM HORROCKS, CHOREOGRAPHER JENNIFER TSUKAYAMA, MICROSCOPIST CHARLES KAZILEK

PHOTOGRAPHS BY CHARLES KAZILEK, MICHAEL HAGELBERG, JOHN C. PHILLIPS, TIM TRUMBLE

