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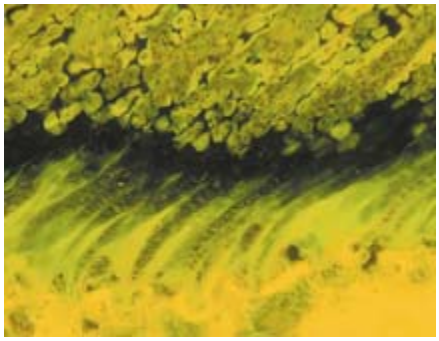
Nature's Miniatures

Gary Greenberg's microscopic photography exposes the art of science

by Stu Dawrs

Anyone who thinks science is solely the realm of cold, unfeeling rationalists has obviously never met Gary Greenberg. A biologist, inventor, filmmaker and photographer, Greenberg has devoted much of his adult life to watching events unfold on the cellular level. That is, he spends his time looking through microscopes—and the way he describes what he sees goes far beyond the stereotype of dry techno-speak.



Cartilage

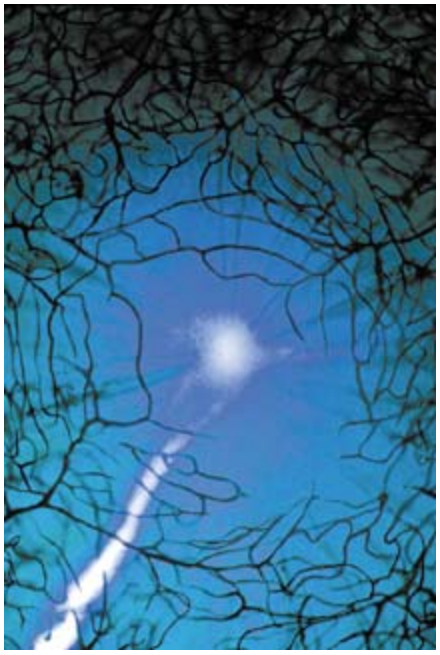
"I'm always looking at the micro-world, and it's just so incredible," says the fifty-nine-year-old Los Angeles native. "It's the only place in the universe where reality is truly abstract ... a great place for art."

It's this micro-world that Greenberg has been documenting through his own art for more than twenty-five years. Using a 35mm camera attached to a three-dimensional microscope—a microscope that, by the way, he invented—he has photographed everything from the nerve cells of a lowly leech to those of a human cerebellum. Watching as he flips rapidly through a portfolio of his work, one begins to understand why he often describes himself as a landscape artist: The images he creates, some magnified as much as 800 times and printed at sizes up to several feet across, often have the feel of large-scale panoramas shot in some sort of parallel universe—a place that is both recognizable and, well ... out of this world.

For instance, there's the electric-blue photo he calls "Breath of Life": What looks like a river winding its way through some sort of lunar estuary is in reality a capillary in a human lung—the point, he explains, where oxygen is transferred from the air into the bloodstream, where the external becomes internal. "Is that cool, or what?" he says, eyes shining.

Turning the page, he points to a rush of yellows and greens that could be a soft-focus summer landscape—in fact, it's a minute bit of cartilage from a knee. (The

vivid colors, it turns out, are from dyes used to make otherwise invisible elements appear. Greenberg also sometimes manipulates the colors—but not the shapes themselves—with the computer program Photoshop.)



Portal of Perception

As he moves from image to image, his commentary is a mix of medical knowledge and pure, simple wonder. Pausing over an image titled "Portal of Perception"—a human retina that looks somehow floral, a bit like a dandelion held up to the sun—he marvels at how far light has to travel into the eye before we actually “see” it. Looking over a series of magnified diatoms—sea organisms so small they’re almost beyond the visual range of conventional light microscopes—he breaks into a broad grin.

“Look at this one: It’s like a perfectly formed geodesic dome ... except that about 500 million years before Buckminster Fuller got the idea, evolution got the idea.”

As fascinating as Greenberg’s photos are, they face some tough competition from the story of his life. At twenty, looking to “get as far away from Los Angeles as possible and still speak English,” he left home for Australia. He lived in Melbourne for more than a year, teaching math and science at a technical school. Upon returning, he enrolled at UCLA, where he finished his studies with an undergraduate degree in psychology and a minor in art.

“So before I was a scientist I was an artist,” he chuckles. “And I used way more of the art than the psychology.”

For the next twelve years, he worked as a filmmaker and photographer. Then, in 1975, a biologist he knew asked for help in making time-lapse films of cells. “I had always been interested in science, but at that point I was in my mid-thirties, and I thought it would never happen,” he says. “But here I was looking through a microscope and seeing these truly incredible things.” Two years later, he began his formal study of biology, and in 1981 he earned a Ph.D. in anatomy and developmental biology from the University of London. And so began his second career, as a biomedical researcher at the University of Southern California.

Which is not to say he set aside his first career altogether. “When I was a graduate student in London, I was hired by the film director Richard Donner to work on special effects for the first *Superman* movie,” Greenberg recalls. “I made movies of human pancreatic cancer cells and made it look like the audience was

orbiting the surface of the planet Krypton. Those were the days before computerized special effects. ..."

It was during his time at USC that he began tinkering with the first of several three-dimensional microscopes he has invented, working on a process that allowed light to be shot in at an angle rather than from straight-on. While the end result would lend itself well to creating dramatic photographs (because lighting from the side restores the depth-of-field and contrast that is otherwise lost with traditional microscopes), the real impetus was to aid in research and potentially save lives. And well it may: One recently published study showed that Greenberg's microscopes can reduce the number of "false negative" results in pap smears, which in turn could aid in the early diagnosis of cervical cancer and potentially save the lives of thousands of women each year.

About a decade ago, Greenberg made career change number three, giving up teaching to found Edge 3-D, a full-service company that not only sells his microscopes but also offers a variety of consulting and three-dimensional imaging services. These days, he mostly travels to universities to lecture on his microscopes' applications, as well as doing occasional collaborative research and, of course, working on his photography.

But does he ever have trouble reconciling the scientist with the artist? On the contrary: "My passion is combining the science with the art," he says. "And, really, science and art are very similar: They're both explorations of nature, it's just that science is meant to be more objective and artists tend to be more subjective."

A few years back, Greenberg received a small gift from his brother David, who lives in Maui's Hana district: A 35mm film canister full of sand. It took several months before he got around to looking at a bit of it under a microscope, but when he did he was amazed at what he saw.

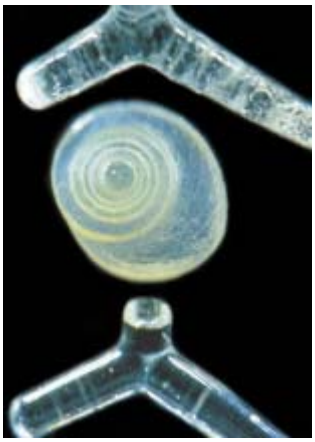
Maui Sand Grains

"When we walk on the beach, we're walking on millions of years of biological and geological history," he enthuses. "In Hawaii, there's this treasure we're all walking on, and Maui, in particular, contains some of the most beautiful and varied sand grains in the world."

Returning to his portfolio, Greenberg flips through dozens of images he has made over the course of the last two years: Bits of coral; the smallest piece of a sea urchin spine; microscopic, perfectly formed shells. ... Again, there is that irrepressible, boyish wonder: "The microshells don't get broken up by the surf, because they're just too small. Imagine how old that one might be!"

The production of these images requires a perfect melding of artistic vision and the patient, steady hands of a skilled researcher. While every sand grain is unique, Greenberg estimates that maybe one in 500 is “spectacular” enough to spend the time photographing, an incredibly labor-intensive process that can take several weeks.

“I have to use really small grains because of depth-of-field problems,” he explains. “Any of the larger grains lose focus. Then sometimes dust falls, and the dust is bigger than the sand grain itself—you have to have a lot of patience.”



While he continues to work his way through Maui’s beaches, Greenberg is also juggling a number of other projects, including working with the Public Broadcasting Service to write a series of documentaries he hopes to produce on the micro-world, along with actor Stacy Keach, who has signed on as the narrator and co-producer.

In the end though, the sand images go a long way to explaining what motivates Greenberg to keep making these complex, time-consuming prints. “Sand is so ubiquitous, I wanted to use it to show people the beauty that is right beneath their feet,” he says, the hint of wonder again creeping into his voice. “I just want to turn people on to how beautiful the world is.”

Gary Greenberg’s micrographic images can be seen in person at the Maui Ocean Center, or on the Internet at sandgrains.com.