

are needed to cut down on per capita light pollution. That would allow for many years of population growth on the island while still preserving the dark night sky for astronomy.”

Ordinances are one thing, enforcing them is another. “It’s like keeping Jell-O down; stuff pops up all over,” says Crawford. In southern Arizona, for example, where astronomy brings hundreds of millions of dollars into the state annually and the skies are widely considered a natural resource and tourist attraction, the billboard indus-

try has for years fought to win exemptions from local outdoor lighting codes.

“The gutting of lighting codes could be devastating,” says Buell Jannuzi, deputy director of Kitt Peak National Observatory near Tucson. “It’s a never-ending education effort to explain to people why it’s important to regulate lighting. Most people understand that light going up into the sky is not making you more safe.” And by not sending light up, he adds, “you save energy and money in the long run. The irony is that it’s a win-win situation.”

Indeed, a few years ago, IDA estimated that the US was spending \$1–2 billion annually on wasted light. In Chile, new shielded fixtures will save the town of Monte Patria about \$1.3 million over a decade, Smith says. By shielding, “you can usually end up with about the same amount of light on the ground for about half the cost,” adds Bill Wren, a dark skies consultant. “In another energy crisis or two, the light pollution problem could solve itself.”

Toni Feder

Creationist Wave Hits *Volcanoes of the Deep Sea*

With science museums finding an increasingly important source of revenue in their IMAX theaters, some museums are yielding to anti-evolution sentiment and not showing controversial films.

Stephen Low isn’t sure which line of dialog in his award-winning 2003 IMAX film *Volcanoes of the Deep Sea* raised the ire of creationists. Maybe it was the one about soft-bodied creatures that were in the seas “hundreds of millions or even a billion years ago.” Or perhaps it was the description of a deep-sea thermal vent as a place that “had seen a billion years of darkness, yet there was no night.”

Low suspects it was the statement that the microscopic hyper-thermophiles living in the hellishly hot, poisonous thermal vents have the same “universal alphabet” in their DNA as humans. “We are most certainly related,” the film’s narrator says. “There is a good chance that this is where life began on Earth, and here . . . is where we began our journey five billion years ago.”

“That’s just solid science, not controversial, but [creationists] didn’t like that either,” Low says. “Anytime you touch on science, it contradicts the Bible.”

Low, a Canadian filmmaker, became the focus of a battle between science and creationism earlier this year when the Fort Worth Museum of Science and History in Texas decided not to show his film after the museum’s marketing director said several members of a test audience called the film “blasphemous” and objected to its “presentation of human existence.” The *New York Times* reported that several IMAX theaters associated with science centers in the South would not run the film for religious reasons, although it isn’t clear how many theaters or which ones.

“We don’t know because [the reports] are anecdotal,” Low said. “We’ve had, I think, about 10 or 15 that didn’t take it because of [religious

objections], but it is hard to know for sure.” Many IMAX theaters are commercial facilities not connected to science centers or museums, but 54 of the large-format theaters in the US are regarded as “institutional or cultural” theaters that typically show science films.

The decision by the Fort Worth museum not to run Low’s film triggered strong objections from the local community in the form of letters, phone calls, and e-mails, and in late March the museum finally booked the film for a month-long showing, with a longer run scheduled for the fall. In Charlotte, North Carolina, officials at the Discovery Place IMAX theater who rejected the film when it first became available two years ago reversed their decision after the *Charlotte Observer* newspa-

per reported that evolution had played a role in the film’s not being shown. Discovery Place’s president John Mackay Jr said the film was rejected primarily because it might scare children. The film was shown three times on a single day in April at the Discovery Place IMAX. Low introduced one of the screenings.

Low says he has heard the scared children excuse before. “Sometimes they say that the science is too much for the children,” he said, “but that is only said in the South. No one says that anywhere else. Is that coincidence? Who knows?”

But Mike Day, executive producer at the Science Museum of Minnesota’s IMAX theater, said that in more than 20 years of making and distributing such IMAX films as *Genesis*, *Darwin on the Galapagos*, and *Jane Goodall’s Wild Chimpanzees*, he has never faced significant objections from creationists or religious conservatives. He adds, “I think this is a bit of a tempest in a



STEPHEN LOW PRODUCTIONS

This antler-shaped formation from the film *Volcanoes of the Deep Sea* was nicknamed “Moose” after it was discovered at a thermal vent about 3.5 km deep in the Atlantic Ocean. The structure’s appendages may serve as nurseries for juvenile shrimp. Scientific speculation that life on Earth could have begun at such deep vents offends creationists.

Scientists Boycott Kansas Antievolution Hearings

While the US science community has been concerned about antievolution pressure on some science museums around the country, there was even greater concern recently about a potential reprise in Kansas of the Scopes "monkey trial" of 80 years ago (see PHYSICS TODAY, April 2001, page 32). In January religious conservatives took control of the Kansas State Board of Education and organized several days of hearings intended to pit the theory of evolution against intelligent design. The science community, led by Kansas Citizens for Science and the American Association for the Advancement of Science, organized a boycott of the hearings on the grounds that evolution isn't debatable. In a letter to George Griffith, the board of education's scientific consultant, AAAS CEO Alan Leshner wrote, "The fundamental structure of the hearing suggests that the theory of evolution may be debated. It implies that scientific conclusions are based on expert opinion rather than on data. The concept of evolution is well-supported by extensive evidence and accepted by virtually every scientist." As PHYSICS TODAY went to press, the hearings, described as "political theater" by Leshner, were under way with more than a score of antievolution experts expressing their views. Connie Morris, one of the education board members who organized the hearings, said she was "profoundly disappointed" that the scientists declined to participate.

Jim Dawson

teapot." Day, who is a friend of Low's, hasn't purchased *Volcanoes* for his theater because he said it is a film of limited appeal and difficult to market.

Both Day and Low note that the marketing potential of IMAX films is increasingly important for science museums struggling with budget constraints. Low worries about what he calls the "beach-boy science" aspect of new IMAX films. Marketers want appealing young people in the films, not the "couple of old guy scientists" that star in his *Volcanoes* film, he said. "The box office for IMAX has become so important. Science museums clean their toilets and floors and run their institutions with this money."

Lawrence Krauss, chair of the physics department at Case Western Reserve University in Cleveland,

Ohio, doesn't object to the entertainment and marketing aspect of science but is concerned that some museum officials let it undermine their educational mission. Krauss, who has served on the boards of two science museums and written the mass-market book *The Physics of Star Trek* (HarperCollins, 1995), said that the people who object to films such as *Volcanoes* "are really fighting against science. It's not just evolution. Evolution is there, but the Big Bang and age of the Earth is right behind it. They don't want to have people informed in any way that can challenge their belief systems."

"Showing [*Volcanoes*] isn't going to change anybody's mind," Krauss said. "But not showing it is bad. It is censorship."

Jim Dawson

Infrared Illuminates Ancient Scrolls

And the helmets are shaking their purple-dyed crests, and for the wearers of breast-plates the weavers are striking up the wise shuttle's songs, that wakes up those who are asleep.

—Oxford University's translation of part of *Epigoni* by Sophocles.

Despite the thriving trade in manuscripts that occurred throughout the Greek and Roman empires, many plays, poems, and philosophical musings by writers such as Aeschylus, Euripides, Aristophanes, and Sophocles have been lost. Now, a collaboration between Oxford University and Brigham Young University (BYU) in Provo, Utah, is revolutionizing paleography by rescuing words and images from charred and battered fragments of ancient scrolls.

Paleologists have been experimenting since the 1930s with IR pho-

tographs to decipher old paintings and texts. But success with manuscripts was elusive until 1994, when Greg Bearman, a physicist at NASA's Jet Propulsion Laboratory and an amateur history buff, hit upon the idea of using a space satellite technique called multispectral imaging. Bearman used MSI, in which photographs are taken at different wavelengths, on a badly degraded fragment of the Dead Sea Scrolls. The nearly invisible text showed up clearly at a wavelength of 900 nm. "We were surprised at how easy it was when we got the results," says Bearman.

After hearing of Bearman's research, BYU's Institute for the Study and Preservation of Ancient Religious Texts commissioned Gene Ware, a professor of engineering who was already building a multispectral imager to study ancient murals, to try MSI on

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