

One Stone: A Traditional Play on Einstein

“Truly, truly, as the Hermit Isseki said, time is slow for one who flies with the light, but it is fast for him who rests.” Isseki is Japanese for “one stone,” and the Hermit Isseki is, of course, Einstein in the Noh play in which these words are spoken by a messenger.

The *Hermit Isseki* is a new play written by immunologist Tomio Tada in the centuries-old Noh style of music and poetic drama. A group of physical societies commissioned a performance of the play this past summer in Tokyo, and, with a pre-show discussion panel and some corrections to the physics, made it into a World Year of Physics (WYP) event.

In the play a wise woman wanders across deserts and seas, over mountains, and through forests in search of Isseki and answers about the universe. As the drama unfolds, allusions are made to art and science of the East and West. Relativity, the warping of spacetime, the twin paradox, energy and mass, the Big Bang, the birth and death of stars, and the end of the world are among the scientific references that are woven into the play. (An English translation of *Hermit Isseki* is available at <http://www.physicstoday.org>.)

Toward the end of the play, Isseki warns against nuclear bombs. “Behold the power of the nucleus!” he says. “May this atomic power ne’er be used, for war, strife, or destruction.”

Hermit Isseki played to a packed house of 900 theatergoers. That’s almost double the usual attendance for a Noh play, says Kazuo Kitahara, chair of Japan’s WYP steering committee. To help the audience follow the play’s symbolism, Kitahara, along with another scientist, a seasoned Noh performer, and Japan’s representative to Pugwash, the international scientific organization dedicated to reducing armed conflict, made presentations beforehand. The play “was a great occasion,” says Kitahara. “It’s the 50th anniversary of Einstein’s passing, and the 60th anniversary of dropping atomic bombs on Nagasaki and Hiroshima.”

Among the other WYP events in Japan was a national physics competition for teenagers. That was just one in a flurry of firsts, Kitahara says, noting that the WYP kick-off in Paris last January marked the first time Japan had sent college students to an international scientific meeting, and that Japanese



Hermit Isseki (top), representing Einstein in a Japanese play, explains cosmological theories. In another scene (bottom), two nucleons dance vigorously, symbolizing nuclear fission. (Images courtesy of the Japan Committee on the World Year of Physics.)



high-school students will participate for the first time in the International Physics Olympiad next year in Singapore.

Hermit Isseki and other WYP events attracted interest in physics, Kitahara says. “The Noh contains thoughts of Einstein, peace, relativity, nuclear fission, nuclear power. These contents draw attention. I hope the general public feels familiar with the play and with Einstein.” A performance of the play is planned for next June at the United Nations headquarters in New York.

Toni Feder

US Ground-Based Telescopes Under the Microscope

NSF is conducting its first examination of spending across all wavelengths in ground-based astronomy. The so-called senior review aims to cut spending by \$30 million a year on existing facilities to bolster current top priorities and start paying for future ones.

A committee will “advise us on the balance of programs, and in particular how we might rebalance to make faster progress on new facilities without losing strength at existing ones,” says NSF astronomy division head Wayne Van Citters. He expects the committee to consider financial data and scientific justification from the optical-infrared, solar, and radio astronomy observatories, NSF schemes for cutting spending, various reviews, and input from the astronomy community. Chaired by Roger Blandford,

director of the Kavli Institute for Particle Astrophysics and Cosmology at Stanford University, the committee begins meeting this month and is supposed to give NSF its recommendations next spring. (For more information, including a schedule of town meetings, see http://www.nsf.gov/mps/ast/ast_senior_review.jsp.)

The NSF astronomy budget is about \$195 million. “Everything is under the gun,” Van Citters says, except the roughly \$30 million a year in grants to individual investigators. Adds Blandford, “It will be painful for all concerned. You are not looking at fat. You are looking at a choice between the very good and the excellent, and you have to sacrifice some of the very good to have a chance to fulfill some of the dreams spelled out in the [2000 astronomy and astro-

physics] decadal survey.”

Those dreams include an optical-infrared Giant Segmented Mirror Telescope (GSMT) and a large-aperture synoptic survey telescope—with two projects competing for each. Among the other priorities in the decadal survey are the Telescope System Instrumentation Program, the Advanced Technology Solar Telescope, an upgrade to the Very Large Array in New Mexico, operating the Atacama Large Millimeter Array, and studies of dark energy and the polarized cosmic microwave background. The total tab dwarfs what could be done with \$30 million a year. “We know we have tremendously exciting science,” says Van Citters. “If we have scrubbed our program as hard as we can, we will end up with a stronger case for getting future support.”

The senior review “is the right thing to do,” says Indiana University astronomer Caty Pilachowski. “The decadal survey outlined an extremely ambitious and expensive plan. At the time, we didn’t have these huge



A scramble to find money for the US share of operating the Atacama Large Millimeter Array is a motivating factor for a senior review. Under construction in Chile, ALMA will consist of more than four dozen antennas like this prototype.

fit the funding profile.”

Forming partnerships with industry, universities, and foreign countries and converting general instruments to single-purpose use

national commitments—terrorism, the Iraq war, Hurricane Katrina. We need to know what is practical and what is not.”

But broad support for the review doesn't mean astronomers aren't nervous about it. The leaders of the optical, solar, and radio observatories say their organizations are threadbare, and that despite flat budgets, they are already investing in future facilities. “It's a very delicate exercise,” says Fred Lo, director of the National Radio Astronomy Observatory. “If the budget is constant or decreasing, you have to be careful not to damage the current program, since there is no guarantee the new projects will

are among the ideas for lowering NSF's costs while keeping telescopes running. Delaying or canceling new facilities is also possible—though the committee won't be asked how to apply any savings it achieves.

“If we can't find the free energy we need, we are in trouble,” says John Huchra, vice provost for research at Harvard University and a member of the committee. “If there is no national contribution or effort as part of these new major projects—if, for example, US astronomers don't contribute to the GSMT—it would be very sad for the country. We could lose the edge we have in astronomy and astrophysics.”

Toni Feder

TV Series Raises Profile of Science

In the CBS television series *Numb3rs*, science is getting a better rap than the usual “mad scientist” so often portrayed on screen. Television shows such as *CSI* and movies such as *A Beautiful Mind* have been about scientists, but *Numb3rs* is unusual in the steps the producers have taken to make sure the science is right.

The series, about a mathematician who helps his FBI-agent brother solve crimes, has proven to be an unexpected hit. Produced by the husband-wife team Nick Falacci and Cheryl Heuton, *Numb3rs* has just started a 24-episode second season after first being broadcast as a 13-episode mid-season replacement earlier this year.

Falacci and Heuton, both avid readers of popular science books, had been trying to do a series on scientists for years. “Mathematicians and physicists have such an interesting way of looking at the world, and we wanted to deal with that in a narrative structure,” Heuton says. “But with today's commercial TV, you most likely need to

hook [a series] around crime.” The unlikely hero of *Numb3rs* is Charlie Eppes (played by David Krumholtz), a mathematician based at “CalSci,” a fictionalized Caltech. The character is loosely based on physicist Richard Feynman. In one episode, Eppes uses equations to plot the probable address of a serial rapist. In another, he shows how probability and statistics can reveal the source of a Spanish flu outbreak.

Eppes is helped in his crime solving by astrophysicist Larry Fleinhardt (Peter MacNicol), a character based on several Caltech astrophysicists. “Larry's office wasn't seen in the first season as we didn't have the budget or a good location. . . . This time around he will be seen more often,” says Heuton. Another link to physics is provided by actor Judd Hirsch, who plays Alan Eppes, Charlie's father; in real life Hirsch holds a bachelor's degree in physics.

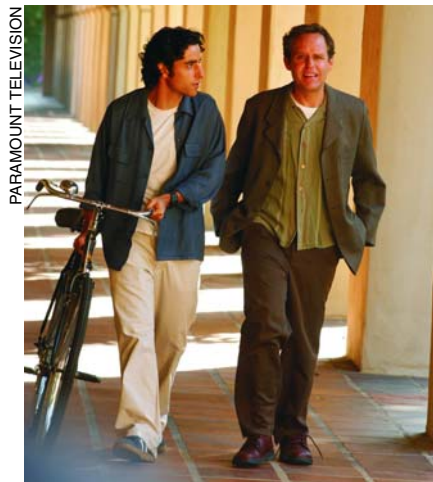
Scientists were initially skeptical that the show would be accurate, says Falacci, “but once they watched a few

episodes and saw we were trying to use real math and real science, we've had nothing but support from the community.”

For scientific advice, Heuton and Falacci hired mathematicians Gary Lorden of Caltech and Keith Devlin of Stanford University. Lorden, the main consultant, reviews scripts for scientific accuracy and provides mathematical background, including equations and language typical of academics. He also puts the producers in touch with economists, physicists, and other scientists.

How the Riemann hypothesis could be used to violate internet security protocols has been the most challenging concept to convey so far, the producers say. “It was a very complex set of ideas to put in a show for a general audience,” says Heuton. The inspiration for the episode came when screenwriter Matt Witten interviewed for a job. “Matt mentioned that he had given a copy of the script to his brother Ed [the physicist],” who, Heuton says, had suggested the Riemann hypothesis to Matt as a theme.

For Lorden, involvement in the show has another Hollywood side: Students sometimes ask for his autograph. Shows like *Numb3rs* give scientists and engineers more respect among the general public, he says. “I have anecdotal evidence from teachers that teaching 10- to 14-year-olds . . . is getting a little boost because of the show.” That has not gone unnoticed by the US Department of Defense, which, with an eye toward making science careers more attractive to young people, in August sponsored a workshop organized by the American Film Insti-



Mathematician Charlie Eppes (played by David Krumholtz, left) and physics professor Larry Fleinhardt (Peter MacNicol) are the faces of science in the TV show *Numb3rs*.