TOM FOLEY

KAKALIOS

"but I am struck by how often they do." Over the years, he says, comics have kept up with the times: In the 1940s, a lot of superheroes gained their powers through some mystical artifact from the Far East; in the 1960s, they got them through radioactivity; and, since the 1990s, they get them through genetic engineering. A few years ago, adds Kakalios, results on entangled quantum states found their way into a comic book just months after they were published in *Physical Review Letters*.

"Interestingly," says Kakalios, "when I talk about comic-book examples, no one asks how they'll use it in real life. They never expected comics to be accurate. Once you show them it's relevant, and develop the physics, I put in real-world applications." For example, he continues, "once we've talked about the Spider-Man story line, and shown that it's conservation of momentum [that delivers the impact that kills Gwen], I bring in airbags. They increase the time to slow your head down. The force to your head can still knock you out, but it doesn't kill you."

It's a sneaky class, says Kakalios. "Basically, the course is really 'physics in the everyday world.' [Students] are so busy eating their superhero ice cream sundaes, they don't notice that I am feeding them their spinach."

TONI FEDER

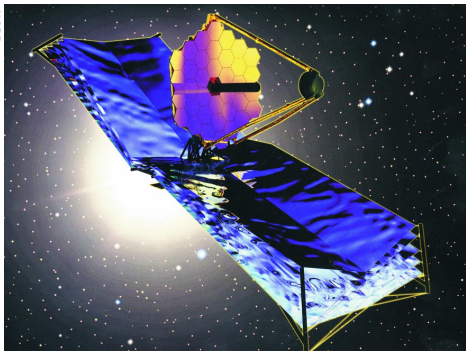
Hubble Successor Takes Shape

NASA, in signing a contract last month with TRW Inc to build the next-generation space telescope, has taken a big step toward peering at objects that are around 400 times fainter than are visible with current ground- or space-based telescopes. The move means that, after months of "blackout" associated with the NASA selection process, research groups can start working with the engineers on integrating the science instruments into the spacecraft, says Peter Jakobsen of the European Space Agency, a partner in the new observatory. The telescope has been named the James Webb Space Telescope, after NASA's second administrator, who served in the 1960s.

The JWST design calls for at least six times the light-collecting area of the 2.4-meter Hubble Space Telescope (HST) but the same 0.1-arcsecond resolution. "The original requirements were chosen to complement the capabilities of other telescopes, both existing and planned," says John Mather, JWST project scientist at NASA's Goddard Space Flight Center in Greenbelt, Maryland. In September, a JWST science working group was formed to construct a research program for the telescope. "New discoveries over the last few years do call for some updates to the proposed observing plan," says Mather. The JWST will mainly study the early universe, giant extrasolar planets, supernovae, and supermassive black holes.

The competition for the $824.8 million contract came down to TRW and Lockheed Martin Corp, and industry observers were not surprised by the outcome. The contract, which NASA and TRW signed on 11 October, is for the design and construction of the observatory's 6-meter primary mirror and spacecraft chassis. The JWST design has a primary mirror consisting of 36 semirigid hexagonal segments, similar to those used by the ground-based Keck telescopes, that will unfurl from the spacecraft once it reaches orbit. "I'm anxious to begin moving ahead on JWST," says Marcia Rieke, a working group member from Steward Observatory in Tucson, Arizona. "I'm glad that a contractor has been finally selected." TRW is responsible for integrating the module containing the three science instruments from the US and international partners—a near-infrared camera, a multiobject spectrometer, a mid-infrared camera and spectrometer—and the guider into the spacecraft, and for performing preflight testing and an in-orbit checkout of the observatory. The JWST, which, unlike the HST, is not designed to be serviced by astronauts, is scheduled to be launched in 2010. It will be positioned 1.5 million kilometers beyond Earth's orbit at the second Lagrange Point (L2), where the gravity of the Sun and Earth cancel each other out. The L2 location will allow the JWST to be easily cooled to 30–50 K, as a single Sun shield can block light and heat from both the Sun and Earth. This will simplify the design of the spacecraft, which is expected to last 5–10 years.

TRW



AN ARTIST'S RENDERING of the James Webb Space Telescope.

The JWST is the first NASA observatory not named after a scientist or astronomer. "It is fitting that Hubble's successor be named in honor of James Webb," says current NASA Administrator Sean O'Keefe, who chose the name. "Indeed, [Webb] laid the foundations at NASA for one of the most successful periods of astronomical discovery." Astronomers seem more resigned to the name change. "As a scientist, I would have preferred the telescope to be named after a very prominent scientist, but clearly Webb had major accomplishments," says Mario Livio, head of the science division at the Space Telescope Science Institute in Baltimore, Maryland. "It is a change from tradition," says working group member Simon Lilly of ETH Zürich in Switzerland. "But I have no particular problem with it myself. Europeans and Canadians may find it less easy to identify with a NASA administrator than with a prominent scientist, but in the end, it is a case of 'he who pays the piper calls the tune.' "

PAUL GUINNESSY

NEWS NOTES

Stockpile stewardship grants. The National Nuclear Security Administration (NNSA), a semiautonomous agency within the Department of Energy, is awarding $27.5 million in grants to universities and colleges to conduct research related to stockpile stewardship or to maintenance of the US nuclear weapons inventory. Everet Beckner, the agency's deputy administrator for defense programs, said the grants are part of the NNSA's stewardship science academic alliances program and contribute to "the science which underpins the NNSA stewardship of the nuclear weapons stockpile. These grants are also a key means of training the scientists needed to maintain the outstanding capabilities of our national laboratories."

The grants will fund such projects

as "nuclear probing of dense plasmas" at MIT, and "measurement of fission neutron multiplicities and energy spectra for actinide nuclei" at Oregon State University. According to the NNSA the grants are also intended to strengthen the agency's relationship with university scientists. —JLD

UCSC adaptive optics lab. The cutting edge of adaptive optics R&D is where the University of California, Santa Cruz, hopes to land with the help of a new laboratory for adaptive optics. The lab will be established with the largest private gift the university has ever received—$9.1 million from the Gordon and Betty Moore Foundation.

The lab's main research thrusts will be extreme adaptive optics and multiconjugate adaptive optics. "Extreme adaptive optics does very, very high precision corrections of turbulence in the atmosphere," says the lab's chief scientist, UCSC astronomer Claire Max. "The scientific aim is focused on directly imaging planets around nearby stars—it optimizes the imaging of something faint that is close to something that is bright. You could also look at brown dwarf companions to bright stars, disks beginning to form into planets, or disks accompanying star formation." Multiconjugate adaptive optics uses multiple deformable mirrors to compensate for the turbulence from different layers of the atmosphere. It is being developed for use with the new generation of 30- to 100-meter ground-based telescopes, says Max.

The lab will augment the campus's Lick Observatory and multi-institutional NSF Center for Adaptive Optics, which focuses on adaptive optics for both astronomy and the human eye, says Max. "This lab will let us test ideas that people come up with before we decide whether they are ready to go on a telescope," she adds. —TF

HESS gamma-ray telescope. One eye has opened in the High Energy Stereoscopic System (HESS) on the Khomas Highland, 100 km southwest of Namibia's capital of Windhoek. In September, the first of four 12-meter gamma-ray telescopes that make up the European–African array began searching the skies for Čerenkov showers initiated by gamma rays hitting the atmosphere. The full array is slated to be up and running by late next year. The HESS team hopes to eventually increase the sensitivity by either quadrupling the array or adding a few larger telescopes.

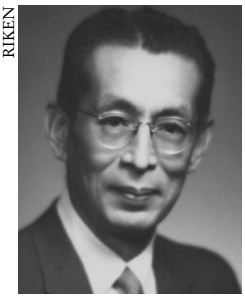
HESS COLLABORATION

The thrust of HESS and a handful of similar telescopes under construction around the world is to learn what powers violent celestial phenomena such as supernova remnants, pulsars, and active galactic nuclei (see PHYSICS TODAY, June 2000, page 50). "Equally important," says Riaan Steenkamp of the University of Namibia, "we want to find evidence for cosmic-ray acceleration in our own galaxy. We have a theory that works beautifully, but precious little experimental evidence."

As part of its bid to attract astrophysics students, the university has set up exchange programs with HESS partner institutions in South Africa, France, and Germany. —TF

Atomic plans return to Japan. Fifty-seven years after they were believed to have been destroyed, papers describing plans for a Japanese nuclear bomb have been returned to the Institute of Physical and Chemical Research (RIKEN) outside Tokyo. At the close of World War II, and despite orders to destroy it, the 23-page document was secretly entrusted to Kazuo Kuroda, a research assistant who worked on the project with Yoshio Nishina, the scientist who headed the atomic bomb development team. The papers, written by a military officer who interviewed Nishina, include details and diagrams of a weak atomic bomb. In 1949, Kuroda emigrated to the US and eventually became a professor at the University of Arkansas. After his death in April last year, RIKEN personnel asked his widow to return the papers.

RIKEN



KURODA

This is not the first time fresh evidence has come to light about Japan's nuclear weapons program. In 1997, newly declassified documents revealed that, in 1945, a German submarine bound for Japan was captured carrying two Japanese officers and 1200 pounds of uranium oxide, an ingredient for an atomic bomb. But there was "no chance" that the Japanese could develop a bomb in time to stop their defeat, says Herbert York, a nuclear weapons expert in San Diego, California. "I believe that, at the close of the project, Nishina said that not even the US could develop an atomic bomb during this war," says York. Kuroda's documents will be made available to historians through RIKEN's archives. —PKG

Cuba to sign nuclear treaties. Cuba will sign the nuclear nonproliferation treaty (NPT) after 34 years of refusal. That leaves only three countries—India, Israel, and Pakistan—all of which are believed to have substantial nuclear weapon programs, outside the treaty.

Cuba's willingness to sign was announced in September by Cuban foreign minister Felipe Perez Roque during a speech to the United Nations General Assembly in New York City. Roque said that Cuba had not signed the NPT before because the major nuclear powers—China, France, Russia, the UK, and the US—had not attempted to meet their disarmament commitments under the treaty. Cuba's decision, says Roque, was motivated by "its commitment to an effective disarmament process that guarantees world peace." The surprise announcement was welcomed by the international community. "With Cuba's intention to become party to the NPT, we have come a step closer to a universal nuclear nonproliferation regime," says Mohamed ElBaradei, the director-general of the International Atomic Energy Agency.

Roque also announced that Cuba will ratify the 1967 Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean, also known as the Treaty of Tlatelolco, which prohibits signatories from developing and acquiring nuclear weapons and establishes a nuclear-weapon–free zone in the two regions. Cuba, which signed the treaty in 1995, is the last country in the Caribbean to ratify it. —PKG

Muon spin society. The use of muons to probe the internal magnetic fields of materials is what unites the condensed matter physicists, chemists, and other scientists who, this summer, founded the International Society for μSR Spectroscopy (ISMS). "We felt it was important to formally organize ourselves to take advantage of the growing worldwide develop-