ASTRONOMY

## Italian Observatories to Form National Institute

**NAPLES, ITALY**—Small organizations usually resist being subsumed into a larger one. But for astronomers at Italy's 12 observatories—all independent but funded directly by the government—their amalgamation into the new National Institute of Astrophysics (INAF) can't come soon enough. They argue that the current fragmentation of astronomy in Italy is hampering their ability to play in the international big leagues. "The foundation of this national institute has long been a wish of all Italian astronomers. They want to be able to compete at an international level, which was not possible with small entities like the observatories," says Marcello Rodono, director of the Observatory of Catania.

The 12 observatories, which employ about half of Italy's 700 astronomers, control their own budgets, choose their own scientific programs, and hire their own researchers. In addition, Italy boasts eight astronomical research institutes run by the National Research Council (CNR), and several universities have astronomical facilities. Without some form of central body to manage this scattered enterprise, the observatories have found it hard to work together on large national and international research projects. "It was rather difficult to start national projects that would imply big expenses," says Rodono. "With a [national] institute, you can plan the extra money for the years to come and be sure that this will be allocated for the projects."

The government approved the new institute in July and is expected to appoint a president and two board members in November. Four more board members will be elected nationally, two from the observatories and two from universities. At some point, the research ministry may also transfer the CNR's eight astronomy institutes to INAF, says Rodono, who expects that INAF will become fully operational next summer. INAF headquarters will be in Rome, although technical facilities may be located on La Palma in the Canary Islands. The total budget of INAF will be at least $54 million, the sum of the budgets of the 12 observatories.

Massimo Capaccioli, director of the Capodimonte Observatory in Naples, says the new institute should improve the management of projects such as the recently completed Galileo Telescope, the national 3.5-meter telescope on La Palma; the Large Binocular Telescope, two joined 2.84-meter scopes now under construction at the University of Arizona, in which Italy has a 25% share; and a 2.65-meter survey telescope that the Capodimonte Observatory is building with the European Southern Observatory to aid its Very Large Telescope in Chile. INAF may also give a push to plans for Italy to join Spain in the construction of a replica of the Keck 10-meter telescope to be located on La Palma. The next few years will be a "very critical phase," says Giancarlo Setti of the University of Bologna. **–ALEXANDER HELLEMANS**

Alexander Hellemans writes from Naples, Italy.

**Under one roof.** Star trails above the Observatory of Catania, shown in a time exposure.

EARTHQUAKES

## Prediction Claims Stir Greek Controversy

Bucking any scientific consensus can be rough, but insisting that you can predict earthquakes in a quake-prone country like Greece—when practically no one thinks it can be done anywhere—is sure to create a fuss. For almost 2 decades, a group of Greek scientists has claimed they could predict damaging earthquakes by monitoring electrical currents in the ground. Although many Greek colleagues have questioned the scientific rigor of the method (called VAN, after the initials of its inventors), a run of seeming successes in 1995 caught the attention of researchers outside of Greece (*Science*, 10 November 1995, p. 911). Now, after a lull, the VAN scientists are making new claims. They say the ground gave clear warning signs of the 7 September earthquake that struck near Athens, killing 67, and they think they may have picked up signs of another, perhaps larger, temblor in the offing.

These claims are meeting with scorn, especially in the Greek scientific community. "This has nothing to do with seismology or science," says Leonidas Resvanis, director of the Physics Laboratory of the University of Athens. Adds Gerry Chouliaras, a seismologist at the National Observatory of Athens: "There's no scientific reason to make this alarm. I don't believe their 'signals.' I'm not going to believe anything." This rancor has emerged over years of frustration with VAN, explains seismologist Robert Geller of Tokyo University. Outsiders must compare vague predictions made on the basis of ill-defined criteria against the earthquake record, he says, while being denied access to the full VAN observations.

The controversy began in the early 1980s with laboratory experiments conducted by solid state physicist Panayiotis Varotsos of the University of Athens and his colleagues. They found that rock squeezed in the lab produced a transient electrical current just before fracturing. Might it also give off electrical signals before fracturing under stress in Earth's crust, they wondered—that is, during an earthquake?

To find out, they set up what amount to giant voltmeters around Greece: up to several kilometers of wire connected to two electrodes stuck in the ground. Their equipment turned up signals aplenty, including extraneous currents such as radio broadcasts and industrial noise. But once Varotsos and his colleagues thought they could recognize and weed out noise, they identified "seismic electric signals," or SESs, that seemed to precede quakes of all sizes in Greece.

Some seismologists were intrigued, but many objected that any apparent VAN successes were just dumb luck; by making enough predictions, the VAN group was sure to catch a few of the many quakes that strike Greece each year. Unfazed by such objections, Varotsos and his colleagues expanded their monitoring. On 1 and 2 September, a station near Lamia, about 150 kilometers northwest of Athens, recorded the first powerful signal in its 4 years of running, says Varotsos. He and his University of Athens colleagues, physicists Vassilios and Claire Hadjicontis, say they immediately recognized the signal as the SES of a significant forthcoming earthquake.

**Disaster foreseen?** Some Greek scientists think the deadly Athens quake gave warning before striking, but others doubt it.

CREDITS: (TOP) ASTROPHYSICS OBSERVATORY OF CATANIA/UNIVERSITY OF CATANIA; (BOTTOM) DIMITRI MESSINIS/AP

They concluded that the SES signaled a magnitude 5.5 quake that would strike something like 70 kilometers away sometime in the coming few weeks. The Athens quake came 5 days later, 140 kilometers away, with a magnitude of 5.9. "It is very impressive to see the signals and expect an event," says Claire Hadjicontis. "I think it's very promising."

The VAN group never made this prediction public, according to Varotsos, because of an understanding with the Greek government that they would only announce predictions of imminent quakes of magnitude 6.0 or larger. But Varotsos soon thought he had another prediction, which did fit the bill. The signal of 1 to 2 September, he had noticed, changed polarity before disappearing, something that had happened before when a single station had picked up merged SESs from two impending quakes. Then, on the 13th, the Lamia station picked up another SES of the same polarity as the end of the earlier signal—seemingly a continuation of the first.

"This strengthened our interpretation that the last part of the signal should correspond to future activity," Varotsos told *Science* on the 14th. On the 16th, VAN group member Kostas Eftaxias went public on national TV with both their "postdiction" of the 7 September quake and suggestions of another impending temblor somewhere around Lamia, this time with a magnitude of about 6.0.

Chouliaras is not impressed. "It is ridiculous to continue this debate," he says. In recent published papers, he says, he and colleagues have shown that the SES-like signals they recorded independently at the VAN station in western Greece are radio and phone transmissions, not crustal signals. Resvanis also remains to be convinced. "If they did predict [the 7 September quake], it would be random coincidence," he says. Adds Geller: "His 'predictions' are on the same level as those of the oracle at Delphi." To be taken seriously, he says, the group needs to change its ways. "Varotsos is simply not carrying out scientific research as it is understood by scientists. ... None of the necessary conditions—free availability of continuous raw data, publication of the prediction algorithm—are satisfied."

Even those who have offered some support in the past are being cautious. Stephen Park of the University of California, Riverside, says he "would back off and take a little more conservative view than in '95," when his analysis suggested VAN was doing better than chance at predicting quakes. With a longer VAN record to work from, Park now finds that any claims of real success "could be questioned by statisticians."

Varotsos has answers to all these criticisms. For example, he acknowledges that he and his colleagues "record a lot of noise, but we apply certain criteria and immediately classify noises versus signal," and he can point to a published algorithm. But he gets the feeling that his critics are actually sending a broader message: "The problem [of earthquake prediction] is very difficult, and therefore no one should try." Varotsos insists he must, although he now faces both the mysteries of earthquakes and the deep skepticism of his colleagues. **–RICHARD A. KERR**

NASA

## Space Science Feels Budget Ax in Senate

Sighs of relief resounded everywhere at NASA last week, with Hurricane Floyd blowing past the Kennedy Space Center without damaging the shuttered shuttles, and a Senate panel granting the agency its full $13.6 billion request for 2000. Everywhere except Ed Weiler's office, that is. "This is bizarro-land," the space science chief complained after hearing that his division was the only one at NASA to get clobbered. "What have we done to deserve this?"

What distressed Weiler was the Senate Appropriations Committee's bottom line for NASA space science: $2.08 billion in 2000, $43 million less than this year's budget and a hefty $120 million shy of his request. The cut was especially painful because the committee granted NASA and the National Science Foundation (NSF) the overall amounts the White House asked for—thanks to a critical decision by Senate Republican leaders to break strict budget caps. NSF scored a 7.9% boost for research, putting it just over the $3 billion level, an outcome a relieved NSF chief Rita Colwell calls "wonderful."

**Singled out.** NASA's Weiler is frustrated over looming space science cuts.

CREDIT: BILL INGALLS/NASA

The proposed budgets are in stark contrast to the House plan to stick with the spending caps and chop funding for NASA and NSF (*Science,* 17 September, p. 1827). The full Senate is expected to vote this week, and the two chambers will meet in coming weeks to hammer out a final plan that will go to President Bill Clinton for approval. A White House official told *Science* that the Administration will fight to restore space science funding.

Although the Senate panel bit half as deeply into the space science budget as did the House, which had slashed $240 million from NASA's request, Weiler warns that even the more modest cut could cripple programs ranging from the Hubble Space Telescope to comet and planetary missions. "The irony is that this is the heyday of space science," he says. "We had eight successes out of 10 launches this year," including the Chandra x-ray telescope, which began sending back images this month.

But Senate members take a dimmer view of NASA's record. Appropriations Committee documents refer to "mixed successes and some outright failures," including the loss in space of the Wide Field Infrared Explorer mission in March and the unexpected need for an expensive mission to repair the Hubble's gyros. The panel also notes that NASA may be shortchanging data analysis—research and analysis account for one in four space science dollars—and asks the White House and NASA to consider developing a data warehouse. Weiler does not quibble with the need for better dissemination and analysis of the flood of data streaming back from probes circling Mars and Jupiter and from observatories like Hubble and Chandra, although other NASA officials note that much of the data is available on the Internet. But he warns that the proposed Senate cuts would mean less money for everything, including analysis.

The Senate panel finds more to praise in projects that will benefit particular states. For example, Senate Majority Leader Trent Lott's (R–MS) desire for more spending on space transportation—specifically, engine testing at Stennis Space Center in his home state—took precedence over space science, according to NASA officials. The Senate plan includes $100 million above the $1.1 billion requested for aerospace technologies. The bill also includes a host of pork projects having nothing to do with space, ranging from $1 million for a museum on "the underground adventure" of soil ecosystems to $14 million for a life sciences upgrade at the University of Missouri, Columbia. That's the home state of Senator Kit Bond (R–MO), who chairs the panel that appropriates NASA funding. The pork projects—some of which would have to be paid for out of Weiler's budget—put even more pressure on space science funding.

With space science likely destined for a big cut, finger-pointing has begun in earnest. Weiler worries that most scientists don't understand the extent of the threat and adds that congressional staffers have told him that only a handful of researchers have complained