issues—and get past their mutual mistrust. At a forum 2 years ago on science in resource management, for instance, SEI president Deborah Brosnan broke the ice with a skit in which she played "the scientist from hell"—nose in the air, demanding endless cash and time for experiments, and offering ambiguous results in return. Across stage, arms folded, was "the manager from hell." She had zero money—and less patience—for slow-moving science. Shakespearean comedy it was not, says Brosnan, but "it opened the floodgates." Scientists came up with a proposal to rate their degree of confidence in conservation recommendations in order to help managers weigh the options. At SEI, this practice has become routine.

Such efforts toward rapprochement are a good start, say conservation biologists, who are counting on stronger advocates from the next generation to narrow the divide even more. The Nature Conservancy just launched its $9.5 million David H. Smith Conservation Science Fellowship Program, sending the first seven of 50 postdocs to work with managers in the field. The idea, says program director Guy McPherson, is "to grab the best and brightest headed into academia and expose them to the culture of on-the-ground conservation."

One Smith fellow, Jake Vander Zanden, a postdoc at the University of California, Davis, is plucking nonnative fish and amphibians from streams in the Sierra Nevada to help native populations rebound. "This is get-your-hands-dirty work," says Vander Zanden, who earned his Ph.D. studying food webs in lakes.

Progress may be halting, but scientists are beginning to find their voice, says Meffe. "Conservation biology is growing up."

–KATHRYN S. BROWN

Kathryn S. Brown is a writer in Columbia, Missouri.

MEETING VSOP SYMPOSIUM

Knotted Jets and Odd Quasars Reveal Secrets by Radio

SAGAMIHARA, JAPAN—More than 100 radio astronomers from around the world gathered here last month* to review early results of the first radio observation program that makes use of a space-based antenna and related topics. The Highly Advanced Laboratory for Communications and Astronomy (HALCA), launched by Japan's Institute for Space and Astronautical Science in 1997, was designed to make observations at three frequencies—1.6, 5, and 22 gigahertz. Unfortunately, the highest frequency band never worked properly, and problems with orienting the spacecraft and with its power supply have left it capable of making observations only at certain points in its orbit. Even so, HALCA, in combination with ground-based telescopes, is helping answer some long-standing puzzles.

Telltale Jets

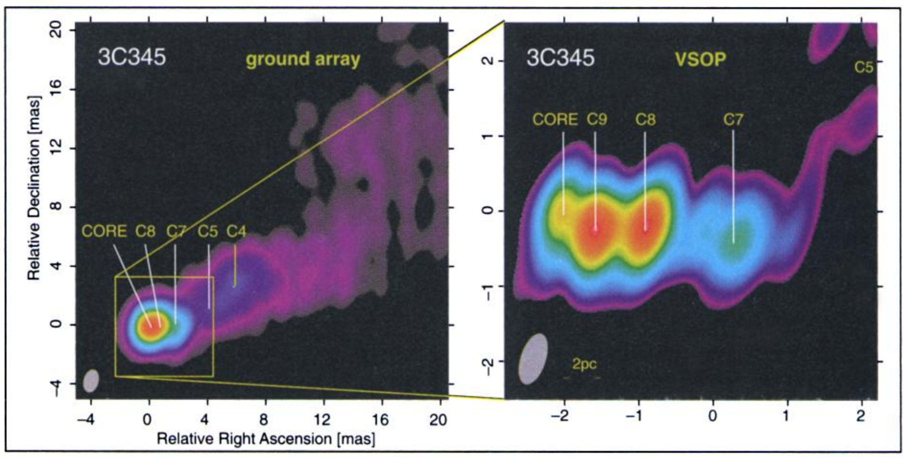
Active galactic nuclei (AGNs) are among the most fascinating and puzzling structures in space. An AGN packs the energy output of an entire galaxy of stars into a region smaller than the solar system. At the center of each AGN, scientists believe, lurks a black hole that sucks in gas and dust from a surrounding accretion disk of rotating matter. Perpendicular to the disks, enormous jets of gases hundreds of light-years long spurt from the AGN's core at velocities near the speed of light.

How AGNs form and what drives them are puzzles. But scientists are getting a closer look at the jets and how they change over time from the Very Long Baseline Interferometry (VLBI) Space Observatory Programme (VSOP), which uses HALCA in combination with ground-based radio telescopes to generate images with a resolution that earthbound equipment alone cannot approach.

Ground observations had shown that the jets are made up of bloblike knots of material that seem to emanate from the core and move lengthwise along the jet. Now, VSOP has added a wealth of extra detail. "We can see it's not just a blob [of material in the jet] but that it's extended and moving around," says Bernard Burke, a radio astronomer at the Center for Space Research at the Massachusetts Institute of Technology.

One of the clearest examples of the increased resolution of VSOP images was presented by Jens Klare, a doctoral student in astronomy at the Max Planck Institute for Radio Astronomy, in Bonn. He and colleagues are studying the quasar 3C345. In a jet from the quasar, VSOP revealed that what looked like a single large blob (a "component," in astronomer-speak) in images from ground arrays actually consists of three separate components. What's more, images captured a year apart seem to indicate that the knots are moving away from the core and that one is getting brighter while another dims. Klare suspects that the knots are following a helical spiral along the axis of the jet, dimming and brightening as they veer away from and toward Earth.

But other observations suggest knots do not move away from an AGN's core. William Junor, an astrophysicist at the University of New Mexico in Albuquerque, and colleagues have been using both ground-based arrays and VSOP to study M87, the central galaxy in the Virgo cluster and one of the first radio galaxies in which a jet was observed. "We didn't see much movement" in the components of M87's jet, Junor says. This raises the possibility that jets from different sources behave differently, suggesting that the jets change over time or that different forces are at work depending on the scale of the AGN.



Kinky. Trained on a jet from quasar 3C345, VSOP split what had looked like a single knot of material *(left)* into three.

*The VSOP Symposium, "High Energy Astrophysical Phenomena Revealed by Space-VLBI," 19–21 January.

CREDIT: J. KLARE

A hint of what might be happening in the jets comes from recent three-dimensional computer simulations created by Kazunari Shibata, a theorist at Kyoto University's Kwasan Observatory in Kyoto. Based on magnetohydrodynamic equations, his simulations show gas and dust ejected from the core swirling into knots and rings. The knots and rings are more or less stationary, wobbling slightly toward and away from the core while the material that forms them continues on its way.

So far, even the most sophisticated simulations can only model systems a tiny fraction of the size of the AGNs radio astronomers are observing. The complexity of the forces involved stretches the limits of supercomputers and their programs, Shibata explains. Still, astronomers say the simulations are coming of age. "We're seeing a convergence of the magnetohydrodynamic modeling and observations," says Junor, and this will make simulations an increasingly useful tool for testing theories.

Twinkle, Twinkle, Little Quasar One of radio astronomy's longest running debates centers on distant objects whose radio emissions vary over time. Do the emissions really wax and wane, or is the variation caused by some sort of scintillation in the interstellar medium, the gas and dust between the stars? Astronomers generally accept that variability on the order of months or years comes straight from the source. But change over less than a day, so-called intraday variability, is harder to explain. Astrophysicists believe that the shorter the period of the variability, the more compact the source has to be. Yet these highly variable quasars are emitting thousands of times more radiation than theory would allow highly compact sources.

David Jauncey of the Australia Telescope National Facility and colleagues have now pinned the intraday variability of at least one radio source on the interstellar medium. The source, known as PKS 0405-385, is extremely variable: Its emissions nearly double in intensity and then fade within an hour.

Jauncey and his colleagues theorized that they might be able to tell where the variability was coming from by precisely timing when changes in the radio signals arrived at radio telescope arrays on opposite sides of Earth. Because PKS 0405-385 is halfway across the universe, signals due to changes in the source itself would reach the arrays simultaneously, give or take a few milliseconds. But if the variability arises in the relatively nearby interstellar medium of our own galaxy, the signals reaching two arrays might form different patterns or arrive at different times.

Using the Very Large Array, a set of 27 radio telescopes near Socorro, New Mexico, and the Australian Telescope Compact Array, a set of six telescopes in Narrabri, New South Wales, the astronomers found that both arrays detected very similar patterns of variability. But the signals arrived in New Mexico about 2 minutes before reaching Australia—much too long to be explained by one array being closer to the source or by experimental error.

"The conclusion is inescapable," Jauncey says. "It is interstellar scintillation that is at least a major cause of this intraday variability." William Junor, an astrophysicist at the University of New Mexico, Albuquerque, agrees: "It looks pretty conclusive and comprehensive."

If other groups get similar results with other sources, the technique could provide a means of probing the interstellar medium. "I think this result is going to motivate a lot of work on other [intraday variable] sources," says Bernard Burke, a radio astronomer at the Center for Space Research at the Massachusetts Institute of Technology.

–DENNIS NORMILE

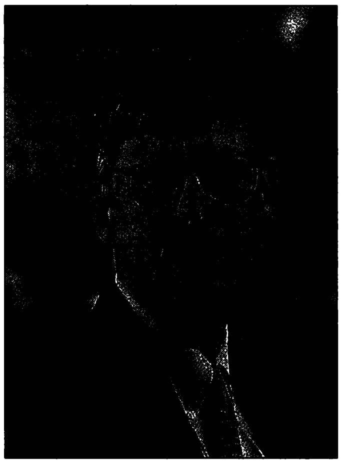
BIOMEDICAL PATENTS

Patent Office May Raise The Bar on Gene Claims

But NIH officials worry that the bar might not be high enough to keep out unwarranted claims, which they say threaten to stymie research

The U.S. Patent and Trademark Office (PTO) is inching toward resolution of an issue that has dogged it, and the biomedical research community, since the early 1990s: What sort of genetic information is patentable? Over the past decade the PTO has been deluged with applications for patents on millions of gene fragments. Yet most have been stalled because of enduring questions over exactly what can be patented.

Now, in a major shift, the PTO has proposed a policy that will raise the bar for patent applications on DNA—a change that could lead to the rejection of many of those idling claims. Although the proposed change is welcomed by many in the research community, some, including top scientists at the National Institutes of Health (NIH), argue that it still does not go far enough. Unless the PTO tightens its rules further, they warn, research and innovation could be stifled by a quagmire of overlapping rights and claims. "This could be a big disincentive for biomedical research," says Maria Freire, director of the Office of Technology Transfer at NIH.



Patent worries. NIH's Francis Collins is "very concerned."

By all accounts, the stakes are enormous. To reap the harvest of the genome era, companies have invested hundreds of millions of dollars in uncovering genes on which new drugs and diagnostic tests can be based. Analysts say their business strategies are at least partly based on the assumption that they will own the rights to exploit that genetic knowledge. Few in the biomedical community argue against that basic position. Without some form of intellectual property protection, pharmaceutical companies would not bet large sums on developing gene-based drugs, and those drugs would never reach the market.

The question, then, is how much someone needs to know about the usefulness of a piece of DNA—its "utility," in patent law terms—to merit a patent. NIH officials and many other publicly funded scientists argue that no DNA patent should be granted unless researchers know a gene's full sequence and have figured out what protein it produces and what that protein does in the cell. The first hard-won gene patents, issued in the 1970s and 1980s, met those criteria, because researchers often started with a known protein and worked their way back to the encoding gene—a difficult and laborious process.

Since then, new and less cumbersome ways to find genes have emerged. In the early 1990s, scientists discovered a way to identify short scraps of DNA—called expressed sequence tags (ESTs)—about which they knew little more than that they belonged to some gene that was switched on somewhere in the body. That didn't deter researchers from applying for patents,

CREDIT: SAM KITTNER