NIH's planned purchase of 14 young, uninfected chimps from Coulston for nearly $30,000 each is a less happy development for activists. Vaitukaitis says her office was concerned that the animals, among those still owned by Coulston, "would be sold to the entertainment business" if NIH didn't act. She says it is not yet clear where the young chimps, ranging in age from 1 to 2 years, will live, but they will be available for research if the need arises.

Animal activists complain that NIH is "adding more babies into a supply" that already exceeds demand, says Chris Heyde of the Society for Animal Protective Legislation in Washington, D.C. For its part, McKinney says that the company has no plans to sell its animals to the entertainment industry but would try to sell them to other research laboratories if NIH didn't buy them.

–GRETCHEN VOGEL

RUSSIAN UNIVERSITIES

Centers of Excellence Get Big U.S. Boost

CAMBRIDGE, U.K.—A unique experiment to improve Russian science has won a ringing endorsement: Two heavyweight U.S. foundations are plowing $12.5 million into an effort to create scientific oases in Russia's impoverished university system. The funding boost more than doubles the budget of the fledgling Basic Research and Higher Education (BRHE) Program, allowing it to expand from eight to 16 centers across the country.

BRHE's aim is to help break down the firewall between the Russian Academy of Sciences' institutes—where much of the country's best research is carried out—and the universities, which tend to lack world-class scientists. Toward that end, the program gives university-based centers 3-year, $1.05 million grants for purchasing major equipment and supplies, with the stipulation that the center collaborate with academy researchers. These are huge amounts—as much as 20% of a recipient university's annual budget. A key to sustaining the centers is to involve young scientists; this the BRHE ensures by mandating that 10% of center funds be distributed as grants to scientists who have received a Ph.D. or the Russian equivalent within the past 6 years.

BRHE debuted in 1998 with a 1-year pilot project: a center for scanning probe microscopy at Nizhny Novgorod State University, 400 kilometers east of Moscow (*Science*, 29 May 1998, p. 1336). BRHE has since expanded to seven more universities, from a center on nonlinear dynamics in Saratov, southeast of Moscow, to a marine biology center in Vladivostok, in Russia's Far East. One goal of the peer-reviewed program has been to beef up science outside Moscow and St. Petersburg; universities from these two powerhouses have been prohibited from competing for BRHE funds.

The initiative has also required the Russian federal government and local authorities to pony up half the funding for each center. The fact that Russia has come up with every ruble it has pledged "tells us that we're responding to a need that's real," says Gerson Sher, president of the Civilian Research and Development Foundation, an Arlington, Virginia–based nonprofit that runs BRHE with Russia's Ministry of Education. The eight centers are blossoming, adds Marjorie Senechal, a mathematician at Smith College in Northampton, Massachusetts, who attended a conference in Nizhny Novgorod last September to review the program's progress.

The new money announced last month—$11.5 million over 5 years from the John D. and Catherine T. MacArthur Foundation and $1 million over 2 years from the Carnegie Corp. of New York—will allow the BRHE to give 2-year extensions to some existing centers as well as add four centers in the Russian provinces. The new funding will also open up the peer-reviewed competition to Moscow and St. Petersburg, each of which will get two centers. The first winners will be announced in November, with another four centers to be chosen in 2002.

The BRHE's rising fortunes should help dispel the gloom that some scientists in Russia are feeling over the impending demise of another major Western effort: the 7-year-old International Soros Science Education Program, which has, among other things, provided stipends to 3750 university professors, high school teachers, and students in Russia, Ukraine, Belarus, and Georgia. The billionaire financier George Soros, who has sunk $109.5 million of his own fortune into the program, has said that this is the last year he will support it. Georgia's president, Eduard Shevardnadze, and others are lobbying Soros in the hopes he will change his mind.

–RICHARD STONE

THE ELITE EIGHT

University	Specialty
Nizhny Novgorod State	Scanning probe microscopy
Krasnoyarsk State	Environmental technologies
Far Eastern State	Marine biology
Rostov State Kuban State Taganrog State Univ. of Radio Engineering	Ecological modeling and geophysics
Ural State	Advanced materials
Saratov State	Nonlinear dynamics and biophysics
Kazan State	Advanced materials
Novosibirsk State	Molecular design

Half of the sweet 16. Eight new Russian centers will join the existing BRHE units, above, over the next 2 years.

GENOMICS

New Genomes Shed Light on Complex Cells

COLD SPRING HARBOR, NEW YORK—Biologists have long wondered what genes separate the men from the boys—that is, the complex eukaryotes from the more primitive prokaryotes. Now they are beginning to find out, thanks to new work deciphering the genome sequences of higher organisms.

At a genome sequencing and biology meeting last week,* researchers announced that they have decoded the genetic complement of a second yeast and are in the midst of sequencing two fungi. Already, these three new genome sequences are shedding light on what it takes to be a eukaryotic cell, says Paul Nurse, director of the Imperial Cancer Research Fund in London. By determining which genes these varied organisms have in common and removing those that are also shared by prokaryotes, he and his colleagues have identified the subset of genes that make possible more complex cell functioning.

Yeast, fungi, and all multicellular organisms—from plants to humans—are eukaryotes, with complex cells that have discrete subunits, such as the nucleus and mitochondria, to help with various tasks. For decades, cell biologists have studied yeast, simple, one-celled organisms, for insights into how they and more complex eukaryotes work. Toward that end, in 1996, the yeast research community decoded the genome of the budding yeast, *Saccharomyces cerevisiae*.

Now a European consortium of 12 labs led by the Sanger Centre in Hinxton, United Kingdom, has sequenced and analyzed the 14-million-base genome of *Schizosaccharomyces pombe*, also known as fission yeast. The team has even determined three-quarters of the bases in a hard-to-sequence region, called the centromere, that is critical to the proper replication and separation of chromosomes during cell division—a feat few other groups have accomplished on any genome.

* Genome Sequencing and Biology was held in Cold Spring Harbor, New York, 9 to 13 May.

Minimalist genome. For the yeast *Schizosaccharomyces pombe,* fewer than 5000 genes is still enough to live the eukaryotic lifestyle.

Of all the eukaryotes sequenced to date, fission yeast "has the smallest number of genes," with 4944 predicted, Nurse reported at the meeting. Budding yeast has 5805 predicted genes, while humans have some 37,000, by the latest count. Even some lowly bacteria, such as *Pseudomonas*, have more than 5000 genes. That makes it clear, Nurse says, "that being a eukaryote doesn't simply depend on the number of genes, but the type and context."

Fission yeast is "a stripped-down eukaryote," says Nurse, and as such, it likely contains the bare essentials of the eukaryotic cell, along with genes that define it as a fission yeast. To check this out, Nurse and his colleagues analyzed which genes fission yeast shares with the other sequenced eukaryotes. (These include the budding yeast, human, the plant *Arabidopsis*, the fruit fly *Drosophila melanogaster*, and the nematode *Caenorhabditis elegans*.) With yeast in the six-way comparison, Nurse eliminated genes that in humans and worms, for example, support multicellularity, as well as those genes that help define each species. They then excluded all the genes that fission yeast shares with prokaryotic bacteria or archaea. Those genes that remained are "a first step toward defining the eukaryotic cell," says Nurse.

Eukaryote-only genes include, for example, those that encode proteins involved in the spatial organization of the cell. Other genes produce proteins that help move molecules around and through membranes within a cell. Some code for proteins that organize chromosomes within the nucleus or regulate cell division, while others encode proteins involved in breaking down other proteins. Eric Green, a geneticist at the National Human Genome Research Institute in Bethesda, Maryland, calls the new work an "exciting first pass" that hints at the power of comparing genome sequences to learn not only about what distinguishes eukaryotes from prokaryotes but also about what sets various eukaryotes apart. "It illustrates the exciting analytical glasses that we are going to be able to put on," he adds.

In related work, a team from the Center for Genome Research at the Whitehead Institute in Cambridge, Massachusetts, has taken a first pass at the genome of the fungus *Neurospora crassa*, another model organism. And the Department of Energy's Joint Genome Institute in Walnut Creek, California, has sequenced and assembled almost 30 million bases of the genome of the fungus *Phanerochaete chrysosporium*. These fungi have much larger genomes and, presumably, more genes than fission yeast. Comparing these fungal sequences to those of yeast and others will help define the genetic underpinnings of that branch of the eukaryotic family tree. –ELIZABETH PENNISI

VOLCANOLOGY

Oregon's Rising, an Eruption to Follow?

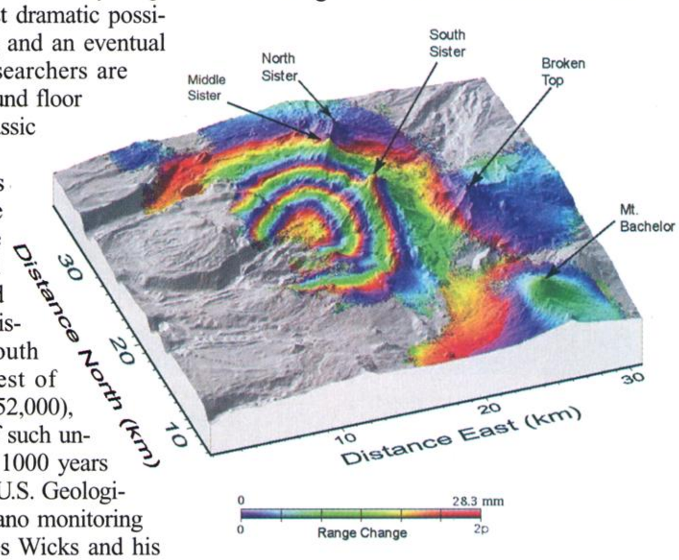
When a parcel of land including a trio of volcanoes swells upward by a tenth of a meter over 4 years, volcanologists tend to get excited. That's exactly what's happened in the U.S. Pacific Northwest. By excruciatingly precise comparison of satellite radar data, they've discovered a broad, 10-centimeter-high uplift on the flanks of the Three Sisters volcanoes in the Cascade mountain range of central Oregon. No one can say what, if anything, will happen next—the most dramatic possibility is continued doming and an eventual volcanic eruption. But researchers are thrilled to be in on the ground floor of what could become a classic case study in volcanology.

Usually, volcanologists arrive on the scene after the ground has begun to shake or, rarely, even as gas and ash are spewing out. Around the Three Sisters—North Sister, Middle Sister, and South Sister—35 kilometers west of Bend, Oregon (population 52,000), there is no geologic sign of such untoward activity in the past 1000 years or more. But as part of the U.S. Geological Survey's Cascades volcano monitoring duties, geophysicist Charles Wicks and his colleagues at the USGS office in Menlo Park, California, were using interferometric synthetic aperture radar (InSAR) to search for any change in the shape of the Cascades.

Like ordinary radar, a satellite-borne SAR measures the distance to the surface by clocking the travel time of a microwave signal bounced off the surface (*Science*, 28 June 1996, p. 1870). Taking data from overflights of European Earth Resources Satellites in 1996 and 2000, Wicks and his colleagues measured the change in the distance to the surface during the 4 years by letting the two slightly out-of-phase signals interfere with each other to form an image of interference fringes. Each rainbow fringe in an interferogram would represent a rise or fall of the surface of 28 millimeters over the 4 years, at least where snow, dense vegetation, and soil moisture variations didn't intervene.

What the InSAR analysis produced was a stunning bull's-eye of interference fringes centered 5 kilometers west of the South Sister volcano. Fifteen to 20 kilometers across and 10 centimeters high at its center, the uplift could have formed as magma oozed up into the crust within 7 kilometers of the surface; in fact, geophysicists are hard-pressed to think of any other explanation. "This came as a shock," says volcanologist C. Dan Miller of USGS's Cascades Volcano Observatory (CVO) in Vancouver, Washington. "We had no idea anything was going on in that part of the world. We may have caught an eruption in the very earliest stages."

Eruptions have certainly happened before near the Three Sisters. "Every bump around there is a volcano," says William Scott, scientist-in-charge at CVO. "It's what central Oregon is famous for." Beyond the Three Sisters, which last erupted with lots of ash about 2000 years ago, there are hundreds of volcanic vents and cones that have briefly spewed less explosive lavas as recently as 1200 years ago. If such magma reached the surface at the



On target. A bull's-eye of a bulge falls among major Oregon volcanoes and hundreds of minor vents.

bull's-eye, which is in the Three Sisters Wilderness, the hazard would be largely limited to the immediate vicinity, says Scott. If the magma turned out to be the more explosive sort, ash could blow downwind toward Bend or flow down streams as searing ash clouds or muddy floods for many kilometers.

USGS researchers should have some answers by summer. They are moving equip-

CREDITS: (TOP TO BOTTOM) QUEST/PHOTO RESEARCHERS; C. WICKS/USGS