le the task of identifying the remains of the victims, many of them Muslim men and boys slain during the fall of Srebrenica, a United Nations "safe haven" that Western peacekeepers notoriously failed to protect. Many survivors of the rampage fled to Tuzla, the nearest city under Muslim control. And they've stayed here, loath to move back to Srebrenica, now part of the Republika Srpska. Thus it made sense to ship the victims' remains, unearthed from pits or collected from fields, to the Podrinje Identification Project's morgue here in Tuzla.

The ICMP project got going last year, when it began dispatching teams to collect blood from relatives of the missing persons. So far the ICMP has amassed more than 12,000 samples, with some relatives coming here from as far away as Australia. On average, it requires 2.5 donors to identify a body, says Huffine. The ICMP has 100,000 blood kits in hand, enough in principle to identify 40,000 bodies. "Once we have 100,000 samples, then we can expect that almost every body we find can be identified," says Amor Masovic, director of the Bosnian Muslims' missing persons commission.

The blood samples are shipped to a newly outfitted lab at the Tuzla Clinical Center, where key DNA regions are sequenced. The ICMP will open a second DNA lab in Sarajevo to sequence DNA from the bone. The researchers use the polymerase chain reaction to churn out millions of copies of the target DNA regions. The DNA is tagged with fluorescent dyes; different colors bind to each of DNA's four repeating nucleotides. A laser reads the colors to sequence the DNA.

Nuclear DNA is the material of choice for samples in which it has been preserved. Because roughly half is inherited from each parent, it offers "a unique profile for every individual, just like fingerprints," says molecular biologist Rijad Konjhodzic, ICMP's DNA lab coordinator. In Bosnia, where tens of thousands have been killed—many from large families—telling brothers apart or son from father would be virtually impossible without nuclear DNA. The lab also uses nuclear DNA to sequence telltale markers on the Y chromosome, which can reveal a male victim's paternal lineage.

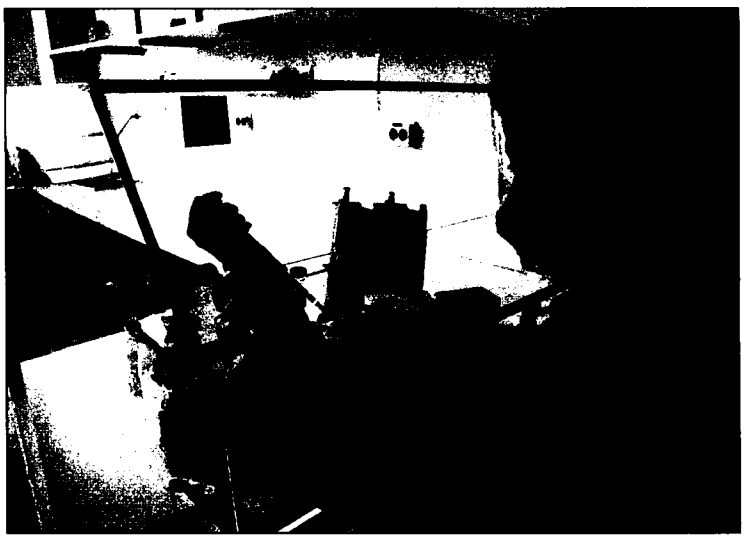
A second procedure involves screening the mtDNA, which is "better preserved than nuclear DNA and will stay [intact] longer in a corpse," Konjhodzic says. As mtDNA is inherited only from the mother, an individual will share virtually identical sequences with all maternal relatives. Because most of the survivors—and blood donors, therefore—are women, the odds of determining the families of at least the male victims are higher than they might have been through random screening of a gender-balanced population.

"There are a lot of maternal relatives [of the victims], so we will have a lot of matching DNA," says Konjhodzic. Often, no single test will identify remains. But combining the results from the nuclear DNA and mtDNA tests, he says, "can give us an answer."

If successful, the DNA work could soon expand to the rest of the former Yugoslavia. The ICMP recently signed an agreement to collect blood and bone samples in Kosovo, and it hopes that a new office in Belgrade will oversee the collection of blood from those who fled Bosnia and Croatia to avoid the fighting. There is also a preliminary agreement to incorporate DNA samples from a state-funded organization in Croatia into the ICMP database. Such international agreements, says Huffine, helped overcome "a certain degree of mistrust between parties" when surviving relatives live outside the country in which the victims' remains were recovered.

Before DNA testing from blood samples became automated about 5 years ago, Huffine says, the effort in Bosnia could not have been done. But for every victim that the latest DNA science helps the ICMP team to identify, that's one less ghost to haunt this troubled land. **–SUSAN LADIKA**

Susan Ladika is a freelance writer in Vienna.



Clean room. DNA testing will be carried out in three new Bosnian labs, including this one in Tuzla.

CREDIT: EILEEN KOVCHOK

ASTRONOMY

India Seeks Partners for 'Himalayan Space Telescope'

Ground-based astronomers lust after sites that are cold, dry, high, and dark. India's new Hanle observatory fits the description—and fills a geographic gap

HANLE, LADAKH, INDIA—It's a 9-hour Jeep ride from the nearest airport, over rugged terrain. And local officials recommend a 2-day layover before setting out, to get used to the Himalayan altitude. But the cloudless skies and cold, dry climate at Mount Saraswati make this remote, 4517-meter-high site ideal for optical, infrared, submillimeter-, and millimeter-wavelength astronomy. Next week Indian officials will dedicate a new 2-meter optical/infrared telescope here with the goal of turning the world's highest observatory into one of the world's most productive scientific locales.

Ground-based astronomers are forever trying to escape the limits that Earth places on their profession. That search has led them to higher and more remote regions of the planet. The Indian Astronomical Observatory at Hanle, operated by the Indian Institute of Astrophysics (IIA) in Bangalore, is perched some 200 meters higher than the Meyer-Womble Observatory operated by the University of Denver in the Rocky Mountains and at a similar altitude to the proposed Atacama Large Millimeter Array in the Andes Mountains of northern Chile. With several observatories already in operation, the Atacama desert region may be Hanle's chief competition for new astronomy facilities.

"It's a dream site," says Yash Pal, an astrophysicist and former chair of the University Grants Commission, who has dubbed the facility the "Himalayan space telescope." Other scientists add that Hanle's location also makes it an excellent site for research in several other disciplines, including geophysics, atmospheric science, climatology, and conservation biology.

The Indian government has already invested over $10 million to develop the infrastructure at Hanle, located along the eastern edge of the contentious Jammu and Kashmir region but well removed from the ongoing civilian violence and fighting between Indian and Pakistani troops. One of the site's major attractions is a dedicated satellite link that allows astronomers to operate their instruments remotely, from a branch of IIA at Hosakote near Bangalore. A 2-megahertz data link, via an Indian geosynchronous satellite launched in March 2000, transmits information much faster than the shared lines used by most isolated observatories. "That makes it rather special," says Peter Wehinger, a staff astronomer at the Steward Observatory in Tucson, Arizona. Boasts IIA director Ramanath Cowsik, "no astronomer actually needs to visit Hanle to conduct his observations."

The 2-meter telescope being dedicated next week will be used primarily by Indian scientists. But some IIA astronomers are also involved in a joint project with Washington University in St. Louis, Missouri. The effort, called the Antipodal Transient Observatory, features two identical 0.5-meter photometry telescopes, one at Hanle and one half a world away in Arizona, that will continuously track highly variable objects, including a class of active galaxies, called blazars, with a supermassive black hole at their center.

Government officials hope the 2-meter telescope, to be named after India-born astrophysicist and Nobelist S. Chandrasekhar, will be a test-bed and demonstration site for larger projects. "The telescope is a small steppingstone toward making this the best astronomical site in the Eastern hemisphere," says Bhuwan Chandra Bhatt, who manages the Hanle facility. Valangiman Subramanian Ramamurthy, a nuclear physicist and secretary of the Department of Science and Technology, which has funded the Hanle observatory, says that the government is studying a $100 million proposal from IIA and the community for a binocular telescope, with two primary mirrors in the 6.5- to 8-meter range, that would have international partners. He says that India may include a down payment for the project in next year's budget.

Japanese and U.S. astronomers familiar with the site extol its suitability for a range of investigations. "The site appears to have great potential, especially for the submillimeter and midinfrared spectral regions," says Wehinger. "In addition, it is extremely dark and has excellent seeing conditions." Munetaka Ueno, an assistant professor of earth sciences and astronomy at the University of Tokyo, has visited the site twice and says that its low winter temperatures make it an ideal location for follow-up observations to ASTRO-F, an infrared imaging and surveyor satellite scheduled for launch in 2003. Japanese scientists from the Nobeyamo Radio Observatory have pronounced the geography suitable for a submillimeter array, and they are monitoring water vapor at the site.

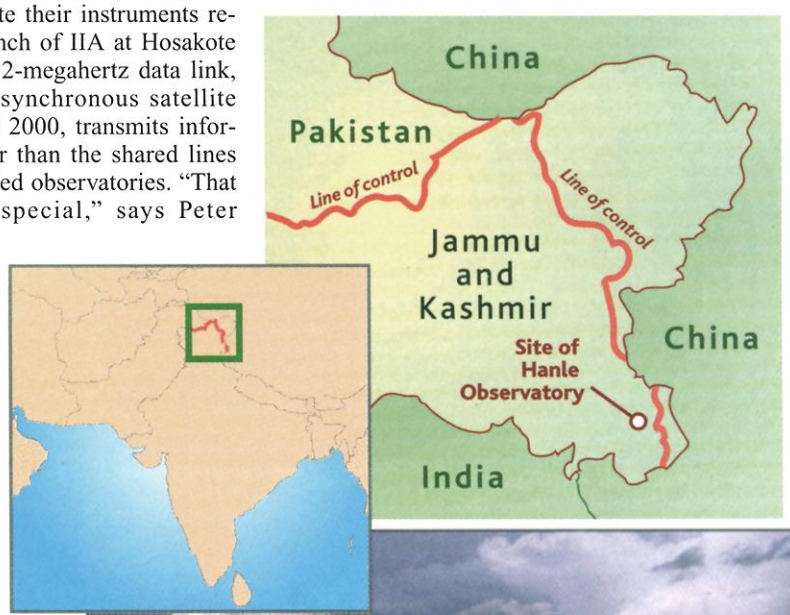
Astronomy is not the only discipline expected to reap benefits from the Hanle observatory. Its location on the Asian tectonic plate fills an important gap in a network of geodetic research stations on the Indian plate. IIA scientists are collaborating with the Center for Mathematical Modeling and Computer Simulation in Bangalore to quantify the dynamic deformation field in Ladakh and have already confirmed predictions from models that India and Eurasia are colliding at the rate of 55 mm a year.

For atmospheric scientists, Hanle offers an opportunity to collect better data on factors that shape climate. Researchers from the National Physical Laboratory in New Delhi are already monitoring ozone and ultraviolet levels, while the Indian Institute of Tropical Metrology in Pune is gathering data on aerosol levels. A French group plans to install a permanent CO_2 monitor at the site.

Despite its barren and desolate look, the region is home to highly endangered animals such as the elusive snow leopard, Tibetan gazelle, and the Tibetan wild ass. It is also the only known breeding ground for the highly threatened black-necked crane. Hanle is already providing scientists from the Wildlife Institute of India and World Wide Fund for Nature with a base camp for their expeditions.

To secure Hanle's future, Indian officials must convince the worldwide scientific community that it not only offers exquisite viewing conditions but also fills an important geographic gap in data collections. In the meantime, they plan to lavish resources on it. "No stone will be left unturned to make the site a world-class facility," says Ramamurthy.

–PALLAVA BAGLA



Looking up. India hopes its new telescope atop Mount Saraswati in Hanle *(inset)* will attract more instruments and scientists to this highest-in-the-world observatory.

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