

## Extinguishing pain's flame

Some researchers argue that the clinical uses of PET and fMRI won't be limited to diagnosing brain disorders. In the 20 December 2005 *PNAS*, neuroscientists reported using fMRI to teach people with chronic pain to monitor and control their own brain activity—a high-tech version of biofeedback. The research team included scientists from Stanford and the Massachusetts Institute of Technology and was led by Christopher deCharms, a neuroscientist and president of Omneuron, a start-up company in Menlo Park, California.

Each patient slid into an fMRI scanner and watched a computer-generated flame flickering on a monitor. The intensity of the flame reflected, with a few seconds' delay, neural activity picked up by the scanner in the patient's right anterior cingulate cortex, a region implicated in pain perception. The patients who best learned to minimize the flame reported the greatest reduction of pain symptoms immediately after the session. Another group of patients whose flames were fed by neural activity in their posterior cingulate cortex, an area not associated with pain processing, showed no such reduction.

"I thought this was enormously clever," says Raichle. Biofeedback has been tried previously for chronic pain, he says, but this is the first attempt to specifically target the brain regions that process pain. DeCharms's team is now doing a larger trial with weekly neurofeedback sessions for pain patients and following up to see how long the effect lasts.

Omneuron is also experimenting with real-time fMRI to assist psychotherapy. The firm's preliminary work has been in people with obsessive-compulsive disorder (OCD). Last year, at the annual meeting of the Organization for Human Brain Mapping, deCharms and colleagues described the method. Patients with OCD lie in the scanner, where they see the computer-generated flame, as well as a video link to their therapist, who sits in the control booth and also keeps an eye on the flame.

It's far too early to say whether the method will work. One of the central challenges, deCharms says, is determining the best brain areas to fuel the flames. Fortunately, he adds, functional neuroimaging methods such as fMRI have already provided many clues about what regions are involved in many psychiatric disorders. "The big question for us is, 'How can we take this nearly 20 years of research and turn it into clinical applications?'"

—GREG MILLER



**Priceless.** Changbai's stunning vistas are drawing increasing numbers of tourists—and increasing pressures on the landscape.

## ECOLOGY

# A Threatened Nature Reserve Breaks Down Asian Borders

**Chinese and Koreans share a love of Changbai Mountain, which straddles their border. Now that the area is under threat, the two sides may join hands to save it**

**CHANGBAISHAN NATURE RESERVE, CHINA—**To many Chinese, Changbai Mountain, whose jagged volcanic summit cups a crater lake on the border of North Korea, is the fatherland of Manchurian emperors who rose to power during the Qing Dynasty 4 centuries ago. Koreans, meanwhile, revere the iconic peak, which they call Paektu, as the birthplace of their culture and the nerve center of resistance to Japanese colonial rule in the 1930s and '40s. For scientists, Changbai is precious for another reason: It's a unique set of ecosystems under siege. Now, a new Chinese initiative aims to save it.

Changbaishan Nature Reserve, the largest protected temperate forest in the world, is home to endangered Siberian tigers and the last stands of virgin Korean pine-mixed hardwood on the planet. It's "one of the most spectacular and relatively undisturbed ranges in China," says Burton Barnes, a forest ecologist at the University of Michigan, Ann Arbor, who conducted research here in the 1980s and early '90s. But aggressive logging along the reserve's Chinese edge, and conversion to croplands on the Korean side, threaten to turn Changbai into "an oasis in a sea of clear-cutting," says Wang Shaoxian, director of

the Jilin Changbai Mountain Academy of Sciences (JCMAS).

The reserve, roughly half the size of New York's Long Island, is also under increasing pressure from the inside. Chinese hot-spring resorts and Korean revolutionary museums on Changbai's flanks—the rugged, isolated terrain provided cover for the resistance—have transformed the reserve into a tourist mecca.

Hoping to counter these threats to the fragile ecosystems, the Chinese government this year designated Changbaishan, or "Perpetually White Mountain," as a major research initiative in its latest 5-year plan. It's pouring money into new facilities and projects, including a biodiversity survey and a study of how to better manage the Changbai ecosystems. The venerated mountain may also become a symbol of science transcending boundaries. Chinese and North Korean forest ecologists, who have had scant contact in recent years, are discussing the potential for collaborations at Changbai. From the vantage of local authorities, such cooperation "would be incredibly possible," says Ding Zhihui, deputy director of the Jilin Changbaishan Protection, Development, and Management Committee.

A research stint at Changbai has long