Abstractions

FIRST AUTHOR

The Tibetan Plateau, sometimes called the 'roof of the world', is thought to be the largest and highest flat area ever to exist on Earth. We know how it formed — through a massive collision between the Indian and Asian continental plates — but how it is maintained in the face of erosion and incision by the powerful rivers that flow along its fringes is much less clear. On page 786, Oliver Korup of the Swiss Federal Institute for Snow and Avalanche Research in Davos and David Montgomery at the University of Washington in Seattle propose that glacial advances over at least the past 10,000 years preserved the plateau's southeastern edge by blocking and weakening the flow of water through much of the river network. Korup tells *Nature* more.

Why is the Tibetan Plateau's magnitude such a mystery?

According to widely accepted theory, the plateau margin should erode rapidly, and the plateau itself should be sliced to bits by some of Asia's largest rivers. Yet the plateau surface and its edges are prominent. Classic explanations for this mainly invoke aridity and highly localized rock uplift as limits to the plateau's dissection.

What made you think that glaciers might be involved instead?

Satellite images of the area showed a surprising number of large moraine dams — river-blocking piles of debris formed by glaciers. The way these dams cluster together is unusual, so we decided to reconstruct how much ice once occupied the drainage network. Just as you can figure out somebody's shoe size from their footprint, the extent of past glaciers can be calculated from moraine dams.

How do glaciers help to preserve the plateau margin?

The glaciers act a bit like bulldozers: they collect a lot of sediment and push it into the larger river valleys, where it sits like used coffee grounds in a sink, and blocks up the drainage network. We argue that a similar mechanism is shutting down the incision into bedrock along the plateau edge. Meanwhile, aggressive river incision below the dams helps to accentuate the steep plateau margin.

How might climate change affect the Tibetan Plateau's landscape?

If most of the remaining glaciers in this area dwindle away, the rivers' stream power, and so erosion potential, could increase as the glaciers melt. But eventually, with little or no ice left, the erosion potential of the smaller rivers will decrease, thereby slowing down incision into the plateau edge. ■

MAKING THE PAPER

Daniel Stark

Tracking the swirl of gases in a far-off galaxy's rotation.

Because they are so far away and light has taken so long to travel from them, we see distant galaxies as they were billions of years ago. Studying the early stages of these galaxies — such as those that formed just 2 billion–3 billion years after the Big Bang — can help us to understand how galaxies evolve into present-day systems such as our Milky Way. So far, most work has focused on information assembled from many galaxies that sheds light on important aspects of development, such as star formation rates. But, to amass more details of galaxy formation through time, scientists need knowledge of individual galaxies' internal structures — for example, the motion of gases within them.

During the next decade, high-powered telescopes will help to realize that goal. In the meantime, the application of technological advances to existing telescopes has allowed astronomers to amplify the light behind massive galaxy clusters to effectively create a zoom lens. This technique is known as gravitational lensing.

Daniel Stark, a postdoc at the California Institute of Technology (Caltech) in Pasadena, teamed up with colleagues at Caltech and in the United Kingdom to use gravitational lensing to zoom in on a distant galaxy. The group also took advantage of two other innovations: first, integral field spectrography, which can be used to provide spectra from many locations across a galaxy to give two-dimensional measurements of velocity; second, laser-guided adaptive optics, which correct for the blurring of the atmosphere, and allowed the team to more clearly determine whether a distant galaxy is rotating.

Perhaps most importantly, the researchers needed the perfect galaxy to study — one that was both distant and bright enough. In 2006, co-author Ian Smail of Durham University, UK, and his collaborators had discovered a galaxy referred to as the Cosmic Eye using gravitational lensing. One month later, Stark's Caltech co-authors Richard Ellis and Johan Richard confirmed that it formed just 2 billion years after the Big Bang.

In July 2007, Stark and co-author Mark Swinbank, a Durham University postdoc, had booked one night on Hawaii's Keck telescope to measure the galaxy's internal structure. Unfortunately, Stark's flight was cancelled, but the observations proved fruitless anyway because of clouds — a common frustration for astronomers. Two months later, Stark made it to Hawaii with Ellis, Swinbank and Richard, and they succeeded in measuring the movement of ionized gas within the galaxy. Swinbank conducted the preliminary analyses in real time at the telescope. "By the end of the night, we had preliminary evidence for rotation in this distant galaxy, which was very exciting because it provided the most detailed view yet achieved of a young galaxy in the early Universe," Stark says.

Stark then compared the galaxy's known distribution of molecular gases with that of ionized gas measured at Keck. He confirmed that the cold molecular gas — which was being converted into stars — shared the same rotation pattern as the ionized gas (see page 775). These measurements will help to determine at what point in their lifetimes galaxies acquire angular momentum and how galaxies grow over time. For example, the findings may help to resolve the relative importance of galaxy collision versus gas accumulation in galaxy assembly, Stark says.

As a young scientist, Stark can see one other thing clearly in these data — a life's worth of work ahead. "It is exciting to get a glimpse of what I and others will be able to do once future facilities, such as the Thirty Meter Telescope and the Atacama Large Millimeter Array, allow us to easily sample more distant galaxies," he says. ■

FROM THE BLOGOSPHERE

What happens if proposed stem-cell-based therapies actually work? Monya Baker, editor of Nature Reports Stem Cells, ponders this question for stem-cell researchers in a post at 'The Niche' blog (http://tinyurl.com/4qrybk).

In discussions at several large conferences, as reported on The Niche, scientists are addressing how society might pay for expensive therapies that arise from their research. Patient-advocacy groups are funding many research laboratories, and there are well-established collaborations between researchers, clinicians, patients, regulators and industry. Organizations that pay for health care, as well as social activists, may soon need to be included, writes Baker.

Previous concerns about stem-cell therapies have come from outside the research or treatment fields, from people who are primarily concerned about social equality or about basic ethical issues. As stem-cell research projects move towards applications, such as disease modelling and patient screening, scientists and social activists will need to find new ways to interact — to ensure that they also address the associated economic hurdles. ■

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