Abstractions

LAST AUTHOR

A Holliday junction is a fleeting four-way crossover that occurs between DNA strands of the two chromosomes that make up a pair, allowing the reciprocal exchange of genetic information during a process known as homologous recombination. This mechanism was first proposed in 1964, and so far, only proteins from prokaryotes — organisms whose cells lack a nuclear membrane — have been shown to promote the formation of this type of DNA structure. On page 1018, Hiroshi Iwasaki of Yokohama City University in Japan and his colleagues demonstrate that similar proteins from eukaryotic — or nucleated — cells from yeast and humans promote Holliday-junction formation. Iwasaki spoke to *Nature* about why he finds the Holliday junction so intriguing.

You have worked on Holliday junctions for the past two decades. Why?

Holliday-junction formation is dangerous for cells, because their DNA must be cut in order to be rearranged. But this step is necessary for all organisms, not only to generate genetic diversity, but to repair damaged DNA — for example, in double-strand breaks. I find this very interesting. In 1991, we identified an enzyme that disassembles the Holliday-junction structure in the bacterium *Escherichia coli*. After that, I was motivated to find such an enzyme in eukaryotic cells, because no one had yet done so.

Did you use a novel approach to do this?

Yes. DNA is polar, and in prokaryotes DNA-strand exchange proceeds in only one of two possible directions. We looked for DNA-strand exchange from both polarities in eukaryotes, and found that it runs in the opposite direction to that in prokaryotes. Without looking in both directions, we would not have found the protein activity responsible for eukaryotic strand exchange.

Is there more to learn about basic biological mechanisms?

Yes. Basic biological mechanisms can easily get overlooked in science, but they underlie so many processes. For example, induced pluripotent stem cells — which can develop into any of the body's cell types — obtained from skin cells are a hot topic at the moment, but the fundamental mechanism underlying their transformation from differentiated cells to stem-like cells is simply the regulation of transcription.

Where will your work go from here?

We still don't know the precise mechanisms by which a Holliday junction is formed and later disassembled by the enzymes we have identified. My goal is to uncover the entire mechanism of homologous recombination. ■

MAKING THE PAPER

Erin Kraal

Shifting sands suggest origin of mysterious martian landforms.

Sandboxes are not just for kids. Giant ones — such as the Eurotank flume facility at Utrecht University in the Netherlands — can be used to study landscape and river evolution. And not just on Earth: Erin Kraal travelled to Utrecht to investigate landforms on Mars. But her big discovery came while she was taking time out from this work to show two high-school students how the tank can be used to study the formation of alluvial fans — the wedges of sediment left by rivers when they enter a basin. A simple demonstration in the 12 × 5-metre sandbox offered an unexpected explanation for how the red planet's 'stepped' deltas may have formed.

On completing her PhD, Kraal, now a research scientist at the Virginia Polytechnic Institute and State University in Blacksburg, was awarded an international fellowship from the National Science Foundation to spend her postdoc year at a foreign institution. She chose the home of the Eurotank. Her interest lay in the formation of alluvial fans, which provide a record of surface water flow. Understanding how these formations were produced on Mars is key to establishing not only where water flowed, but whether it was present for just decades or for millions of years.

Particularly intriguing were images of the martian surface that showed stepped, or terraced, fans. These are unlike any alluvial fan seen on Earth — here, such deposits have a single steep edge. Although Kraal wasn't focusing specifically on the origin of these stepped deltas, they were rarely far from her thoughts.

During her year at Utrecht, the editors of *Copernicus*, a European online science journal for young people (www.journal-for-young-scientists.net), approached Kraal to ask whether she might teach two high-school students about the Eurotank. She jumped at the chance. Clad in rubber boots, the trio carved extraterrestrial landscapes into the sand. They built a mock crater, fed a river to its rim and created an alluvial fan. The simple experiment was filmed, turned into a video and posted on *Copernicus*.

Afterwards, Kraal quickly drained the lake that had formed, because others were eager to use the facility. She was left with stepped deltas just like the ones in the images. "We were freaking out," says Kraal. "It had been a seat-of-the-pants experiment and we hadn't made any measurements!" She immediately shifted her attention to developing control experiments, and recreating the crater and the unusual deposits.

On page 973, Kraal and her colleagues offer a model for the creation of martian stepped deltas. They propose that water was released suddenly from subsurface storage, carved out short canyons, cascaded over the rim of a crater, filled it, then rapidly drained away. These discharges, which would have been comparable in size to large rivers such as the Mississippi, would have to have occurred over a period of decades, not millions of years.

"We don't see stepped deltas on Earth," says Kraal. "It is hard to imagine a situation that would have such a rapid release of water, but even if such a delta did form, it would not be preserved because there is so much rain here." The group is now exploring what might have caused the water's rapid release on Mars. One possibility is a volcanic intrusion, which might have melted ice, mobilizing the water very quickly. ■

FROM THE BLOGOSPHERE

In the space of a few days, *Nature*'s Editorial on double-blind peer review (*Nature* **451,** 605–606; 2008) had gathered almost 50 comments on the Peer-to-Peer blog at http://blogs.nature.com/peer-to-peer/2008/02/working_doubleblind.html#comments.

The Editorial concluded that double-blind peer review (in which both authors and reviewers are anonymous) is unlikely to be used at *Nature*, but asked readers for their views. In a torrent of comments, a theme emerged among self-defined junior researchers that the current single-blind system is biased against them in favour of established investigators.

But "Bob O'H" performed a model calculation that suggests that double-blind review merely shifts the bias so that "the very famous" actually do better, as do "the very obscure"; the scientists who lose out are the ones in the middle. Another view expressed is that in journals with high rejection rates, reviews are of lower quality.

Would double-blinding affect review quality? Or would it result in more scientists declining to review for journals? Your comments are welcome! ■

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