Abstractions

FIRST AUTHOR
The western Pacific warm pool, one of the open ocean's largest bodies of warm water, wields significant influence over Earth's climate. Even though scientists understand the key part that the warm pool plays in the El Niño/Southern Oscillation (ENSO), they do not know the extent to which it influences global climate change — past and present. Graduate student Jud Partin and his adviser at Georgia Institute of Technology, Atlanta, turned to stalagmites from Borneo to create a tropical climate history (page 452). Partin spoke to *Nature* about how this new approach revealed complex climate controls.

Did you set out to be a spelunking scientist?
No, I consider myself a lucky graduate student who enjoys the fieldwork — even though it is demanding. Other people have been using stalagmites as a proxy for past climate records, but we were the first to use ones from remote areas in the ENSO-affected west Pacific. To sample the stalagmites, we hiked 20 kilometres with 32-kilogram packs to get to a remote part of the Gunung Buda National Park in Borneo.

Why use stalagmites rather than sediments or coral reefs to understand climate change?
Our mission was to create high-resolution records of the history of the tropical Pacific climate. Stalagmites provide decadal resolution within a 30,000-year record. We can absolutely date stalagmites using the radioactive decay rate of uranium, and we can determine the past rainfall amounts by measuring oxygen isotopes. Sediment cores are difficult to date accurately, which obscures climatic cause and effect. Corals provide monthly resolution, but an individual coral is usually only several hundred years old, and those pre-dating 1800 AD are extremely rare.

How can you use absolute dates to a scientific advantage?
Absolute dating allows a direct comparison of climate records from all over the world. This helps scientists to determine the sequence of events during abrupt climate changes in the past. Armed with precise dating from other stalagmites around the world, we can next ask: does the western tropical Pacific act as an amplifier or as a trigger of global climate variability?

What was the biggest surprise the stalagmite data revealed?
Some people think that the tropical Pacific is slave to the climate influence from higher latitudes. We found, however, that it is more complex because the tropical Pacific can also act independently — responding to changes in solar input. ■

MAKING THE PAPER

Leslie Vosshall and Hiroaki Matsunami

Response to the scent of a man is genetically determined.

Leslie Vosshall (left) and Hiroaki Matsunami (right) collaborated in their olfactory research.

One of the famous problems in the olfactory science field is why the perception of androstenone, an odorous steroid found in high levels in the urine and sweat of men, varies. Some describe the smell as pleasantly floral and sweet, others as an offensive urinous reek, and many can't smell it at all.

Researchers have suspected a link between genes and odour perception for about 40 years. In 1967, olfactory biochemist John Amoore found that some people are insensitive to certain odours, a condition he called specific anosmia. Amoore predicted that the root of odour 'blindness' would be traced to genes. Some years later, researchers discovered that the ability to smell androstenone was genetically determined, but they never pinpointed the gene.

Leslie Vosshall, a neurogeneticist at the Rockefeller University in New York, learned about Amoore's research as a postdoctoral researcher in 1993, which sparked her interest in the genetic underpinnings of the perception of smell. At the time, she thought "This is something I really want to figure out".

Her most recent work contributes part of the answer. On page 468, Vosshall and colleagues establish how genetic variation in the odour receptor OR7D4 alters people's perception of androstenone.

Vosshall says the project developed slowly out of an impasse her group reached while studying olfactory responses in fruit flies. "As wonderful as fruit flies are, they don't talk," she says. "You cannot get them to give a declarative answer to the question: how does this smell?" Gradually, they realized that humans would be the perfect experimental organism.

But Vosshall had no experience with human subjects, and colleagues thought it a risky venture. She and her team recruited hundreds of volunteers from all walks of life, from "ladies who lunch to graduate students", drew blood and tested the volunteers' responses to a panel of 66 odours, including androstenone. Soon, the freezer was packed full of blood samples.

"We had this vague idea that DNA sequencing would get cheap enough and then we would sequence their genomes," she says. Meanwhile, Hiroaki Matsunami and his group at Duke University Medical Center, in Durham, North Carolina, had taken a mirror approach, expressing the genes for various odour receptors in tissue-culture cells, including OR7D4, which responded selectively to androstenone.

The field of smell is tiny, and it wasn't long before word of Matsunami's discovery reached Vosshall. They hammered out an agreement and began a collaboration in June 2005.

Matsunami's laboratory sequenced the coding region of the *OR7D4* gene of 391 of Vosshall's volunteers. "Very quickly there was a clear and strong correlation between having the functional receptor in your genome and being very sensitive to androstenone," says Vosshall. People with the common version of OR7D4 found androstenone strong and unpleasant and described it as sickening. Those with two one-letter changes in the gene's code found it less so — some even said it smelled like vanilla.

Some studies show that androstenone can cause arousal, sweating and a surge of stress hormones in women, particularly around ovulation. So for males, says Vosshall, success in landing a date may lie in the woman's genes. ■

FROM THE BLOGOSPHERE

A news in brief article (*Nature* **449,** 13; 2007) reported that the Association of American Publishers (AAP) is taking part in the Partnership for Research Integrity in Science and Medicine (PRISM). The PRISM initiative protests against government interference in scholarly communication. Some groups and legislators are pushing for all publicly financed research to be made freely available, whereas PRISM holds that "society is best served by sustainable business models and reasonable copyright protections".

Timo Hannay, web publishing director at Nature Publishing Group (NPG), writes on Nascent (http://tinyurl.com/25dzny): "Although Nature America is a member of the AAP, we are not involved in PRISM and we have not been consulted about it. NPG has supported self-archiving in various ways and our policies are already compliant with the proposed US National Institutes of Health mandate."

Nature's policies can be found at our author website (http://www.naturecom/authors). Hannay's post, with further thoughts and opinions about 'open-access' publishing, is highly recommended reading. ■

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