Abstractions

FIRST AUTHOR
Vega is the second brightest star in the northern hemisphere and is used by astronomers as a benchmark for assessing the brightness and colour of other stars. But on page 896 of this issue, it is Vega itself that gets assessed, with some surprising results. In the course of testing a new instrument, Deane Peterson at Stony Brook University in New York and his team discovered that Vega rotates rapidly, is slightly tilted on its axis, and is older than was previously thought. Peterson talks to *Nature* about the effect these results may have.

Why look at Vega?
Vega is the absolute standard: you classify other stars using it. It is also a photometric standard — when you want to measure how much light you're getting from an object you compare its brightness with that of Vega. But there have been some niggling problems: calibrations for Vega in the visible spectrum that have been extrapolated to the infrared don't quite fit. But these issues have been around for some 30 years and they weren't what motivated our work.

So what did motivate you?
We had used our new interferometer to observe the star Altair, which is not circular in shape. But we also wanted to measure a star that was round, so we looked at Vega. Looking at the data, Vega had the shape we expected. It was only after we wrote our paper on Altair that it occurred to me that we could look at the Vega data in another way. Doing that, we got a signal that wasn't quite symmetrical. Some astronomers had suggested that Vega might be rotating rapidly, and I realized that we had the proof. It turns out we're looking right down the star's axis, which is why we don't see signs of rapid rotation.

As Vega is a benchmark, how will this affect understanding of other stars?
It will ripple through the system. It's like a small tremor; it will be felt everywhere but it won't break anything.

Why is Vega brighter than it should be?
One of the issues was that in general Vega seemed too bright. Normally you would just dismiss it and say it is closer to us than we thought — but we know the distance. In fact, because we are looking at it 4.5° off the poles, it seems a half magnitude brighter.

Your wife is a vet. What, if any, impact does this have on the way you do research?
We don't bring work home together. She's amused when I tell her things she doesn't understand and I'm amused when she tells me things I don't understand. We don't talk shop too much when we get home. ■

MAKING THE PAPER

Jay Keasling

Brewer's yeast joins the fight against malaria.

Yeast is not often associated with efforts to control a global health problem, but work published on page 940 of this issue manages to bridge the gap. Jay Keasling, a synthetic chemist at the University of California, Berkeley, and his team have engineered yeast cells to produce an important precursor for a drug to treat malaria.

Artemisinin is an extremely effective treatment for malaria, but is also very expensive and in short supply. Normally extracted from sweet wormwood (*Artemisia annua*), the active compound has proved remarkably difficult to synthesize in the laboratory.

Keasling and his team already had ample experience of modifying microbes to produce or degrade specific compounds when they turned their attention to the biosynthesis of artemisinin. In 2000, the enzyme responsible for the first step in the production of the drug in plants was discovered. Three years later Keasling's team showed that this enzyme could be introduced into microbes, which could then carry out the first steps of the synthesis, albeit with low efficiency.

Soon after this advance, Keasling teamed up with the Institute for OneWorld Health, a non-profit drug company based in San Francisco, and Amyris Biotechnologies of Emeryville, California, to try to complete the synthesis with funding from the Bill & Melinda Gates Foundation. The partners divided the work up: Keasling tackled the synthesis, Amyris was charged with scaling the process up, and OneWorld Health took on responsibility for regulatory work to prove that the compound being produced was equivalent to the natural form.

Keasling opted to use brewer's yeast (*Saccharomyces cerevisiae*) for his putative microbial factory because "it is well studied and plant enzymes seem to be more functional in yeast", he says. The product he was aiming for was artemisinic acid, which can readily be converted into artemisinin. One element of the biosynthetic pathway already existed in yeast, so the first task was to mutate certain genes to maximize production for this step. Next the team repeated its earlier work and introduced the plant enzyme into the yeast. Finally, the group needed to find a gene that would perform the final conversion of intermediates to artemisinic acid — a three-step reaction. The researchers found what they were looking for after cloning and testing a number of potential candidates. "It was very helpful that one enzyme catalysed all three reactions we needed," Keasling says.

"Going into the project, it was a significant challenge but I am actually surprised at how well every step worked," says Keasling. Indeed, an added bonus was that yeast seems to transport the artemisinic acid out of the cell, making isolation and collection of the product much easier.

Although the pathway still requires optimization, Keasling remains optimistic that this can be achieved. "We have a real opportunity to get this treatment to people who need it," he says. According to his estimates, the drug could be offered at a fraction of current costs. ■

QUANTIFIED **THE NETHERLANDS**

A numerical perspective on *Nature* authors.
At the University of Utrecht in the Netherlands, Dirk Spengler is writing up his PhD thesis in structural geology. Undertaking the PhD project was an easy decision, he says, as it offered a combination of all the things he enjoys most about research — fieldwork collecting samples, lab time analysing data and the chance to do some teaching.

"As a PhD student, it took some time to realize that the project was entirely mine," admits Spengler, but he has since enjoyed taking it in his own direction. On page 913, Spengler and his colleagues present some of the project's results. They show that mantle fragments (peridotites) from Norway originated at much greater depths than the thickness of the oldest continents, which means the fragments can be used for the direct study of continental evolution in the early Earth. ■

9 people are in the structural-geology group at Utrecht University.

65 authors working in the Netherlands have presented original research in *Nature* this year (3% of all authors).

4 authors working in the Netherlands have published more than one paper in *Nature* this year.

20% is the accept rate for manuscripts submitted to *Nature* from Utrecht University over the past calendar year.