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Abstractions

FIRST AUTHOR

Astronomers believe that planets form in 'protoplanetary disks' — swirling masses of gas, dust and other particles that surround newborn stars. But direct proof of this theory has been lacking, and the timescales over which planets form, as well as the process by which they do so, are still up for debate. On page 38, Johny Setiawan and his colleagues at the Max Planck Institute for Astronomy in Heidelberg, Germany, reveal their discovery of a giant planet orbiting a star young enough to still be surrounded by a protoplanetary disk. This is a key piece of evidence in the endeavour to understand planet formation.

Were you determined to prove that the protoplanetary disk is deservedly named?

Yes. By studying planet formation we hope to understand the origin of planetary systems and put our solar system in a universal context. To do so, we have to look among the more than 100 young stars with documented circumstellar disks, in which we believe planets are born. Previous work drew attention to TW Hydrae, an 8 million to 10 million-year-old star. There was speculation that variations in its disk structure could be due to a planet forming. So we decided to take a closer look.

Why has no one found this evidence before?

Previous work focused on the quickest way to discover extrasolar planets — using radial velocity, which measures changes in an object's velocity along the line of sight over time. Most researchers excluded young stars from such surveys because they are rife with noisy data resulting from stellar activity. Now that more than 270 extrasolar planets have been found, attention is turning to the physics of young stars to help us understand the birth of planetary systems. We used radial velocity to search young stars one by one and extracted information carefully. We were lucky that the planet we found is big enough for us to detect around a young star.

Do your findings change our understanding of planet formation?

Our work gives an observational upper limit for the timescale of giant planet formation. Statistical studies of young stars suggested that disk lifetime can be a few tens of millions of years. More recent studies put a typical disk lifetime at about 10 million years. Our work indicates that planet formation should be complete within 8 million years.

Do you intend to search for other planet-forming protoplanetary disks?

Yes. But we are also continuing to observe TW Hydrae. A companion planet could be forming in the disk around it. ■

MAKING THE PAPER

Roger Reeves

Down's syndrome holds genetic clue to cancer prevention.

Scientists have struggled for more than 50 years to resolve the controversial claim that individuals with Down's syndrome are less likely to develop solid tumours. Although the idea has become accepted dogma in recent years, studies hoping to prove or disprove the theory have been less than definitive. Reports of research showing cancer rates in people with Down's syndrome to be equal to or greater than those in the general population appear in the literature just as frequently as those concluding that rates are lower.

The difficulty of searching for low-frequency cancers in an already small sample size (only 1 in 700 people have the extra copy — known as 'trisomy' — of chromosome 21 that leads to Down's syndrome), confounds epidemiological studies. "Looking for lower incidence of an already very rare event makes it difficult to obtain an adequate sample size, which is the Achilles' heel in these studies," says Roger Reeves, a geneticist at the Johns Hopkins University School of Medicine in Baltimore, Maryland. In addition, he says, some studies make no adjustments for the generally shorter lifespan seen in Down's syndrome.

About five years ago, Reeves made what he calls a "leap of faith" after taking a good look at the conflicting epidemiological data. He decided that the statistics had reached an impasse and opted to take a biological approach based on mouse models of Down's syndrome. By studying mice with three copies of a group of mouse genes that correspond to a subset of genes found on human chromosome 21, Reeves and his colleagues have pin-pointed a dosage-dependent tumour 'repressor' gene that may hold promise for cancer prevention (see page 73).

Early in the study, the team showed that a genetic cross between trisomic mice and mice

carrying a gene associated with a high proportion of intestinal cancers reduced tumour formation by almost half. Then, Reeves' doctoral student, Thomas Sussan, narrowed the search for the responsible genes by using a mutant mouse with fewer triplicate genes — just 33.

Having found that this also lowered tumour incidence, the team looked more closely at the subset of 33 genes. They found that, despite being known to cause cancer when mutated, in triplicate the transcription factor Ets2 decreases tumour incidence.

As he became more involved with individuals with Down's syndrome, Reeves uncovered much misinformation about their quality of life. He cites published studies indicating that 80–90% of pregnant mothers who are told they will give birth to a child with Down's syndrome are likely to terminate the pregnancy. Yet, "they have little idea of what it means to have a child with Down's syndrome or to be a person with Down's syndrome," says Reeves. He notes that people with Down's syndrome have become actors, authors and musicians — feats many of us only aspire to. And just in the past two years, he says, several studies have made breakthroughs in developing pharmacological approaches to address cognitive deficits that will allow those with Down's syndrome to live even fuller lives.

Reeves sees a great irony in the fact that although their quality of life is often disavowed, it is the genomes of those with three copies of chromosome 21 that may ultimately yield a key to cancer prevention. "If trisomy 21 weren't compatible with a full life, it is unlikely that a study such as this would have been undertaken, let alone funded," he says. "Who would be foolish enough to randomly overexpress genes thought to cause cancer in order to prevent it?" ■

FROM THE BLOGOSPHERE

For those concerned about the effects of conference air travel on the environment, Second Nature, NPG's archipelago in Second Life (www.secondlife.com), was the virtual venue for a series of talks coinciding with the United Nations climate-change conference held in Bali in December (see Joanna Scott's blog for details: http://network.nature.com/blogs/user/joannascott).

Tara LaForce from Imperial College London spoke about whether and how we might capture carbon dioxide from power plants, compress it, and store it long-term in various geological structures such as oil reservoirs and deep saline aquifers. And, in another lecture, Euan Nisbet of Royal Holloway University in Surrey, UK, talked about the necessity for accurate monitoring of the climate, greenhouse gases and 'top producers' to have any realistic hope of tackling global warming. Both of these talks, and their associated slides, are available through Scott's blog.

If you are interested in giving your own research talk in this global environment-friendly format, please contact Joanna via her blog, or find her in Second Life, where she is known as Joanna Wombat. ■

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