Abstractions

FIRST AUTHOR
Obesity is an increasing health concern worldwide, yet little is known about the timing and regulation of fat-cell, or adipocyte, formation. Work by Kirsty Spalding, a molecular biologist at the Karolinska Institute in Stockholm, and her colleagues has determined that, in adults, new adipocytes are generated to replace those that die. The total number of these cells remains constant, with obese adults having almost twice as many as lean adults (see page 783). Spalding tells *Nature* that the tight regulation of this process might explain why it is so difficult for some to maintain weight loss.

How did you come to use a carbon-dating technique to monitor cell turnover?
I trained as a neuroscientist, and initially used the carbon-isotope signature from 1950s nuclear-bomb tests — the prevalence of which is decreasing over time — to detect the generation of neurons in adults. I thought the technique could also be used to establish whether cell turnover occurs in adipocytes.

So, will the current human population be able to shed more light on cell dynamics?
Yes. We all have traces of nuclear-bomb tests in our bodies. So, for example, we'll be able to study brain-cell dynamics associated with dementia as the peak population — those who grew up during the nuclear tests — reach their 70s and 80s.

How do adipocyte dynamics differ between obese and lean people?
In obese children, adipocyte number starts to increase at the age of two; this doesn't happen in lean children until they are almost six. The number of adipocytes seems to become set as people mature, so that, even in people who have lost a lot of weight, new adipocytes replace those that die. This may explain why it is difficult to keep weight off. As people lose weight, adipocyte volume decreases, possibly prompting the brain to send signals to eat more. We have not yet examined whether lean individuals are capable of making additional adipocytes if they gain a lot of weight as adults.

Does your work offer options for treatment?
Not yet, but regulation of adipocyte turnover might be a good target for therapeutic intervention if we can find a way to interrupt the interplay between cell generation and the brain signals for energy maintenance.

Do you still pursue neuroscience research?
Yes, but I definitely focus more on the obesity work. I did not appreciate how much of a struggle weight loss is for some until people began e-mailing me their life stories. ■

MAKING THE PAPER

Carl Murray

Image mosaics reveal structure of Saturn's outermost ring.

Some of Saturn's rings have constantly changing structures, making it difficult for researchers to decipher the processes that shape them. Yet such knowledge could provide a window on the formation of the Solar System. Data from Cassini — the first spacecraft to enter into orbit around Saturn — have allowed Carl Murray at Queen Mary, University of London, and his team to study Saturn's outermost ring, the F ring, in unprecedented detail. They find that constant collisions and the gravitational pull among a population of small satellites give the ring its form (see page 739).

Saturn's narrow F ring was discovered from images captured by the Pioneer 11 spacecraft in 1979. Later data from Voyagers 1 and 2 revealed the ring as having a core about 1 kilometre wide surrounded by a 50-km-wide envelope, both supposedly held in place by the gravitational pull of Saturn's shepherding moons, Prometheus and Pandora.

Cassini entered into orbit around Saturn in July 2004, and detected additional and somewhat puzzling features of the F ring. For example, outward and inward extensions of material called 'jets' project from the ring. Particles further away from Saturn move more slowly than those closer to the planet — a process known as keplerian shearing — which causes the jets to appear distorted, like smoke from a chiminey being blown by a gentle breeze. Moreover, some of these sheared jets aggregate together, forming arrangements known as fans.

To explain these structures, Murray and his colleagues took advantage of movie footage of the F-ring captured by Cassini between December 2006 and May 2007. The researchers took stills from these movies, each containing a part of the ring, and used them to compile a series of 'mosaics' that provided a complete view of the ring. "We unwrapped the ring to get a complete 360° panorama," says Murray, explaining that the photos from the previous missions by Voyagers 1 and 2 and Pioneer 11 were simply "snapshots over time". With Cassini in orbit around Saturn, the team had a chance to view the entire F ring at many different times. "This is something we couldn't have done with a fly-by spacecraft," Murray says.

Originally, the team was looking for particles that might, through collisions with one another, cause the jets and fans to appear. "It's like a crime scene," says Murray. "You're trying to figure out what the evidence is telling you, and then trying to come up with some suspects. Prometheus and Pandora are the usual suspects, but we think they have some interesting accomplices."

Cassini detected 13 large objects — with diameters ranging from 27 metres to 9 km — lying within about 10 km of the F ring's core, providing direct evidence of a 'moonlet belt'. Murray's group determined that a population of larger (5-km diameter and more) moonlets continuously collide with material within the core, producing new particles that are then pulled by the gravitational force of smaller, nearby moonlets. The combination of these two processes determines most of the ring's morphology.

The F ring is possibly unique in the Solar System as a location where large-scale collisions happen almost daily. "These processes are similar to those going on in a protoplanetary disc and in basic planet formation," says Murray. "The F ring has a lot of secrets. We need to continue looking at it." ■

FROM THE BLOGOSPHERE

Does a scientist who has had three patents in the past five years, but only three papers, each cited just three times, deserve more recognition than one with five *Nature* papers and 1,000 citations? Does a scientist who works in a hot field and has made nice contributions deserve more credit than another working in a less glamorous, lonelier field, who has made equally profound contributions? These questions — which were often difficult to answer — were uppermost in the mind of *Nature Medicine*'s editor Juan Carlos Lopez when he recently served as one of the judges for a young scientist award, as he describes at Spoonful of medicine (http://blogs.nature.com/nm/spoonful/2008/05/the_jurys_way_out.html).

Lopez reflects that if he and his fellow judges made a mistake in their decision, the consequences would not be all that serious for the scientist who should have won. But similar questions are also considered by grant reviewers. In such cases, wrong decisions "can lead to a lab's shutdown, to fired postdocs and to truncated careers, which, alas, are becoming more and more common". ■

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