Abstractions

FUTURES AUTHOR
Robert Metzger splits his time between research on semiconductors and writing science fiction. His stories tend to be set in the not-too-distant future, building on the latest scientific theories and pushing them close to breaking point. Metzger, who contributes to this week's Futures (page 394), explains to *Nature* how the boundaries between his research and his fiction writing sometimes blur.

How does your science influence your sci-fi?
There is very little difference between doing science and writing science fiction. When you do science, you pray that the data that have so far made no apparent sense coalesce when you ask the right question. When I write science fiction and really get into it, and create my world and have all these interlocking pieces, it becomes alive. And when it becomes alive it has to follow rules. For me a lot of those rules are physics-based or mathematics-based. Figuring out these rules in my science fiction provides me the same 'gee-wiz' moment that I get from science.

What about your fiction influencing your science?
For one story, I thought up a scenario where crop-harvest residue sunk into the ocean combats global warming. I worked up some formulas to see if it was possible and checked with some colleagues and found it wasn't as far out as I initially thought.

You describe your writing as 'hard' science fiction. What does that mean?
In hard sci-fi, you can't violate any known laws of physics — but you really need to stretch them. If you do stretch your physics — such as going faster than the speed of light — you have to explain it. If you do traditional sci-fi, it's like, you engage the warp drive and the good guys win.

What's your biggest science-fiction influence and why?
A lot of Robert Heinlein and Andre Norton. As a kid, I thought: 'Wow, this stuff is different. It's not my world.'

What do you read now?
The bulk of my reading is non-fiction.

How else do you bridge the science and science-fiction community?
The Science Fiction and Fantasy Writers of America association puts out a quarterly bulletin. For the past ten years I've been doing a column that helps people incorporate real science into their writing. I show them that science is far weirder than most fiction. ■

MAKING THE PAPER

Andrew Smith

A journey back in time to trace the ancestors of starfish.

For 25 years, Andrew Smith, a palaeontologist at the Natural History Museum in London, has been troubled by a question of symmetry. It began while he was working on a PhD thesis about the modern history of echinoderms — marine organisms such as starfish that are defined by radial symmetry, much like the symmetry seen in the spokes of a bicycle wheel. During subsequent research, he came across a debate over the provenance of asymmetric organisms called Stylophora.

Palaeontologists have long considered these extinct organisms to be primitive echinoderms — even though they had only one mobile structure that could have been an 'arm', rather than the multiple arm-like structures seen in echinoderms today. Nevertheless two opposing views arose, which put the organisms at different points along the evolutionary tree.

One view held that Stylophora were primitive chordates — organisms characterized by a hollow nerve tube — but with an echinoderm skeleton; the other that they were primitive echinoderms that predated forms with radial symmetry. More recently, a third view emerged that the organisms weren't so primitive after all, but were highly evolved echinoderms.

"These arguments have been going for some time," Smith says. "What was needed was some hard data in place of speculative reconstruction of soft tissues."

Putting Stylophora into the right category depends largely on determining the use of the 'arm', as each camp has ascribed it different functions. But pinning down its use has been difficult, because this would mean analysing soft tissue, such as muscle, which isn't present in fossils. Smith's PhD had shown him that it is possible to reconstruct the nature of soft tissues lost during fossilization — provided you have samples of the skeleton that preserved their original microscopic structure.

But such samples had eluded Smith and the rest of the field. Then last October, Smith received an e-mail from Sébastien Clausen at the University of Science and Technology in Lille, France, who was doing field work in the Moroccan desert. Clausen had uncovered a large bed of sediment in which there were pieces of Stylophora that showed remarkable preservation.

The two scientists had never met — Clausen had found Smith's name by doing a literature search — but they quickly agreed to collaborate. Smith's anticipation was justified when he got to handle the specimens this March. "The preservation of the fine details of the plates was absolutely spectacular," he says. "Just as good as modern specimens."

The preservation was good enough for Smith to reconstruct the soft tissue. His results, shown on page 351 of this issue, put the Stylophora solidly in the 'primitive echinoderm' camp. They also offer some insights into how these asymmetrical organisms evolved into symmetrical creatures such as starfish and sea urchins. "What we get from studying these early forms of echinoderms is how they worked towards symmetry," Smith says.

Although Smith thinks that the evidence he and Clausen have produced is solid, he is unsure if it will end the debate. "Are controversies ever put to rest?" he asks. ■

QUANTIFIED **FRANCE**

A numerical perspective on *Nature* authors.
At the Curie Institute, in the heart of Paris, Edith Heard and her team study X-chromosome inactivation — how female embryos 'silence' one of their X chromosomes, to prevent overexpression of the genes contained on the two copies.

The group is part of the Epigenome Network of Excellence, an initiative that spans ten European countries and aims to understand changes in genome function that occur without a change in DNA sequence. Heard says that communication between the member groups helps to coordinate research efforts and share knowledge.

Heard's latest collaborative work shows that although it is always the X chromosome inherited from the father that is silenced, this is active at first but then switched off through the action of one of its own genes (see page 369).

231 *Nature* authors published in 2005 work in France (total number of published authors = 5,098).

53% of papers published in *Nature* this year that have contributing authors working in France are in the physical sciences.

7 people are in Edith Heard's Mammalian Developmental Epigenetics Group at the Curie Institute.

3 papers in this week's issue, have contributing authors working in France.

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