Abstractions

FIRST AUTHOR
Evolutionary biologists would like to map the origin and early diversification of animals. So far, researchers have targeted sponge and sea anemone genomes for clues. The seeming simplicity of a microscopic soft-bodied marine organism called *Trichoplax adhaerens* made it a top candidate for a descendent of the earliest animal branch of the evolutionary tree. Mansi Srivastava, a PhD student at the University of California, Berkeley, was part of the team that decoded the *Trichoplax* genome (see page 955). She tells *Nature* about *Trichoplax*'s surprising complexity.

Did *Trichoplax* turn out to be an evolutionary goldmine?
More than we expected. It has only four or five cell types, yet we found an extensive repertoire of factors that are involved in specifying additional cell types in other animals. We even found genes for neural functions, even though *Trichoplax* has no neurons. Maybe most strikingly, co-author Nicholas Putnam found that some genes that are present together on human chromosomes are also present together on *Trichoplax* chromosomes — despite their having diverged perhaps 650 million years ago.

Is *Trichoplax* a blueprint for modern animals?
It's tempting to assume that. Unfortunately it's impossible to say without a fossil record of *Trichoplax* or its ancestors. But we can safely say that the *Trichoplax* genome has retained a lot of primitive features relative to other living animals.

Why is so little known about this organism?
Because of its small size, it is hard to observe *Trichoplax* in its native marine environment. In the lab, it only grows asexually, but sexual activity has recently been inferred on the basis of genetics. Unfortunately, no one has yet observed its entire life cycle. Its genes will tell us what *Trichoplax* is capable of.

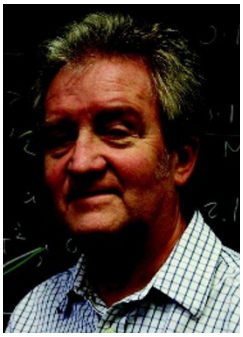
Do you expect *Trichoplax*'s evolutionary significance to be debated?
Yes. Mitochondrial gene sequences suggest that it belongs to the earliest branch of animal evolution, but our data conflict with that hypothesis. We suggest that *Trichoplax* and its relatives diverged from other animals after sponges but before the diversification of all other animals. Decoding the genome of a comb jelly, or ctenophore, will help to illuminate early evolutionary events because recent studies suggest this was the earliest animal group to evolve.

Has this work shaped your aspirations?
Yes. Working on this exciting and contentious project has given me a taste for work with far-reaching implications for animal evolution. ■

MAKING THE PAPER

Andrew Fabian

Giant galaxy's filamentous structure is held stable by magnetic fields.



Bright streams of gas fan out from NGC 1275 — the giant elliptical galaxy at the centre of the Perseus constellation — making it look a bit like a supersized space jellyfish. These filaments are thought to be around 100 million years old, and although they appear static, they are buffeted by the extreme pressure and heat of the gases that surround them. Using images from the Hubble Space Telescope, astronomer Andrew Fabian at the Institute of Astronomy in Cambridge, UK, and his colleagues were able to discern how these filaments maintain their structure.

Images of the galaxy had already been attained by ground-based telescopes such as the WIYN telescope, which is owned and operated by a consortium comprising the University of Wisconsin, Indiana University, Yale University and the National Optical Astronomy Observatory. But to get finer detail, Fabian's team commissioned Hubble, which has tenfold better resolution than WIYN.

They booked four blocks of observations with the Advanced Camera for Surveys on the Hubble, one of the cameras responsible for the deepest view yet obtained of the cosmos. Two observations were made in August 2006 and one in January 2007, but before the final data collection could be made the camera broke down. "We only got three-quarters of the data we were hoping for," says Fabian. "Nevertheless, we were able to get some wonderful images."

These images allowed Fabian's team to shed light on the characteristics of the network of gaseous filaments that reach out from this galaxy. The filament system extends across a distance of 100,000 parsecs (1 parsec is about 206,000 times the distance between Earth and the Sun), making NGC 1275 almost ten times larger than the Milky Way.

The filaments are emitted from the galaxy either radially or at an angle, as exemplified by a characteristic filament dubbed 'horseshoe'. Embedded within the filaments, the team discovered long thin strands that they called threads. Some extend across a distance of about 6,000 parsecs, but are only 70 parsecs wide.

Fabian explains that although the filaments look static, there is nothing placid about their environment. A black hole inside the galaxy squirts out jets of gas into the cosmos, creating bubbles. The bubbles become buoyant and drag some of the cooler gas from the centre of the galaxy outwards. "The filaments we see are actually these gases being dragged outwards," Fabian explains. "In order for the filaments to not be dragged or broken apart, they need magnetic fields to give them integrity and structure." Fabian's group was able to calculate that the magnetic fields found within these threads, which are about one-ten-thousandth of the strength of Earth's field, help to give the filaments their stability amidst the cauldron of activity at the galaxy's centre (see page 968).

The team also found that most of the filaments do not have star clusters associated with them. "Normally, cold gases collapse under their own gravity to form stars. But in these structures it seems that the magnetic fields are preventing this," says Fabian.

With a space-shuttle mission to refurbish Hubble planned for October 2008, Fabian hopes to use the telescope again to make further observations of this cluster. He also wants to look at similar filaments in other massive galaxies around the Universe, because these may hold the key to how stars are formed. "One third of the central galaxies in cluster galaxies have filamentary structures," says Fabian. "We want to have a go at them." ■

FROM THE BLOGOSPHERE

Should there be affirmative action for women in science? Heather Buschman, a science writer for the Consortium for Functional Glycomics, poses that question at the *Naturejobs* careers advice forum (http://tinyurl.com/65x54m). "Wouldn't it do more harm than good," she wonders, "to punish departments or universities if they don't recruit enough women to science?"

Her post provoked a debate about why women drop out of science career tracks and possible solutions. Heather Etchevers, an embryologist at INSERM in France, says an affirmative action policy need not be punishment. "On the contrary," she writes, "it could be an opportunity to praise certain policies and highlight them as examples." And Hilary Spencer, product development manager for Nature Precedings, points to a report suggesting that factors beyond family matters, such as reward systems based on taking big risks, are important in female attrition.

Forum moderator Paul Smaglik notes that the tricky part will be finding ways to level the playing field without diminishing the success of women who have already made the climb unaided. ■

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