



Vanessa Gould was intrigued by the idea of origami as visual maths.

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## Q&A: Origami unfolded

In her documentary *Between the Folds*, film director **Vanessa Gould** explores the expression of mathematics through origami. She tells *Nature* how she became captivated by the art and science of transforming sheets of paper into three-dimensional geometric shapes — and exposed a hidden subculture.

### Why did you make a film about origami?

I was working on Wall Street in New York, earning a living with the mathematics side of my head, but not happily. I was number crunching by day but coming home at night and painting. My degree is in physics and architecture.

Then, around five years ago, I heard about a mathematician, Tom Hull, and a computer scientist, Erik Demaine, who were using origami in their research. I was fascinated with the idea that in doing something mathematical, you could produce something beautiful to look at. A friend challenged me to make a short film about it. I had never picked up a camera before.

### How did you find the story?

When I visited Tom Hull in Massachusetts, I felt that I'd hit on a gold mine. He showed me an origami piece called *Five Intersecting Tetrahedra*, a beautiful, three-dimensional pointed star made with 30 pieces of paper. As I was leaving, he said 'Hey, I'd love to introduce you to a friend of mine'. His friend, a paper-maker, started talking to me about the same medium of origami but from the opposite perspective.

And that became the story — the fact that artists and scientists were all working with the same medium. Whose hands are going to hold the paper, and what are they going to turn it into?

### What are your favourite shapes?

Eric Joisel folds the human form in a way that really blows audiences away. And Chris Palmer makes a spinning top out of a single square; when you pull the corners it torques the paper in such a way that it spins for 30 seconds afterwards, and that always gets a huge gasp. There's also Miyuki Kawamura's *Cosmosphere*, a huge, self-supporting sphere which is made out of many hundreds of pieces of paper.

### Are there any unusual uses of origami?

We focus on a woman in Israel, Miri Golan, who has developed a mathematics curriculum which she calls *Origametria*. It has been extremely successful, and thousands of kids every week in Israel learn geometry through paper-folding.

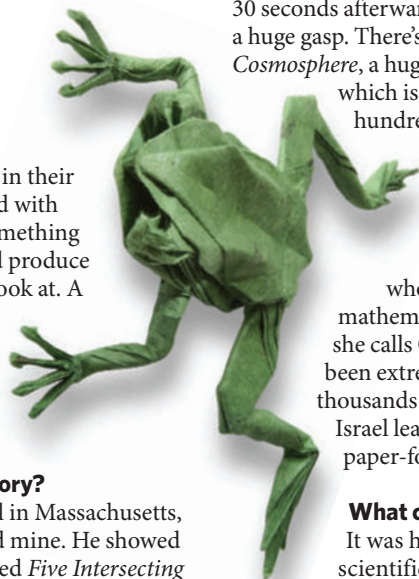
### What challenged you most?

It was hard to present the scientific ideas in the film without intimidating the audience.

The aim was to show science in a poetic and romantic way, but with depth so it could appeal to existing scientists and maybe titillate non-scientists. Art is a metaphor for science — they are just two different lenses through which we see the Universe.

Interview by **Roxanne Khamsi**, news editor at *Nature Medicine* in New York.

See [www.greenfusefilms.com](http://www.greenfusefilms.com) for future screenings.



R. J. LANG/PHOTO BY L. GARDINER

## Art tied up

### Ravelling, Unravelling

Royal Institution of Great Britain, London  
Until 28 May 2009.

A chance meeting between artist Naheed Raza and mathematician Steven Bishop led to Raza's recent year-long residency in the mathematics department at University College London. Four of her resulting works, on show this month at the Royal Institution of Great Britain, examine knotted structures and the parts they play in the body and in disease, as well as in mathematical theory.

In *Nidus 1-4*, four tiny, prototype bronze casts of tangled blood vessels resemble intricate jewellery. These malformations can impede blood flow to tissues and are implicated in neurological diseases such as Alzheimer's, Creutzfeldt-Jakob and Parkinson's, and in epilepsy.

*Mile of String* is a rigid three-dimensional structure, made by twisting a single length of twine so that it holds a complex, coral-like form under its own tension. It evokes both Albert Einstein's concept of warped space-time and the folded and coiled structures of proteins and DNA.

For *Silk*, Raza filmed a golden orb-weaver spider. Her focus shifts between close-up shots of the spider extruding silk and hypnotic footage of its web, pulsating in the breeze. The high tensile strength of spider silk has led to its being investigated as a biomaterial that could provide a scaffold for the formation of new body tissues.

The fourth work is a digital animation produced in collaboration with Carl Fairweather. *Ravel* shows twisting, coiling ropes (pictured below) that undergo ever more complex permutations while being pulled into a vortex.

Raza says that "there is a convergent ground for fruitful dialogue about knotting as a recurring motif in science and medicine, art and culture".

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