



A Paris exhibition mingles mathematical concepts with work by artists including songwriter Patti Smith.

MATHEMATICS

Drowning by numbers

Stefan Michalowski and Georgia Smith find that a mix of unexplained equations and thunderclaps doesn't add up.

Entering the Cartier Foundation for Contemporary Art in Paris for the exhibition *Mathematics: A Beautiful Elsewhere*, you are directed to an oval room, entirely white and very noisy. A recording of singer-songwriter Patti Smith intoning *Baa, Baa, Black Sheep* in a weary voice plays over deep, rumbling sounds. In a video projected on the wall, a book crashes into view as if dropped from the sky, accompanied by a thunderclap. It is Gregor Mendel's 1865 *Experiments in Plant Hybridization*. A long quote from the book appears on the screen.

Turn around and you find yourself staring at a fireplace in which black-and-white cartoon flames flicker, numbers dancing above them. Another thunderclap. Blaise Pascal's *Of the Geometrical Spirit* drops into view on the back wall. Overhead, an animated mandala by US film-maker David Lynch grows: stones, trees, humans, continents, planets, stars and galaxies, all drawn in a childlike hand. "Yes, sir, yes, sir, three bags full," drones Smith.

What is going on here? According to the exhibition guide, the goal is to "transform the abstract thinking of mathematics into a stimulating experience for the mind and the senses, an experience accessible to everyone". In this eclectic array of maths-inspired art, it is the pieces that don't try too hard that really work.

To create the show, the foundation's director, Hervé Chandès, and astrophysicist Michel Cassé of the French Atomic Energy Commission, brought together pairs of artists and

mathematicians who then collaborated to make the exhibits. Jean-Pierre Bourguignon, director of France's Institute for Advanced Scientific Study (IHES) near Paris, one of the world's leading centres of mathematical research, is co-curator. Most of the mathematicians involved have worked at the IHES. Chandès selected artists from among those who had exhibited previously at the foundation.

"No format was fixed, and everything was open," says Bourguignon. "It was very difficult to predict at the beginning what would happen."

The main exhibits in the museum's quiet basement work well. Film-makers Raymond Depardon and Claudine Nougaret had the excellent idea of letting mathematicians speak for themselves: four minutes to say whatever they wanted. These mini-monologues are fascinating, accessible and beautifully shot. Cédric Villani (wearing his signature velvet butterfly bow-tie) recounts his passion for triangles. Michael Atiyah eloquently describes how maths and art are explorations of inner thoughts and visions, as well as external reality.

In another room, an elegant aluminium sculpture by Hiroshi Sugimoto embodies a surface with constant negative curvature. It tapers upwards from a round base in an asymptotic curve that, theoretically, would come to a point at infinity. There is an equation on the wall, but no explanation of its

Mathematics: A Beautiful Elsewhere

Fondation Cartier, Paris.
Until 18 March 2012.

relationship to the sculpture.

Other installations border on the inexplicable. A static video feed from the control room at the Large Hadron Collider at CERN, Europe's particle-physics lab near Geneva, Switzerland, cuts to a silvery hand that draws Feynman diagrams; the accompanying voice-over is too technical for most visitors. Nearby, a video by Brazilian artist Beatriz Milhazes uses origami-like graphics to demonstrate some nicely rendered geometrical proofs that flit past too quickly to follow. Milhazes illustrates other mathematical phenomena, such as Penrose tiling and prime numbers, with beautifully apt images, and she shows some natural phenomena (iridescence, bird flight) alongside the equations that describe them. Again, unexplained images flash by and the equations become merely decorative.

In the same room, Lynch has fitted a group of robotic arms with mask-like faces. No information is volunteered, but quizzing a staff member reveals that they were created at the University of Bordeaux, France, to explore a theory of artificial curiosity that links sensing, interpreting the environment and learning. Visitors can interact with the machines using simple gestures and sounds.

The lack of information is intentional: the curators didn't want to be didactic. "That's not our role," says Chandès. "Our idea was, we'll immerse people. They can read later, at home, on the Internet."

But have the artists actually transformed abstract mathematical concepts into stimulating, accessible art? For the science-library video in the first room, IHES mathematician Misha Gromov selected a set of books that constitute a scientific canon. But all the visitor sees is covers and a few quotes, often framed off-kilter by a jittery camera. The crashing sound effects verge on self-parody, as if the oracle at Delphi (or the Wizard of Oz) were proclaiming these to be Very Important Texts. At times, the exhibition's refusal to help the visitor understand the mathematical content produces the discouraging sensation that one is being shown fancy images, but excluded from the priesthood of knowledge.

Despite what must have been serious efforts by both mathematicians and artists, most of the latter seem to have acquired relatively superficial notions of maths, physics or biology. This is a show rich in theatrical effects, but it reveals little engagement with the power and beauty of maths on a deeper artistic level. ■

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