



### The Universe in Zero Words

by Dana Mackenzie

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"No history of art would be complete without pictures," says the dust-jacket blurb of this book that sets equations centre-stage in the history of mathematics. Focusing on just 24 of them, which vary in fame and sophistication (Pythagoras, Fermat's last theorem, the Chern-Gauss-Bonnet equation), Mackenzie traces their stories in a work that is also exquisitely illustrated.

of formulae or a passing mention of "Bern, Switzerland, 1905". But others are subtler and more satisfying, like the stylized solar eclipse that evokes Eddington's observation in 1919, confirming Einstein's general theory. Others still provide light relief: during a particularly intense choral arrangement the singers poke their tongues out at the audience, evoking the now-famous photograph.

From all reports, the fascination with Einstein seems to be Glass's domain. Having begun his studies in mathematics and philosophy at the University of Chicago at the tender age of 15, he went on to study at the Juilliard School of Music in New York, eventually becoming one of the most important composers of our time.

His score is emphatically algorithmic — repetition creating a tension that is relieved only by subtle but deliberate variations of rhythm, emphasis and melody. By reducing melodic and harmonic complexity, Glass throws these shifting patterns into sharp

relief. And as if that weren't enough, at times he takes us by the hand and pares the lyrics down to a mere counting of beats — underlining the equation.

From today's perspective (saturated as it is with electronic music), it is almost hard to believe that *Einstein on the Beach* is performed by live musicians, whose stamina and endurance is astounding. Because only a handful of very short melodic ideas populate the entire five hours, the audience experiences each motif thousands of times. Perhaps surprisingly, the effect is nothing short of mesmerizing. The repetition is reflected on-stage in recurring themes, characters and gestures. Lucinda Childs' brief but breathtaking dance interludes provide a perfect complement to Glass's unrelenting score — matching his every change, and offering the audience a rare moment of respite from Wilson's dramatic direction.

For such a long opera, *Einstein on the Beach* fares remarkably well in capturing and

retaining the audience's attention. However, in a gesture that is both unusual and refreshing, Glass and Wilson invite their audience to come and go as they please throughout the five hours. This in itself creates an interesting dynamic: audience members stumbling across handbags and umbrellas (this is England, after all) contribute to the action on-stage.

It must be said that the opera, although repetitive, is certainly not lacking in emotion. Indeed, Einstein's solo passages come across as almost romantic laments, at least when held up to the mechanical rush of the ensemble pieces. It may be this incongruity that so beguiles Glass and Wilson's audience. For, in spite of technical difficulties that drastically reshaped the performance, the work prompted a standing ovation from an ecstatic crowd at its London premiere.

One might well argue that *Einstein on the Beach* makes as little sense now as it did in the 1970s, but perhaps therein lies its beauty — its absurdity lends it a timelessness. As the superb Kate Moran repeatedly intones with arched brow, in her leading role, "these are the days my friends," leaving the audience to decide to which days she refers. It is 1905. It is 1976. It is 2012. Glass, Wilson, Childs and Einstein remain nothing if not captivating. □

#### REVIEWED BY CHRISTIAN GNODTKE AND ABIGAIL KLOPPER

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## The art of sound

Supersonix, a six-month celebration of the art and science of sound, culminates this month in a lively programme of workshops, lectures and performances ([www.supersonix.org](http://www.supersonix.org)).

The festival has been put together by the Exhibition Road Cultural Group, which represents a host of cultural organizations based around Exhibition Road in southwest London, including the Science Museum, Natural History Museum, the Royal College of Art and Royal College of Music, and Imperial College London.

Among the Supersonix artists-in-residence, at work since the beginning of the year, is Aleks Kolkowski, who has been exploring historic recording technologies

in the Science Museum collections. On 'Music Day' on 23 June, Kolkowski will lead the performance of a reconstructed 1905 concert, featuring musicians from the Royal College and an 'auxetophone'. The Science Museum holds the only surviving, working auxetophone, a historical link between the purely mechanical and purely electronic technologies for the recording of sound.

Elsewhere, sound artist Jason Singh, in residence at the Victoria and Albert Museum, has been exploring the acoustic dimensions of sonifying vessels in the museum's Middle Eastern collections. A three-day symposium in the run up to Music Day includes sessions on sound and space, such as the 'sonification of the cosmic background radiation in everyday spaces' by Robin McGinley. And on the day itself, venues around Exhibition Road will be

given over to free performances of all kinds of music, an array of sound installations, and, at the Natural History Museum's Darwin Centre, the premiere of *Live and Roar*, written by DBC Pierre and featuring musicians from contemporary-folk groups the Seth Lakeman Band and Bellowhead.

Running until 3 June is New York's World Science Festival, now in its fifth year (<http://worldsciencefestival.com>). Highlights of this year's programme include the premiere of a surreal short film, *The Creator*, made by award-winning filmmakers Al+Al and inspired by mathematician and computer scientist Alan Turing's proposal in his 1950 'Turing test' paper to "consider the question, 'Can machines think?'". □

ALISON WRIGHT