

## BOOKS &amp; ARTS

## Oppenheimer: the opera

A musical treatment of the development of the atomic bomb raises questions still relevant today.

**Doctor Atomic**

composed by John Adams, directed by Peter Sellars  
San Francisco Opera world premiere,  
1 October 2005  
www.doctor-atomic.com

**Philip Campbell**

For an opera to succeed, the music not only has to have a stature of its own, but also needs to supply a deeper insight that could not be expressed by a spoken narrative. In other words, it must seem truly necessary. Challenging under any circumstances, this goal for a composer is all the more so when the opera's purpose is to reflect the states of mind of the people who created the first atomic bomb, in the weeks and hours leading up to the 'Trinity' test in the Alamogordo desert.

John Adams' opera *Doctor Atomic*, which was premiered earlier this month, seemed to my ears ultimately to succeed in that goal. The audience in the San Francisco Opera house certainly gave it enthusiastic acclaim. The soloists, chorus, dancers and orchestra, under the strong leadership of director Peter Sellars and conductor Donald Runnades, did the piece proud. Readers should see it if they get the chance.

There are four narrative elements at the core of the opera: the moral concerns of the physicists, realizing that Germany had been defeated and facing the prospect of the bomb being used on Japan; the preparations and tensions in the small community charged with delivering a working device, now needed ahead of President Harry Truman's discussions with Joseph Stalin and Winston Churchill; the emotional states of Robert Oppenheimer — the technical leader of the project — and those close to him, especially his wife Kitty and children's maid, Pasqualita; and an extended passage at the end when time stretches out, in the moments leading up to the explosion.

Each of these elements is conveyed by distinct means in the opera. It successfully conveys the industrial scale of activity in the preparation of the device through (for example) scurrying descending scales in the orchestra accompanying choral chants on the principles and power of the weapon. This is all visually amplified on the stage by movements of the chorus and dancers. Here, Adams' repetitive patterned style of writing is perfectly suited



The spectre of the bomb hangs over Oppenheimer and those around him.

to the task, as it is also in the opera's climactic representation of the endless moment just before the detonation.

To express the charged emotional states of Oppenheimer and his household, Sellars, the opera's librettist, used poetry — extracts from Charles Baudelaire, John Donne, the *Bhagavad Gita* and the US poet Muriel Rukeyser. This approach has some justification, as poetry was second nature to the Oppenheimers. These texts draw from Adams the most beautiful music in the opera, at times orchestrated with a French feel for sensuality and delicacy.

But there is a downside. The texts are elusive in their meaning — they require an extra layer of interpretation from a listener already faced with the challenge of following an operatic narrative. This task would be impossible without having the texts displayed in surtitles, as they were in San Francisco. Even so, it is difficult to be drawn into the emotions with immediacy, despite the lyrical strength

of Adams' music.

A similar distancing arises at other instances as a result of the music. While busy on its surface, the music is occasionally little more than a slow succession of static chords embellished by the singers' matter-of-fact sequences of notes. Lyricism is not essential in opera, but there seems occasionally to be a need for a more vivid integration of the musical elements. Unlike some contemporary composers, Adams builds on the expressive power of sequences of chords, but here the compelling power slackens.

The musical language of the opera is direct, and as a whole it has a strong structure with reference points of recapitulation that relate to the state of

the action, and a series of scenes of suitably contrasting character. The opera never seeks crassly to judge the character of Oppenheimer (*Doctor Atomic*), who is portrayed as personally sensitive yet consistently discourages his scientists from communicating their concerns: he remains an enigma. As Sellars explained in an eloquent introductory lecture, the opera steps up to the complexities of both Oppenheimer and the issues of science's power. As such, it provides a welcome contrast to the superficiality, as he sees it, of contemporary politics and culture.

Does the opera have a timeliness beyond the fact that we have reached the 60th anniversary of these events without being annihilated? Yes, on several levels. Adams characterizes this and his other operas (*Nixon in China*, *The Death of Klinghoffer*) as symbolic. The subject of the atomic bomb, the meeting between Nixon and Mao Zedong, and the events on the *Achille Lauro* appeal to him as an archetype, he says,

“summoning up, in choice symbols, the collective psyche of our time”.

But the opera is also pertinent to issues that often arise in *Nature's* pages. The application of science is ever more extended into the workings of the world and is all the more capable of instilling distrust in the society that pays for it. We should expect non-scientists to be wary of a profession that is often as excited, driven and single-mindedly focused as the Manhattan Project scientists.

The end of the opera should leave receptive audiences more aware of the case for scientists engaging with the public. The opera is framed at the beginning and end of each act by electronic soundscapes. The last moments take us beyond the Trinity test to the voice of a Japanese woman begging for water. This is not only a fitting reference to the ethical question that

overshadows the opera, but also a reflection of the societal challenge facing any scientist or technologist today whose research could change people's lives. Scientists still face equivalent moral debates of expediency (is the work justified by the benefits?) and of fundamental principle (is it in opposition to humanity's deepest values and hence to be forbidden?). They can choose to lock themselves away or consider the full implications of what is being achieved and reach out.

The efforts of leading scientists such as Robert Wilson and Leo Szilard to engage with decision-makers over Hiroshima, however debatable, should inspire us today. Adams' opera has helped them to do so in a way that no conventional history can. His music really is necessary. ■

Philip Campbell is editor-in-chief of *Nature*.

## Mathematical musings

### **Euclid in the Rainforest: Discovering Universal Truth in Logic and Math**

by Joseph Mazur

Pi Press: 2005. 352 pp. \$14.95, £10.99

#### **Timothy Gowers**

*Euclid in the Rainforest* by mathematician Joseph Mazur is difficult to summarize, as its title perhaps suggests, but here is an attempt. Mazur's central theme is reasoning, both mathematical and scientific, and he divides it into three kinds. First he discusses simple syllogistic reasoning of the kind made systematic by Aristotle, of which the most famous example is the following deduction: all men are mortal; Socrates is a man; therefore, Socrates is mortal.

Next, he shows that this sort of logic is not powerful enough to deal with an essential part of mathematics: the infinite. For thousands of years, mathematicians had to rely on intuition and common sense when, for instance, they

were discussing calculus or sums of infinite series. It was not until the late nineteenth and early twentieth century that formal systems were developed that provided the necessary rigorous underpinning.

The standards of proof in science are very different from those in mathematics, and in the third part of the book Mazur discusses less formal reasoning: what it is that makes certain statements highly plausible, even when it is inappropriate to look for formal proofs. For example, why is it rational to believe that a political party that is well ahead in the opinion polls just before an election will probably win it? Or why am I confident that when I go upstairs I will not fall through the floor?

What this summary of the book fails to convey is any sense of how Mazur writes about these ideas. He does not just dive in and try to explain them as clearly as possible. Rather, he tells stories, many of them about his own life,

which seems to have been very interesting — from time to time one wonders whether he has partly fictionalized it. He then lets his preoccupations emerge, much as a novelist might.

If you are interested in different forms of reasoning and are looking for a systematic treatment, this book is not the place to find it. For instance, Bayesian analysis has a lot to say about plausible reasoning, but Thomas Bayes is mentioned only once, very briefly, in the introduction. Instead, this book is more like a fascinating conversation that stays within certain bounds but nevertheless often moves in unexpected directions.

For example, Mazur discusses, and clearly cares deeply about, a technique called ‘facilitative communication’, which allegedly allows severely autistic children to communicate with the help of a trained intermediary. Sceptics, of whom Mazur is one, ask why we should believe that messages that result from the technique come from the child, rather than the intermediary — a question of some importance, because evidence based solely on facilitative communication has been used to send parents to jail for sexual abuse. The reader is not offered a general method for deciding whether or not a statement is plausible, but the examples that bubble up from the narrative are thought-provoking in many ways.

These qualities make *Euclid in the Rainforest* an unusual book. It even contains, briefly and tastefully, a sex scene, which is probably a first for a popular mathematics book. There are also a few spelling mistakes (for instance, the playwright David Auburn, the philosopher Carl Hempel and Blecker Street are all misspelled), but these contribute to the conversational feel of the book — as if it's the sound that really matters — and add to its charm. Rather than trying to extract general conclusions from the book, the best approach is simply to relax and enjoy the company of its author. ■

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## Up close and colourful

Coral reefs are fascinating places. Marine biologists are still seeking to understand the complexity of life within these ecosystems, which also provide a valuable physical barrier, protecting coasts from storm surges. Many divers will have found impressive coral formations and wondered at the colourful fish and crustaceans that inhabit these rich habitats. But few will have ever noticed the subtle variations in colour shown in this photograph of an anemone coral, as the coral polyps emerged at night. In *Another World* (ACC Books, £29.50), photographer Dos Winkel has brought an artist's eye to capture the diversity of colours and textures found on coral reefs.

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