

Bye Bye Blackboard

Blackboards were wiped after use: they were meant for immediate communication, not for record. Even as they were being used, their messages were continuously revised, erased and renewed. But when Einstein came to Oxford in 1931, he was already an international celebrity. After one of his lectures a blackboard was preserved and has become a kind of relic. It is the most famous object in the Museum of the History of Science.

To mark the centenary of the Special Theory of Relativity the Museum invited a number of well-known people in Britain to chalk on blackboards the same size as Einstein's. All these guest blackboards were prepared in the early months of 2005. The result was an exhibition about science, art, celebrity and nostalgia. The blackboard is fast disappearing from meetings, classes and lectures: 'bye-bye blackboard'.



Jon Snow
Journalist and broadcaster
Chancellor of Oxford Brookes University

'One is tempted in 2005 to consider Africa as our first responsibility – certainly it is my first love – but then if our global environment fails, what of Africa, what of us?'

Jon Snow's blackboard is a recently-acquired object in the collection of the Museum. Such blackboard globes would have been used in 20th-century geography classrooms.



Brian Eno
Musician

'This is the depiction of a theory that Arabic singing bounced around the world in several directions, creating what we call popular music, and how the British Isles were central to this.'

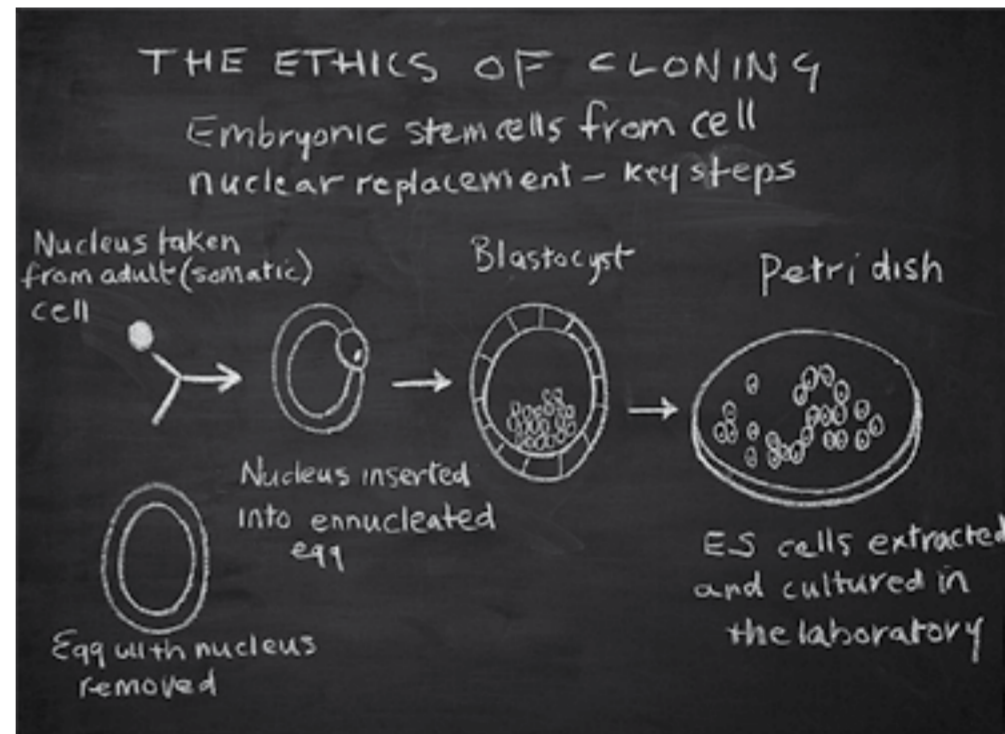
Alain de Botton
Writer and philosopher

'I used my blackboard at a lecture in Borders Oxford Bookshop on 9th February 2005 to help to explain the structure of my latest book, entitled *Status Anxiety*. Part 1 of the book concerns the causes of status anxiety. These include the contrast between the unconditional love that babies receive and the conditions attached to love in the adult world, the snobbery of others, the high expectations we have of our lives and the so-called meritocratic system we live under. Part II of the book and blackboard looks at possible solutions to the problem of status anxiety - and includes the philosophies of Jesus and Socrates, the role of art, the thought of death (and the perspective this offers) and the invitation to reconsider our view of success. The audience was very polite and pretended to understand what I was trying to say even if they had no clue.'

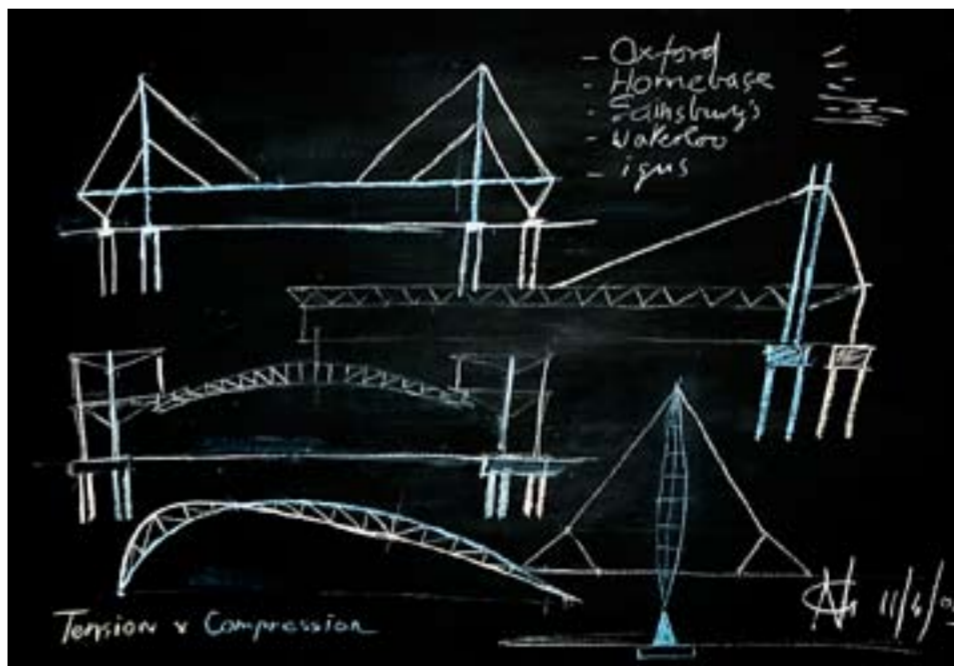


The Right Reverend Richard Harries
Bishop of Oxford

'I had the privilege of chairing the House of Lords Select Committee on Stem Cell Research. Most of us were non-scientists, but with the aid of a very good scientific adviser we did I think grasp some of the fundamental principles involved. Cloning was one issue we had to discuss and both then and subsequently I have found these little drawings helpful both for myself and others to whom I am talking.'



Sir Nicholas Grimshaw
President of the Royal Academy



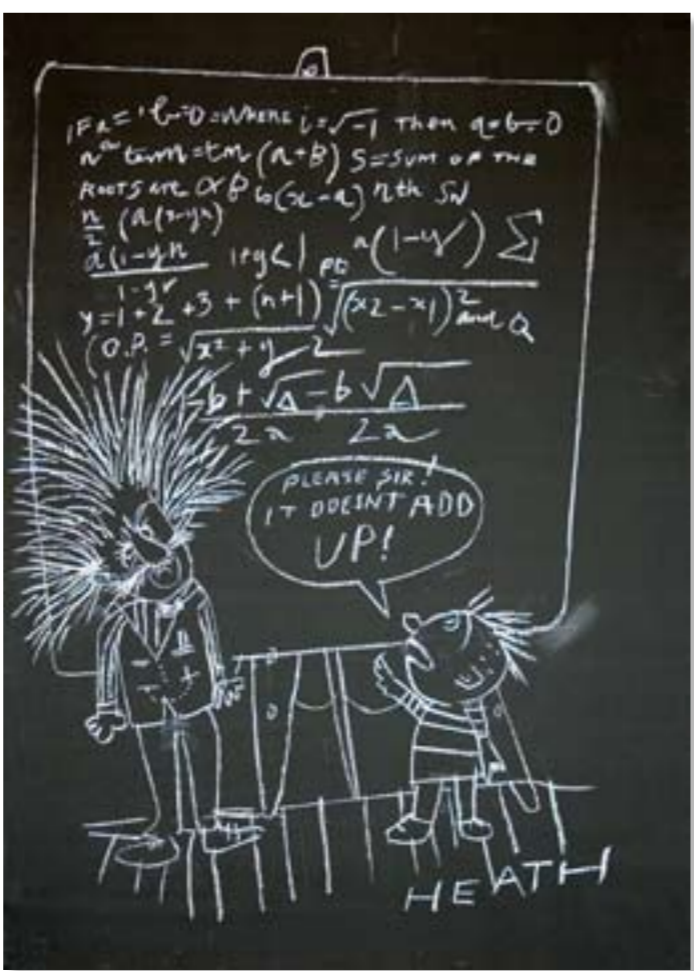
'Tension & Compression'



Raymond Blanc
Chef

'This blackboard illustrates how the "polymeal" recipes were created as a response to the announcement from medical science that a "polypill" could significantly reduce the risk of cardiovascular disease. The key ingredients can be taken in a more enjoyable way.'

Michael Heath
Cartoonist



BROAD SHEET

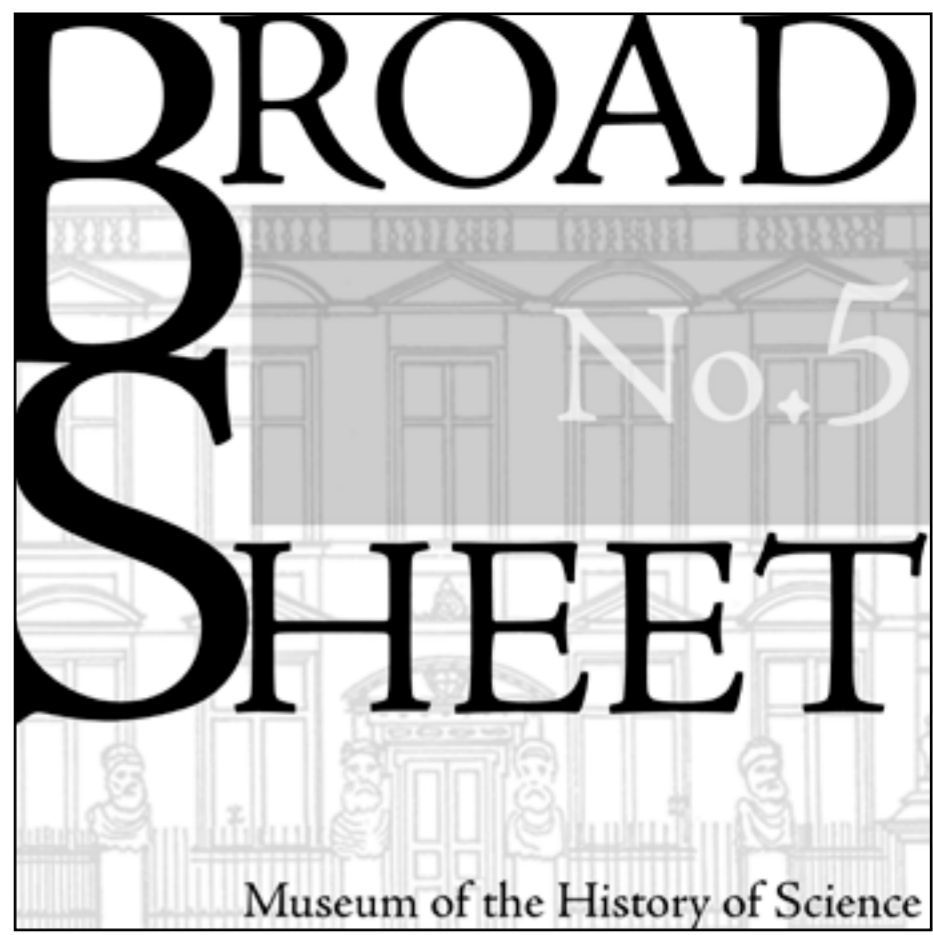
BROAD SHEET communicates the work of the Museum of the History of Science, Oxford.

It is posted on the Museum's website, sold in the shop, and distributed to members of the mailing list, see www.mhs.ox.ac.uk.

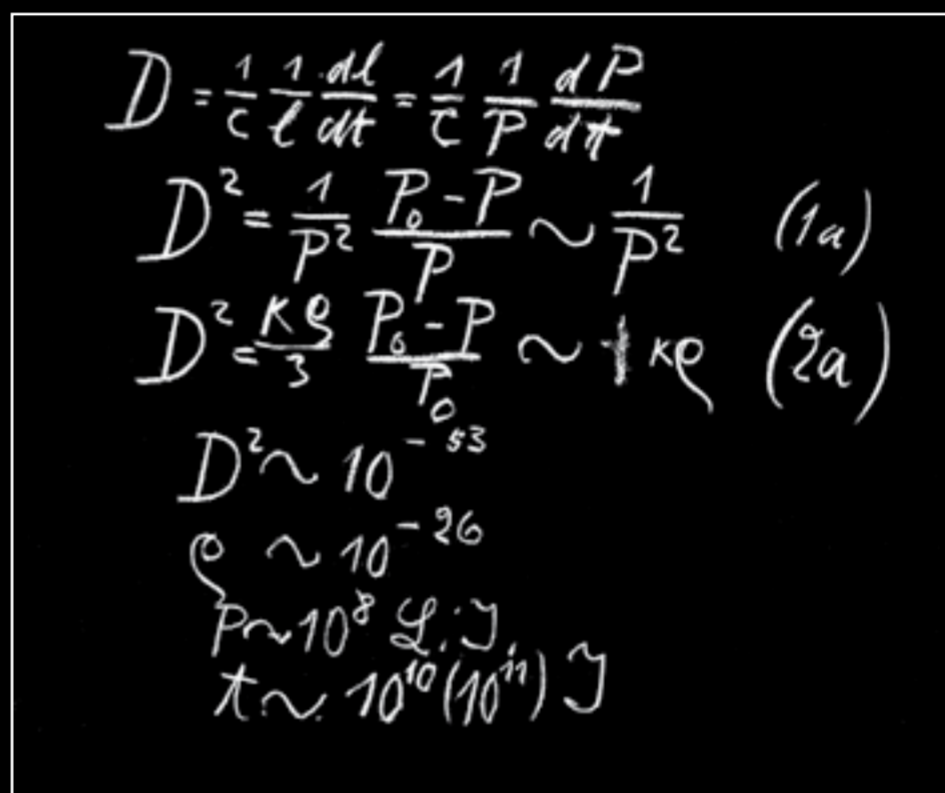
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Broad Street, Oxford OX1 3AZ
Tel +44(0)1865 277280 Fax +44(0)1865 277288
Web: www.mhs.ox.ac.uk
Email: museum@mhs.ox.ac.uk



£1.00



Bye Bye Blackboard... from Einstein and others



Einstein's blackboard is on permanent display at the Museum of the History of Science, Oxford.

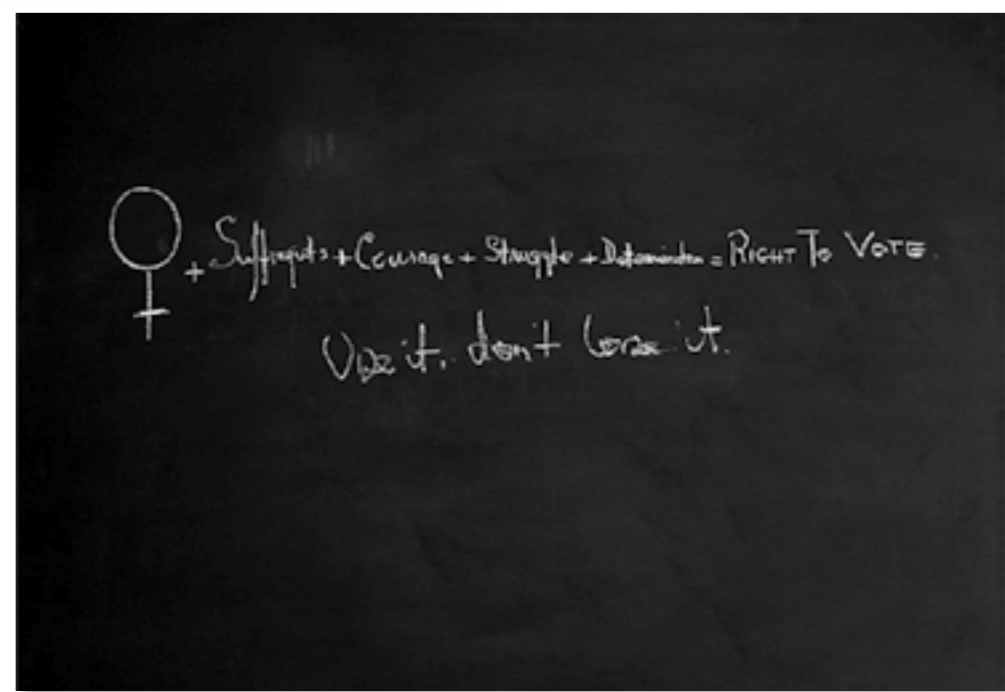
Albert Einstein
Physicist

Einstein's blackboard was used in a lecture in Oxford on 16 May 1931. It deals with some of the most fundamental questions in cosmology.

At that time Einstein's theories of relativity were being combined with astronomical data to explain the shifts towards the red in the spectra of distant galaxies, which indicated that the universe was expanding. In his lecture Einstein outlined a fairly simple model to explain this apparent expansion. In the first line on the blackboard, D , the measure of expansion in the universe, is defined in terms of the expansion factor P . The expression for the density of matter in the universe, given by ρ in the third line, is derived from the field equations. The last four lines contain numerical data, giving values for density, radius and age of the universe, where 'L' stands for 'Licht Jahr' (light year) and 'J' for 'Jahr' (year). According to the last line, the age of the universe is about 10, or perhaps 100 billion years (the bracket indicates an alternative figure, not a product of two figures).

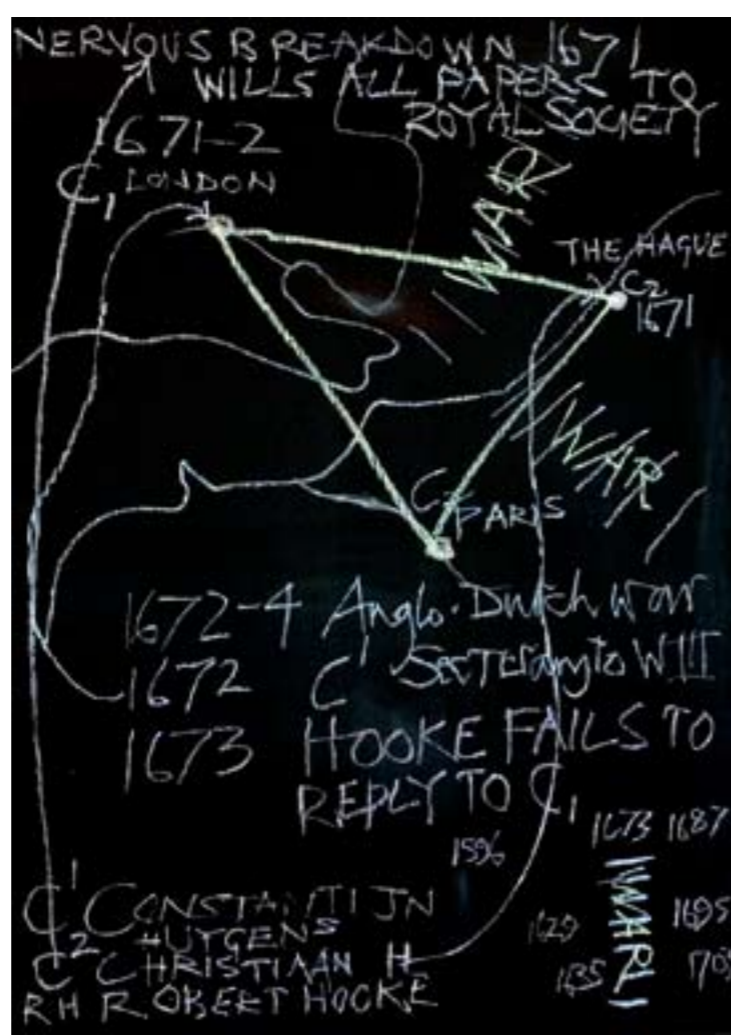
Glenda Jackson MP
Actress and politician

'For me one of the most heartbreaking responses I get campaigning is when a woman will say, "Oh, I never vote." Women died to give us this right. Obviously I'd like all women to vote Labour, but even more importantly, whomsoever you select, vote, vote, vote.'



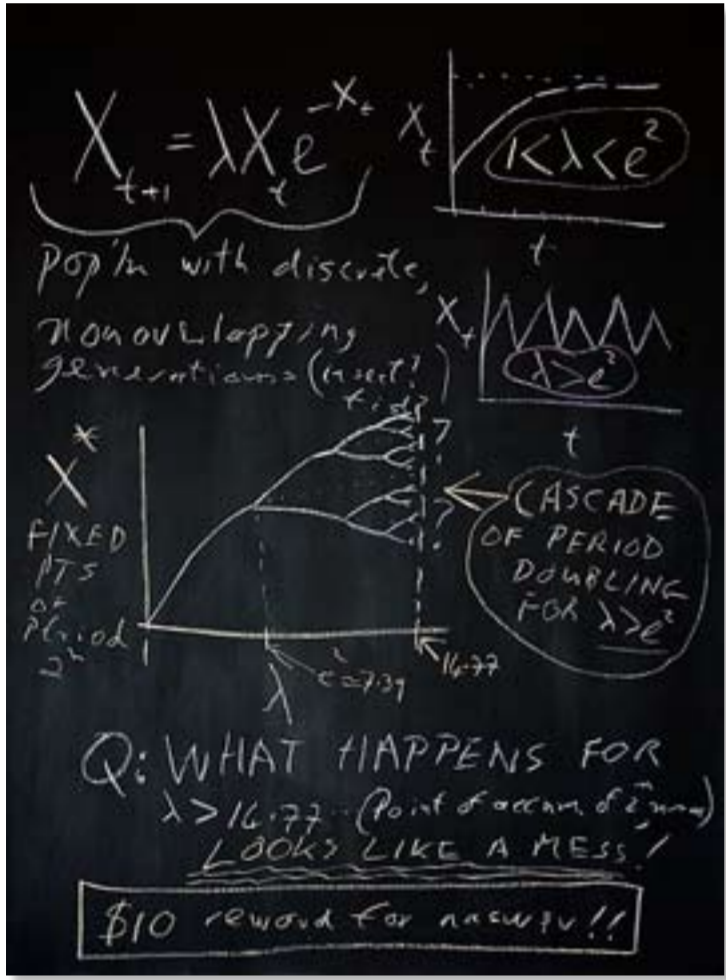
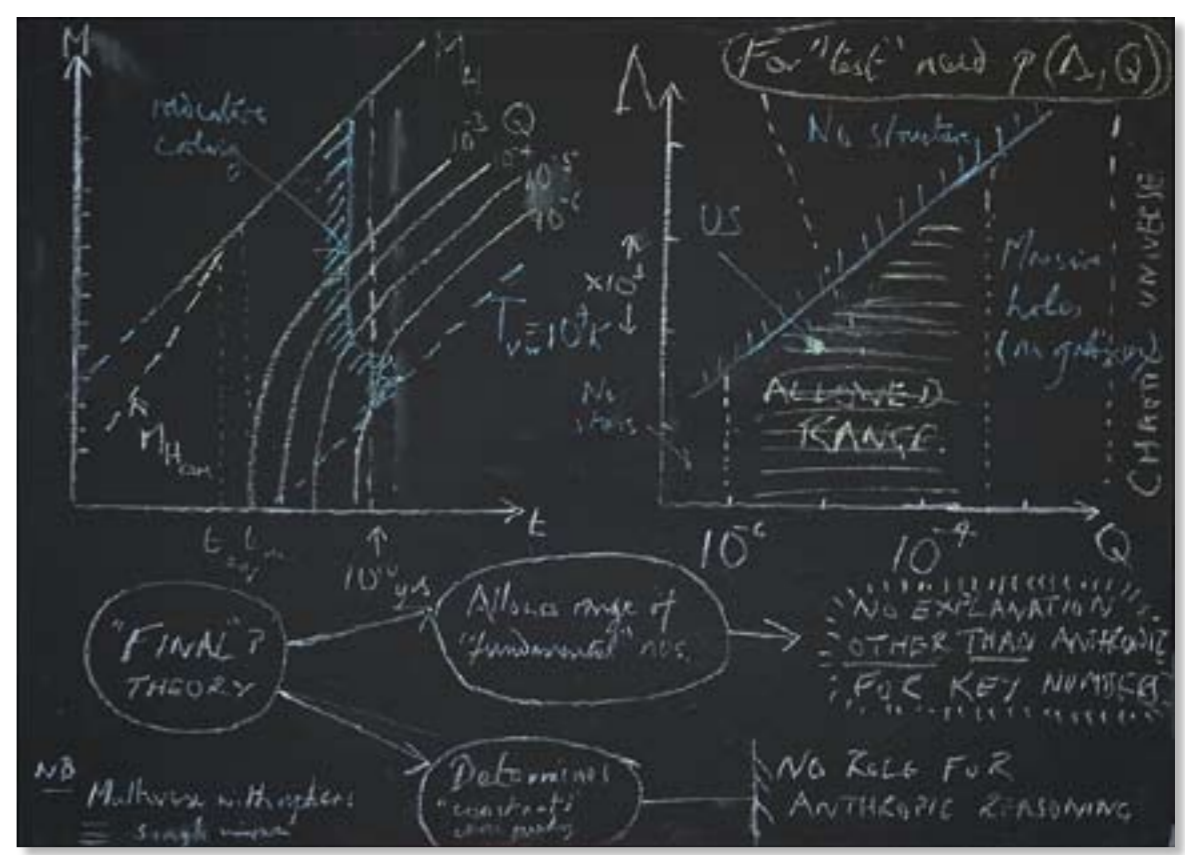
Professor Lisa Jardine
Historian and broadcaster

'I created this blackboard in the course of a seminar paper entitled "Following the Trail of an Unanswered Letter: Sir Constantijn Huygens Writes to Robert Hooke", which I delivered on 24 February 2005 to my weekly Director's Seminar at the AHRB Centre for Editing Lives and Letters. The paper centred on the draft of a letter sent by Sir Constantijn Huygens to Robert Hooke in 1673, which I found in the Royal Archives at The Hague in 2002. When writing my biography of Robert Hooke I had considered this letter as part of an England-centred exploration of early science and the history of the Royal Society. Now I proposed to step back and set the letter in its wider European context. In order to understand the importance of the letter, and the consequences of its having gone unanswered, I argued that we needed to treat it as part of a complex set of intellectual, social and political relationships which spanned the English Channel. These took in London, The Hague and Paris, and were significantly influenced by events usually invisible to History of Science, like the Anglo-Dutch wars and the so-called "Glorious Revolution":



Sir Martin Rees
Astronomer Royal

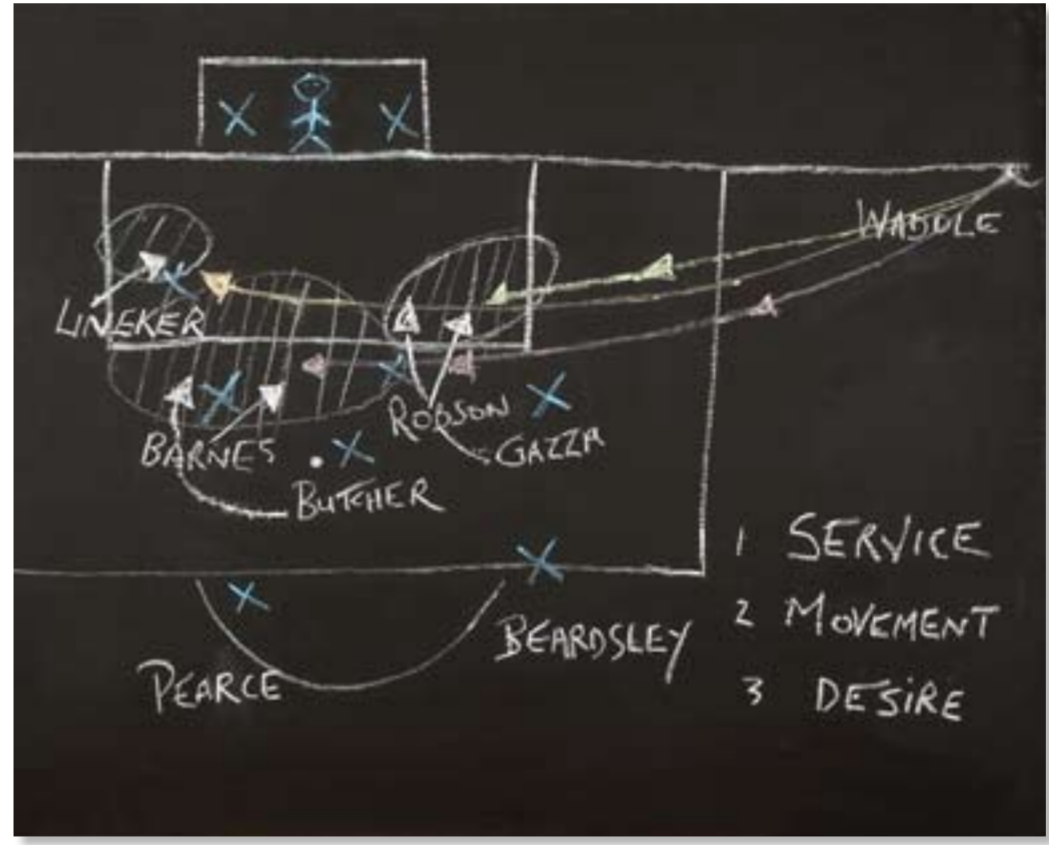
'Some of us suspect that there is more to physical reality than what we've traditionally called 'our universe' – the aftermath of 'our big bang'. Moreover, other big bangs could give rise to cosmoses that behave very differently – with more structure or less; with galaxies that are bigger, smaller, or nonexistent. These diagrams consider what the aftermath of the big bang would have been like if two particular parameters were different from the values in our actual big bang: the quantity Q that measures how smooth the universe is, and Einstein's cosmological constant 'Lambda'. The shading delineates regions where galaxies could form.'



Lord Robert May of Oxford
President of the Royal Society

'This is a reconstruction, to the best of my memory, of notes and a question (Q) that I put on the blackboard – of almost exactly this size – in the corridor outside my office in the Theoretical Physics Department at Sydney University in 1972. Motivated by problems in ecology, I had been studying some first-order difference equations that entomologists and fisheries people had suggested as rough caricatures of the dynamics of certain populations. Earlier work had focused on identifying constant, equilibrium solutions ("nature's balance") and left it at that. I elucidated the "cascades of period doubling" (and coined this term) as the "boom and bust" of the nonlinear difference equation became more pronounced with increasing population growth rate, lambda; as lambda increases, the equilibrium solutions for X change from constant to up-down cycles with successive periods 2, 4, 8, 16, But I could make no sense of what happened next, beyond the "point of accumulation" of these cycles at lambda = 14.77... . Later, in collaboration with Jim Yorke (Maryland), George Oster (Berkeley) and others, I came to understand that beyond lay 1-dimensional "chaos". This was one of the two strands that brought chaos centre stage in the mid-1970's, the other strand being Lorenz's work on 3-dimensional systems of differential equations, where what is going on is inherently harder to understand. Incidentally, 10 Australian dollars in 1972 is more like £50 or more today, although still grossly inadequate for the (unclaimed) reward.'

'For further information, see my chapter in *It Must Be Beautiful: Great Equations of Modern Science* (ed. G. Farnello) Granta, London, 2002 or J. Gleick, *Chaos: Making a New Science*, Viking, New York, 1987.'



Sir Bobby Robson
England international footballer and manager

'This is one of England's routine corner kicks in the 1990 World Cup campaign. The corner comes from the right-hand side, taken left-footed by Waddle. There are three alternative areas to hit (shown shaded) and the target area is signalled by Waddle. The England players are named, the white arrows are their expected movements and the blue crosses are their markers. Lineker waits at the back post for the long ball or to pick up a deflection. The three things I used to say we needed for the corner kick were service, movement and desire.'



Joanna MacGregor
Pianist

'I wrote the music on this blackboard while I was giving a lecture about Bach's Goldberg Variations at the Holywell Music Room on 22nd March this year (2005), before performing them. I was trying to make a connection between Bach's super-sensitivity to the contemporary styles around him – very very acute in this piece – and today's musicians. There's a lot of information in the Goldbergs – structure, harmony, a ladder of canons – and coded information we can only guess at – myths, cosmological allegories, and a soulful journey. It all starts with the bass line.'

Tony Benn
Politician

'I used my blackboard to list a few key questions we should all ask.'

- ASK THE POWERFUL FIVE QUESTIONS
- 1 WHAT POWER HAVE YOU GOT ?
 - 2 WHERE DID YOU GET IT FROM ?
 - 3 IN WHOSE INTERESTS DO YOU EXERCISE IT ?
 - 4 TO WHOM ARE YOU ACCOUNTABLE ?
 - 5 HOW CAN WE GET RID OF YOU ?
- ONLY DEMOCRACY GIVES US THAT RIGHT THAT IS WHY NO-ONE WITH POWER LIKES DEMOCRACY AND THAT IS WHY EVERY GENERATION MUST STRUGGLE TO WIN IT AND KEEP IT – INCLUDING YOU AND ME HERE AND NOW
- TONY BENN 2005

Richard Wentworth
Artist

TRANSLITERATOR (As above, so below) 2005

'I like word of mouth. The invitation to try on Einstein's shoes came to me in a personal call to my mobile. The physicality of the blackboards of my childhood sprang to mind immediately – their sense of landscape, as if text were a horizon, their sounds, their beautiful receptive surfaces, and their fog of palimpsests. I enjoyed putting a crease in a piece of timber.'

'The phrase 'As above, so below' has been with me for nearly thirty years. My decision to use it, in two languages, lies perhaps with the way that Einstein showed us a new alphabet, an exquisite Rosetta moment.'

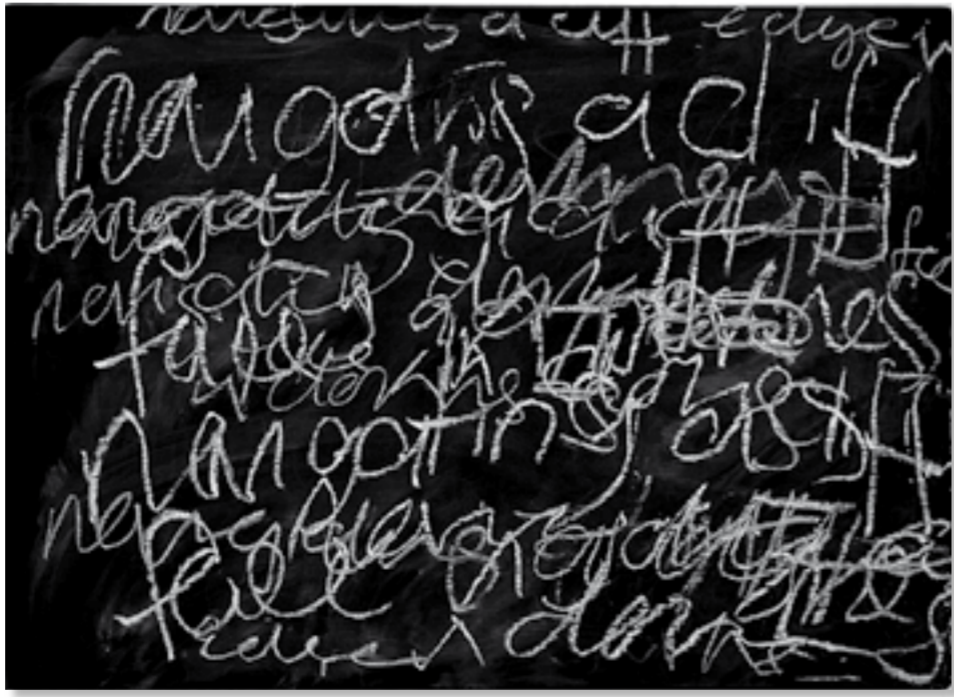
The alchemical epithet 'As above, so below' derives from the text known as the 'Emerald Tablet' attributed to Hermes Trismegistus, and known in the West from at least the 10th century. It encapsulated the fundamental alchemical idea of a correspondence between the heavens and the earth.'

Richard Wentworth would like to thank the writer James Hughes and the staff of the Victoria and Albert Department of Ceramics and Glass, and to extend his calligraphic gratitude to Gudrun Bielz.

Cornelia Parker
Artist

Navigating a Cliff Edge in Darkness 2005

'Written while blindfolded, using cliff chalk from Beachy Head, Sussex'



If it wasn't for the squeaks, I would much prefer this technology to my newly acquired laptop.

Chris Patten
Chancellor of a well-known univers. &

The Rt Hon the Lord Patten of Barnes
Politician and statesman
Chancellor of the University of Oxford

wie oben, so unten
as above, so below