BOOKS & ARTS

An act of communal imagination

A Disappearing Number, a play exploring the partnership between mathematicians G. H. Hardy and Srinivasa Ramanujan, opens in London this week. It is the latest of several astonishing works devised by leading international theatre company Complicite, marbled with science and technology. Artistic director **Simon McBurney** tells *Nature* about the results of his most recent round of collaboration and experimentation.

What drew you to the tale of Hardy, the maths professor, and Ramanujan, his self-taught Indian protégé?

I grew up in Cambridge, surrounded by academics' stories of brilliant people, including these two. Then, around 1997 I was in Toronto talking to the writer Michael Ondaatje about creativity — in a bowling alley. He said, "The best book I know about creativity is Hardy's *The Mathematician's Apology*", and he gave me a copy.

It haunted me. I started to read about how, in 1913, Hardy got a letter from Ramanujan so interesting that Hardy brought him to study at Cambridge University. The pioneering work they did together meant that the frail Ramanujan was made a fellow of the Royal Society before he returned to Tamil Nadu in India. By 1920 he was dead.

After I had made *Mnemonic* — our play on the discovery of Ötzi, the 5,000-year-old 'iceman' — the book just kept nagging at me. So I did some research with the mathematician and actress Victoria Gould.

We discovered that this almost mythological story of somebody finding somebody else at the beginning of the twentieth century is important on many levels: for the scientific and mathematical ideas that are still being used; for the image of collaboration; for the notion of misunderstanding or accepting another culture, which is still present.

Composer Nitin Sawhney has created tabla lines based on Ramanujan's work, and mathematician Marcus du Sautoy inducted Complicite into primes and hypergeometric series. Even the president of the Royal Society, Martin Rees, advised. What have you discovered through this collaboration?

I learnt that mathematics is a relay race. This provides an important image of human continuity in these egotistical times. In biology or physics or chemistry, people might have an idea that is then completely refuted, but Euclid's proof of the infinity of primes or Pythagoras's proof of the irrationality of the square-root of 2 are immutable.

G. H. Hardy (played by David Annen) saw mathematicians as pattern-makers, like poets or painters.

Likewise, I am constantly in a relay race. Only when somebody gives me an idea can I transform it into something else. If I sit by myself in an office to write down ideas, they vanish. The moment I'm in contact with other people, they seem to flow.

Hardy felt that a mathematician, like a painter or a poet, is a maker of patterns. A director is also a maker of patterns. Theatre is what the audience makes of those patterns. It is an act of communal imagination, of collaboration. It is no coincidence that theatre audiences are about the size of early human communities. Theatre touches on people's fundamental need to connect.

Like a lab, Complicite creates through years of experiment and iteration. How?

I am completely remaking *A Disappearing Number* for the Barbican Theatre in London from the show that toured Europe earlier this year. Each time you work at something again,

you try to make it a little more accurate, to take it another step further, to make it more compelling, more comprehensible.

There is a great freedom in saying "let's just throw this away". At the same time, when you discard ideas, you have to be careful not to take away what was instinctive and intuitive. You can be left with something much too simplistic. This brings us back to Ramanujan and Hardy. Ramanujan lived with an enormous amount of mystery and, in mathematical terms, roughness. He was constantly guessing and approximating, nonetheless coming up with extraordinary ideas. Hardy was a great deal more disciplined in the way that he created proofs. In the end, some say the mathematics of Ramanujan is much greater than that of Hardy.

***The Elephant Vanishes*, your 2003 show, investigated the wave–particle duality**

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of light. In 1999, *Mnemonic* juggled archaeology and neurochemistry. Might audiences be more afraid of maths than any of these topics?

We're addressing that. The play begins with the explanation of the functional equation of the Riemann zeta function — to do with the distribution of primes — and that is as difficult as it gets. Even if the audience doesn't understand the mathematics, they start to get a sense that it can be beautiful, simply for its elegance and economy. Great ideas themselves are touching, in the same way that a human story is touching.

Hardy was the only person who could recognize how incredible Ramanujan's work was, because he could appreciate something enormously, even if it was plain wrong. The pattern of how or why it was wrong

fascinated him — as we might be enchanted by any other work of art.

What idea would you like to play with next?

Consciousness. Theatre must always be interested in what we don't know. We still can't explain consciousness — whatever Daniel Dennett might say. Putting things we don't understand on stage is a process of trying to learn about them: you communicate something of what you're learning, and perhaps take the audience on the journey you are in. ∎

Interview by Sara Abdulla, *Nature*'s **chief commissioning editor.**

A Disappearing Number **runs at the Barbican Theatre in London from 5 September to 6 October (www.complicite.org).**

tradition was revived in the eighteenth century by William Hogarth and Francisco de Goya.

Until Darwin came along, such cross-attribution never shook the deeply held belief that humans, with their capacity for abstraction, were cleanly distinct from animals, with their inability to rationalize their feelings or control their instincts, appetites and passions. In the seventeenth century, René Descartes argued that animals were but machines without souls, incapable of experiencing the finer emotions that elevate humans.

That concept was dangerously extended in the eighteenth century by Julien Offray de La Mettrie, who described humans as 'perfect machines'. He was not putting the human soul in doubt — but European philosophy was certainly moving along a path that spelt trouble for God. Automata became popular in La Mettrie's time. These 'living' or 'philosophical' machines could accurately reproduce particular behaviours of animals and so demonstrate the redundancy of the soul. The 'digesting duck' of Jacques de Vaucanson, for example, could eat grain and apparently expel the digested waste from its anus (a mechanical achievement not diminished by the fact that the chemical laboratory claimed for the stomach was later found to be absent). The greater challenge for philosophers was Wolfgang von Kempelen's 1770 chess-playing automaton, 'the Turk'. It seemed to have the ability to reason, a defining characteristic of 'humanness'.

The boundaries between what is human and what is animal became increasingly blurred in that century, with the rise to fame of some feral children raised alone in the forest, who had a limited ability to learn to speak or behave in other ways considered to be human. Travelling circuses and freak shows were popular. They displayed animals trained to do 'human'

The animal in us

The Human Animal in Western Art and Science
by Martin Kemp
University of Chicago Press: 2007. 320 pp. $40

Alison Abbott

On waking, Henry Jekyll stared with horror at the metamorphosis of his hand, normally "professional in shape and size… large, firm, white and comely". Jekyll's experiment to separate the human and animal sides of himself had been all too successful. He noted further: "The hand which I now saw…. lying half shut on the bedclothes was lean, corded, knuckly, of a dusky pallor and thickly shaded with a smart growth of hair. It was the hand of Edward Hyde."

Thus Martin Kemp ends his treatise *The Human Animal in Western Art and Science* with this apposite quote from Robert Louis Stevenson's 1886 novel. It epitomizes the dilemma that has fascinated us for millennia. How much of the animal is there within us? Conversely, how much is human in animals?

Kemp answers these questions. Science, from Darwin to the latest neuroscience and genomics, has shown that there is no sharp animal–human divide, only a sliding scale. And in guiding us to this conclusion, Kemp's six chapters deviate through an amusing and erudite visual history, drawing from art, philosophy, literature, film and other cultural media.

We humans have always had a tendency to anthropomorphize, and no amount of science will erase our pleasure in imagining the lion as fierce but noble and generous, the snake as cold and deceitful. We also instinctively assign animal labels to our moods and attributes, a tendency frequently exploited over the centuries as a literary device. In the fables of Jean de La Fontaine (1621–95), so beautifully illustrated in the eighteenth century by Jean-Baptiste Oudry,

animals endowed with specific human failings (and speech) enact tales of eternally relevant morality. And when negotiations between the head pig and the farmer in George Orwell's 1945 *Animal Farm* become ugly, the other creatures "looked from pig to man, and from man to pig again; but already it was impossible to say which was which".

In classical times, the theory of physiognomics attempted to provide a rational framework for all this. Those with the broad brow and square face of a lion might be expected to share the lion's perceived nature, for example. Artists have often used such physiognomics to inform their portraits — Albrecht Dürer for sure, and Rembrandt, ventures Kemp, and the

This sketch by Charles Le Brun of a man with a beak-like nose plays on the similarities between animals and humans.