fingerprint-like pattern of starlight near the edge of the black hole's shadow, which comes from this gravitational lensing. There are regions where the stars look as if they are still, right next to others where the stars are swirling around. When we first saw hints of this, I thought we had done something wrong. We now think it is caused by a complex set of caustics (wrinkles) in the camera's 'past light cone' — not unlike the patterns on the bottom of a sunlit swimming pool. These wrap around the sky many times because the black hole's spin makes space whirl.

Was there any culture clash?

No, there was a full embrace of this melding of arts with science that extended to all four lead actors. Matthew McConaughey and Anne Hathaway came to me for in-depth discussions — they were trying to wrap their heads around the science. Michael Caine asked to have his photograph taken with me, and my jaw dropped. He told me his character was based on me and he wanted to talk about how a theoretical physicist thinks. Jessica Chastain asked for help with quantum equations. The nicest thing was working with artists who are brilliant, intellectually curious and from a background so different from my own.

Will interstellar travel ever be possible?

The nearest potentially habitable planet outside the Solar System is perhaps just under 12 light years (3.7 parsecs) away, orbiting the star τ Ceti. If you think of that distance as like going from New York to Perth, Australia, then the distance from Earth to the Moon would be about 7 centimetres. That gives you some sense of the challenge involved. I think humans will make that journey, but not in this century or the next, or maybe the one after that. It is too hard. For a science-fiction story, a wormhole created by an advanced civilization is the only way to do it in the next century, but it is unlikely that wormholes exist. You have to prop them open with 'negative energy' and it is unlikely that the laws of physics allow you to collect enough negative energy. But there is no proof that they can't exist.

What areas of physics currently excite you?

My passion is to understand the non-linear dynamics of warped space-time, and the ideal venue for this is black-hole collisions. There is a high probability that in the next several years we will detect gravitational waves — ripples in the fabric of space-time — generated by such collisions. A combination of computer simulations and gravitational-wave observations will really open our eyes about the behaviour of warped space and warped time when they are wildly dynamical. And who knows, maybe the next movie will involve colliding black holes. We will have to see! ■

INTERVIEW BY ZEEYA MERALI

Books in brief

Looking Inside the Brain: The Power of Neuroimaging

Denis Le Bihan (Translated by Teresa Lavender Fagan) PRINCETON UNIVERSITY PRESS (2014)

Who better to lead us into the technological wonderland of *in vivo* brain imaging than Denis Le Bihan, pioneer of diffusion magnetic resonance imaging (dMRI)? His densely factual narrative takes us from the seminal work of French surgeon Paul Broca through evolving technologies such as X-rays and MRI. Now the story is being carried forward by Le Bihan's brainchild NeuroSpin, a French Atomic Energy Commission institute for ultra-high-field brain imaging. In 2015 it will gain an 11.7-tesla magnet and begin the search for a 'neural code'.

Ocean Worlds: The Story of Seas on Earth and Other Planets

Jan Zalasiewicz and Mark Williams OXFORD UNIVERSITY PRESS (2014)

For this exhilarating foray into our increasingly water-rich Universe, geologist Jan Zalasiewicz and palaeontologist Mark Williams navigate oceans earthly and elsewhere. They explore our ocean systems' formation in deep time, eons of service as life's nursery, current state of crisis and evaporation a billion years hence, under a Sun that will be 10% hotter. They then boldly go to seas actual and putative in the Solar System and beyond, such as the methane-rich Kraken Mare on Saturn's moon Titan, or oceans on exoplanet 55 Cancri e, which may host expanses of that ambiguity, pressurized 'supercritical' water.

The Best American Infographics 2014

Edited by Gareth Cook MARINER (2014)

The second in the US infographics series edited by Pulitzer-prizewinning journalist Gareth Cook, this is as brilliant as its predecessor. Try the 'Taste Tube Map': James Wannerton's "synaesthetic tour" ascribing mouthfeel to the name of every London Underground station: Bethnal Green is "Boiled Cabbage"; Mile End, "Fingernails". *National Geographic's* 'In Harm's Way' is a gorgeous rendering of how tornadoic thunderstorms form. And *Nature's* own 'In the Flesh' beautifully realizes research suggesting that *Tyrannosaurus rex* may have sported fetching plumage.

Amnesia

Peter Carey FABER & FABER (2014)

This tale of cyber-hackery set against recent upheavals in Australian government is audacious and deliriously strange. Self-described "shit-stirrer" Felix Moore, a journalist in meltdown, is commissioned to write an exclusive on Melbourne radical Gaby Baillieux. Through Moore's eyes and taped conversations, Gaby's relationship with proto-geek Frederic Matovic emerges as a fury-fuelled mission to right corporate wrongs. The two, with thousands of others, are eventually, paradoxically, liberated by malware. Peter Carey's novel jolts us out of a collective amnesia about political trouble Down Under.

The Book of Beetles: A Life-Size Guide to Six Hundred of Nature's Gems

Patrice Bouchard IVY (2014)

A beetle with "dense, decumbent golden pubescence" inhabiting an air bubble in submerged wood: what's not to love? Imaged in glorious, furry close-up, *Lutrochus germari* is just one of the 600 species (out of a total of 400,000) featured in this paean to the insects that entranced evolutionary-theory pioneer Alfred Russel Wallace. Curator Patrice Bouchard has picked a bevy of beauties, from the tubercle-covered *Gagatophorus draco* to the stunning Atlas beetle (*Chalcosoma atlas*) — three-horned, lustrous and the size of a human hand. *Barbara Kiser*