

is also a factor in children drifting towards a life of crime. In one study, those carrying a specific gene variant who were also victims of abuse were nine times as likely to become delinquents than carriers who were not abused. The variant encoded a defective version of monoamine oxidase, an enzyme that regulates levels of certain neurotransmitters.

The significance of genetic factors in criminality is evident in Spector's observation that only one-third of identical-twin pairs who experienced childhood abuse are both inclined towards criminality. Magnetic resonance imaging of the brains of individuals in that criminal subgroup revealed an excess of grey matter — generally regarded as a sign of brain immaturity, and also seen in psychopaths and individuals with autism spectrum disorder. Spector suspects that this pathology involves the epigenetic modification of genes that profoundly affect behaviour, such as the stress response, mood-regulating neurotransmitters and the “trust hormone” oxytocin.

Spector believes that sexual preferences are governed by a substantial genetic factor, but there are many instances in which one twin is straight and the other gay — notably Ronnie Kray, the British gangster, who was bisexual, unlike his brother Reggie, and also had schizophrenia. One possibility is that sexual orientation relates to prenatal hormonal exposure, which affects brain development. It also leaves a curious anatomical signature: in heterosexual males, the index finger tends to be shorter than the ring finger. The reverse is true in gay men.

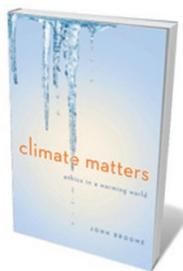
Perhaps the strangest idea to emerge from twin studies is that belief in a deity may have a substantial genetic component. This seems to transcend particular faiths and, mysteriously, maps to a region of chromosome 15 that lacks any protein-coding sequence.

Spector skates over the biochemistry of epigenetics, without reference to recently recognized players, such as microRNAs, that might modify neuronal activity. More discussion about different sorts of identical twin might have been informative. Are twins who shared a placenta more similar than those who did not? Are ‘mirror-image’ twins — those with small asymmetries in appearance — more different than those who are truly identical?

Real case histories of identical twins may be the only way to help us to understand how life experiences influence personality and behaviour. They may also suggest how some problems might be more manageable than we had imagined. ■

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Books in brief



Climate Matters: Ethics in a Warming World

John Broome NORTON 224 pp. £14.99 (2012)

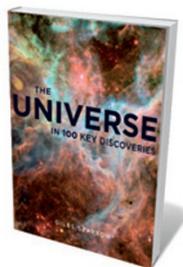
With climate-change policy looking increasingly toothless, we need fresh ways of grappling with this environmental catastrophe. Philosopher and “lapsed economist” John Broome vaults in where policy-makers fear to tread, exploring the moral aspects of climate choices. In the latest instalment in the Amnesty International Global Ethics Series, Broome argues that countries and individuals are ethically obliged to curb emissions. With penetrating clarity, he uses science and economics as a springboard to cover big issues, from the need for action despite uncertainty to the value of human life.



Beyond the Blue Horizon: How the Earliest Mariners Unlocked the Secrets of the Oceans

Brian Fagan BLOOMSBURY 336 pp. £20 (2012)

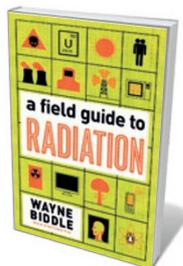
What motivated the first seafarers to take to uncharted open water — land grabs, a thirst for trade, conflicts at home or restlessness? Anthropologist Brian Fagan sails far back, beyond explorers such as Magellan and Cook, to when those intrepid pioneers travelled in rafts, coracles and longboats. Starting 50,000 years ago with the southeast Asian exodus to the Pacific Islands, he also examines early sailors in the Aegean Sea, monsoon winds, Norse voyages and the complexities of marine exploration in the ancient Americas.



The Universe: In 100 Key Discoveries

Giles Sparrow QUERCUS 416 pp. £19.99 (2012)

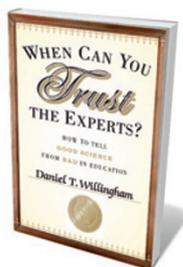
If you hanker for a compact compendium of cosmological breakthroughs, this is it. Astronomy writer Giles Sparrow is an able guide through 100 discoveries that have shaped understanding of the Universe and its workings. Trawling the eons, we explore the scientific revolution that unseated Earth from the centre of the Universe, the bombardment of Earth 4 billion years ago, flare stars and much more, finishing with speculation about the cosmological endgame. Essays and stunning images are framed by a definition and description of each breakthrough and its relative importance.



A Field Guide to Radiation

Wayne Biddle PENGUIN 288 pp. £10.23 (2012)

Pulitzer prizewinning writer Wayne Biddle, author of the award-winning *A Field Guide to Germs* (Henry Holt, 1995), here tackles another ubiquitous aspect of daily life: radiation. He briefly covers the history — pioneering researcher Marie Curie, to whom the “glowing tubes looked like fairy lights”, the stockpiling of nuclear warheads and the spread of nuclear power — before moving on to radioactive elements and related phenomena, from critical mass and decay products to fallout and occupational radiation. Witty, succinct and handily organized in an A–Z format.



When Can You Trust the Experts?: How to Tell Good Science from Bad in Education

Daniel T. Willingham JOSSEY BASS 272 pp. £16.99 (2012)

Cognitive psychologist Daniel Willingham offers a cautionary tale about poor science in education. With some teaching tools backed by research that is far from robust, Willingham calls for a four-step process for selecting the best of them: ‘strip it’ (look at the claim and decipher the promised outcome); ‘trace it’ (find the source of the idea and how others view it); ‘analyse it’ (determine whether the evidence is sound); and ask, ‘should I do it?’ (factor in the urgency of the need).