For years, the official budget for building and operating Hubble for one year was US$300 million, a number that NASA administrator James Fletcher seemingly "picked out of the air with no connection to actual cost". Combined with a NASA culture at the time of suppressing problems, this underestimation led to successive budget crunches — but perhaps not, as Zimmerman suggests, to the three washers placed in error on the reflective null corrector of the Hubble test setup at optics company Perkin–Elmer, which ultimately caused the main mirror's spherical aberration. Not every event has a deep original cause, nor happens because it was not prevented.

We don't know exactly how the pyramids of Egypt were built; as with Hubble, the planning was probably not linear, and people may well have temporized and played games with the budget and schedule. For better or worse, the planning process works because honest and well-motivated people participate. Fixing the system, except to better accommodate uncertainties, is not always realistic when unique projects demand the highest performance and operate at the limits of technology.

It is unrealistic to suggest that the scientists, contractors and bureaucrats could have warned Fletcher of the infeasible budget, and either accepted the telescope's cancellation or forced him to seek more funding. No one knew what Hubble would cost in 1974, and a simple working agreement on a large budget was a form of success. Everyone involved knew where this project was going — they were glad to be part of it and believed that it would be a game-changer.

Hubble has operated for 18 years and counting. Another servicing mission planned for October 2008 will bring it two new instruments and other replacement modules. To the limits of its 2.4-metre aperture, the telescope has revealed the visible Universe to the scientific community and a worldwide public.

What grand vision will motivate the telescope's successor in the visible-wavelength range? To many, the compelling answer is a Hubble-like telescope some eight times larger, with exponentially greater power to observe fainter objects and in finer detail. Equipped with multiple instruments, including a wide-field camera to detect the wobbling of stars caused by orbiting planets, and a coronagraphic spectrometer to detect atmospheric oxygen and water on faint sources, it could find and characterize potentially habitable planets around hundreds of nearby stars, looking for signs of life. Answering the question 'Are we alone?' by means of a telescope is now an obtainable goal, a point that we have reached because of all the people and drama that Zimmerman brings to life in this terrific book. ■

Robert A. Brown is an astronomer at the Space Telescope Science Institute, 3700 San Martin Drive, Baltimore 21218, Maryland, USA.
e-mail: rbrown@stsci.edu

Living Googles?

Representing Autism: Culture, Narrative, Fascination
by Stuart Murray
Liverpool University Press: 2008.
288 pp. £50

Representing Autism examines how we use the word autism and what this reveals about how we think about it. A form of literary criticism or cultural anthropology, this original book fills an important gap. Too often, scientists believe that they have direct, unmediated access to the object of their study. Stuart Murray reminds us that autism is not an unambiguous 'natural kind': our scientific taxonomy is also prone to biases.

Autism lies on a spectrum, and comprises two major subgroups: people with classic autism and those with Asperger's syndrome. These groups share the combination of social-communication difficulties, narrow interests (pejoratively called obsessions) and a love of sameness (known clinically as resistance to change). In classic autism, language development in children is also delayed and they can have additional learning difficulties. Autism and Asperger's syndrome are genetic in origin, affecting how the brain develops and thus affecting mind and behaviour. The terms 'autism' and 'Asperger's syndrome' are medical diagnoses, applied when the defining features interfere with an individual's ability to function, causing them to suffer.

According to Murray, whether we are making a film or writing a scientific paper about autism, we are superimposing categories on to it. For example, the major charity for families and individuals with autism in Britain, the National Autistic Society, was founded in 1962 as the Society for Psychotic Children. This shift in the name could have affected what we looked for and what we saw. Similar shifts occurred in the first scientific journal for autism research. Now called the *Journal of Autism and Developmental Disorders*, it began as the *Journal of Autism and Childhood Schizophrenia*. These changes signal how we used to believe autism was just the childhood form of schizophrenia, and how we used to think this condition only affected children.

We now know that autism and schizophrenia are distinct. For example, schizophrenia typically causes delusions, hallucinations and 'thought disorder' whereas autism does not. And schizophrenia may entail a rather loose

GUBER-PETERS CO./MIRAGE ENTERTAINMENT/STAR PARTNERS II/RONALD GRANT ARCHIVE

Dustin Hoffman (seated, centre left) played a card-counting autistic savant in the 1988 film *Rain Man*.

GLORIOUS GARDENS
The chateau grounds at Chaumont-sur-Loire, France, form the backdrop for a contemporary garden festival, running until October. Sustainability, biodiversity, bees and pollination, taste buds and continental drift are among the ideas brought to life in plants by top landscape designers, mirroring the festival's theme of *partage*, or division and sharing.
www.chaumont-jardins.com

ANIMAL PASSIONS
Sexuality in the animal kingdom is the subject of an exhibition running until Spring 2009 at New York City's Museum of Sex. The show, advised by Stanford University ecologist Joan Roughgarden and other scientists, suggests that sex has various roles beyond reproduction and mating. Challenging the simple evolutionary theory of sex selection, Roughgarden aims to change our view of sexual behaviours to a more nuanced one, including orientation and cognition.
www.museumofsex.com

HEAVENLY HOUSES
The buildings of influential twentieth-century architect John Lautner are showcased in *Between Earth and Heaven* at the Hammer Museum, Los Angeles, until 12 October. Having mainly worked in California, Lautner famously designed modern homes that are open to the environment, use innovative materials and take on futuristic shapes.
www.hammer.ucla.edu

J. WHITE

CULTURE DISH

or casual use of evidence to form beliefs, whereas Asperger's syndrome may be marked by a desire for very tight, unambiguous evidence as a basis for forming beliefs. We now also know that autism is lifelong, and the old view that this was just a condition of childhood has meant there have been few, if any, studies of autism-spectrum conditions in adulthood.

One narrow slice of the autism spectrum disproportionately dominates public perceptions of the conditions. In the 1988 movie *Rain Man*, Dustin Hoffman's character Raymond Babbitt could impressively recall all airline crashes by date of incident, or could tell a waitress her phone number just from seeing her name badge, having memorized the local phone directory up to the letter G. Kim Peek, the real man on whom Babbitt is based, is even more impressive. He can recall every word of every one of the thousands of books he has ever read, and can read two facing pages of a book simultaneously. Interestingly, he also completely lacks a corpus callosum, the connective tissue between the two hemispheres of the brain, which may be related to his remarkable skills. Peek was described as a 'living Google' in a British television documentary about him in February 2006. Another documentary in 2007, entitled *Brain Man*, featured Daniel Tammet, a British man with Asperger's syndrome and synaesthesia, who memorized pi to 22,514 decimal places.

TV documentaries and box-office successes such as *Rain Man* have educated the public only about the savant subtype of autism. This same bias appears in best-selling novels too. The central character Christopher in *The Curious Incident of the Dog in the Night-Time* by Mark Haddon (Jonathan Cape, 2003) was a boy assumed to have Asperger's syndrome who, despite his limited social understanding, took advanced mathematics exams at the age of 13. In such books and films, it is fiction that ends up educating the largest audience about autism.

Murray discusses why art is attracted to autism. We are fascinated, he posits, because autism seems to strike at the neural systems that define us as a species: the ability to pretend and deceive flexibly, to communicate through hints and innuendo, and to respond with empathy. At the same time, autism can, in some cases, facilitate other systems that also define us as a species, such as the ability to do mathematical calculations. Murray suggests the range of representations of autism in fiction include Spock from *Star Trek* and Sherlock Holmes.

Slanted views about autism can even be found in the research community. On the website of Autism Speaks, the major charity funding autism research in the United States, are the words "This disease has taken our children away. It's time to get them back." This is as clear a statement as one can find of autism as a disease, a view that many but not all autism scientists would endorse. Contrast this with Amanda Baggs's online video *In My Language* (http://tinyurl.com/2pczl2), which she launched as a statement about her civil rights as a person with autism, to be recognized and understood as different but not diseased. Another website, Autistics.org, proudly proclaims that people with autism are simply differently wired, and names one of their online groups the Autistic Liberation Front. These statements, along with *Representing Autism*, serve as a valuable reminder that we need to challenge how we conceptualize such medical conditions. ■

Simon Baron-Cohen is director of the Autism Research Centre, University of Cambridge, Cambridge CB2 8AH, UK. His latest book is *Autism and Asperger Syndrome: The Facts*.
e-mail: sb205@hermes.cam.ac.uk

Visions of our far future

Year Million: Science at the Far Edge of Knowledge
Edited by Damien Broderick
Atlas: 2008. 330 pp. $40.00, £20.35

The Victorians' discovery of deep geological time was unsettling. Suddenly, human history was an afterthought, a link between an unthinkably long past and a newly imaginable future. H. G. Wells and his heirs, from Olaf Stapledon and J. D. Bernal to Freeman Dyson, tried to sketch what might come in the millennia after us. Today, most futurists are preoccupied with the problems of the next ten decades, although a few bright-eyed fabulists still scan the far horizon. Australian author and critic Damien Broderick brings them together in this mind-expanding volume of essays.

A million years, or 40,000 generations, is a long time — but not that long on a cosmic timescale. As Broderick puts it, the number is an emblem of a remote future. Most of the book's contributors pitch their remarks around this target, even though some believe the next few hundred years will see the advent