

Nonetheless, this is just one minor weakness in a book filled with successes. Through the equally brave breadth of topics covered, Ferguson provides a confident and convincing corrective of spiritualist scholarship. Spiritualism's much-lauded proto-feminism is tempered by the appreciation of the thanato-patriarchy that emerges from her reading of the understudied afterlife novels. In one such novel, wives become the heavenly handmaidens to their husbands for eternity. Similarly, she highlights the highly unsatisfactory treatment of spiritualism's discourse on race. She uncovers that much writing within the community presented non-whites becoming white in heaven (as part of the thanato-perfectionist narrative) or a form of celestial apartheid. It is important that this awareness of a less progressive discourse on gender and race feeds into the wider work on spiritualism.

Chapter 2 and the first half of Chapter 5 are two particular highlights. Chapter 2 quickly picks apart the spiritualist movement's complex relationship with the mentally defective and disabled. Ferguson notes that spiritualists were not just objects of medico-cultural discussion of mental defect (E.B. Tylor, for example, seeing their belief as mentally primitive and atavistic), but active participants in the broader discussion. She carefully unravels the complex antagonism between, on one hand, their elevation of intellect and denigration of the mentally disabled in wider society and, on the other, their simultaneous elevation of the ignorant in the promotion of the movement itself.

The first half of Chapter 5 is also fascinating. It offers a brief reappraisal of the celebrated criminologist Cesare Lombroso. Lombroso's adoption of spiritualism in later life is often considered an atavism in itself. However, Ferguson chooses deliberately to focus on 'the persistent but hitherto unexamined affinity between nineteenth-century biocriminology and modern Spiritualism' (p. 144). This is a valuable contribution to the still nascent move to offer a more sympathetic reading of the conversion of leading scientific figures to spiritualism. Future works on other 'atavistic' spiritualist scientists – such as Alfred Russel Wallace, Oliver Lodge and William Crookes – will no doubt benefit from aspects of this work. Equally, future biographers of Lombroso will find this entire chapter particularly enlightening.

Overall, this book does exactly what it sets out to do. For those familiar with the period under study, the image pulled from Ferguson's book is undoubtedly more clearly rooted in its time. Ferguson brings to relief the 'conflicted discourse' of the spiritualist movement with regard to race, gender, criminality and mental ability and disability with great clarity (p. 81). As a result, *Determined Spirits* provides an intelligent and impressive corrective of the radical bias in spiritualist studies. Similarly, her focus on spiritualism's complex but notable place in the wider scientific discourse of the age will offer scholars a worthy go-to text to build a fuller picture of spiritualism's place in the history of science.

Determined Spirits is, undoubtedly, a worthy purchase for those within the field of spiritualist and occult studies. What is more, Ferguson's highlighting of the movement's 'overt commitment to bioessentialism and eugenics' heightens the movement's place within the history of science (p. 3). As such it should find its way onto the bookshelves of many academic libraries and individual scholars alike.

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ALEXANDER C.T. GEPPERT (ed.), *Imagining Outer Space: European Astroculture in the Twentieth Century*. Basingstoke: Palgrave Macmillan, 2012. Pp. xvii+393. ISBN 978-0-230-23172-6. £70.00 (hardback).

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'It is virtually impossible', notes Alexander Geppert, 'to experience outer space in a direct, unmediated manner' (p. 13). Before the space programmes of the twentieth century, humans could only observe at a distance or imagine the extraterrestrial. Even the handful of people who have

been in space, from Yuri Gagarin to the twelve men who walked on the Moon, or the astronauts of the International Space Station, have been cocooned in spacesuits and spacecraft, peering out from small reservations of the terrestrial environment, never touching the alien environments to which they were so close. For everyone back at home, of course, the experience of outer space was even more mediated, relayed through radio, television and print. The consequence is that understanding 'culture' is especially important for the historiography of outer space.

This is an eclectic, detailed, sometimes uneven, and occasionally revelatory set of essays that delve into how (mostly Western) Europeans portrayed outer space, spaceflight and space exploration. It certainly fills a gap. Most historical writing on space has focused on the technological achievements and political contexts of the superpower space programmes, or has taken the form of literary commentaries on the genre of science fiction with little engagement with history of science and technology. However, as Geppert points out, (Western) Europe is in fact particularly interesting because of a 'paradox of overwhelming space enthusiasm simultaneous with ... an extended period of abstinence from independent manned spaceflight activities' (p. 11). Abstinence makes the astroculture grow stronger, it seems.

There are some space oddities among the essays. Claudia Schmölders analyses the Tunguska event as a symbol for the meeting of Heaven and Earth within a tradition of 'astronöetic' writing. Thore Bjørnvig identifies a persistent religious and apocalyptic strand in Arthur C. Clarke's fiction: Earth, at the bottom of its gravity well, was what needed to be transcended. Bjørnvig's essay contains the superb factoid that 'Clarke's predilection for scuba diving', with its escape from gravity, was one reason he relocated in 1956 to Sri Lanka (p. 135). Elsewhere, Guillaume de Syon reveals how Hergé's Tintin cartoons, with their V-2-style moon rockets, were influenced by French comic book censorship: children had to be protected from overly speculative stories about space exploration; while Debora Battaglia briefly dips into the extraordinary world of the International Raëlian Movement, a creationist alien religion also born in France.

While there are sound essays by old space history hands, such as Steven J. Dick (on aliens, world views and Big History) and Michael J. Neufeld (on East German cultural propaganda against Wernher von Braun), I was particularly taken by the contributions by Thomas Brandsetter, Pierre Lagrange, James Miller, William Macauley and Tristan Weddigen. Brandsetter traces the surprisingly long history of the idea of crystalline life, in fiction and science. French author Joseph Henri Bœx (pen name Rosny) imagined mineral creatures as rivals of humans in the evolutionary race in 1888. Already, by then, physiologist William T. Preyer, in the context of the debate over Huxley's protoplasm, had speculated about silicon-based life forms. By 1894 H.G. Wells was picturing "silicon-aluminium organisms ... wandering through an atmosphere of gaseous sulphur ... by the shores of a sea of liquid iron' (p. 71). There are two interesting claims made by Brandsetter. The first is that the imagining of crystalline life forms can be seen as the invention of exobiology, the science of alien life forms. The second is that the early twentieth-century investigations that followed, along with contemporary research into liquid crystals, traded under the name 'synthetic biology'. Like 'biotechnology', 'synthetic biology' has early twentieth-century roots, at least in name.

Lagrange and Miller both offer serious and thoughtful studies of the UFO phenomenon. Lagrange compares in detail the first responses to saucer sightings in the north-west United States, in which incredulity was the common reaction, to the reception of reports of 'ghost rockets' over Sweden and Norway. While the latter were believed, and attributed to Cold War enemy weapons tests, Lagrange insists that a Cold War context should not be invoked to explain American UFO witnesses. Miller, on the other hand, examines the context of French UFO sightings, for which the key witness was Marius Dewilde, a rather socially marginalized Parisian living in a shack in Quarouble in northern France, who from 1954 met visiting aliens. Miller weaves a plausible social history of isolation and retold imperial violence.

Two other papers, by Ray Macauley and Tristan Weddigen, in contrast, concern spacecraft sent from Earth to other planets, and, indeed, beyond. Macauley analyses, in a comparative foray into American astroculture, how the famous plaque attached to the *Pioneer* probes was negotiated. Designed by Frank Drake, Carl Sagan and Linda Salzman Sagan, the plaque pictured two naked human beings against the background of a map of pulsars. The scientists argued that science, as universal knowledge, would be a language understood by any alien sophisticated enough to find the probes. Macauley, however, teases out the plaque's earthbound cultural specificities. Weddigen's short paper is a drily comic reading of the art and music carried by the *Beagle 2* mission to Mars. Given that the lander was lost, perhaps smeared over the planet's surface, it is a moot point whether a Martian would consider their lost chance to hear Blur or see Damien Hirst's spot paintings to be a blessing or a curse. 'Historically, aliens have been the mirror image of humanity's fears and hopes by surpassing us in intelligence or wickedness', notes Weddigen; 'In 2003, Martians were imagined as late consumers of mainstream Britpop' (p. 306).

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GABRIELLE HECHT (ed.), *Entangled Geographies: Empire and Technopolitics in the Global Cold War*. Cambridge, MA and London: MIT Press, 2011. Pp. ix + 337. ISBN 978-0-262-51578-8. £20.95 (paperback).
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Gabrielle Hecht's *Entangled Geographies* brings together a collection of essays exploring the Cold War and empire building through the under-studied lens of technopolitics, which she defines as 'the hybrid forms of power embedded in technological artifacts, systems and practices' or a 'range of ways in which technologies become peculiar forms of politics' (p. 3). The volume, which resulted from workshops at the University of Michigan (2005) and Technische Universiteit Eindhoven (2007), explores the strategic dimensions surrounding the quest for a technology-driven modernity for which states have striven during much of the Cold War. The tensions that ran through the Cold War were replicated in the struggles over technology in both the West and the East. Nonaligned countries like India, which had a well-developed scientific and technological base at its independence, were not outside this purview either. The quest for a universal Baconian modernity seemed to offer the panacea for all pressing predicaments – from everyday human suffering to national economic underdevelopment.

The book places itself at the interdisciplinary crossroads of science and technology studies (STS), diplomatic history, and anthropology and history of development, and provides the much-awaited intellectual bridges amongst these. Hecht's own piece on South African nuclear geographies provides a succinct analysis of the internal and international politics surrounding uranium mining in apartheid South Africa – a subject she explores in greater details in her book *Being Nuclear: Africans and the Global Uranium Trade* (2012). Itty Abraham studies the discourse of sovereignty in the Indian state of Travancore surrounding the strategic significance of radioactive thorium, with the end of British rule in the subcontinent. Alongside Hecht's and Abraham's contributions, Sonja D. Schmid's essay on Soviet practices of technology transfer in the nuclear domain to Czechoslovakia and East Germany demonstrates well the significance of nuclear technopolitics during the Cold War on both sides of the Iron Curtain. In a post-Hiroshima world, the 'nuclearity' of things, to borrow Hecht's own expression, was inevitable.

The close liaison between science and the state apparatus transformed the prevailing economic theories of development into rational instruments of large-scale problem solving in the laboratory of society. Martha Lampland explores how state planning was not the sole preserve of socialist governments, but has been adopted by capitalist states like the United States, Japan, Sweden and Nazi Germany at different times in history. Her essay on technopolitical planning in Hungary