about the silly Nobel committee or conniving colleagues, Gray lets us know plausible reasons for this failure: on the one hand, a still higher esteem placed on experimental contributions; on the other hand, the careful and, in my view, appropriate qualification of Poincaré's work in physics as 'less outstanding' and 'more responsive than innovative' (p. 199). To even out the balance, we of course also learn all we need to know about Poincaré's many outstanding successes and prizes (starting with the prize competition of the Académie des sciences in Paris of 1879–1880 and ending with his election in the Académie française as the Panthéon of French academe).

Gray argues that throughout his career, Poincaré 'was guided in his mathematical and scientific work by his philosophical reflections' (p. 6). Therefore a clear conception of the latter, often dubbed conventionalism, is crucial for understand Poincaré's stance on issues of all kinds, from the status of non-Euclidean geometry to that of relativity and quantum theory. Gray weaves into his account Poincaré's positioning with respect to Hermann von Helmholtz and Federigo Enriques, Felix Klein and David Hilbert, Bertrand Russell and Ernst Zermelo, to name just a few of the geometricians and philosophers of mathematics with whom he quarrelled. In his account of Poincaré's position with respect to relativity theory, these philosophical differences with the world views of H.A. Lorentz, Joseph Larmor or Albert Einstein also play a large role. In a final chapter, Poincaré's conventionalist philosophy of science is convincingly summarized as a tricky epistemological position somehow between idealism, scepticism and structural realism. Because Poincaré thought that no experiment can ever decide between two geometrical descriptions of space, pragmatic criteria such as simplicity gained such high importance for him. That these philosophical opinions occasionally also misled this superb thinker into false beliefs and into an impasse with respect to the theory of relativity, for instance, is not suppressed.

Gray does make use of unpublished materials in the Archives Henri Poincaré at Nancy, but this is not a biography mainly based on correspondence or unpublished material (such as Michael Eckert's recent biography of Sommerfeld, for instance) – in the centre of Gray's account remain Poincaré's published works that do contain all the key elements of his thought. Gray manages to capture them lucidly and clearly explains hairy topics such as Fuchsian functions, algebraic topology, complex function theory and number theory. Gray handles these difficult issues masterfully – he does not shy away from occasional formulae and subtle points, but always focuses on the goals, results and interconnections between these highly technical fields of Poincaré's research. The biography is rounded off with approximately forty well-chosen black-and-white figures (mostly colleagues and non-Euclidean surfaces), a name and a subject index (although the latter is terribly gappy, not even listing frequently occurring key terms, characteristic of Poincaré's style, such as 'analogy'). Altogether, I do recommend the book very much to all readers interested in Poincaré or his multifaceted and fascinating *oeuvre* – Jeremy Gray has done a marvellous job of exposition and of binding together the many different cognitive, social and biographical strands into the coherent whole of a challenging, but highly rewarding, 'scientific biography'.

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Paul Crook, **Grafton Elliot Smith, Egyptology & the Diffusion of Culture: A Biographical Perspective**. Brighton: Sussex Academic Press, 2012. Pp. vii + 160. ISBN 978-1-84519-481-9. £19.95 (paperback).
doi:10.1017/S0007087413000782

Grafton Elliot Smith (1871–1937) was a key scientific figure within the early twentieth-century British world. Born in Australia and trained in medicine, he followed a migratory academic career across the networks of the British Empire, moving through medical schools and universities at Sydney, Cambridge, Cairo, Manchester and London. His interests were equally wide-ranging, as he became a leading authority and public intellectual in the fields of anatomy, neurology, human

evolution, racial theory, anthropology and archaeology. Yet while elements of Elliot Smith's research have become important points of reference for numerous aspects of early twentieth-century British science, there has never been a sustained examination of his life and career. This slim yet lively book by Paul Crook is not an attempt to completely fill this gap (a full academic biography would be a daunting task, requiring archival research on at least three continents). It follows instead the less ambitious but still important aim of raising the profile of this 'great forgotten Australian' (p. vi) and provides an effective summary and introduction to a number of aspects of his life and thought.

Given the book's slenderness, it wisely concentrates on one, and probably the most controversial, part of Elliot Smith's work: his attempt to build a new school of 'diffusionist' anthropology. The core concept of this grand unifying theory of human culture and civilization, developed in conjunction with William James Perry and W.H.R. Rivers, was that the key features of civilization had originated in ancient Egypt, and were transferred in a varyingly mediated fashion through Europe, Mesopotamia, East Africa, India, East Asia, Polynesia and (most problematically) as far as Mesoamerica. Global comparisons identified a cluster of cultural motifs and practices (including mummification, dragons, sun cults and megalithic architecture) associated with the origin of agricultural civilization across the world. These were judged as too idiosyncratic to have been independently developed, and instead were supposed to have spread from the common Egyptian source across a network of maritime migration routes. Even though this idea may seem bizarre to modern readers, was controversial among contemporaries, and was ridiculed in following generations, this brand of diffusionism was a provocative idea in the interwar period, and novel in relation to the evolutionist frameworks which had dominated British anthropology and archaeology from the second half of the nineteenth century, but also possessing much deeper resonances with earlier ideas of human difference.

The book traces the intellectual and conceptual development of Elliot Smith's diffusionism in a largely chronological manner, from his initial interest in Egyptology while in Cairo, through the consolidation of the school, and then his fierce and multi-sided battles for support, public profile, and research funding, with a range of critics and opponents, in the 1920s and 1930s. The account is solid, although, contrary to expectations, the book is actually strongest when it veers away from this focus to connect the core concepts of diffusionism to Elliot Smith's wider interests. The argument that his commitment to Darwinian evolution actually led him away from the linear evolutionary schemas put forward by the likes of Lubbock and Tylor is a fascinating one, and provides more impetus to disentangle the complexities of evolutionary and developmental thought in the modern human sciences. Likewise, the discussion of his views of human evolution, and the ways they caused him to separate human biology from human culture, is an excellent and highly succinct summary of a complex area. These offer fascinating areas to pursue, particularly with regard to the relationship and common context of 'biological' and 'cultural' sciences in this period.

The book's limitations largely grow from its contextualization. The study touches on a range of important issues in the modern history of science, including the political and cultural impact of archaeological and anthropological research, scientific popularization, the relationship between nationalism and scholarship, and scientific networks and institutionalization in the British Empire and beyond. While the characterization of these themes is cogent, the book does not really engage with the growing recent literature around them (the secondary works listed do not really postdate the 1990s). This means that Crook is only really able to signal the significance of Elliot Smith's thinking for these current historiographical themes, rather than to contribute to debates directly. This also ensures that some aspects of Elliot Smith's thought – particularly on racial matters – are not as deeply considered as they could have been. We are correctly told that he was a high-profile opponent of National Socialist Aryan racial theories in the 1930s, but this tends to be used to blunt

any discussion of his racial or eugenic views in earlier periods. In the context of the growingly sophisticated literature on interwar eugenics and racial theory, this deserves greater study.

Likewise, the secondary agenda which emerges in the latter part of the book – to rehabilitate aspects of diffusionism for modern anthropologists and archaeologists – blunts one of the most interesting issues hanging over the discussion: why such an extreme brand of diffusionist thinking should have been convincing to many in the intellectual and cultural atmosphere of the interwar years. Hints and suggestions are given, including institution-building in anthropology, changing understandings of the human mind and brain, the influence (or parallel development) of trends in German anthropological thinking, reflections on the contemporary spread of technology and communications, and growing uneasiness over civilization and ideas of linear progress. However, there is never really a sustained attempt to pull these together. As such, this stands as a key open question – although one which again shows Grafton Elliot Smith's wide engagement and, as Crook suggests, the need for further examination of his thought, career and place within the contemporary scientific and cultural landscape.

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Andrew W. Appel (ed.), **Alan Turing's System of Logic: The Princeton Thesis**. Princeton and Oxford: Princeton University Press, 2012. Pp. xv + 142. ISBN 978-0-691-15574-6. £16.95 (hardback).
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The legacy of British mathematician Alan Turing (1912–1954) has been widely acknowledged and discussed in the last twenty years or so in the history-of-science community. The main focus of the debate is usually on his concept of the 'universal machine' (also referred to as the 'Turing machine'), his famous paper on the limits of computability from 1936, his wartime work on deciphering the German Enigma codes, and his postwar work on artificial intelligence – and his tragic death, of course.

Little is known about his time at Princeton in 1937 and 1938 where he met with the champions of mathematical logics such as Kurt Gödel, John von Neumann and Alonzo Church. In 1938 Turing wrote a PhD thesis under the supervision of the latter on 'ordinal logics' in Princeton. The present book is a facsimile of the typescript with two introductory chapters by editor Andrew W. Appel (pp. 1–12) and Solomon Feferman (pp. 13–26). The facsimile is the typescript that was submitted to the London Mathematical Society in 1939 in their *Proceedings*, with markers in the margin (and a list at the beginning) where the reviewers of the journal requested changes to the manuscript.

Given that most books on Turing lack any information on Turing's PhD work – Andrew Hodges's path-breaking biography *Alan Turing: The Enigma* (1983) only deals on two pages with his actual doctoral work, giving much more space to his social life while in the USA – the present book could have closed an important lacuna in our knowledge of Turing. However, the volume falls somewhat short on delivering just that.

The Austrian logician Kurt Gödel published a now-famous paper in 1931 presenting his 'incompleteness theorem': mathematics, he stated, can never be 'complete' (i.e. free of contradictions). He left open, however, the question whether there is a method to decide if a given theorem is provable or not. Alonzo Church of Princeton took up this question. Shortly after Church had published a paper on this issue on 15 April 1936, he was contacted by the editor of the *Proceedings of the London Mathematical Society*, who told him that a young mathematician from Cambridge – Alan Turing – had sent in a paper dealing with the same topic, and coming to the same conclusion as Church's, but with a very different approach, and that this approach was so