a country with an active and successful feminist party. Although readers may not be familiar with the ESS, the book's interdisciplinary character and broad scope make it a fascinating read for anyone working on any aspect of big science. The editors focus on the impact of the ESS on the small Swedish host town currently preparing for the start of the project. Research policy scholar Olof Hallonsten looks at the myths and realities of the project, providing a 'systematic scrutiny of readily accepted "truths"' (p. 43). Sociologist Tobias Linné provides an interesting and slightly worrying overview of the local news media interest and the expectations that the ESS will have to try to fulfil. Josephine V. Rekers looks at the geography of innovation from an economist's perspective, whereas Sara von Platen, an assistant professor in strategic communication, focuses on member identification and auto-communication during organizational transition. Birgitta G. Olander, associate professor of library and information science, offers an account of the social-media context, which provides a refreshing review of the research practices of big science, and Kerstin Sandell, associate professor of gender studies, makes use of her fascinating interviews with scientists in similar international laboratories. Art historian Max Liljefors's account of the vision of the ESS through image and power is a must-read for anyone who studies the contemporary SciArt trend, and his focus on the rhetoric of this field also introduces important questions about power and scale. Victoria Höög asks what happens when technoscience comes to the small university city of Lund, in the context of the history of science, in particular the Enlightenment. Finally, historian of science Gustav Holmberg asks what to do with ageing big-science facilities, a vital question for anyone in the business of building structures that are not only not biodegradable but also potentially toxic.

The combination of rich, interdisciplinary research has clearly been fascinating to the writers themselves, who seem to have enjoyed the experience and ventured beyond their own disciplines in order to ask questions that draw on many fields. As a consequence, this volume goes beyond the history of science, and opens up the topic to other forms of enquiry. Historians of other kinds, scholars of the visual, scientists, politicians and policy-makers will all be interested in the questions asked in the book, although not all answers are provided. As the ESS has yet to actually come into being, this is the first book on the subject. Compared to the works on CERN, it is refreshing, and perhaps also a positive sign of our times, that the first scholarly book engaging in the ESS is asking large, difficult and political questions.

For writers on big science this book is an important, yet quick, read. The language is clear throughout, with all the Swedish authors providing the footnotes and bibliographies required by those wishing to engage further in the themes presented. The handful of images are also clear and relevant, giving a visual insight into the future site discussed in the text. The only reservation I had whilst reading the text was a worry that there will be no future legacy from the *Legitimizing ESS* collaboration. The realization that this team, alongside other contemporary scholars, are providing a much-needed shift towards the political in our field gives hope for future books, seminars and events from this interdisciplinary group. I remain confident that anyone who ventures into this volume will feel the same.

Camilla Mørk Røstvik
University of Manchester

Steven J. Dick, **Discovery and Classification in Astronomy: Controversy and Consensus.** New York: Cambridge University Press, 2013. Pp. xvi + 458. ISBN 978-1-107-03361-0. £30.00/ $45.00 (hardback).
doi:10.1017/S0007087414001058

Discovery is not a particularly popular subject of analysis for our discipline. Philosophers have long been fascinated by the topic, classifying scientific discovery into myriad types whilst probing the distinction between contexts of discovery and contexts of justification. But historians

have tended to shy away from a concept that is evidently deeply problematic from a historiographic perspective. Who 'discovered' what and when are questions that skirt dangerously close to the kinds of 'textbook' history that most of us actively seek to question and revise. And as several classic analyses by historians and sociologists of scientific knowledge have shown, at the very least discovery is a much more complicated and long-winded process than it is commonly taken to be. The pioneering work of Ludwik Fleck, Thomas Kuhn, Augustine Brannigan and others has persuasively demonstrated discovery's temporally extended, socially negotiated dynamics, which more recent accounts have developed into a case for discovery as a process constituted within disciplinary communities through the retrospective attribution of the discovery label to work judged significant, following a period of conceptual and linguistic adjustment. Whilst accounts of such work can tell us a great deal about how disciplines organize themselves, they nonetheless leave discovery as a troublesome concept for historians seeking to analyse and explain the day-to-day practices of the sciences.

Steven J. Dick, in this rich and enlightening book, attempts to bridge these realms of scientific practice and disciplinary work through a detailed analysis of one particularly intriguing category of discovery, that of astronomical objects. Dick's entrée to the subject is the 'Pluto affair', a familiar yet fascinating example of the myriad complexities associated with the claim that a celestial object was ever, at a given moment or by a given person, 'discovered'. Predicted, observed, established as our solar system's ninth planet, and then ultimately demoted (we might say 'rediscovered') through the detection of other similar objects in the Edgeworth–Kuiper belt, Pluto exhibits very clearly two of Dick's central arguments: on the one hand that astronomical discovery is a complex and extended process, and on the other that it is inextricably tied up with the vexing issue of classification. To flesh out and substantiate these claims, Dick follows his close focus on Pluto with a long section of discovery narratives. Extraordinarily wide-ranging and detailed, this second part of the book provides a beautifully written, authoritative account of the non-mathematical facets of astronomical work since Galileo. An impressive work of synthesis, Dick's account ranges across the planetary, stellar and galactic realms, revealing humankind's dramatic transformation in understanding of the nature and structure of the universe since the Renaissance, whilst demonstrating the centrality of discovery and classification to that change.

The details of these narratives are then picked through and their lessons drawn out, as Dick attempts to distinguish 'patterns of discovery'. Unsatisfied with a merely social explanation for the attribution of the term, Dick argues for a complex but discernible structure to discovery: 'extended in time … multifaceted … grounded in reality yet influenced by social and institutional circumstance' (p. 177). The macro-structure of this process is therefore firmly realist in nature, comprising a tripartite structure of detection, interpretation and multiple stages of understanding. Within this (admittedly general) pattern, Dick finds a micro-structure of practical and conceptual elements influenced by technological, social and psychological components. And bound up with these socially *influenced* processes is the socially *determined* need of astronomers to classify celestial objects, not as an end to discovery but very much as part of it. Discovery is therefore 'an unveiling of nature', whilst the 'creation of classification systems is a human invention' (p. 335). Pluto, classified as a planet 'before "the thing itself" was known' (p. 261), thus stands as an example both of how classification can precede discovery, and of how some boundary objects can challenge firm classification even when copious amounts of observational data are in hand.

By constructing his own rigorous 'natural history of discovery', Dick's stated ambition is to 'place discovery at centre stage in science' (p. 329). The two final sections of the book first explore the technological and theoretic components that drive discovery, before concluding with a consideration of the apparent grand synthesis that defines our present understanding of the universe, the discovery of cosmic evolution itself. Discovery ends, Dick argues, when astronomers have a basic understanding of the fundamental properties of a class of object, but before what

he calls 'mature understanding', achieved above all by knowing an object's place in an evolutionary scheme. Strikingly for a work of historical synthesis, Dick then formalizes the current state of this mature astronomical knowledge in his own new classificatory scheme for the discipline. Billed as the first comprehensive system of its kind, the 'Three Kingdom' system classifies what Dick identifies as the eighty-two known classes of celestial object. Though a bold exercise in the challenges of classification, it is here that one may locate the source of a flaw in Dick's account. By committing himself to a 'natural history of discovery' that elucidates the discovery stories of the objects in his own 'Three Kingdom' system, Dick's account weds itself to the present state of astronomical knowledge. It therefore almost entirely lacks in accounts of the myriad discoveries that did, for a time, become accepted parts of astronomical knowledge for at least some in the community, yet do not survive to be regarded as such today. Whilst William Parsons's triumphant discovery of spiral nebulae is carefully discussed, his resolution of the Orion Nebula into stars is not. Likewise, whilst William Huggins's pioneering determination of the gaseous constitution of nebulae is analysed, his discovery of an aqueous atmosphere on Mars shortly afterwards goes unnoted. Though they may have little to contribute towards any present classificatory system for astronomy, rejected discoveries – from Vulcan to volcanoes on the Moon – surely have an important role to play in our historical understanding of discovery as a complex amalgam of observational practice and disciplinary work. As these once-taboo subjects continue to become a greater focus of attention for historians of astronomy, the need only grows for their incorporation into a wider, more symmetrical, account of astronomical discovery. Those who undertake such work will gain a great deal from an engagement with Dick's important and stimulating book.

Joshua Nall
University of Cambridge

Rob Boddice (ed.), **Pain and Emotion in Modern History**. Basingstoke: Palgrave Macmillan, 2014. Pp. xii + 284 ISBN: 978-1-137-37242-0. £65.00 (hardback).

Joanna Bourke, **The Story of Pain: From Prayer to Painkillers**. Oxford: Oxford University Press, 2014. Pp. xii + 396. ISBN: 978-0-19-968942-2. £20.00 (hardback).
doi:10.1017/S000708741400106X

Pain is central to human experience. Historically, the manner by which humans experienced, suffered and articulated physical distress was conditioned by a range of factors. Individuals invariably experienced pain as a physical, psychological, emotional and spiritual sensation. While pain is familiar to us all, its meaning has constantly shifted over time; pain having been felt in disparate social, geographical and political contexts. Perhaps surprisingly, historians of medicine have tended to neglect pain, a subject routinely sidelined in broader studies of disease and illness. The publication of two historical studies dedicated to this important subject is therefore timely and necessary. Joanna Bourke's *The Story of Pain: From Prayer to Painkillers* and Rob Boddice's edited collection *Pain and Emotion in Modern History* address pain from various perspectives, with an emphasis on its medical and emotional dimensions.

By focusing on the expression of pain, Bourke provides a counterpart to pre-existing studies of pain that have typically focused upon the techniques developed to alleviate pain during the previous two centuries (routinely presented as a 'battle' against pain ultimately won by the development of effective anaesthetic and pain-relief methods). One of Bourke's key aims is to tackle the problem of defining pain through an exploration of modern British contexts. As she convincingly argues, pain proved historically difficult to describe. Distressing body states resisted precise articulation. Although a rich vocabulary existed for describing physical agony, the articulation of pain often depended upon the use of vague metaphors. Bourke's narrative rests upon a steady modern transition from pain being experienced in terms of religiosity to pain being regulated in clinical