(60) J. M. Carpenter, *AJ*, **121**, 2851, 2001.
(61) A. Bressan *et al.*, *MNRAS*, **427**, 127, 2012.
(62) Y. Chen *et al.*, *MNRAS*, **444**, 2525, 2014.
(63) J. Southworth & J. V. Clausen, *A&A*, **461**, 1077, 2007.
(64) J. Southworth, in *Living Together: Planets, Host Stars and Binaries* (S. M. Rucinski, G. Torres & M. Zejda, eds.), 2015, *Astronomical Society of the Pacific Conference Series*, vol. 496, p. 321.

REVIEWS

Supermassive Black Holes, by Andrew King (Cambridge University Press), 2023. Pp. 308, 25 × 17·5 cm. Price £54·99/$69·99 (hardbound; ISBN 978 1 108 48805 1).

Recently, supermassive black holes have garnered significant attention, captivating both the public and scientists alike. The no-hair theorem states that any black hole can be completely described by its mass, angular momentum, and charge; nevertheless, a multitude of intricate phenomena emerge from these systems. The past decade has seen ground-breaking advances, such as the direct detection of gravitational waves from merging stellar-mass and intermediate-mass black holes as well as the imaging of black-hole shadows by the *Event Horizon Telescope*.

Looking towards the future, black-hole science holds immense promise, especially with electromagnetic facilities such as *JWST* pushing detections of supermassive black holes to higher redshifts, and next-generation gravitational-wave detectors, such as *LISA* and *IPTA*, targeting the supermassive black-hole regime. Notably, strong observational hints at a gravitational-wave background formed from the cosmic population of supermassive binary black holes detected by *IPTA* have further intensified the excitement.

Amidst this backdrop, Andrew King's book, *Supermassive Black Holes*, proves to be a timely and relevant textbook in the current research landscape. It masterfully weaves together the theories of General Relativity and fluid dynamics with the rich phenomenology of active galactic nuclei (AGN) and the co-evolution of supermassive black holes and their host galaxies. The book comprises eight chapters, where the initial four lay the essential groundwork for the cutting-edge research topics explored in the latter four.

In the first chapter, the author outlines crucial theoretical concepts and observational characteristics of supermassive black holes. Moving on, the second chapter serves as a summary of the salient features of General Relativity concerning black holes, catering to both those familiar with GR and newcomers. The third chapter focusses on astrophysical gasses, encompassing fluid dynamics in various relevant regimes, including incompressible flows, shocks, plasma theory, and magnetohydrodynamics. The author establishes connections to different astrophysical scenarios, discussing the applicability of standard approximations while cautioning against quasi-Newtonian treatments. Chapter 4 delves into accretion-disc theory, starting with Newtonian orbits

and subsequently connecting them to previously discussed GR solutions. A detailed examination of the thin-disc model follows, with attention to other disc types, particularly in the super-Eddington regime (slim discs and advection-dominated accretion flows). The chapter concludes by addressing accretion-flow simulations and associated numerical pitfalls.

The second half of the book delves into frontier research topics. Chapter 5 covers various theoretical aspects of black-hole growth, including gas-transport mechanisms and chaotic accretion. It extensively discusses misaligned accretion discs, applying the same theory to circumbinary discs and their significant role in orbital shrinking and the final-parsec problem. Tidal-eruption events and the novel field of quasi-periodic eruptions are also explored, with the latter potentially providing crucial insights into low-mass black holes. Chapter 6 is a deep dive into the black-hole–galaxy scaling relations, with a focus on the AGN wind-driven scenario, supplemented by alternative explanations like deriving scaling relations from the assembly history. Observational constraints, especially from AGN in dwarf galaxies, are also analyzed. Chapter 7 reviews other forms of AGN feedback, in particular radiatively-driven winds and jets. Different jet-production mechanisms and jet precession are discussed from both observational and theoretical perspectives. The book concludes with Chapter 8, which broadly addresses 'black-hole growth' and the process of constraining different theoretical models through observations, including the AGN luminosity function, supermassive-black-hole-mass limits, and deviations from the scaling relations. Each chapter includes problem sets for further engagement.

Personally, I found the book to be a highly enjoyable read, offering a comprehensive overview of crucial theoretical concepts related to supermassive black holes. Andrew King presents the material in an accessible manner, making it particularly well-suited for graduate students embarking on their journey in this field. Additionally, advanced undergraduates seeking background reading for research projects could find this book valuable. It is also an excellent resource for individuals transitioning from a general physics background to astrophysics, as it illuminates the connections between General Relativity, fluid dynamics, and the intricate world of AGN physics. As I pass the book on to my summer student, I wholeheartedly recommend it to anyone interested in exploring the fascinating world of supermassive black holes. — Sophie Koudmani.

Simulating the Cosmos. Why the Universe Looks the Way it Does, by Romeel Davé (Reaktion), 2023. Pp. 199, 22·5 × 14·5 cm. Price £15·95 (hardbound; ISBN 978 1 78914 714 8).

Who would have thought that a book on numerical modelling could be such fun! A leading practitioner of the art, Davé demystifies the black boxes of N-body simulations, hydrodynamical modelling, and the rest in irreverent style, exemplified, perhaps, by the final sentence of Chapter 1, prior to embarking on modelling the Universe: "To do this, we're going to need computers. Big ones." The first chapter itself sprints through the development of cosmology, both observational and theoretical, from Hubble and Lemaître through the CMB and inflation to the concordance model of ΛCDM in 40 pages. While unsurprisingly light on the nuances of the history, this provides an excellent background for the later chapters on 'Putting the Universe on a Computer' and on the ever-improving simulations of large-scale structure and the formation and evolution of galaxies (including a section 'Are We There Yet?'). The easy-