to the physical context of the effects covered, and, having only a nodding acquaintance with some of them myself, I found these interesting. That apart, the text is full of formulae, usually with no more than outline derivations, which the reader has to fill out from the cited literature or provide for himself. The references to the literature are apparently very comprehensive, and the citations and the formulae themselves are presented with a lot of care; the longest ones are hived off to separate appendices.

The author's main application of such results is observational, but almost nothing is said of the statistical methods which such work requires. He does, however, point out the danger of searching for an effect by fitting the residuals from an existing incomplete theory, if one does not repeat the entire fitting with the augmented theory. And when no natural binary motion exists for examining some effect, it can sometimes be done with a suitably designed probe. Some of these are described in a separate chapter at the end, and include proposals with amusingly quirky names, including IORIO (In-Orbit Relativity Iupiter [*sic*] Observatory). The entire text is lightened with etymological and other notes. — Douglas C. Heggie.

Hidden in the Heavens. How the Kepler Mission's Quest For New Planets Changed How We View Our Own, by Jason Steffen (Princeton University Press), 2024. Pp. 253, 24·5 × 16·5 cm. Price £25/$29·95 (hardbound; ISBN 978 0 691 24248 4).

This fascinating book tells the story of *Kepler*, one of the most significant space-science missions ever launched. It is a tale of imagination, innovation, perseverance, technological wizardry, and human ingenuity, described in graphic detail by one of the members of the science team who made the mission such a resounding success.

Until the 1990s, the only family of planets available for astronomers to study was our own Solar System, populated by nine planets (now eight, after the demotion of Pluto), hundreds of satellites, and countless chunks of icy or rocky debris. There seemed little reason to expect any other planetary systems — if they existed — to be very different. Then, in 1992, the first planets confirmed to exist beyond our Solar System were discovered in orbit around a dense, dying star — a pulsar. Three years later, a planet (51 Peg b) was found in orbit around a distant, Sun-like star for the first time. Furthermore, 51 Peg b turned out to be something most unexpected — a searingly hot gas giant that circled its star once every four days, the first example of what came to be known as a 'hot Jupiter'. According to the theories of the time, such a world should not exist. In the years that followed, a steady stream of exoplanet discoveries was recorded, but progress was very slow. However, a group of scientists, led by William Borucki of NASA's Ames Research Center, envisaged a revolutionary space observatory, equipped with a highly sensitive photometer, that would be able to study minute changes in brightness caused by planets transiting in front of distant stars. After years of trying to convince NASA that such a mission was viable, the *Kepler* planet-finding mission was given the go-ahead in 2001 December.

Kepler's primary objective was to spend up to four years staring at more than 100 000 pre-selected stars in order to detect variations in light with an accuracy of 20 parts per million. So much data came pouring in that the science analysts were in danger of being swamped, but the introduction of computer simulations helped to speed up the process. Today, more than 5800 exoplanets have been confirmed, and about half of these were discovered by the *Kepler* team. Jason Steffen, recruited to the *Kepler* science team before it was launched in 2009, gives a compelling account of this groundbreaking mission, including how the mission was conceived, the success of the primary mission that was cut short after four years by a hardware malfunction, and the redesign of the mission (dubbed K2) so that it was able to continue until 2018. He also describes the remarkable variety of worlds that *Kepler* brought to light, including the first super-Earths and sub-Neptunes, the first Earth-sized planets in the habitable zones of their stars, the first planets orbiting in a binary system, systems with seven and eight planets, and astrometric observations that enabled unprecedented photometric studies of numerous stars. The remarkable conclusions are that there are more planets than stars in the Milky Way galaxy, and that many of these worlds are comparable in size to our Earth. Perhaps we are not alone after all! — PETER BOND.

Starbound, by Ed Regis (Cambridge University Press), 2025. Pp. 240, 22·5 × 14·5 cm. Price £25/$29·95 (hardbound; ISBN 978 1 009 45759 0).

There are several versions of a painting under various titles commonly known as *The Fall of Icarus*. The painting, possibly by the Flemish painter Pieter Bruegel (the elder) from perhaps around 1558, shows a coastal landscape in which a horse-drawn plough is guided by a farmer across a field. In the middle distance, in the sea beyond the farm, Icarus, his wings having disintegrated, plunges to his death. Only his flailing legs are visible in the large splash. The farmer doesn't notice. The painting is said to be an allegory about both the dangers of excess ambition and the security to be had from humble toil. The story of Icarus and his father Daedalus, the maker of the wings, is said to originate with the Roman poet Ovid — the dream to fly is very old, and to fly to the stars is a desire possibly as old as humanity itself. In other versions of the Icarus painting the fate of Daedalus is also depicted; he is seen to have continued his flight to land safely on the shore.

Ed Regis is a thoughtful and amusing commentator but his exasperation with wilder extrapolations from reality seems to increase through the 12 chapters of this book, and by the last he has had enough and reveals his inner dream-shattering grouch. But it is in one of the early chapters about three 'Icons of Star Travel' that he lays out his stall. Describing the Bernal sphere, the Bussard Interstellar Ramjet, and Project Daedalus thus: "... each concept was a blend of unrealistic assumptions about what was possible or practical in an indefinite future", which he believes reflects the view that since an object had a name it also has an existence, even though "none of the designs obeyed general principles of standard engineering practice".

We need not trouble ourselves with the details of those projects to see clearly what Regis thinks is important about most of the schemes and plans to deliver humanity to the stars. He would like to see some standard engineering practice, and indeed some real existing physical objects. In 12 chapters he carefully unpicks and assesses the stories and the technology of proposed interstellar travel. He begins by leading us through the origins of the dream — and to be clear the dream is for the transport of humans to a suitable Earth-like planet in orbit around a star other than the Sun. He is not discussing manned excursions to Solar System locations: Mars, Europa, or wherever. The subject of discussion