ROCZNIKI FILOZOFICZNE
Tom LXIX, numer 4 – 2021

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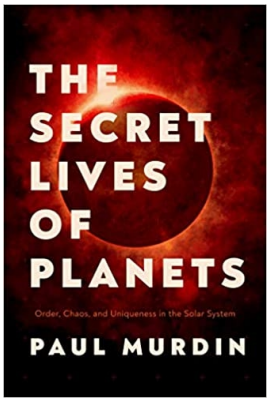
FAR WORLDS IN ASTRONOMICAL RESEARCH*

Paul MURDIN. *The Secret Lives of Planets: Order, Chaos, and Uniqueness in the Solar System*. London/New York: Pegasus Books, 2020. 280 pp. ISBN: 978-1-64313-336-2 (hardcover).

DOI: http://doi.org/10.18290/rf21692-23



Murdin's book has many merits. It is well written and covers a large swath of material in a small amount of space, while avoiding misleading simplifications. This book is a refreshing and liberating take on a well-trodden subject, and brilliantly shows how philosophical views on the structure of the solar system were shaped by the progress of astronomical knowledge, and how the advancement of technology has contributed to the advancement of astronomy. It is no accident that the book is dedicated "To the engineers and scientists who have shown us far worlds." It is also worth adding that the book is published in a very accessible format. Most scientific books have footnotes and bibliographies, while this one does not.

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* The work realized as part of the project funded by the Minister of Science and Higher Education within the program under the name "Regional Initiative of Excellence" in 2019-2022 (project number: 028/RID/2018/19, the amount of funding: 11 742 500 PLN).

Nevertheless, in my opinion, this book is very professional; true mastery lies in self-limitation. In this book, information from the history of astronomy is successfully combined with reports from contemporary research, and it is admirably clear in its exposition and often forceful in argumentation. It is also worth mentioning that Paul Murdin is an internationally known astronomer and author of well-written books and lectures concerning astronomy. His achievements in popularizing science are enormous.

The subject of this book is immense: the solar system and especially the order, chaos, and uniqueness of it. These are all very significant issues, not only scientifically, but also philosophically. The author is aware of this significance, even though the book is dedicated "To the engineers and scientists who have shown us far worlds." Philosophers also appear in this book, for example William Paley, but most of the figures therein are astronomers. Of particular interest is the inclusion of artists in this work. *The Planets* of Gustav Holst are found on several pages of Murdin's book, however Ron Miller, an American artist who illustrated Titan's surface prior to Cassini's research with his paintings, does not appear. From a philosophical point of view, it is of interest to not only answer the question: how was the solar system formed, but also: why is it so individual? In this book we find the answers to both of these questions. The first chapter contains a significant number of philosophical considerations, while in subsequent chapters, *margarita philosophica* happens often as well.

In this book on planets, we find not only dwarf planets (Ceres, Haumea), hypothetical planets (Vulcan, Theia), and the moons of planets (inter alia Ganymede, Europa, Phobos, and Enceladus), but also asteroids (Pallas, Itokawa) and even Martian meteorites, to which one of the chapters of the book is devoted. Such a structure may surprise you, but is justified. From this structure, we gain extensive knowledge on the solar system, with not only planets being the subject thereof. The author pays particular attention not only to descriptions of the bodies of solar system, but also to explanations of their origin. Chapters two and three deal with Mercury, Venus, and Vulcan. This hypothetical planet was "discovered" by Edmond Lescarbault (1814–1894), an amateur astronomer from France. In Murdin's book, we are presented with the interesting history of this "discovery." Vulcan remained a notional member of the solar system right until the discovery of general relativity. The hunt for Vulcan was an instructive lesson in how science works—the search for sustainable and replicable research strategies in science. Thomas Levenson has written a very interesting book on this subject, entitled *The Hunt for Vulcan: ... and How Albert Einstein Destroyed a Planet, Discovered Relativity, and Deciphered the Universe* (Levenson 2015). It's just a pity that Murdin didn't use Levenson's book. Too bad even more that the chapter on Venus does not contain a history of the "discovery" of this planet's moon. This moon was identified not only by amateur astronomers but also by professionals like Giovanni Dominique Cassini (1625–1712), and James Short (1710–1768). An excellent book on this subject, *The Moon that Wasn't. The Saga of Venus' Spurious Satellite*, was written by Helge Kragh (Kragh 2008).

From the time of Copernicus, the Earth has also been a planet, and therefore the fourth chapter is devoted to the Earth. Still, it should be said that in the eighteenth cen-

tury, the Earth was less well known than the heavens. However, even now, our knowledge of the Earth's interior is very limited. In chapter four we are presented with knowledge not only about the history of astronomy, but also information concerning the history of geology and geomorphology. We get an insight into the history of past catastrophes, but we primarily learn about the catastrophe that awaits us when the Earth's magnetic field disappears.

In chapter five, the author describes modern theories on the origin of the Moon. The Giant Impact Hypothesis is preferred over the Capture Theory. The author holds that the aforementioned impact determined "[…] the colourful poetry of spring, the ice grip of winter, the torrential rain of the monsoon, the sweltering heat of the sirocco wind" (Murdin 2020, 112). Other philosophical issues present problems regarding the stability of the solar system. Karl Popper devoted much attention to this issue and yet was not noticed. The object of Popper's attention was the work "Les surfaces à courbures opposées et leurs lignes géodésiques" by Jacques Hadamard (1865–1963). In this work, Hadamard provides a physical argument against scientific determinism. According to Popper's scientific determinism, even in classical physics, cannot be applied. Contemporary philosophers, however, see a weakness in Popper's argumentation.[1] The conclusions that can be found in the book are in line with Popper's solutions, but they do not show all the complexities of the philosophical context. "What 'chaos' implies for the solar system is that there have been incalculable upheavals in the positions of the planets over the last 4 billion years since our planetary system was formed. These upheavals were unique events, which have given character to each planet of the solar system. What is even more surprising, and, so far, unexplained, is that, to our knowledge, the solar system, as a whole, seems to be unique" (Murdin 2020, 10). In this context, the design argument appears (teleological argument). Of course, this argument has been in use for millennia, but the English theologian William Paley (1743–1805) is considered to be its creator. Paul Murdin thinks so too. In his book, however, the design argument is confronted with an Uncertainty Principle and the chaos theory. This is a good opportunity for a philosopher to see how a philosophical argument is understood by scientists. Historians of science can also benefit from this book because it shows the links between modern science and its past.

Chapters six and seven describe Mars and Martian meteorites. Particular attention in the seventh chapter is devoted not only to Martian meteorites, but also to the moons of Mars, and especially to the story of their discovery and naming. Astronomy lovers will find here a detailed story about recorded events, which is now known as the fall of Martian meteorites. In chapter eight, the author describes Ceres. You can find here not

[1] "It is curious that Popper, who is elsewhere (as we have seen) opposed to instrumentalism and in favour of realism, should here discuss at length a version of 'scientific' determinism which is thoroughly instrumentalistic in character, in that it makes assertions about *predictability*, and should ignore a version of 'scientific' determinism which is much more in keeping with scientific realism, in that it makes an assertion about the nature of the universe. This oversight seriously weakens Popper's argument for indeterminism" (Maxwell 2017, 35).

only pieces of historical information, but also reports on the latest space missions (the *Dawn* space probe). Other space missions like *OSIRIS-Rex* and *Hayabusa 2* are also mentioned in this chapter. Murdin provides accurate information about the potential of near-Earth asteroids for space resource gathering, and their impact threat to Earth. However, nonetheless, Professor Murdin deserves great credit for the thorough and lucid way in which he undertakes this endeavour. The main characters in chapters nine and ten are Jupiter and its moons. The author describes discoveries made by the *Juno* probe, and comes to the conclusion that: "The planets have individual personalities and lives, but together they make up a planetary system that acts as a community in which some members, like Jupiter, have greater influence than others" (Murdin 2020, 171).

In eleventh chapter of this work, the main hero is Saturn. The author tells us not only a beautiful story about the discovery of Saturn's rings, but also about the recent discovery of Saturn's additional moons (Atlas, Pan, and Daphnis). These small inner ring moons of Saturn are incredibly interesting, but little is known about them by people interested in science. In this chapter, we can also find a philosophically inspirational comment on Saturn's hexagon. "Lots of purported explanations for the hexagon shape have been put forward but, so far, the jury is out and the reason for the precise geometrical shape remains one of Saturn's secrets" (Murdin 2020, 196–197). It is worth adding that a new study of the hexagonal, pole-centered cloud feature in Saturn's northern atmosphere shows just how complex this weather system is. This is an excellent example to illustrate so-called complex systems, and it is very valuable to philosophers. It shows that in science, solving a problem can be as difficult as in philosophy.

The next chapter is devoted to the largest moon of Saturn — Titan. Murdin details the findings of the Cassini-Huygens mission to Saturn. Today, Titan's landscape is very familiar, but Murdin also describes the excitement which accompanied the first images of Titan's surface. Enceladus, in Murdin's opinion, is so extraordinary that it is justified in having a chapter devoted strictly to itself. This moon of Saturn is presented as being a cousin to Jupiter's Io. On one side of Io, there are fiery volcanoes erupting with hot lava, while on the opposite side of Enceladus, there are cryovolcanoes. Between these two poles there are more similarities. "Just as the surface of Io is covered by sulphur and ash from its volcanoes, half the surface of Enceladus is covered by ice from cryovolcanoes" (Murdin 2020, 214). It is well known among exobiologists that Enceladus provides perhaps the most promising potential habitat for life in the Solar System. That's why they plan a low-cost sample return mission to Enceladus. Murdin is well aware that this celestial body has high astrobiological potential, but in his book, there is no mention of missions such as Enceladus Life Finder (ELF). This is probably because the mission was not selected by NASA for a Phase-A design study.

In the last three chapters, the author describes the farthest planets: Uranus, Neptune, and the dwarf planet Pluto. According to Murdin, astronomical studies of Uranus provide a philosophical reflection: "The lives of planets are a mixture of orderly and accidental events. Our own lives consist of the same mixture, not only of events, but also of

orderly, rational thoughts, and disorderly, irrational speculation" (MURDIN 2020, 236). In recent times, a lot of historians of science and philosophers of science have devoted much attention to the discovery of Neptune (KOLLERSTROM 2006, 151–158; GAPAILLARD 2015, 48–65; BETANCUR 2017, 30–53; ERIKSSON and GARCIA MARTIN 2018). Today, historians of astronomy do not claim that Neptune was discovered "at the tip of a pen." Some Philosophers of science have adopted this view. It is a pity that the Author has not made it clear that Neptune was discovered largely by accident. An even greater coincidence was the discovery of Pluto. About this discovery, Whitehead said that it was a result of imaginative speculation. Unlike Whitehead, who argues that Pluto was also discovered "at the tip of a pen," Murdin writes, "Like Neptune, Pluto was found near to the place where it had been predicted to be. However, this was a matter of luck" (MURDIN 2020, 249).

This book is most interesting, not just in its content, but in the questions it forces us to ask about the future. There are people who would profit from it immensely and for whom it ought to be required reading. In the end, one should notice an error in the subtitle on the book's dust jacket. The letter **u** is missing in the word "Uniqueness." Additionally, the sentence on page 121, "The US businessman Percival Lowell used his riches to set up an observatory in Flagstaff, Arizona, to search for Pluto and study Mars", suggests that the Lowell Observatory was founded to search for the planet Pluto, but the search for planet X was the actual subject of investigation.

REFERENCES

BETANCUR, Molina. 2017. "The method of analysis and synthesis and the discovery of Neptune." *Estudios de Philosophia* 55: 30–53.

ERIKSSON, Gustav, and Kevin GARCIA MARTIN. *Discovery of Neptune*. Degree Project in Technology. KTH Royal Institute of Technology. School of Engineering Sciences. Stockholm, 2018.

GAPAILLARD, Jacques. 2015."By How Much Did Le Verrier Err on the Position of Neptune?" *Journal for the History of Astronomy* 46: 48–65.

HADAMARD, Jacques. 1898. "Les surfaces à courbures opposées et leurs lignes géodésiques." *Journal des mathématiques pures et appliquées* 4: 27–73.

KOLLERSTROM, Nicholas. 2006. "John Herschel on the Discovery of Neptune." *Journal of Astronomical History and Heritage*" 9, no. 2: 151–158.

KRAGH, Helge. 2008. *The Moon that Wasn't. The Saga of Venus' Spurious Satellite*. Basel/Boston/Berlin: Birkhäuser.

LEVENSON, Thomas. 2015. *The Hunt for Vulcan: ... and How Albert Einstein Destroyed a Planet, Discovered Relativity, and Deciphered the Universe*. New York: Random House.

MAXWELL, Nicholas. 2017. *Karl Popper, Science and Enlightenment*, London: University College Press.

MURDIN, Paul. 2020. *The Secret Lives of Planets: Order, Chaos, and Uniqueness in the Solar System*. London/New York: Pegasus Books.