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**Maria Rosa Antognazza, ed.** *The Oxford Handbook of Leibniz*. Oxford University Press 2018. 824 pp. \$175.00 USD (Hardcover ISBN 9780199744725).

A true universal genius, Gottfried Wilhelm Leibniz contributed to countless disciplinary fields, such as physics, mathematics, logic, metaphysics, law, history, optics, cosmology, chemistry, geology, physiology, and so on. Over the years, numerous writings from the archives have appeared, proving that Leibniz was a philosopher with many speculative interests. For this reason, the *Oxford Handbook* series certainly could not fail to devote a volume to the philosopher of Leipzig. This new volume, edited by Maria Rosa Antognazza, provides a broad overview of Leibniz's thinking in light of new material from the archives. The volume is well structured and divided into eight parts, which cover Leibniz's wide range of interests. The eight parts of the volume are preceded by an introduction and a brief bio-bibliographic survey of Leibniz by Antognazza.

The first part of the volume, 'God, Possible Worlds, and the Actual World,' begins with an essay entitled 'Essences, Ideas, and Truths in God's Mind and in the Human Mind' by Massimo Mugnai. The problem of essences is closely connected to the problem of God and to pre-established harmony. According to Leibniz, essences are 'the models of all things, possible and actual, in God's understanding' (11). While the scholastic tradition linked Leibniz's essences to Plato's ideas, Mugnai affirms instead that '[a]ttributing the status of modes to ideas and truths in God's understanding, Leibniz distances himself from a strong form of Platonism: ideas and truths are not objects existing by themselves, in a separate world of some kind' (13). Mugnai is also the author of the next essay entitled 'Theory of Relations and Universal Harmony.'

Some questions of logic are addressed by Gonzalo Rodriguez-Pereyra in his essay 'The Principles of Contradiction, Sufficient Reason, and Identity of Indiscernibles.' In his logical works Leibniz distinguishes two types of truth: those of reason and those of fact. The truths of reason—which coincide with those identified by formal logic—are based on the principles of identity and non-contradiction (everything is true or false and cannot be both true and false). They are necessarily true, but they do not increase our knowledge of existing reality. They are therefore not derived from the latter and are innate. The truths of reason can be traced back to identical propositions. The principle by which non-identical but necessary truths are brought back to identical truths is the principle of sufficient reason, that is, no proposition is true if it does not have in itself or in another the reason for its truth. According to Rodriguez-Pereyra, Leibniz 'tends to assign different domains to these two principles. The domain of necessary truths and mathematical truths is assigned to the Principle of Contradiction, while the domain of contingent truths and truths from natural philosophy is assigned to the Principle of Sufficient Reason' (53).

This essay is followed by Donald Rutherford's essay 'The Actual World,' which addresses the issue of pre-established harmony. Once he has demonstrated the existence of God, Leibniz asks why there is something rather than nothing. The answer is creation. In God's mind are contained infinite possible worlds and in a free act God decided to confer on one of them existence. But this is not only one of the many possible worlds but the best of all possible worlds. This is a moral necessity that is connected to divine goodness. By virtue of a pre-established harmony, God made it possible for ideas and the qualities of bodies to correspond. This also explains the communication between body and soul and the concordance between representations; so, as Rutherford says, according to Leibniz 'nothing possible becomes actual except through the exercise of God's power' (83).

The two final chapters of Part I also consider questions linked to the problem of freedom and contingency, and of evil and good: Jeffrey K. McDonough's 'Freedom and Contingency' and Paul Rateau's 'The Problem of Evil and the Justice of God.'

Part II, entitled 'Concepts, Knowledge, and Language,' considers Leibniz's theory of knowledge as well as his project of a universal science. The first essay of this second part is Stefano Di Bella's 'The Complete Concept of An Individual Substance.' It is well known that the fact that bodies are made up of energy led Leibniz to believe that matter was nothing more than the limit of that energy, that is, the passive aspect of bodies. Therefore, their essence is not matter but substantial form. This immaterial form must be simple, since there is composition only where there is matter. Therefore, bodies are material substances composed of simple immaterial substances.

The issue of knowledge is addressed with great clarity by Martha Bolton in her essay 'Theory of Knowledge: Mathematical and Natural Science.' Very interesting as well is 'The *Scientia Generalis* and the Encyclopaedia' by Arnaud Pelletier. This essay is particularly important because it expresses the basic idea of the whole volume: that the various disciplinary fields studied by Leibniz are not so much single aspects without connection but parts of a whole that coalesce in the concept of *Scientia Generalis*. The latter, obviously, cannot be 'understood as a universal science, in the sense of a calculus or a single method that could be applied to all sciences. Its unity is not given by the uniqueness of an *organon* ... but by the plurality of elements and principles whose domain of validity are to be determined through the collective progresses of the sciences' (171). This essay is followed by another essay by Massimo Mugnai entitled 'Ars Characteristica, Logical Calculus, and Natural Languages.' In his *De arte combinatoria* Leibniz conceived the project of a universal science, reducing all true propositions to primitive ones. He wanted to express propositions with graphic symbols to pass from one set of propositions to another by means of a logical calculation. It would thus have been possible to construct a universal language called *characteristica universalis*. He wanted to create a formal logic and reduce mathematics to a particular case of logic.

Part III is entitled 'Mathematics' and contains contributions by Siegmund Probst ('The Calculus'), Eberhard Knobloch ('Determinant Theory, Symmetric Functions, and Dyadic'), Vincenzo De Risi, ('Analysis Situs, The Foundations of Mathematics, and a Geometry of Space'), and James Cussens ('Probability and Statistics'). It is followed by Part IV, 'The Physical World and its Metaphysical Grounding.' In the first essay, 'The Labyrinth of the Continuum,' Richard T. W. Arthur takes into account the solution provided by Leibniz for the difficulties of the continuum, that is to say his theory of substance. Philip Beeley, in his essay 'Early Physics,' explores the problem of motion in Leibniz's thought. Leibniz contributed to physics through a dynamic interpretation of mechanics and discovered new physical laws. He rejects the Cartesian reduction of matter to pure extension, which for Leibniz is a way in which matter manifests itself. The property of the latter is impenetrability, that is, the resistance of bodies to accept other bodies in the space they occupy. Therefore, the nature of matter consists in a force. In this way Leibniz discovered that what is kept constant in the movement of bodies is not the product of mass and velocity ( $mv$ ), but kinetic energy, that is, the product of mass and velocity squared divided by two ( $mv^2/2$ ), which he calls living force. For him, space and time are relations between bodies. Therefore, the universe presents itself as a system of forces. Other essays devoted to Leibniz's reflections on physics include 'Force and Dynamics' by Daniel Garber and Tzuchien Tho, Daniel Garber's 'Body and Corporal Substance,' Donald Rutherford's 'Monads,' Heinrich Schepers's 'Monadical Perception,' Adam Harmer's 'Mind and Body,' and Heinrich Schepers' 'Space and Time.'

Part V, 'Scientific and Technical Work,' opens with Jeffrey K. McDonough's contribution 'Optics,' which considers Leibniz's thoughts on modern optics. The next essay is 'Cosmology,'

written by Domenico Bertoloni Meli. Related to the latter is ‘The Origins and History of the Earth’ by Andre Wakefield. François Duchesneau’s essay shows the depth of Leibniz’s interest in the life sciences—specifically the link between Leibniz’s metaphysics and his studies on physiology. In fact, ‘his metaphysics contains arguments and notions that build on physiological concepts to express the condition of finite substances and the relationship between substances in the phenomenal world’ (466). Justin E. H. Smith’s essay, entitled ‘Medicine,’ follows. Anne-Lise Rey’s ‘Alchemy and Chemistry’ brings to light the important role of chemistry in Leibniz’s concept of the monad. Matthew L. Jones is the author of an essay entitled ‘Calculating Machine,’ which is devoted to an interesting and well-detailed analysis of the calculating machine. In the beginning, Leibniz could only build a model of one he had seen by Minister Colbert in Paris. Another contribution which takes into account the technological aspects of Leibniz’ works is ‘The Technology of Mining and Other Technical Innovations,’ by Harmut Hecht and Jürgen Gottschalk.

Part VI, entitled ‘Scientific Organizations, Cultural Networking, and Scholarship,’ opens with Hartmut Rudolph’s essay ‘Scientific Organizations and Learned Societies.’ The author, before getting into a discussion of Leibniz’s projects for scientific organizations, first points out ‘that Leibniz spoke of “societies” rather than universities. The reason for this is that, like many of his contemporaries, Leibniz did not believe that universities had much potential for innovation’ (545). The following contribution by Howard Hotson, ‘Leibniz’s Network,’ speaks to a paradox in the study of Leibniz: Leibniz’s system of thought ‘is an all-embracing network of mutually dependent conceptions, each one so inextricably related to the others that changing one would alter the whole. Yet Leibniz never expressed this coherent, all-embracing system in a single, all-embracing work’ (563). On the contrary, Leibniz’s writings are a ‘patchwork of innumerable fragments,’ but according to Hoston the key to resolving this paradox ‘is the recognition that, for Leibniz, philosophy was a societal activity’ (563).

As already said, Leibniz had a universal mind with multiple interests, including history, and it is precisely the figure of Leibniz as a historian that is the subject of the next contribution—Maria Rosa Antognazza’s ‘Leibniz as Historian.’ An essay by Margherita Palumbo, entitled ‘Leibniz as Librarian,’ closes section VI.

Section VII, entitled ‘Ethics, Jurisprudence, and Politics,’ opens with Gregory Brown’s essay, ‘Happiness and Justice.’ This contribution shows how Leibniz approached legal problems. In fact, the philosopher of Leipzig ‘became involved in a project, under the auspices of the Elector of Mainz, to reform Roman civil law. Although this project was never completed, it provided occasion for Leibniz to produce a series of important studies in natural law’ (623). Strictly linked with the contents of the previous essay is ‘Leibniz as Jurist’ by Alberto Artosi and Giovanni Sartor. Friedrich Bedierbeck’s essay ‘Leibniz’s Political Vision for Europe’ highlights the important role played by the Holy Roman Empire of the German Nation, which ‘constituted the conceptual framework most familiar to him’ (664). Stephen Waldhoff, one of the editors of the political writings of Leibniz at the Leibniz Editionstelle of Potsdam, in his contribution ‘Proposals for Political, Administrative, Economic, and Social Reform,’ shows how difficult it is to bring Leibniz’s political thought back to a common centre or to a work that could constitute the summary of his political thought. According to Waldhoff this situation can be explained by three intertwined reasons: first, ‘Leibniz was not only a political theorist, but was also, above all, an administrative practitioner. Many of his political writings were commissioned. In other words, they were occasional writings that can only be understood within the context of the situation’ (684). Second, ‘Leibniz served as a councillor in a principality of the Holy Roman Empire of the German Nation. Political discussions in the Holy Roman Empire

primarily took place within the context of *Reichpublizistik* (684-685), and finally, ‘there is good reason to assume that much of what Leibniz wrote was politically motivated’ (685).

Opening Part VIII, ‘Natural and Revealed Religion,’ is Brandon C. Look’s essay, ‘Arguments for the Existence of God.’ The author examines three argumentative strategies for proving the existence of God: the ontological, the cosmological, and the argument from eternal truths. Since we do not know things directly but only our ideas, how do we ensure the correspondence between ideas and things? Leibniz finds the solution in God, whose existence is demonstrated by three arguments: 1) there are contingent realities which, not having sufficient reason for their being in themselves, must have it in others. This necessary reality is God. 2) there are eternal essences that are conceivable but that need an eternal intellect that thinks of them. 3) Anselm’s Proof. The volume closes with Maria Antognazza’s essays ‘Faith and Reason,’ ‘Philosophical Theology and Christian Doctrines,’ and ‘Ecclesiology, Ecumenism, and Toleration.’

In conclusion, this substantial volume is addressed not only to an audience of specialists, but to students, who will be able to appreciate not only the vastness of the topics covered, but also the simplicity and fluency of the various contributions that constitute this volume. The index at the end of the volume is also very useful.

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