Making Waves: Leibniz's Legacy and Impact

The story of the legacy and impact of Gottfried Wilhelm Leibniz (1646-1716) has as many twists and turns as there are people who have been touched by his ideas, each twist and turn forming a new story about the adoption, amplification, development, rejection, or distortion of Leibniz's thought from his own time to ours. This volume contains eleven such stories. The aim of this chapter is to introduce them and put them in a broader context.

Part 1: Early Impact

As is well known, during his lifetime, Leibniz won his greatest fame in the republic of letters for his contributions to mathematics,[1] especially for his development of the differential and integral calculus, which was acknowledged to be a landmark contribution to the field from the 1690s onwards, following its endorsement by a number of influential mathematicians (see Probst 2018).[2] The invention also soured the final years of Leibniz's life—and his reputation in Britain for many generations—following the 1712 verdict of the Royal Society that he had plagiarized the calculus from Isaac Newton (1643-1727). While the priority dispute, as it became known, has been the subject of many works (e.g. Hall 1980, Meli 1993), the early background to it has remained underexplored, at least till now.[3] In the opening chapter of this volume, Philip Beeley turns back the clock to tell a captivating tale about Leibniz's varied and more often than not volatile relationships with the members of the Royal Society in London. Drawing on new material, Beeley reveals some of Leibniz's misjudgments and faux pas in his dealings with the Society that would contribute to shaping his reputation in Britain for decades to come. Through a careful interlacing of daily minutiae and fateful episodes, Beeley establishes an intricate web of factors that explains what gave rise to the suspicions of plagiarism against Leibniz. While the priority dispute was inevitably a huge personal setback for Leibniz and cast a long shadow over his reception in Britain for the remainder of the eighteenth century, on the European mainland he was able to rely on the faithful support of a group of influential mathematicians[4] who defended him against the attacks of the Newtonians

[1] As Fontenelle (1812, 137) wrote in his eulogy of Leibniz of 1717: "It would be pointless to say that Mr Leibniz was a mathematician of the first rank, [since] it is through mathematics that he is most generally known."

[2] For the influence of Leibniz's mathematics, see especially Krömer and Chin-Drian 2012. Amongst his contemporaries, Leibniz's insights clearly inspired the works of the Bernoullis (Jakob and his younger brother Johann) and also Jakob's nephew Daniel Bernoulli, himself a contemporary of one of the greatest mathematicians of the eighteenth century, Leonhard Euler. Basel born and bred, Euler would join the academies in Berlin and then Saint Petersburg to develop amongst other, the variational calculus which optimizes for functions, not for points. In France there are at least two significant figures, Émilie du Châtelet (1706-1749) and Jean le Rond d'Alembert (1717-1783), a mathematician, mechanician and physicist who repeatedly referred to Leibniz in his *Encyclopédie* [Encyclopedia], with entries amongst others on Action (I, 119-20), Binary Arithmetic (I, 680), Final Causes (II, 789), the Law of Continuity (IV, 116-17), Cosmology (IV, 294-7), the Calculus (IV, 985-8 and 988-9), Conservation of Living Forces (VII, 114-16), Dynamics (V, 174-6), Living Force (VII, 112-14), Logarithm (IX, 630-3), Sufficient Reason (XV, 634-5). To jump ahead two hundred years, in our times Leibniz has inspired eminent figures such as Ernst Mach (1838-1916) and more recently Julian Barbour (1937-) , as well as Georg Cantor (1848-1918), L.E.J. Brouwer (1881-1966) and Hermann Weyl (1885-1955), and also Kurt Gödel (1906-1978) who, according to anecdote, borrowed every available book on Leibniz from the Princeton library and never brought them back. Karl Friedrich Gauss (1777-1855) picked up the linear algebra which Leibniz had started off with the concept of the "determinant". In the 1970s, Benoît Mandelbrot (1924-2010) brought fractals back to life and credited Leibniz with anticipating many key concepts; even more recently, in an article in 2006 Gregory Chaitin (1947-) went as far as to suggest that Leibniz was the original source of algorithmic information theory. A big thanks to Erik Vynckier for his input and explanations.

[3] Though see Boas Hall 1978.

[4] Most visibly, in Switzerland under Johann and Daniel Bernoulli and in Germany under Christian Wolff.

and continued promoting his work, ensuring that his calculus and the use of differential equations entered into university curriculums.

Yet while many of Leibniz's innovations, especially in mathematics and philosophy, went on to influence those who followed, as we shall see, others did so only belatedly or in some cases not at all. For example, it has been noted that Leibniz was the first to produce a geological theory of the Earth's formation in his *Protogaea* of 1691-1693 (Hedge 1884, 198; Poirier 2017, 223), though it would be almost a century before this would shape the thinking of other naturalists, most notably that of Georges Buffon (1707-1788).[5] To take even more extreme examples, while Leibniz appears to have been the first to apply the newly-discovered water cycle to explain a flood event (see Strickland and Church 2015), this discovery did not influence the development of the nascent science of hydrology in any way; and while Leibniz was responsible for many innovations in logic, it has been argued that these did not influence later developments but rather just anticipated them (see Peckhaus 2012). In each of these cases, the reason Leibniz's innovations had belated or even no influence was because the writings in which they are found were not published for a long time after his death, by which time the disciplines to which they contributed had moved on. *Protogaea*, for example, was not published until 1749 (see Leibniz 1749), many of Leibniz's writings on logic not until 1839 (with many more not following until the twentieth century), and his text on floods not until 2015!

There is little doubt that Leibniz's posthumous influence was thus governed—and often considerably restricted—by the availability of his writings.[6] Leibniz wrote incessantly but published relatively little during his lifetime: around two hundred journal articles on a variety of different topics, the *Théodicée* [*Theodicy*] (Leibniz 1710), and several volumes of historical documents. His unpublished writings, amounting to around half a million pages, did not appear immediately after his death but trickled out over the course of the following decades and centuries. A handful of collections of his writings were issued in the years after his death (e.g. Clarke 1717; Leibniz 1718); others appeared in the mid-eighteenth century (e.g. Leibniz 1765; Dutens), with many more appearing in the nineteenth and twentieth centuries (e.g. GM, G, Klopp, A). Attempts to publish all of Leibniz's surviving work is still ongoing, and not likely to be complete for another fifty years. Thus when considering the posthumous impact of Leibniz's work it is important to bear in mind how little of it was available in the decades after his death.

Although the full extent of Leibniz's written legacy has only gradually become apparent since his death, it is possible to ascertain the historical impact of those parts of it that were available to his contemporaries and the generations of thinkers that followed. If we were to summarize what has been written on his posthumous impact thus far (see for example Heinekamp 1986, Adams 2010, Krömer and Chin-Drian 2012), the story would probably go something like this: the strongest impression Leibniz's ideas made on others was felt during his lifetime and in the years immediately following his death. This impression was felt less and less by successive generations, and accordingly Leibniz's influence dwindled to the point where, as one scholar puts it, his ideas "did not find many advocates in the twentieth century" (Adams 2010, 309). But this is far from an adequate picture for a number of reasons. First, Leibniz's influence arguably did not hit an early peak in the decades after his death and then

[5] While claims of Leibniz's influence on Buffon are common (see for example Wakefield 2018, 463), it should be noted that Buffon (1749, I: 196), while clearly an admirer of Leibniz's ideas about the physical history of the Earth, also deemed them to be "devoid of proofs"; in Buffon's view, since Leibniz had concerned himself with the remote past, of which few vestiges remain, there was no way to ascertain whether his account of the Earth's formation was probable or not.

[6] One scholar has argued that Leibniz was "all the less influential" because so many of his ideas were way ahead of their time (Ross 1984, 114).

decline smoothly, but rather oscillated throughout the eighteenth century and beyond; indeed, the second half of the eighteenth century saw a "Leibniz Renaissance" in Germany, stimulated in part by the publication of his *Nouveaux essais sur l'entendement humain* [*New Essays on Human Understanding*] in 1765 and Dutens' six-volume collection of his writings in 1768 (see Wundt 1992, 318-19), while something similar occurred in France in the nineteenth century following the publication in 1819 of Maine de Biran's *Exposition de la doctrine philosophique de Leibniz* [Exposition of the Philosophical Doctrine of Leibniz] (see Dunham 2016). Second, the extent of Leibniz's influence depends very much on the particular idea or doctrine under consideration, with some enjoying much greater longevity than others. And lastly, while it would be true to say that the direct take-up of his ideas and arguments by others was much less evident in the twentieth century than it was in previous centuries, it would be equally true to say that in the last century and in ours Leibniz's ideas continued to serve as a source of inspiration, stimulating the development of new ideas and arguments in others, as will become clear in what follows. With this in mind, let us now return to Leibniz's early impact.

It is a fact often repeated that, in spite of his prodigious productivity, Leibniz published only one philosophical book in his lifetime, namely *Theodicy* (1710), which sought a philosophical-theological justification of God's ways to man. At the heart of the book is Leibniz's doctrine of optimism, which holds that our world (or universe) is the best of all those possible. In chapter 2, Lloyd Strickland sets out to examine the early reception of Leibnizian optimism from the publication of the *Theodicy* in 1710 to the mid-1770s. Strickland's starting point is the centuries-old belief that the devastating major earthquake which struck Lisbon on 1 November 1755 constituted the turning point in the fortunes of the doctrine and led to its ultimate demise. Against this, Strickland shows that the evidence points to a different fate, namely that while Leibniz's doctrine did win a good number of adherents in the 1720s and 1730s, especially in Germany, support for it had largely dried up by the mid-1740s; moreover, while opponents of Leibniz's doctrine were few and far between in the 1710s and 1720s, they became increasing vocal in the 1730s and afterwards, between them producing an array of objections that served to make Leibnizian optimism both philosophically and theologically toxic years before the Lisbon earthquake struck.

Although Leibnizian optimism never regained its popularity, it did at least win many converts in the first few decades of the eighteenth century and shaped the debate about optimism and the wider project of theodicy for centuries afterwards.[7] In contrast, some of Leibniz's endeavors did not yield much if any impact, either in his own lifetime or after. For example, his efforts to unite Catholics and Lutherans, and later Lutherans and Calvinists, were unsuccessful, as was his three-year effort to construct wind machines to drain the silver mines of the Harz mountains (see Jordan 1927 and Wakefield 2010). Moreover, his plans for a universal encyclopedia, which would contain everything that was so far known woven into

[7] Theologians have often either marginalized, ignored or rejected Leibniz's optimism, though this is less because of its perceived defects than because the problem of theodicy has itself changed over the years. As one scholar observes: "the fact that Leibniz's *Theodicy* occupies only a precarious place in theological discourse is also due to the fact that a broad consensus has emerged that the theodicy problem cannot and should not be solved in the form of a consistent theory, that thinking about it, on the contrary, is only of preliminary importance, preliminary in view of the only truly satisfactory solution, the actual overcoming of suffering and evil" (Sparn 2013, 442). But while Leibniz's theodicy has struggled to gain traction among theologians, it continues to fascinate and exercise philosophers; in recent years, Leibniz scholar Nicholas Rescher (2000, 148-79) has developed a naturalistic or non-theistic version of optimism in the form of his axiological metaphysics, which holds that a law of optimality prevails which prevents the existence of every possible world bar the best.

a single system, barely got off the drawing board (see Rateau 2018).[8] Rather more headway was made with Leibniz's desideratum for a better understanding of inductive and probable logic, for which he enlisted the support of Jakob Bernoulli (1655-1705) in establishing a mathematics of probability. Leibniz's conceptions of induction and the distinctions between demonstrative and probable logic certainly foreshadow David Hume's (1711-1776) own arguments on truth modalities and associationism. But was this mere anticipation on Leibniz's part or something more? In chapter 3, Julia Weckend suggests the latter. Her starting point is a short piece by Hume entitled *Abstract of a Book Lately Published* (1740) in which he portrays himself as responding to Leibniz's call for a "new kind of logic" with a novel theory on causal or probable reasoning. She argues that, on close examination, there are discernible traces of Leibnizian elements in Hume's arguments in the early *Treatise of Human Nature* (1739-40), in particular Leibnizian principles which inform Hume's handling of truth modalities, in spite of the obvious disparity in philosophical temperament and overall background assumptions between Leibniz and Hume.

When examining Leibniz's early impact it is tempting to focus only on those who explicitly adopted some of his ideas or developed parts of his intellectual program, but to do so would be to tell an incomplete story. After all, Leibniz so dominated the intellectual landscape of the eighteenth century that those not prepared to endorse his ideas felt obliged to respond to them and to position themselves relative to them. We might term this Leibniz's "negative influence", so to speak, where his ideas inspired others to craft responses, either in the form of objections or, more commonly, in the form of new ideas and philosophies. It was in response to Leibniz's philosophy that André Pierre Le-Guay de Prémontval (1716-1764) was stirred into developing a process philosophy *avant la lettre* (see Strickland 2018) and Immanuel Kant (1724-1804) his critical philosophy, at least to some extent (see Jauernig 2011). It has been claimed that, in fashioning his critical philosophy, Kant came to reject virtually all of Leibniz's principles and doctrines (see Wilson 2018), and certainly Kant's handling of Leibniz was deemed to be so hostile to Leibniz's thought that it prompted spirited responses from Leibniz's supporters such as Johann August Eberhard (1739-1809), who insisted that whatever is true in Kant's philosophy had already been said by Leibniz, and on those points on which Kant did differ he was simply wrong (see Allison 1973). What certainly stands out is Kant's ubiquitous references to Leibniz—in both Kant's precritical and critical period there are by far more explicit references to Leibniz than to any other early modern philosopher. Whether Kant, as the traditional view would have it, had genuinely abandoned Leibnizianism by the time of the *Critik der Reinen Vernunft* [*Critique of Pure Reason*] (1781) is unclear. What is known for sure is that Eberhard's attack deeply upset Kant. In a short polemical piece, *On a Discovery Whereby Any New Critique of Pure Reason is to Be Made Superfluous by an Older One* (1790), Kant set out to defend himself against Eberhard's attack by claiming that his first *Critique* could in fact be read as "the true apology for Leibniz," thereby insinuating that Kant himself, rather than Eberhard and the Wolffians, was the true philosophical heir to Leibniz. In chapter 4, Nicholas Jolley takes Kant up on his suggestion and addresses two puzzles of interpretation posed by Kant's reply to Eberhard, namely whether Kant takes Leibniz to be an idealist, and why Kant fails to cite his agreement with Leibniz that space and time are ideal.

Part 2: Legacy in Science and Metaphysics

Kant's reaction to Leibniz would ensure that Leibniz's reception at the end of the eighteenth century differed considerably from that at the beginning. After his death in 1716, Leibniz was

[8] The fate of projects such as these have given rise to the common portrayal of Leibniz as a man with the greatest of ambitions but who spread himself too thinly, leaving behind him a series of projects either conceived but never really started or started but left unfinished.

widely praised for his universal genius and his contributions to many disciplines. In a eulogy delivered in 1717, Bernard le Bovier de Fontenelle noted some of the disciplines to which Leibniz had made original contributions, including politics, history, law, mathematics, philosophy, and many areas of science, including what we would now call physics, biology, and chemistry (see Fontenelle 1812). Fontenelle also noted that Leibniz helped advance the sciences indirectly, through his lobbying for the establishment of scientific academies. Indeed, in 1700 Leibniz succeeded in persuading Frederick III (1657-1713) to establish a scientific academy in Berlin, the Royal Prussian Academy of Sciences, an institution that survived until German reunification in 1991, after which it was reconstituted as the Berlin-Brandenburg Academy of Sciences and Humanities. In 1712 Leibniz also sought to establish an Imperial Society of Sciences in Vienna, though the institution existed in name only during his lifetime, being finally established only long after his death, in 1847 (see Rudolph 2018).

As for Leibniz's own contributions to the sciences, one of the most notable resulted in the so-called "vis viva" controversy, which had started with Leibniz's attack on the Cartesian measure of "force".[9] The dispute itself turned on the question of whether the quantity conserved in the collision of bodies is the Cartesian "quantity of motion" (momentum, mv) or the Leibnizian "living force" (mv^2). This question is no longer considered in classical physics, having been superseded by the subsequent work of physicists like Émilie du Châtelet (1706-1749), Leonhard Euler (1707-1783), Pierre Louis Maupertuis (1698-1759), Joseph-Louis Lagrange (1736-1813), and Pierre-Simon Laplace (1749-1827), who between them successfully established classical mechanical physics. To illustrate this, in chapter 5 Tzuchien Tho examines Leibniz's contribution to the physics of body of the early eighteenth century and the true extent of Leibniz's influence on classical mechanics. At the core of his analysis is the role Leibniz's dynamics may have played in informing the *Traité de dynamique* [Treatise on Dynamics] of Jean Le Rond d'Alembert (1717-1783). Tho's verdict is mixed. Although d'Alembert used Leibnizian terms (e.g. "dynamics") in his discussions, he also clearly did not adopt any of the metaphysical and theological trappings that Leibniz attached to them, on the grounds that these were obscure and useless to mechanics. D'Alembert thus shared few, if any, of the same background assumptions as Leibniz, particularly those concerning the meaning and importance of the conservation of a "living force", and as such his general aims of physics were fundamentally different from those of Leibniz. Thus Leibniz's influence on d'Alembert is better understood as one of the transmission of a problem in need of a solution rather than a positive doctrine or method of calculation. According to Tho, what Leibniz lacked was an analysis of how the universal conservation of living forces was to be achieved by the motion of bodies. This left behind a robust question d'Alembert was able to answer. Whilst Leibniz's impact on d'Alembert was less pronounced than perhaps expected, Tho also suggests that the intellectual lineage that originated in Leibniz is in fact more evident in d'Alembert's successor, Lagrange.

If Leibniz succeeded in leaving his mark on a number of fledgling sciences, all the more was his influence felt on the philosophical landscape. Leibniz had of course attempted to shape a number of philosophical debates in his own day through a series of journal articles, such as "Meditation on truth, knowledge, and ideas" (1684, A VI 4, 585-92/L 291-6), "New system of the nature and communication of substances" (1695, G IV, 477-87/SLT 68-77), and "On nature itself" (1698, G IV, 504-16/L 498-508), as well as through the *Theodicy*. Many more philosophical pieces appeared posthumously, which made possible a more rounded picture of Leibniz's philosophy than was attainable from the pieces he had published in his lifetime. The richness and originality of Leibniz's philosophy ensured he attracted his

[9] For Leibniz's part in overturning Cartesian physics, achieved through a series of anti-Cartesian articles placed in various journals from the 1680s onwards, in 1715 the Dutch thinker Herman Boerhaave (1668-1738) described him as "the ornament of Germany" (Boerhaave 1983, 160).

fair share of followers in the eighteenth century, and in the decades after his death it was not uncommon for these to be referred to as "Leibnizians". But just as there was no single set of doctrines to which all followers of René Descartes (1596-1650) subscribed, and certainly no single movement called Cartesianism (see Schmaltz 2004, 9-12), there was no set of doctrines to which all of Leibniz's followers subscribed either, let alone a movement that could be correctly described as Leibnizianism. Those who were called Leibnizians were not true disciples; indeed, true disciples prepared to adopt and defend most or all of the master's ideas are rare for any thinker, and Leibniz is no exception. Even in the decades after his death in 1716, most of those who felt his influence were selective in the ideas they endorsed and typically sought to refine his ideas and principles rather than embrace them unchanged, though the extent to which supporters made their modifications varied considerably.

Undoubtedly the most well-known partisan of Leibniz's philosophy was Christian Wolff (1679-1754), though the extent of Wolff's debt to Leibniz was a matter of some debate in the eighteenth century. One of Wolff's opponents, Johann Joachim Lange (1670-1744), claimed that Wolff had borrowed his views on God, the world, and the soul from Leibniz and had merely "put the Leibnizian philosophy ... into the form of a specific system" (Lange 1723, preface, n.p.). The suggestion that Wolff had done little more than systematize Leibniz was captured in the expression "Leibnizian-Wolffian philosophy", which was freely used by both Wolff's supporters and detractors alike, with a flurry of books on the "Leibnizian-Wolffian" philosophy appearing in the 1720s and 1730s. Wolff was quick to deny that he was merely a systematizer of Leibniz, stating "It is not true at all that I have put the Leibnizian philosophy into the form of a specific system, since my metaphysical meditations contain only a few things from Leibniz" (Wolff 1724, 34).[10] But Wolff's efforts to downplay his debt to Leibniz did not prevent it from becoming widely believed that his was a modified form of Leibniz's philosophy. And indeed, for good reason, for as has been noted (see Ecole 1986), Wolff borrowed numerous definitions, principles, and doctrines from Leibniz, often without acknowledging his debt, such that Wolff's philosophy draws from and depends upon Leibniz's philosophy as much as it diverges from it.

Leibniz's philosophical thought—often in modified form and sometimes through the mediation of Wolff—was also defended by a number of other eighteenth century thinkers, such as Georg Bernhard Bilfinger (1693-1750), du Châtelet, and most notably Alexander Baumgarten (1714-1762), whose oft-reprinted *Metaphysica* [Metaphysics] was more closely aligned to Leibniz than to Wolff (see Baumgarten 2011). In the first few decades after Leibniz's death some thinkers even attempted apologies for entire texts, with Michael Gottlieb Hansch (1683-1749) publishing a lengthy defense of Leibniz's "Monadology" (see Hansch 1728) and Emer de Vattel (1714-1767) doing likewise with Leibniz's *Theodicy* (see de Vattel 1742). But this was the exception rather than the rule, with most training their attention upon specific doctrines or themes in Leibniz's thought rather than on entire texts.

While Leibniz's philosophy had its greatest impact in Europe, it is a testimony to its power that its effect has also been felt outside that continent, for example in the United States (see Rescher 2013, 300-12) and in Russia. In chapter 6, Frédéric Tremblay explores the full extent of Russian Leibnizianism, documenting the relevance of Leibniz's philosophy and intellectual lineage starting with his direct impact on Peter the Great (1672-1725) and the establishment of the academy in Saint Petersburg all the way through to modern day Russia.

[10] Wolff was not the only one to resist claims of Leibnizian influence. Another to do so was Maupertuis, who sought to show that his principle of least action, a mathematized version of the metaphysical dictum that nature always acts in the simplest possible ways, differed from Leibniz's principle that light always travels by the easiest path (see Maupertuis 2018, 243; for Leibniz's principle, see Leibniz 1682). This did not satisfy Leibniz's sympathizers, however, who suggested that Maupertuis' principle was not as original as he believed, a claim that Maupertuis forcefully resisted (see Terrall 2002, 289; Lamborn 2016).

Tremblay shows that Russian Leibnizianism was considerably rejuvenated when the Leibnizian German philosopher Gustav Teichmüller (1832-1888) took up a position at the University of Dorpat in 1871. This gave rise to one of two influential strands of Leibnizianism led by Russian philosophers like Evgeny Bobrov (1867-1933) and Alexei Alexandrovich Kozlov (1831-1901), as well as Kozlov's son, Serge Alekseyevich Askoldov (1870-1945) together with his friend Nikolai Lossky (1870-1965). In a second development, Moscow became the conduit of a seemingly independent strand of Leibnizianism presumably under the partial influence of Vladimir Solovyov (1853-1900). Through their efforts, Russian Leibnizianism flourished in the late nineteenth and early twentieth centuries, and has left traces that remain today.

That Leibniz should have won great international appeal is all the more fitting given his own cosmopolitanism, best exemplified in his engagement with China and its philosophy. It has been noted that Leibniz was "the first important thinker in the West ... to start a constructive dialogue between Neo-Confucianism and Western Philosophy" (Meynard 2017, 194), and in the first half of the eighteenth century, Leibniz's admiration of the moral philosophy of the Chinese helped to shape the thorny debate about whether pagans could be virtuous (see [Collins] 1727, 59-60; Tindal 1730, 404; Smith 1740, 114-15). Indeed, his positive attitude towards the Chinese proved quite influential for a number of decades after his death, serving to epitomize and deepen the Sinophilia that was common in the early enlightenment; it also stands in sharp contrast to the racially-motivated dismissal of Chinese philosophy that one finds in the writings of Kant and Hegel (see Fuchs 2006, Park 2013, and Perkins 2016).

In engaging with Chinese philosophy, Leibniz famously tried to show that many of his own ideas had been pre-empted by the Chinese. This resulted in an erroneous claim about his influence, for which Leibniz was partly responsible. In 1701, one of his correspondents, the Jesuit missionary Joachim Bouvet (1656-1730), suggested—erroneously as it happens—that Leibniz's discovery of binary arithmetic was the key to understanding the mysterious hexagrams of the Chinese I-Ching (see A I 20, 533-55).[11] The idea excited Leibniz sufficiently to go public with his discovery, which he claimed—following Bouvet—was the key to deciphering the hexagrams. Compounding the error, Leibniz concluded that he had not so much discovered binary arithmetic as rediscovered it (GM VII, 226). This induced many eighteenth century writers to present Leibniz as the decipherer of the I-Ching (e.g. Bilfinger 1724, 358-60; Croker, Williams, and Clark 1766, n.p.), the error becoming corrected only in the century's closing years (see for example Oznam 1790, 4-5).[12]

While Leibniz's invention of binary arithmetic would have little influence for centuries after his death (see Glaser 1981), many of his core philosophical doctrines had a considerable impact on the eighteenth century and beyond. From the eighteenth century onwards, Leibniz's most famous philosophical doctrines have been the pre-established harmony, optimism, "petites perceptions", and monadology. Of these, the pre-established harmony arguably had the smallest impact. It certainly found a number of supporters in the

[11] An English translation of Bouvet's letter (dated 4 November 1701) can be found here: https://leibniz-bouvet.swarthmore.edu/

[12] Surely most egregious example of a false claim about Leibniz's influence – this time not caused by Leibniz himself – occurred early in the nineteenth century following the discovery of his so-called *Consilium Aegyptiacum* [Egyptian plan]. Written in 1671-2, this was a proposal for a French invasion of Egypt that was intended for Louis XIV, though the French king never did see it and opted to invade Holland instead (in what became the Franco-Dutch war of 1672-8). The discovery of Leibniz's proposal was made only a few years after Napoleon had invaded Egypt in 1798, leading a number of writers to suppose that Napoleon must have come across a copy of Leibniz's Egyptian Plan at Versailles and then followed it in his conquest of Egypt (see for example [Anon.] 1803, viii, and Michaud 1822, V: 156). As it happened, Napoleon did come to know of Leibniz's plan, but only upon its publication in 1803, five years after he'd invaded Egypt.

decades after Leibniz's death, such as Bilfinger, and even Wolff considered it the best or most probable solution to the problem of how mind and body form a unity, a view also taken by some of his followers, such as Ludwig Philipp Thümmig (1697-1728) (see Watkins 1998). However, in the face of fierce opposition, support for the doctrine tapered off dramatically in the second half of the eighteenth century; since then, it has typically been treated as little more than an idea that is as ingenious as it is implausible (see for example Bonnet 1783, XVIII: 104; Brown 1813, I: 396-8; Stewart 1854, I: 55-258).

Of more enduring—if much less immediate—impact was Leibniz's doctrine of "petites perceptions" [little perceptions], that is, perceptions of which we are not conscious, and the associated idea of a threshold (limen). It has often been claimed that Leibniz was the first to discover unconscious perceptions (see e.g. Hartmann 2014, 17), or more correctly, the first to offer a systematic treatment of them (Manson 2000, 153; Tallis 2002, 1),[13] but his ideas were largely neglected in the eighteenth century, partly because their most detailed treatment is to be found in the *New Essays on Human Understanding*, which was not published until 1765. In the 1820s, however, Leibniz's ideas were developed by Johann Friedrich Herbart (1776-1841), and through him helped to shape later thinking about unconsciousness and psychoanalysis (see Claxton 2005, 214-15). More recently, Leibniz's ideas about little perceptions—and the broader framework in which they appear—have formed the basis of a study on the phenomenological and neurophysiological aspects of consciousness and time (see Sieroka 2015).

Arguably the most influential of Leibniz's philosophical doctrines was his monadology, which holds that the universe consists of a plurality of self-determining simple beings. The idea has often been misunderstood, most notably by Leonhard Euler, who construed Leibniz's monads as physical atoms (see Euler 1746, 17-20, and 1833, II: 39-64, especially 45), a rather egregious error that overshadowed the discussion of monads in the eighteenth century but ultimately did not prevent the doctrine from gaining a great many supporters both at the time and long after. Indeed, in terms of influence, few of Leibniz's contributions can match the longevity of the monadology, which had numerous advocates prepared to receive, recast, and rehabilitate it well into the twentieth century (see Poser 1986). In chapter 7, Jeremy Dunham demonstrates the lengths to which supporters of a monadology would go to defend the doctrine. As Dunham explains, in the aftermath of the Darwinian revolution in biology the most crucial challenge concerning monadology was to maintain any framework in which species were understood as "fixed". And yet, against all odds, at the end of the nineteenth century monadological theories were not forever abandoned in the wake of Darwin's evolutionary theory. Instead, as the British idealist F.H. Bradley (1846-1924) prophesized, monadologies increased and flourished again at the turn of the twentieth century when two early twentieth-century philosophers—the American idealist George Holmes Howison (1834-1916) and the British idealist James Ward (1843-1925)—both attempted to adapt Leibniz's monadology to make it compatible with Darwin's findings.

Also notable is that Leibniz's doctrine of the monad has enjoyed great international support, with versions of it put forward not just by German and French thinkers, such as Herbart, Dietrich Mahnke (1884-1939), Charles Renouvier (1815-1903) and Louis Prat

[13] Leibniz was certainly not the first to claim that we have perceptions of which we are unaware, as in 1672 Ignace Gaston Pardies (1636-1673), an acquaintance of Leibniz's during his time in Paris, stated that "...sometimes we also have perceptions ... where we perceive without being aware that we are perceiving... To become fully convinced of this, we have only to reflect on what happens to us every day when we are reading a book with some application. We are attentive to the meaning of the words and do not attend to a consideration of the letters which, by their different shapes and arrangement, make up the whole discourse... In this case we must recognize that we do not perceive the letters and words of this book with that reflexive perception by which we can give an account to ourselves of what we are perceiving, and which would make us aware that we are perceiving" (Pardies 1672, 154, 159-60).

(1861-1942), but also British thinkers such as Herbert Wildon Carr (1857-1931) and Alfred North Whitehead (1861-1947), and Russian thinkers such as (the already mentioned) Alexei Alexandrovich Kozlov (1831–1901) and Lev Mikhailovich Lopatin (1855-1920) (see Renouvier and Prat 1899, Carr 1922, Carr 1926, Lossky 1952, 158-61, Basile 2019, Beiser 2015, Poser 2017). The monadology was also that rare thing, a philosophical doctrine that was able to cross disciplinary boundaries, with versions being developed in disciplines such as sociology and anthropology, to which Arnaud Pelletier's contribution in chapter 8 is dedicated. Pelletier's focus is not the monadological thesis as such but rather the idea of recognizing individuality for its points of view in the network of relation that makes up the overall whole. The monad's particularity in this case is expressed in the thesis of individuation through bodies, which in different ways attracted the attention of social anthropologists Gabriel Tarde (1843-1904) and Émile Durkheim (1858-1917) at the end of the nineteenth century. These authors, together with Émile Boutroux (1845-1921), have played a decisive role in the emergence of Leibnizian thought in the social sciences. How much their two independent stances clashed in the discussion about the definition of the emerging social sciences is well documented, and also that their discrepancies gave rise to two turns amongst French sociologists: Tarde's claimed neo-monadology (positing multiplicities without convergence) and Durkheim's otherwise monadological sociology (positing convergent particularities).

Part 3: Impact in Law, Political Thought and Ecology

By profession, of course, Leibniz was neither a philosopher nor a scientist (*avant la lettre*); from 1676 he was employed as a court counselor in the Duchy of Brunswick-Lüneburg and twenty years later was promoted to privy counselor of justice. His chief responsibilities were for the ducal library in Hanover and, from 1686, for writing the history of the Welf/Guelph family that had ruled the duchy and associated territories for many centuries. In addition, in 1700 Leibniz was appointed privy counselor of justice in Brandenburg, serving the court at Berlin, and in 1713 imperial court counselor in Vienna. Despite Leibniz's success in multiplying courtly appointments, it has been noted that his influence at the courts of Hanover, Berlin, and Vienna was limited; according to Nicholas Rescher, Leibniz "was and ever remained regarded as a resident technical expert, a source of information and informed opinion—an instructive and agreeable interlocutor. To put it in present-day jargon Leibniz had access but not clout" (Rescher 2013, 280). Despite this, two of Leibniz's most notable achievements in his lifetime were in the field of politics: his historical work on the Welf/Guelph family helped elevate the Duchy of Brunswick-Lüneburg to the status of an Electorate of the Holy Roman Empire, while his publication of legal documents helped support the case for the Hanoverian succession to the British throne (see Antognazza 2018, 591).

The posthumous impact of Leibniz's legal work is less clear cut, however, and remains a matter of scholarly debate. In recent years it has been argued that, through his attempts to codify the law, "Leibniz is the force behind the German field of legal science and the related drive toward legal codifications that swept through Europe (and much of Asia and Latin America) throughout the nineteenth century" (Berkowitz 2005, 69), a claim for which others have suggested the evidence is lacking (see Seidler 2006, 94).

Particularly in his very early years Leibniz's productive output of serious juridical writings is astonishing, and throughout his life his involvement in matters of law—theoretical and practical—never diminished. On the practical side, Leibniz was employed by the elector and prince-archbishop of Mainz, Johann Philipp von Schönborn, to assist in the drafting of legal reform and then in 1669 was made assessor in the Court of Appeal (see Mackie 1845,

44-5). He would later serve in some of the highest offices as a diplomat and legal advisor to the likes of Czar Peter the Great (1672-1725) and the Prussian King in Berlin, where he became involved in the geopolitical and legal wrangling amongst the rulers of Europe and Russia, advising on issues such as the legitimacy and rightness of law. On the theoretical or law-defining side, his vision of an *a priori* science of the law he believed could only be accomplished by acknowledging the deeper reasons of justice, which he identified as the "charity of the wise" that would provide the right reasons for actions and ground law in the all-pervasive. In chapter 9, Christopher Johns traces the impact of two of Leibniz's ground-breaking legal tracts, namely *Nova methodus dicendae docendaeque jurisprudentiae* [A New Method for Learning and Teaching Jurisprudence] (A VI 1, 259-364), an astonishing early achievement by the young Leibniz which introduces his paradigm geometrical method to the law, and *Codex juris Gentium Diplomaticus* [Diplomatic Code of People's Rights] from 1693 (A IV 5, 48-79), which is widely considered to be the culmination of Leibniz's efforts of codifying the law. Johns argues that, broadly considered, the method of a "geometric" systematization and codification of the law would become very influential upon the development of the eighteenth-century law codes in France and Germany, and is strongly reflected in the natural law of Christian Wolff and in Anglo-American jurisprudence in the nineteenth century. Inadvertently, however, Leibniz's geometric attack on the voluntarism of the likes of Samuel von Pufendorf (1632-1694) and Jean Barbeyrac (1674-1744) has at the same time adverse effects on the vision of law that Leibniz had promoted, and it equally encourages a rejection of Leibnizian-Wolffian perfectionism in favor of a Kantian ethics of duty. According to Johns, Leibniz's transcendent ideal of justice and his conception of justice as a virtue would be gradually replaced with an empirical-utilitarian, secularized, practice of the law. Such developments constitute the loss of overarching considerations like those towards a common good and a common end, losses, Johns suggests, significant enough for us to seriously reconsider.

In chapter 10, Douglas Moggach continues the theme by examining the consequences of Leibniz's legal theories on the understanding of the political subject, and Leibniz's foundational role for the enlightened absolutism of Christian Wolff, aesthetic concepts of freedom and subjectivity in Romanticism, and Kantian critiques of Leibnizian ideas of spontaneity and perfection. Moggach's central focus is the reception history of the three principles of natural law (freedom, justice and progress) and their contents as Leibniz had endowed them. If we want to understand and defend the program of rational autonomy which is definitive of German Idealism, Moggach suggests, we need to look at its Leibnizian roots, even though the results of such an examination will show an admixture of continuities and transformations. In Christian Wolff we discover an attempt to remedy the conflicts he sees created in combining the law of spontaneous freedom with the requirement for external direction towards a goal of perfection. In Romanticism, on the other hand, we find the very same ideas giving birth to the concept of aesthetic subjectivity and the idea of the subject as formative power. In a separate important strand of development, Kant sets out to reclaim some of Leibniz's most vital elements while according them a new systematic context and meaning. Any of these movements are evidence that Leibniz's three principles, once reconfigured and rethought, remain definitive principles in German Idealism through Kant to Hegel and the Hegelian School.

The idea of autonomous spontaneity and the subject as a self-determining self-sustaining being also made its way into the natural world where Leibniz's vision left deep traces on biologists and environmentally-minded thinkers. It was a clear inspiration for some of the more speculative hypotheses of the naturalist Charles Bonnet (1720-1793), in particular his claim that in the beginning God created the preformed germs of all living things which then developed under their own power, advancing ever closer to perfection (see

Rieppel 1988, Duchesneau 2013). In more recent years, Leibniz's vision of the biological world has been developed by Pauline Phemister (2016), who has argued for its relevance to modern-day environmental concerns. Although these concerns were not Leibniz's, Phemister argues that certain elements of Leibniz's thinking can nevertheless be seen as constituting an attractive vision of the natural world along with a set of values to govern our relationship with it. A central element of Leibnizian thought is his never-ceasing efforts towards reform which involves two closely related and interdependent levels, the theoretical and the practical, the abstract and the applied, or, *theoria cum praxi*. In chapter 11, Pauline Phemister closes the volume by developing this view. In the contemporary context, Phemister argues, we discover how Leibniz's approach resonates today, albeit implicitly, in the methods and aspirations of Denise Herzing's Wild Dolphin Project, where the Leibnizian goal of mutual understanding and respect among humans is being extended beyond the human, helping to foster harmonious relationships between humans and other creatures in nature and encouraging the development of sound environmental policies for their protection. As Phemister suggests, through his theories of self-sufficient agency and the interconnectedness of all things, Leibniz developed—albeit unknowingly—a template that provides a fruitful source for a modern-day ecological philosophy that will enable us to rethink our relationship with the natural world. That Leibniz's ideas should still be relevant more than three hundred years after his death, in a matter of great public concern, surely speaks volumes about their depth and significance.

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