
D'Alembert's Cosmological View of the Sciences and its Legacy in Kant

Stephen Howard

KU Leuven

This paper examines Jean le Rond d'Alembert's views of metaphysical cosmology and argues that these constitute an important context for Kant's critical-period response to rational cosmology. D'Alembert is commonly taken to have dismissed cosmology from the roster of the legitimate sciences, and there is indeed evidence of his scepticism towards Maupertuis' cosmology no less than towards Wolff's cosmologia generalis. I argue, however, that a broadly Leibnizian cosmological perspective underpins d'Alembert's accounts of our knowledge and of the task of the philosopher. D'Alembert's work thus anticipates and helps bring into focus Kant's own nuanced engagement with the cosmological tradition.

1. Introduction

Immanuel Kant claims that the Antinomy chapter of the first *Critique* will reveal the principles of an “alleged pure (rational) cosmology” but only to show that this discipline is a “contradiction of reason” and to “display it in its dazzling but false plausibility (*Schein*) as an idea that cannot be made to agree with appearances” (Kant [1781] 1998, A408/B435).¹ Just as the Paralogisms attack the traditional metaphysical discipline of rational psychology and the Ideal targets natural theology, the Antinomy of Pure Reason is presented by Kant as a critique of rational cosmology. However, while much scholarly attention has been dedicated to the traditions of rational psychology and natural theology that form the background to Kant's critiques in the Paralogisms and Ideal, relatively few commentators

1. Kant's *Critique of Pure Reason* is hereafter cited according to the standard A/B edition pagination. For other abbreviations, see list preceding references.

have examined how rational cosmology was conceived of by Kant's predecessors and how Kant himself and his first readers may have understood it.

Insofar as the question has been posed, the usual response is that the rational cosmology targeted in the Antinomy is that of Christian Wolff and the Wolffian tradition.² In the works of Wolff and his successors in early- to mid-eighteenth-century German school philosophy, cosmology is designated alongside psychology and theology as one of the three disciplines of so-called special metaphysics. Kant's Transcendental Dialectic sharply limits the claims that these metaphysical disciplines can make about their objects, the soul, the world-whole and God. Beyond this general connection, it is clear that Wolff's German and Latin cosmologies characterise the "world," the object of the discipline, in a way that strongly influences his followers and critics alike, and that Kant directly targets this account in the Antinomy chapter. Wolff defines the world as a *complete series of connected* things.³ His definition was adopted, with variations, by Baumgarten, Crusius, and Bilfinger.⁴ The essentials of Wolff's definition can be traced to Leibniz's *Theodicy* ([1710] 1969).⁵ Kant places this conception of the world as a series at the heart of his critique in the Antinomy: the common structure of the four antinomies is that reason purports to know the complete series of conditions for a given empirical object (A497/B525).

While there is no doubt that this German metaphysical tradition is an important stimulus for Kant's critique of rational cosmology in the Antinomy chapter, I will examine another context that has been generally overlooked:

2. Falkenburg's study of Kant's cosmology focuses more on systematic than historical issues but presents the relevant context as Kant's attempt to synthesise Newton's physics with Leibnizian-Wolffian metaphysics (2000, pp. 25–59). Watkins (2000) discusses Kant's four 'cosmological principles' (no fate, no chance, no leap, no gap) in the light of Baumgarten's philosophy. Kim (2004) discusses Wolff's, Baumgarten's, and Crusius' concepts of "world" and their influence on Kant's definition of the concept in the *Inaugural Dissertation*. Al-Azm (1972) argues that the Leibniz-Clarke correspondence was a key influence on Kant's Antinomy; for other advocates of this view, see Kreimendahl 1990, pp. 163–5. Although she points out general and specific problems with Al-Azm's claims, Grier nevertheless also refers to the Leibniz-Clarke correspondence when considering the historical context (Grier 2001, pp. 172n2, 182, 201–2, 205–7). Another body of scholarship focuses on the influence of Hume on Kant's Antinomy: the classic study is Kreimendahl 1990; see also Ertl 2002.

3. See Wolff 1983, §544; Wolff 1731, §48. Kim analyses these two definitions in detail, alongside an earlier one from *Ratio praelectionum* (1718), in Kim 2004, pp. 46–105.

4. See Clavier 1997, pp. 39–40.

5. "J'appelle *monde* toute la suite et toute la collection de toutes les choses existants, afin qu'on ne dise point que plusieurs mondes pouvaient exister en différents temps et différents lieux. Car il faudrait les compter tous ensemble pour un monde ou si vous voulez pour un univers" (Leibniz [1710] 1969, p. 108 (I §8). See Kim 2004, pp. 47–8.

the conceptions of cosmology in the work of the French Enlightenment *philosophes*.⁶ This alternative context is highly likely to have influenced Kant, and I will argue that by taking it into account we gain a more nuanced picture of the relation between Kant's critical philosophy and prior cosmology.

I will focus on Jean le Rond d'Alembert, for reasons I outline in section 2. Section 3 provides evidence for the view that d'Alembert is sceptical towards the claims of metaphysical cosmology, due to his very restricted conception of what constitutes legitimate metaphysics. In section 4, I argue that d'Alembert does not however entirely reject cosmological thinking: it informs the conception of the chain of nature and the sciences that underpins his account of the task of the *Encyclopédie*.⁷ Section 5 shows the hitherto unrecognised Leibnizian influence on this aspect of d'Alembert's philosophy, and section 6 discusses d'Alembert's views on systematicity in relation to my account. Section 7 then briefly considers Kant's views on cosmology in the light of d'Alembert's work. I will argue that d'Alembert and the critical-period Kant have similarly sophisticated responses to prior cosmology. Both thinkers at once reject the specific results of cosmological thinking and yet appropriate aspects of it in their new conceptions of the proper method of metaphysics.⁸

By identifying positive and negative sides to d'Alembert's response to prior cosmology, I aim to draw attention to a positive aspect of Kant's engagement with the cosmological tradition that accompanies his better-known negative critique. Such complexity is missed by historical accounts that consider the rational cosmology at stake in the *Critique* to be only that of the Wolffian tradition. My account of an underappreciated positive side to Kant's critique of special metaphysics also intends to supplement systematic interpretations of the positive project of the Transcendental Dialectic, most notably Marcus Willaschek's recent study.⁹ I will claim that a comparison with d'Alembert helps us to see that the positive result of Kant's engagement with rational cosmology is not only to be

6. Clavier is one of the few commentators to refer to the French background to Kant's conception of rational cosmology, but he briefly discusses only Maupertuis; he gives much more attention to the German metaphysical tradition and to Newton (Clavier 1997, pp. 58–60, cf. pp. 13–57).

7. Hereafter abbreviated E. All translations of articles from the *Encyclopédie* are my own.

8. Groult indicates connections between the projects of d'Alembert and Kant in two articles that, via different routes, arrive at comparable conclusions to mine (Groult 2005, 2011). My approach differs from Groult's, as I show below, in emphasising the cosmological aspect of d'Alembert's and Kant's concerns with systematicity.

9. See Willaschek 2018, particularly 202–17; and section 7 below. Willaschek sets aside the question of the historical context for Kant's arguments in the Dialectic: similarly systematic approaches to the positive results of the Dialectic are taken by Klimmek 2005 and, in the main, Pissis 2012.

found in his account of the rational sources of metaphysical thinking, but also in the way that he transfers key features of prior cosmology into his critical account of the systematic orientation of human cognition.

2. D'Alembert and Kant

There is little direct evidence of Kant's interest in the thought of d'Alembert. Late in his life, Kant refers to d'Alembert in a draft collected in the *Opus postumum*. The draft claims that d'Alembert forecasts the imminent end of the usefulness of mathematics in the *Discours préliminaire*¹⁰ to the *Encyclopédie*: mathematics is "fast approaching its point of completion," which "will make more room for philosophy" (Kant 1902, 22.544n).¹¹ Kant is however misremembering, and is likely referring to a later attack on mathematics written by Diderot that was in fact aimed at d'Alembert, Diderot's former co-editor of the *Encyclopédie*.¹² This mistake indicates that Kant may not have had a lively interest in d'Alembert's views, at least not in his later years.

Only the *Jäsche Logik* contains explicit references to d'Alembert's and Diderot's great *Encyclopédie* project.¹³ In a discussion of the "extension and demarcation of our cognition," Kant notes that one should seek "to determine, in particular, the place that our science occupies in the horizon of total cognition. The *Universal Encyclopédie* serves for this as a universal map (*Mappe-Monde*) of the sciences" (AA 9:43). Kant here alludes to an important image in the *Discours préliminaire*—the *Encyclopédie* as a world map—to which we will return. He (or Jäsche) was evidently here working with the original text of the *Discours préliminaire* and not the German translation that was in Kant's library at his death (see Warda 1922, p. 45), because d'Alembert's term *mappemonde* is translated as "Universalcharte" and the French is given in parentheses. The translation by Jacob Wegelin that Kant owned renders *mappemonde* as "Weltcharte" and does not give the French term (d'Alembert 1761, p. 186).

Although we might take Kant's knowledge of the *Discours préliminaire* of the *Encyclopédie* to be evident in the logic lecture notes, the notes we

10. Hereafter abbreviated DP.

11. Hereafter abbreviated AA. See other versions of this note at AA 21:239n, 21:234n, 21:555n.

12. See Eckart Förster's note on the passage in Kant 1993, pp. 266–7n49; Ferrari 1979, pp. 119–21. Cassirer discusses Diderot's provocative claim in Cassirer 2007, pp. 76–8. On Diderot's criticisms of mathematics, which echo Buffon's views, and his targeting of such statements at d'Alembert, see Hankins 1970, pp. 75–7, 89–92.

13. Kant makes insignificant passing references to d'Alembert at AA 2:247, 16:103 and 16:189.

have of his lectures on *Philosophische Enzyklopädie* make no reference to the great French Enlightenment enterprise. Kant taught this course from 1767–1782; he was the first to teach it in Königsberg.¹⁴ In the extant notes, “encyclopaedia” is defined as one of two branches of philosophy, where philosophy is taken to be “the science that contains all rational cognitions from concepts.” One branch of philosophy is “a more extensive system”; the other is an encyclopaedia, defined as “a short compendium (*Auszug*) of the whole science [of philosophy],” whose primary aim is “the overview of the whole” (AA 29:6). Such a short digest of specifically philosophical knowledge is far removed from *Encyclopédie*'s massive multi-volume attempt to present the most up-to-date knowledge of all the sciences and arts.¹⁵

These meagre direct references should not, however, be taken to indicate that Kant was barely aware of d'Alembert. There has been remarkably little scholarship on the influence of the *Encyclopédie* on Kant's thought, given that, as Jean Ferrari puts it, it was “one of the most considerable intellectual undertakings of the eighteenth century” and appeared between 1751 and 1772, decisive years for Kant's philosophical development (Ferrari 1979, p. 117). It is true that some quickly took the *Encyclopédie* to be a failure: Hamann, for example, could already claim in a letter to Kant of 1759 that Diderot and d'Alembert had “achieved *nothing*” (AA 10:27; see Ferrari 1979, p. 117n53). But this does not detract from the project's gigantic cultural influence in the period.¹⁶

A more personal and political reason for Kant's likely interest in d'Alembert's work is the latter's proximity to Frederick the Great. Frederick was unsuccessful in his repeated attempts to entice d'Alembert to move from Paris to Berlin, but the two were very close and corresponded extensively. Thanks in part to his friendship with Maupertuis and later, after his break with Diderot, with Voltaire, d'Alembert was at the heart of academic power in the Academies. As is well known, Kant kept a close eye on the Academy prize competitions and positively referred to Frederick's favorite *philosophes* throughout his early works; even if he did not cite them, he is likely to have kept up to date with d'Alembert's writings.

14. The sole existing set of notes, published in the Academy edition, likely date from 1777–78 or 1779–80. See Arnaud Pelletier's “Présentation” in his French-German edition of the *Vorlesungen über philosophische Enzyklopädie*, Kant 2009, pp. 8–9, 28. Passages cited are my translations of Pelletier's corrected German text. For an argument that the lecture notes date from 1775, see Kuehn 1983.

15. See Pelletier, “Présentation” in Kant 2009, pp. 9, 13–18.

16. For a sense of this influence, see the overview of European editions, summaries and translations in Pinault 1993, pp. 103–123.

One of these, *Traité de dynamique* (1743/1758), is often taken to have ended the *vis viva* controversy over which Kant agonised in his long first work, *Gedanken von der wahren Schätzung der lebendigen Kräfte* (1747). D'Alembert brusquely “cut the knot” of the problem by rejecting the concept of force outright and reducing dynamics to kinematics.¹⁷ He writes in the Preface to the second edition of the *Traité* and later in the “Force Vive” article in the *Encyclopédie* that he considers the controversy to have been a mere “dispute about words,” which failed to recognise that forces should be excised from dynamics to yield instead a kinematic geometry of motions.¹⁸ Kant is unlikely to have been unaware of this sharp response to the problem that he had tackled in his first work.

Furthermore, two books by d'Alembert were in Kant's library upon his death: *Réflexions sur la cause generale des vents* (1747), on a topic that Kant discussed in lecture advertisements in 1756 and 1757 (Warda 1922, p. 31; see 1:491–503 and 2:3–12); and, as mentioned, the 1761 German translation by Wegelin of the *Discours préliminaire*. This suggests that, despite his late slip in memory and his rare explicit references, Kant was well aware of d'Alembert's work, and he certainly knew the great Enlightenment manifesto that was the *Discours préliminaire*. I will argue that the latter work provides particularly important insights into the significance of cosmology for d'Alembert's thought.

The following two sections examine d'Alembert's views on cosmology. It might be thought that, among the French Enlightenment thinkers, Maupertuis is a more obvious influence on Kant's conception of cosmology. In 1750, Maupertuis published his major work, the *Essai de cosmologie*: the influence of this on Kant's early cosmological works has been documented.¹⁹ Moreover, Maupertuis' broad conception of the metaphysics of nature might also be thought to be closer to Kant's. Such a view can be drawn from a useful sketch by Christian Leduc of a spectrum of positions among Kant's major predecessors (Leduc 2015, pp. 13–15). At one pole is Wolff who, following Descartes, conceived of metaphysics as a foundation for physics: the *a priori* principles for a well-grounded physics must be laid out in ontology and general cosmology. Kant will defend a similar position in the *Metaphysische Anfangsgründe der Naturwissenschaft* (1786). At the

17. Schönfeld 2000, pp. 31–34. Le Ru 1994, pp. 77–106.

18. D'Alembert 1758, pp. xvi–xvii, xxii, xxiv. See Polonoff 1973, p. 38.

19. See Prunea-Bretonnet 2019 for the importance of Maupertuis for Kant's physico-theology in the *Allgemeine Naturgeschichte* (1755). Prunea-Bretonnet notes that a German translation of the *Essai* by Christlob Mylius appeared almost immediately in 1751 (Prunea-Bretonnet 2019, p. 77). An account of the initial German reception of the *Essai* is in Terrall 2002, pp. 287–9. For the influence of Maupertuis on Kant more generally, see Ferrari 1979, pp. 110–116 and, with a focus on the *Beweisgrund* (1763), Ferrari 1999.

opposite pole are Voltaire, Condillac and d'Alembert, who sceptically rejected this foundationalism: physics has a theoretical autonomy, grounded in observation and mathematics, that entirely separates it from metaphysical cosmology (Leduc 2015, p. 14).²⁰ Leduc proposes that Maupertuis and Euler situate themselves between Wolff's foundationalism and d'Alembert's scepticism: they defend a reversal of Wolffian foundationalism in which empirical-mathematical physics grounds and legitimates an adequate metaphysics of nature (Leduc 2015, p. 15). On this view, Maupertuis' inverted foundationalism is closer to Kant's broadly Wolffian position than is d'Alembert's sceptical rejection of a metaphysics of nature.

We could accept the broad outlines of Leduc's sketch and still consider d'Alembert an instructive figure, because his views so strongly oppose Wolff's cosmology: d'Alembert appears to already offer an outright rejection of the Wolffian paradigm to which Kant's critique of cosmology in the Antinomy clearly refers. I will argue, however, that d'Alembert is yet more significant for a proper understanding of Kant's attitude towards cosmology. Close attention to the conception of cosmology in d'Alembert's writings shows that Leduc's sketch should be nuanced. It is true that in many respects, as the next section will show, d'Alembert is among the sharpest critics of Wolffian metaphysical cosmology; even his references to Maupertuis' cosmology can be taken to be merely tactful, masking his rejection of its fundamental claims. But, at the same time as he explicitly and implicitly rejects cosmology as a metaphysical discipline, d'Alembert transfers key aspects of cosmological thinking into his account of the task of the philosopher and the reconceived metaphysics that he outlines in the *Discours préliminaire* and other methodological texts. I turn to this argument in section 4.

3. D'Alembert's Scepticism Towards Cosmology

D'Alembert's importance for mid-eighteenth-century conceptions of cosmology is evident in the fact that he wrote the "Cosmologie" article in the fourth volume of the *Encyclopédie* (1754). The article discusses only two, apparently opposed conceptions of the discipline, those of Wolff

20. Leduc depicts the position of Condillac and d'Alembert as one of "rejetant ce rôle assigné à la cosmologie [i.e., by Wolff's foundationalism] et reconnaissant à la physique une autonomie théorique entière qui posséderait dès lors ses critères de validation propres, plus précisément la confirmation empirique et le calcul mathématique. Nul besoin de recourir selon eux à une ontologie dans l'élaboration des principes physiques ; au contraire, ceux-ci doivent essentiellement prendre appui sur des méthodes antimétaphysiques et non spéculatives" (Leduc 2015, p. 14).

and Maupertuis, and does not explicitly comment on or evaluate their differences. D'Alembert's sympathies are clear, however, in that he accords Maupertuis' *Essai de cosmologie* more than four times the space he gives to his opening summary of Wolff's *Cosmologia generalis* (1731). The final pages of d'Alembert's article provide a staunch defence of Maupertuis against Samuel König's accusation of plagiarism, an accusation that sparked a notoriously vicious episode in the history of the Academies.²¹

D'Alembert's discussion of Wolff's *Cosmologia generalis* is, as he acknowledges, simply an insertion of a text by the Wolffian Henri Samuel Formey, perpetual secretary of the Berlin Academy (E, vol. IV, 294b). The paragraphs repeat Wolff's claim to have invented the metaphysical discipline of general cosmology, and reiterate the distinction made at the beginning of his *Cosmologia generalis* between scientific and experimental cosmology. Wolff characterises scientific cosmology as "a general theory of the world demonstrated on ontological principles" (Wolff 1731, §4). This is the main focus of the *Cosmologia*, as Formey notes: the treatise seeks "to explain how the world results from the collation (*assemblage*) of simple substances, and to develop the general principles of the modification of material things" (E, vol. IV, 295a). Wolff conceives of general cosmology, particularly in the Latin work, as a primarily a priori demonstration of principles, themselves founded on his ontology, for physics.²² He considers cosmology to treat "the total bodies of the world" and his new general cosmology to be yet more abstract, concerned with "things which are common to the existing world and to any other possible world" (Wolff 1963, §§77, 78). This abstract metaphysical cosmology could not be further from d'Alembert's own scientific work. His insertion of Formey's text in his "Cosmologie" article can thus be understood as a polite gesture towards the perpetual secretary of Frederick's Academy.

Less obviously, d'Alembert's discussion of Maupertuis' cosmology is also an act of diplomacy. Thomas Hankins notes that 'd'Alembert is here "very tactful"' (Hankins 1970, p. 54). D'Alembert owed Maupertuis a great deal, as the elder figure who first introduced him into the Parisian social and scientific worlds (Hankins 1970, p. 24). D'Alembert therefore carefully downplays the aspects of Maupertuis' *Essai* that he finds

21. See Hankins 1970, pp. 52–4. Voltaire weighed in against Maupertuis in 1752, and he is conceivably the target of d'Alembert's sharp closing reprimand to 'la quantité de gens qui en ont parlé sans y rien entendre' (E, vol. IV, 297b; see Hankins 1970, pp. 54–5).

22. Wolff 1731, §1–2; Wolff 1963, §97. On the differences between Wolff's Latin and German cosmologies (the 1731 *Cosmologia generalis* and the 1719 *Deutsche Metaphysik*), see Leduc 2021. For a useful account of the *Cosmologia generalis*, see École 1985.

questionable: the teleological nature of the principle of least action, and Maupertuis' claim to have proved the existence of God.²³

Although Maupertuis' cosmology seems far removed from the project of Wolff's general cosmology, it combines metaphysical modesty and extravagance in ways that d'Alembert treats cautiously. The "Avertissement" to the *Essai* denies the possibility of comprehending all aspects of the universe in a cosmology. Maupertuis states that we seem to be permitted only obscure insight into the labyrinths of God's creation. We have made progress in connecting, deducing and calculating phenomena, he writes,

[b]ut I do not think it is possible to hope for a complete system: we will never succeed in following the order and dependence of all parts of the universe. What I have proposed here is very different; I have applied myself only to the first principles of nature, to those laws which we see so constantly observed in all phenomena ...
(Maupertuis 1756, p. iv).

Maupertuis here relinquishes the attempt to provide a fully elaborated system and restricts himself to the first principles, which he will reduce to the single principle of least action. D'Alembert highlights the restricted nature of Maupertuis' cosmology:

He believes that we have neither enough facts nor enough principles to comprehend nature from a single point of view. He contents himself with exhibiting [*exposer*] the system of the universe; he proposes to give the general laws, and he draws from these a new proof of the existence of God (E, vol. IV, 295a).

As d'Alembert's summary reveals, however, Maupertuis' modesty is double-edged. Although he refuses to develop a fully-fledged cosmological system, his *Essai* aimed to reveal the workings of the entire universe by identifying the fundamental principle and, on its basis, the general laws of motion of the universe.²⁴ The principle of least action therefore enables

23. On d'Alembert's antipathy to final causality and the way that he "nonchalantly read the metaphysics out of the principle of least action," see Terrall 2002, p. 291.

24. This double-edged modesty is regularly apparent in the *Essai*, for example in a discussion of bodily collisions: "Without doubt the perfect knowledge of this phenomenon has not been accorded to us; it truly surpasses the reach of our intelligence. I therefore renounce here the task of explaining the means by which movement is passed from one body to another when they collide: I do not even seek to pursue the physics of this phenomenon as far as the weak light of my mind and the mechanical knowledge of our day would permit: I apply myself to a principle *more great, more elevated, and the most interesting in this research*" (Maupertuis 1756, pp. 33–4; my emphasis).

Maupertuis to derive the mathematical laws of collisions of hard bodies, elastic bodies and bodies at rest.²⁵

D'Alembert approves of the way that Maupertuis “applied this same law of the minimality of action to the collision of bodies,” both hard and elastic (E, vol. IV, 296a). D'Alembert corrects Maupertuis' dynamic and static laws in various respects, although he carefully notes that his discussion “will not be fundamentally to Mr. de Maupertuis' disadvantage” (E, vol. IV, 296a). As in his article “Action,” d'Alembert ignores the metaphysical aspects of Maupertuis' principle of least action: he writes that it is “nothing but a mathematical principle” (E, vol. IV, 297b; cf. E, vol. I, 120b).²⁶ He also emphasises Maupertuis' replacement of the concept of force by that of action (E, vol. IV, 295a). Mary Terrall has shown that this was a point on which d'Alembert felt he and Maupertuis were particularly close.²⁷ D'Alembert entirely ignores the third part of the *Essai*, the “Epitome (*Abrégé*) of the System of the World,” where Maupertuis provides a popular, at times flowery summary of the latest findings on the solar system, the earth and the stars.²⁸

D'Alembert's *Encyclopédie* article therefore approaches Wolff's and Maupertuis' cosmologies in comparable ways. In both cases d'Alembert provides tactful, uncritical summaries, careful not to offend Formey or Maupertuis. His extended treatment of Maupertuis' *Essai* stresses the mathematical importance of the principle of least action, downplays the work's teleological and theological aspects, ignores the popular third part, and defends Maupertuis' personal honour against König's attacks. The article's diplomatic handling of cosmology, whether that of Wolff or Maupertuis, suggests that d'Alembert could well be masking his deeper, critical view of the discipline.

This suspicion seems to be confirmed elsewhere in d'Alembert's writings. The famous *Système Figuré* of the *Encyclopédie* depicts cosmology as a minor branch of the tree of sciences.²⁹ Within “Particular Physics,” cosmology is located between and on the same level as meteorology and botany; it

25. See the mathematical appendix to the *Essai*, Maupertuis 1750, pp. 139–73 (this is not in the edition of the *Essai* in volume 1 of Maupertuis' *Oeuvres*).

26. See Polonoff 1973, p. 123; Groult 2001, p. 188.

27. A reply from Maupertuis to d'Alembert suggests that d'Alembert, in a now-lost letter, had praised the *Essai* for rejecting the concept of force. See Terrall 2002, pp. 290–1.

28. Maupertuis 1750, pp. 90–138. In the edition printed in *Oeuvres* this third part is entitled “Spectacle de l'Univers” (Maupertuis 1756, p. 52). On this third part, see Terrall 2002, pp. 285–6.

29. Although based on the version in Diderot's *Prospectus*, the *Système Figuré* was updated by d'Alembert, so we can take him to have approved at least the “Science of Nature” part.

contains the disciplines of uranology, aerology, geology and hydrology. This is a far cry from its position in the schemes of the German metaphysicians, where cosmology, alongside ontology, theology and psychology, is one of the four fundamental branches of metaphysics.

D'Alembert's *Essai sur les Eléments de philosophie* ([1759] 1965)³⁰ does not mention cosmology among the parts of human knowledge for which it seeks to provide the principles. Instead, a chapter treats astronomy (EdP, pp. 406–33), which d'Alembert divides into astronomy proper—the knowledge (*connaissance*) of celestial phenomena—and physical astronomy—the explanation of these phenomena (EdP, p. 406). The former, d'Alembert's subsequent discussion makes clear, consists of the observation and calculation of celestial movements; the latter, one of the sciences that “does most honour ... to modern philosophy,” provides an explanatory framework to explain astronomy's empirical-mathematical results. Neither Wolff nor Maupertuis are mentioned in the chapter, which focuses instead on the relative merits of the Cartesian and Newtonian world-systems. Alongside positive comments about Descartes (testament to d'Alembert's affinity for certain Cartesian principles of method), the “Astronomy” chapter of the *Eléments* firmly sides with the Newtonian hypothesis of universal gravitation, which, thanks to its “admirable agreement with astronomical observations,” is so secure that it “has almost ceased to be a hypothesis” (EdP, p. 414).

The neglect of metaphysical cosmology in the chapter is consistent with d'Alembert's radical limitation of metaphysics earlier in the *Eléments*. D'Alembert states that our ideas all have “their principle in our sensations” (EdP, p. 124; cf. DP, ii, 6). He suggests that metaphysics should “perhaps limit itself” to the question: “how do our sensations produce our ideas?” (EdP, p. 124). As has often been noted, d'Alembert has a broadly Lockean epistemology, inherited from Condillac, which was combined with a modified Cartesian rationalism. As Richard Schwab puts it, “[i]n d'Alembert's exposition the clear and direct sensation replaced the clear, distinct, a priori idea of Descartes as the basis of all truth or certain knowledge” (d'Alembert 1963, p. xxxiii). In the *Eléments*, this leads d'Alembert to attack any metaphysics that goes beyond the single issue of the generation of our ideas:

almost all other questions that [metaphysics] proposes are insoluble or frivolous; they are the food of reckless or false minds; and it cannot be surprising if such subtle questions, always debated and never resolved, have caused good minds to disdain this empty and

30. Hereafter abbreviated EdP.

contentious science that we collectively call metaphysics (EdP, pp. 124–5).

The questions of a metaphysically-infllected cosmology evidently transgress the restricted scope that d'Alembert grants to metaphysics. This is the likely reason for the absence of cosmology from the *Eléments*.³¹

D'Alembert concludes the “Astronomy” chapter on a patriotic note: the French have provided the Newtonian system with “its most indisputable and deepest proofs” (EdP, p. 432). This is an implicit reference to Maupertuis’ experimental work, namely his famous expedition to Lapland to verify Newton’s hypothesis about the shape of the earth. So, whilst approvingly nodding towards Maupertuis’ empirical findings, d'Alembert ignores the more metaphysical cosmology of the *Essai* that he had tactfully treated in his *Encyclopédie* article. The *Eléments* therefore gives the impression that cosmology, whether in the mould of Wolff’s *cosmologia generalis* or Maupertuis’ *Essai*, is a metaphysical relic that can be left aside.

4. The Positive Place of Cosmology in d'Alembert’s Thought

The previous section seems to justify taking d'Alembert to be sceptical critic of metaphysical cosmology. Against this conclusion, however, I will suggest that d'Alembert transfers key aspects of cosmology into other parts of his philosophy.

The “Cosmologie” article begins with what we can take to be d'Alembert’s own words, before he turns to the selective summaries of Wolff’s and Maupertuis’ cosmologies. After a short introduction defining cosmology—as Groult points out, there was no article on the topic in Chambers’ *Cyclopaedia*; the *Encyclopédie* innovatively accorded cosmology an entirely independent place among the sciences³²—d'Alembert depicts cosmology as the discipline that examines the chain connecting all natural beings.

Cosmology is therefore properly defined as a part of general and rational Physics, which, without pursuing excessively particularised details of the facts, examines the metaphysical side of the results of

31. On d'Alembert’s scepticism more generally, see Tonelli 1976 and Le Ru 1994, 149–168. Tonelli claims that d'Alembert considers even a metaphysics restricted to the question of the generation of our ideas to be illegitimate, as this generation is incomprehensible. But the evidence Tonelli cites for this is very weak (only the XVth *Eclaircissement* of the *Eléments* (EdP, pp. 356–7); see Tonelli 1976, pp. 361–2) and does not justify ignoring d'Alembert’s statements to the contrary.

32. D'Alembert 2011, pp. 221n1, 223n4, however Groult goes too far in suggesting that the *Encyclopédie* might even be considered “the first work” to give cosmology such an independent status: this was already the case in Wolff’s system.

these facts, shows the analogy and union between them, and attempts thereby to discover a part of the general laws according to which the universe is governed. Everything is connected in nature; all beings are held by a chain of which we glimpse some continuous parts, even if the continuity escapes us in many places (E, vol. IV, 294a).

"Everything is connected in nature," d'Alembert states (an assertion to which we shall return). Consequently, the universe is a chain, and although we "we glimpse some continuous parts," we do not have knowledge of all its links.³³ Cosmology, which for d'Alembert is concerned with the metaphysical side of the facts of physics, seeks the general laws governing this fully connected universe. To this end, the philosopher proceeds as follows:

The art of the philosopher does not consist, as is too often thought, in forcing distant parts together by inappropriately re-forging the chain in certain places where it is broken; for by such an effort one only separates the parts that are there, or further pulls apart those which were already distant at the end opposite to that which one brings together; the art of the philosopher consists in adding new links (*chaînon*s) to the separated parts, in order to give them the least possible distance from one another: but he should not flatter himself in thinking that empty spaces will not remain in many places. To form the links of which we speak, one must take notice of two things: the observed facts that form the matter of these links, and the general laws of nature that form the connection (*lien*). I call *general laws* those which are observable in a large number of phenomena; for I am cautious not to say *in all*. Such are the laws of movement, which are a consequence of the impenetrability of body, and the source of many effects that we observe in nature (E, vol. IV, 294a–b).

D'Alembert contends that the philosopher, facing the broken chain of our knowledge of the connections between natural beings, should not re-forging (*renouer*) broken links of the chain, which d'Alembert envisages as an activity of forcing together parts of the chain. Such a mistaken approach would make artificial, a priori connections between separated parts of our knowledge: this would merely increase the gaps elsewhere in the chain, because it fails to add genuinely new knowledge. Instead, the philosopher should

33. I here leave aside Lovejoy's famous study of the "great chain of being," which strongly informs Hankins' account of this theme in d'Alembert's work (Hankins 1970, pp. 104–31). Lovejoy's notion is in my view too general to be very helpful in explaining d'Alembert's conception of the chain that connects natural beings and our knowledge.

add new links, but only in two ways: through observations of the natural world or based on the laws of nature that we know connect the links.

Cosmology is here depicted as concerned with the chain connecting natural beings, and particularly with the laws that connect the links. D'Alembert presents nature as a smoothly connected chain of beings, and our knowledge as an imperfect version of this chain to which we strive to add the missing links. Here, a more positive view of cosmological thinking emerges—and this is not limited to the opening paragraphs of the “Cosmologie” article. The conception of nature and of knowledge as a chain reappears in major methodological statements in d'Alembert's other writings.

One of the first paragraphs of the *Discours préliminaire* states:

If one reflects somewhat upon the connection (*liaison*) that discoveries have with one another, it is readily apparent that the sciences and the arts are mutually supporting, and consequently there is a chain that unites them (DP i, 5 t.m.).³⁴

It is true that d'Alembert here writes of a chain of knowledge rather than the chain of natural beings discussed in the “Cosmologie” article. However, as we have seen, the article claimed that the philosopher should seek to add links to the chain to fill the gaps in our knowledge, so both the article and the opening of the *Discours préliminaire* should be taken to refer at once to the chain of natural beings and the chain of our knowledge. This is a result of the broadly Lockean position that d'Alembert inherits from Condillac: as our ideas are derived only from clear and distinct sensations, the chain of our knowledge *is* the chain connecting natural beings; the only difference is that our knowledge is imperfect.³⁵

D'Alembert's article “Éléments des sciences” powerfully exemplifies this point. Here, d'Alembert invites us to imagine that a science is entirely treated in a single work. This would entail that the work would contain the series (*suite*) of propositions that form the collection (*ensemble*) of the science. We should suppose that these propositions, “in the most natural and the most rigorous order possible,” form an “absolutely continuous

34. This is the first paragraph of the text in the German translation that Kant owned: Wegelin drops d'Alembert's opening remarks and designates this as §1 (d'Alembert 1761, pp. 1–2).

35. In an instructive paper on d'Alembert's “Cosmologie,” Groult overlooks the fact that d'Alembert's Lockean epistemology entails that the ever more accurate chain of our knowledge would approximate more and more accurately the chain connecting natural beings. One need not therefore make the sharp distinction implied by Groult when she writes that for d'Alembert, “[l]a totalité n'est plus maintenant le Tout à contempler, mais un discours à analyser” (Groult 2001, p. 190; cf. p. 193).

series" in which each proposition depends uniquely and immediately on its predecessor, and so each is "nothing but the translation of the first [proposition], presented from different perspectives (*sous différentes faces*).” The first proposition would then be an “element” of the science (E, vol. V, 491a). These first propositions should certainly not be *a priori*; rather, the departure-points of a science are “simple, well observed and well confirmed facts” (E, vol. V, 492b). In this d’Alembert follows Condillac, as will be discussed below.

Having proposed this thought experiment, d’Alembert makes explicit that he is here thinking of the *chaîne* of the “Cosmologie” article and the opening of the *Discours préliminaire*. He writes, “if we could perceive (*appercvoir*) without interruption the invisible chain that connects (*lie*) all the objects of our knowledges, the elements of all the sciences would reduce to a single principle, whose principal consequences would be the elements of each particular science” (E, vol. V, 491a–b). Such a perfect perception of the chain of nature would raise us to divine knowledge: “the human mind, thus participating in the supreme intelligence, would see all its knowledges as if gathered together under an indivisible point of view” (E V 491b). However, even if we were to attain such a divine vantage point on the chain of nature and knowledge, there would still be an essential difference between divine and human knowledge: “that God, from this point of view, would perceive at a glance (*d’un coup d’oeil*) all the objects, whereas man would need to look over them one after the other, to acquire a detailed knowledge of them” (E, vol. V, 491b). In fact, d’Alembert writes, we are far from being able to place ourselves at this vantage point: “far from perceiving the chain that joins all sciences, we do not even see in their entirety those parts of the chain that constitute each particular science” (E, vol. V, 491b). As in the “Cosmologie” article, d’Alembert emphasises our lack of complete knowledge whilst affirming that nature and the sciences should be conceived of as smoothly connected chains.³⁶

This discussion in “Éléments des sciences” sheds light on further passages in the *Discours préliminaire*. After a discussion of the unity of geometry, d’Alembert affirms the unity of “physical truths” and the “properties of bodies whose connection (*liaison*) we perceive” (DP ix, 29). These physical properties are—due to this connection—a single piece of knowledge: “All

36. Groult cites some of these passages from “Éléments des sciences” and connects them, as I will, to d’Alembert’s depiction of the *Encyclopédie*’s tree of the sciences as a *mappe-monde* (Groult 2011, pp. 58–60). Although she notes the importance of the idea of the whole and the cosmic concept of philosophy for Kant’s thought (Groult 2011, pp. 53, 62), Groult does not point out the significance of cosmology for the relation between d’Alembert’s conception of the order of the sciences and Kant’s critical philosophy.

of these properties gathered together offer us, properly speaking, only a simple and unique piece of knowledge” (DP ix, 29). The “*Éléments des sciences*” article shows why: the chain connecting physical properties could be traced back to a first proposition or principle, if we can adopt a sufficiently quasi-divine vantage point over the whole series. Earlier in the *Discours préliminaire*, d’Alembert advocated this reduction of the number of principles of a science as a general method for the study of nature (DP vi, 22).³⁷ Now, he makes the cosmological aspect of this approach explicit: “The universe, if we may be permitted to say so, would only be a single fact and one great truth for whoever knew how to embrace it from a single point of view” (DP ix, 29). This single vantage point is that which is attributed to God in “*Éléments des sciences*”: mere mortals can attain this point of view, even if we cannot comprehend the whole chain of natural beings in an instant, the way that God can. And although our knowledge has many gaps, we can progress towards knowledge of the universe as “a single fact and one great truth” by increasing our knowledge of the principles of the sciences and reducing these to the most fundamental principles.

When the *Discours préliminaire* finally turns to the task of the *Encyclopédie*, d’Alembert presents it precisely in terms of this quasi-divine single point of view of the whole chain of our knowledge, of the connections between parts, and of their origin.

After reviewing the different parts of our knowledge and the characteristics that distinguish them, it remains for us only to make a genealogical or encyclopaedic tree which will gather the various branches of knowledge together under a single point of view (*sous un même point de vue*), and which serves to mark their origin and the connections (*liaisons*) that they have among one another (DP xiv, 45–6, t.m.).

The project of the *Encyclopédie* is therefore that of attaining the single, “indivisible” point of view that d’Alembert refers to in “*Éléments des sciences*” and earlier in the *Discours préliminaire*: a cosmological view of the chain of nature and our knowledge as a whole, unified by the internal connections stemming from an origin.

D’Alembert notes that the different sciences have, historically, proceeded simultaneously but that if one wants to write a history of the “progress of the mind,” one would have to approach each science “successively”

37. This method of reduction is discussed further in section 6, below.

or separately in order to make sense of them. This is not the case in an encyclopaedic treatment of our knowledge, however:

This consists in collecting knowledge into the smallest area possible and placing, so to speak, the philosopher above this vast labyrinth at a very elevated point of view, from which he can simultaneously (*à la fois*) perceive the principal sciences and arts; see at a glance (*d'un coup d'oeil*) the objects of their speculations, and the operations that he can make on these objects; distinguish the general branches of human knowledge, the points that separate or unite them; and even sometimes glimpse the secret routes that relate them to each other (DP xv, 47 t.m.).

The encyclopaedic perspective allows the philosopher to simultaneously perceive the connections of the sciences. Such perception “at a glance” is precisely how d'Alembert described the divine view of the chain of sciences in “*Éléments des sciences*” (E, vol. V, 491b). This is not to say that d'Alembert conflates the human and the divine viewpoints in his account of the *Encyclopédie*, but that the encyclopaedic point of view provides an overview of the totality of our knowledge, at least for the parts of the chain that we have so far managed to comprehend.

It is here, where d'Alembert depicts the encyclopaedic point of view as providing the simultaneous overview of the chain of knowledge, that he describes it as “a kind of world map (*une espece de Mappemonde*)” (DP xv, 47). More specifically, the separate articles of the *Encyclopédie* will be like local, very detailed maps, whereas “the tree or *système figuré* will be the world map” (DP xv, 47–8, t.m.). This account of the elevated perspective offered by the *Encyclopédie* as a *mappemonde* is based, I have sought to show, on the conception of nature and our knowledge as a continuous chain that d'Alembert evokes at the beginning of his article on cosmology. In this respect, d'Alembert transfers a key aspect of cosmological thinking into his account of nature and the sciences.

Kant's single direct reference to the *Encyclopédie*, as we have seen, is to the image of the *mappemonde*. Before we consider the affinities between the place of cosmology in d'Alembert's and Kant's projects, we can sharpen our account of the cosmological aspects of d'Alembert's thought through their relation to his views on systematicity and their Leibnizian heritage.

5. Leibnizian Aspects of d'Alembert's Cosmological Views

In the passage from the “*Cosmologie*” article quoted at the start of the previous section, d'Alembert writes: “*Tout est lié dans la Nature*” (E, vol. IV, 294a). This view ultimately underpins his conception of nature and our knowledge as a continuous chain. The passage reveals a Leibnizian

side to d'Alembert's thought, which has not, to my knowledge, been pointed out.³⁸ This can be traced via significant intermediaries, as it is unclear how much *direct* knowledge d'Alembert had of Leibniz.³⁹

The influence on d'Alembert of Condillac's *Traité des systèmes* (1749) is well known: in the *Discours préliminaire*, d'Alembert asserts that Condillac "seems to have delivered the death blow" to the "taste for systems" (DP xxxi, 94). Condillac's *Traité des systèmes* presents Newton as the model for a legitimate approach to systematisation. Systems in the Newtonian mould are based on hypotheses, understood as well-founded facts (Condillac 1947, pp. 123, 210–12; cf. d'Alembert's "Éléments des sciences," E, vol. IV, 492b). Much of Condillac's study is dedicated to a refutation of systems based on "abstract" principles that are not confirmed facts. The second-longest section, only shorter than the point-by-point refutation of Part 1 of Spinoza's *Ethics*, considers Leibniz as an example of the abuse of abstract systems. Condillac first summarises then refutes Leibniz's *Monadology* (Condillac 1947, pp. 151–9; 159–64). The summary gives Condillac occasion to cite the Leibnizian slogan about universal connection. Due to the perfect analogy between "filled space" (*le plein*) and the "reality of things," Condillac writes, "[t]out est donc lié dans la réalité" (Condillac 1947, p. 156).⁴⁰

Condillac's references to Leibniz's view that 'everything is connected' appear in the context of his critical discussion of the monadology as an erroneous system. However, Condillac's criticisms concern only Leibniz's comments about the representative forces of monads; at no point does he attack the doctrine of universal connection. Moreover, Laurence Bongie has established that an anonymous submission to the Berlin Academy's 1746–7 essay competition, which did not win but which was published alongside Justi's winning piece, was written by Condillac. Parts of this prize essay were cut and pasted into his *Traité des systèmes*. Surprisingly, given Condillac's criticisms of Leibniz in the works he published under his own name, the prize essay *defends* a broadly Leibnizian monadology.⁴¹ After rejecting the "false or badly proved" aspects of Leibniz's monadology,

38. Groult draws attention to the phrase "tout est lié" in the "Cosmologie" article but does not consider its Leibnizian heritage (Groult 2001, pp. 191–2).

39. See Hankins 1970, p. 125: "d'Alembert ... had only rather hazy notions about the philosophies of Leibniz and Spinoza"; and Le Ru 1994, p. 63n4: "Il n'est pas sûr que d'Alembert connaisse très bien l'œuvre de Leibniz mais il connaît les *Nouveaux essais*." Much more work has been dedicated to the relationship between Diderot's and Leibniz's thought than to links between d'Alembert and Leibniz: see, for example, Leduc et al. (Eds.) 2015.

40. Condillac repeats this in the section on monads' representative force: "tout étant lié il n'y a pas de raison pour borner cette représentation" (Condillac 1947, p. 157).

41. See Bongie's introduction in Condillac 1980, pp. 11–107.

part 2 of the prize essay attempts to set out “a new system of monads,” which includes the view that monads underpin “the harmony of the whole universe” (Condillac 1980, pp. 112, 144, 176). Whether or not Schwab is correct to suggest that d'Alembert “may have had Condillac himself at his elbow” when writing the *Discours préliminaire*, it seems likely that d'Alembert knew Condillac personally (d'Alembert 1963, p. xxix). Condillac's hidden Leibnizian sympathies, which Bongie unearths, may therefore be significant for d'Alembert's *positive* reference in the “Cosmologie” article to the doctrine that “tout est lié.”

Perhaps a more important influence is Émilie du Châtelet's *Institutions de Physique* (1740). W. H. Barber has shown that the *Institutions* immediately received much attention, being reviewed in the *Mémoires de Trévoux* and in two long articles in the *Journal des Sçavans* (Barber 1955, p. 139). From the mid-1740s to the early 1750s Leibniz's system of monads became well known in France, largely due to du Châtelet's book. According to Barber, “by 1753 Leibnizianism seems to have become something of a *cause célèbre*” (Barber 1955, pp. 142-3). D'Alembert's “Cosmologie” article, and his accounts of the connected chain of nature and of our knowledge elsewhere in the *Encyclopédie*, are therefore written as Leibnizian ideas are rapidly gaining currency within the French intellectual world.

Chapter 7 of the *Institutions*, on the elements of matter, outlines Leibniz's monadology, and dedicates a paragraph to the view that “[t]out est lié dans le monde” (du Châtelet 2009, §130). Du Châtelet proceeds to outline Leibniz's famous view that the universal connection of physical things is grounded in the connection of monads, which she calls elements: “the connection (*liaison*) of the parts of the world depends on the connection of the elements, which is the foundation and the first origin. Thus, the state of each element contains a relation to the present state of the entire universe” (du Châtelet 2009, §131). Du Châtelet adopts Wolff's term, “elements,” in place of Leibniz's monads. One might speculate that this may have influenced d'Alembert's choice to name the basic principles of the sciences and philosophy as “elements” in his 1755 article and 1759 book. In any case, it is notable that du Châtelet describes an *ordered series* of elements when explaining Leibniz's doctrine of the soul obscurely mirroring the whole universe:

this connection (*liaison*) between our soul and the entire universe comes from the union of the elements (*Elemens*) among themselves, and from the relationships (*rappports*) they all have with one another, and these relationships spring from their dissimilarity; for this dissimilarity causes each element, by its essence and its intrinsic

determinations, to require the coexistence of a particular element with it rather than any other (du Châtelet 2009, §133).

Such a Leibnizian-Wolffian conception of the universe as an ordered whole, in which all elements are connected to others that differ from them, bears a striking formal resemblance to the account of the sciences d'Alembert will provide in "Éléments des sciences."

Moreover, as we have seen, d'Alembert repeatedly evokes the idea of a "God's eye" perspective on the chain of knowledge: a single, indivisible point of view from which the whole chain could be seen. The difference between the divine and the human perspectives is that God can see everything immediately, whereas, to gain detailed knowledge, humans must look at the objects of knowledge "one after the other" (E, vol. V, 491b). Nevertheless, the *Discours préliminaire* proposes that an encyclopaedic perspective provides the "very elevated point of view" from which the philosopher can simultaneously grasp the different connected chains of human knowledge (DP xv, 47). This divine perspective on the whole, which is temporally differentiated from the human viewpoint, is also a Leibnizian idea. As du Châtelet presents it:

Thus, it can be said that in M. Leibniz's system, it is a metaphysical-geometric problem, *the state of an element being given, to determine the past state, present, and future of all the universe*. The solution of this problem is reserved to the Eternal Geometrician who solves it at every moment insofar as he sees distinctly the relation of the state of each simple being to all the states, past, present, and future of all the other beings of the universe: but it will always be impossible for finite beings to have a distinct idea of this infinite relationship, that all things that exist have between them, because then they would become God (du Châtelet 2009, §131).

D'Alembert, I have suggested, translates this cosmological conception, of the universe as a universally connected whole that only God can instantly perceive, into an account of the structure of our knowledge. He nevertheless reveals the cosmological roots in his "Cosmologie" article and when he writes in the *Discours préliminaire* that "[t]he universe, if we may be permitted to say so, would only be a single fact and one great truth for whoever knew how to embrace it from a single point of view" (DP ix, 29). The *Discours préliminaire* then proposes that the *Système Figuré* of the *Encyclopédie* provides a *mappemonde* that approximates this single point of view. The world map of the sciences outlined presented in the *Discours préliminaire*, then, is an attempt—of course imperfect and always open to improvement—to reach a perspective on the interconnected chains of

human knowledge comparable to the view that Leibniz's God has of the interrelated monads that reflect and constitute the universe.

6. D'Alembert on Systematicity

D'Alembert first makes a distinction between the *esprit systématique* and the *esprit de système* in the *Discours préliminaire* when outlining the proper method for the study of nature: this should proceed "by thoughtful study of phenomena, by the comparisons we make among them, by the art of reducing, as much as that may be possible, a large number of phenomena to a single one that can be regarded as their principle" (DP vi, 22). This is followed by a line, which, as Schwab notes, is lifted directly from the introduction to the *Traité de dynamique*, about the greater fertility of the principles when they have been reduced in number.⁴² The philosopher should therefore reduce, as far as possible, the principles understood to govern natural phenomena. This reduction "constitutes the true *esprit systématique*" (DP vi, 22). D'Alembert cautions that this should not be confused with the *esprit de système*, and claims he will return to this.

The distinction between the *esprit systématique* and the *esprit de système* is not however clarified in any detail in the rest of the *Discours préliminaire*. D'Alembert merely notes that "the *esprit de système* is in physics what metaphysics is in geometry," that is, something to be avoided at all costs. In place of the "frivolous conjectures honoured by the name of systems," natural science should be "confined only to observations and calculations" (DP, xxi, 95). Despite d'Alembert's minimal explanation, the distinction between the *esprit systématique* and the *esprit de système* is well known, thanks to the significance Cassirer accords it in the first chapter of *Die Philosophie der Aufklärung* (1932) (Cassirer 2007, pp. xi, 7).⁴³

Cassirer notes that d'Alembert's distinction has its basis in Condillac's *Traité des systèmes*. As discussed in the previous section, Condillac distinguishes illegitimate, "abstract" systems such as those of Spinoza, Leibniz and Malebranche, from legitimate systems that are founded on facts. The paradigm of the legitimate system, for Condillac, is Newton's system of

42. Schwab also points out the similarity between these lines and Condillac's opening definition of a system in the *Traité des systèmes*, which states that a "system is so much the more perfect as the principles are fewer in number: it is even to be hoped that one could reduce them to a single one" (d'Alembert 1963, p. 22n30; cf. Condillac 1947, p. 121). This suggests a back-and-forth influence between d'Alembert's 1743 *Traité de dynamique*, Condillac's 1749 *Traité des systèmes*, and d'Alembert's 1751 *Discours préliminaire* (or even, as Schwab speculates, that d'Alembert and Condillac could have collaborated on the latter two works).

43. Cassirer claims no less than that "[d]ie gesamte Erkenntnistheorie des achtzehnten Jahrhunderts bemüht sich um die Feststellung dieses Unterschieds" (Cassirer 2007, p. 7).

the world. As Le Ru points out, d'Alembert's conception of a "good" system is also modelled on Newtonian science (Le Ru 1994, pp. 176–77). D'Alembert can thus be taken to reconceive Condillac's distinction between abstract and well-founded systems as the manifestations of the *esprit de système* and the *esprit systématique*.

I propose that we might also understand d'Alembert's distinction to play on two senses of *esprit*, distinguished in English by "mind" and "spirit." The *esprit de système* would be the "mind of the system," a way of thinking that is narrowed and blinkered by the desire to fit everything into a systematic structure. The minds of Spinoza, Leibniz and Malebranche are therefore hindered from filling the gaps in the chain of knowledge due to their overly strong affinities for systems based on *a priori* principles. Opposed to this is the "systematic spirit": a freer, more open approach to the discovery of the missing links in our knowledge, not fettered by fixed principles but simply guided by the idea that nature is a system.⁴⁴ The systematic spirit is indeed best exemplified by Newton and, d'Alembert would add, the French scientists who better confirmed his system.

What must be added to this reconstruction, in my view, is that the systematic spirit's empirical-mathematical investigation of nature is guided by the fundamental presupposition that "tout est lié." At the outset of the *Discours préliminaire*, after first mentioning the chain that unites the sciences and arts, d'Alembert points to the difficult task, which he suggests is ultimately that of the *Encyclopédie*, of attempting "to encompass the infinitely varied branches of human knowledge in a truly unified system" (DP i, 5). We can compare this affirmation of the endeavour to systematise the chain of knowledge with Wolff's famously systematic *Deutsche Metaphysik* (1719). In the Preface to the first edition, Wolff writes of his approach:

Above all I have ensured that all truths are interconnected [*mit einander zusammen hiengen*], and the whole work would be like a chain, since one link is always connected to another, and hence every link to all others (Wolff 1983 unpaginated).

Although the difficulty of the task, stressed by d'Alembert, is not mentioned by Wolff, the two are surprisingly close in their conception of knowledge as an interconnected chain. This can be explained by the fact that such views stem from Descartes. Hankins points out that in the *Discourse on Method*, Descartes proposes to extend the geometers' "long

44. It is not difficult to see this "systematic spirit" as an anticipation of Kant's conception of a regulative idea of systematicity that guides natural-scientific investigation. This may explain Cassirer's great enthusiasm for the distinction between *esprit systématique* and *esprit de système*: see previous note.

chains of reasoning" to "all those things that fall under the cognizance of man"; elsewhere, Descartes writes that "[a]ll the sciences are interconnected as by a chain" (Hankins 1970, pp. 117–18). This Cartesian conception no doubt also influences Leibniz. However, Leibniz adds the cosmological conception of the universe as a completely connected chain in which the monads, the ultimate constituents of this chain, imperfectly mirror the whole universe or, what is the same, the perspective of God.

D'Alembert can therefore be understood as synthesising the Leibnizian, cosmological conception of the world, in which "everything is connected," with the Cartesian notion of the chain of our knowledge, by way of a broadly Lockean epistemology according to which there should be no difference between the order of our ideas and the order of beings in nature. D'Alembert's conception of a legitimate system brings him closer to Descartes, Leibniz, and Wolff than his polemical statements about systematic metaphysicians may suggest. He affirms the presupposition of the systematicity of nature as a guiding principle for discovery of new knowledge. The difference between an illegitimate and a legitimate use of systematic thinking, or the difference between the *esprit de système* and the *esprit systématique*, is ultimately only one of orientation: whether one begins with the abstract principles of a system and expects knowledge of nature to arise from, or at least conform with, these principles; or whether one presupposes systematicity but seeks to discover well-founded principles through observation and mathematics. That which the systematic spirit produces is, for d'Alembert, still a system; it is simply a better one than those of Spinoza's *Ethics* or Leibniz's *Monadology*.

7. Negative and Positive Responses to Cosmology: d'Alembert and Kant

D'Alembert's view of cosmology, as I have presented it, has negative and positive sides. On the negative side, d'Alembert merely diplomatically summarises the content of Wolff's and Maupertuis' cosmologies, showing enthusiasm only for the principle of least action if understood in strictly mathematical terms. The specific aims of metaphysical cosmology appear to be disqualified by d'Alembert's radical limitation of the scope of metaphysics: the latter should concern itself only with the genesis of our ideas in sensation. The fact that the discipline is entirely absent from the *Eléments de philosophie* could be taken to indicate that d'Alembert sees metaphysical cosmology as ultimately irrelevant, whether in the shape of Wolff's *cosmologia generalis* or Maupertuis' *Essai de cosmologie*, as far as the wider aims of the latter are concerned. The implication is that cosmology should be replaced by the more narrowly empirical-mathematical discipline of astronomy. Such a conclusion coheres with d'Alembert's often-noted scepticism towards traditional metaphysical issues.

This negative view of cosmology has its clear echo in Kant's critique of rational cosmology in the Antinomy chapter of the first *Critique*. Kant seeks to present rational cosmology "in its dazzling but false plausibility as an idea that cannot be made to agree with appearances" (A408/B435). Kant's elaborate critique of metaphysical cosmology shows that rational reflection on the world, understood as the "sum total of all appearances," leads inevitably to antinomies or conflicts of reason with itself (A334/B391–2, A407/B433–4). This is due to reason's search for the "absolutely unconditioned" element in any series of conditions (A409/B436; cf. A497/B525). Rational cosmologists are thus drawn, according to the arguments in the Antinomy, to fruitless attempts to theoretically answer questions regarding the beginning and outer limit of the world in time and space, the divisibility of matter, the possibility of spontaneous causality, or the existence of a necessary being in the world.

Although Kant's claims in the Antinomy are in a very different register to d'Alembert's explicit and implicit criticisms of cosmology, their consequences appear to be the same. D'Alembert's apparent dismissal of metaphysical cosmology is echoed in Kant's critique of reason's cosmological claims. A common interpretation of the Antinomy chapter sees this as Kant's final word on the topic of rational cosmology. Thus Michelle Grier refers to "Kant's rejection of rational cosmology"; on her reading, rational cosmology is for Kant a "pseudoscience" (Grier 2001, pp. 174, 131).⁴⁵ We could thus say that, just as d'Alembert excludes cosmology from *Éléments de philosophie*, Kant dismisses rational cosmology from the roster of legitimate sciences. This conclusion alone would constitute a generally overlooked part of the pre-history of Kant's Antinomy chapter.

45. Willaschek's convincing recent interpretation of the Transcendental Dialectic, as a "positive" account of the rational sources of metaphysics, abstracts from the historical context for Kant's claims (see footnote 9 above). Consequently, Willaschek makes no explicit judgement about the fate of traditional rational cosmology in and after Kant's critical philosophy. On Willaschek's reading, Kant considers human reasoners to inevitably arrive at the dialectical claims of the four antinomies. In this respect, rational cosmology is not simply demolished by Kant's critique in the Dialectic; Kant rather shows the necessity of the cosmological claims, which continue to be made in metaphysics and cosmology today (Willaschek 2018, pp. 215–6, 264). However, insofar as these claims result from the transition from reason's logical maxim to its constitutive supreme principle, they are ultimately illusory, and so it seems that Willaschek would still consider Kant to reject the metaphysical discipline of rational cosmology (Willaschek 2018, pp. 103–56; for a summary, see Howard 2020, pp. 252–3). My account here will briefly suggest, with reference to Ferrarin's contrasting interpretation, that there is a different positive result to Kant's engagement with special metaphysics, and particularly with rational cosmology, to the one reconstructed by Willaschek. This continues a line of argument begun in my review of Willaschek's book (Howard 2020).

However, I have also argued that although d'Alembert rejects cosmology as a metaphysical discipline, he positively appropriates central tenets of a broadly Leibnizian cosmology. His claim in the "Cosmologie" article that "tout est lié" reappears in his conception of the systematic organisation of knowledge in the "Éléments des sciences" article and the *Discours préliminaire*, and it underpins his conception of the task of the *Encyclopédie*. I have contended that there is a Leibnizian background to this aspect of d'Alembert's thought, and that his views on systematicity differ from his so-called rationalist predecessors only with regard to the proper approach to constructing the system of knowledge, not with regard to whether such a system is desirable.

Just as the negative aspects of d'Alembert's views of cosmology are echoed in Kant's critical thought, so too are the positive aspects. Kant can also be taken to have adopted the broadly cosmological conception of the world as an interconnected, unified chain as a fundamental presupposition of his philosophy: in this case, his critically renewed method for metaphysics. Limitations of space require me to draw on Alfredo Ferrarin's innovative analysis to develop this point. Ferrarin argues that Kant has a "cosmic conception of reason," by which he means that Kant conceives of reason as an interconnected, purposive unity that is oriented, via its ideas, towards its theoretical and practical ends (Ferrarin 2015, pp. 10–11). Ideas, insofar as they are "totalizing efforts," contribute to the systematicity of our cognition. The highest idea is the "idea of a system," which "represents the world as if it were a totality accessible to us" (Ferrarin 2015, p. 56). Ferrarin adds that the paradigm of an idea for Kant is the "world," which he glosses with reference to §13 of the *Dissertation* as the "universal connection of all things according to a principle in a *universitas* and *totum*" (Ferrarin 2015, p. 57). In this idea of the world-whole as an interconnected totality based on a principle, we can recognise the cosmological idea that is common to d'Alembert's and Wolff's otherwise very different philosophies. Whereas in the Wolffian tradition, such a definition of "world" is a starting point for a demonstrative, generally *a priori* cosmology, for d'Alembert and Kant alike this conception of world functions as a regulative idea for organising our cognition. But in their common employment of a cosmological conception, these thinkers can be considered to be pursuing various forms of post-Leibnizian philosophy.

The basic development of the tradition of Leibnizian cosmology that I have identified in d'Alembert's philosophy is, I suggest, also evident in Kant's *Critique*. While rejecting the specific content of metaphysical cosmology, Kant, like d'Alembert, presents the ideal system of knowledge as an interconnected whole towards which we should strive. Like Condillac and d'Alembert, Kant distinguishes between illegitimate and legitimate

uses of systematicity in philosophy. The scholastic concept (*Schulbegriff*) of philosophy is “a system of cognition that is sought only as a science without having as its end anything more than the systematic unity of this knowledge, thus the logical perfection (*Vollkommenheit*) of cognition” (A838/B866). Scholastic “artists of reason” like Wolff seek systems merely for their internal (“logical”) perfection (A/B A839/B867, AA 29:8). Kant here echoes Condillac’s critique of “abstract systematisers” and d’Alembert’s rejection of the *esprit de système*. Kant contrasts this inadequate recourse to systematicity with a desirable one, which he calls the cosmic concept (*Weltbegriff*) of philosophy.⁴⁶ Philosophy according to the cosmic concept seeks to systematically relate “all cognition to the essential ends of human reason,” that is, to reason’s speculative and practical ends (A839/B867; see Ferrarin 2015, pp. 81–2, 90). Kant’s conception of a desirable philosophical system is broader than Condillac’s and d’Alembert’s, but like his French predecessors he considers illegitimate and legitimate systems to be distinguished by their orientation: whether one is interested in systematicity for its own sake, or as a means to more perfect knowledge.

I have argued that, in d’Alembert’s references to the fully connected chain of nature and the universe as “a single fact and one great truth” for anyone who can approximate the divine perspective, we find a deep-seated Leibnizian influence on his conception of the sciences. The *mappemonde* represented by the *Système Figuré* of the *Encyclopédie* is an imperfect, human attempt to attain a divine perspective, which would comprehend all the connections between the branches of human knowledge in a single glance. Kant likewise indicates the cosmological provenance of his ideal of systematicity when referring to the object of prior cosmology, the world, in his notion of the cosmic concept (*Weltbegriff*) of philosophy. If the cosmic concept of philosophy is ultimately oriented towards reason’s final ends, namely wisdom and the highest good (see Ferrarin 2015, pp. 58–9, 90–103), then the ideal of systematicity that Kant affirms here is his version of the cosmological “elevated point of view” that d’Alembert seeks in the *Discours préliminaire*.

8. Conclusion

This paper has sought to demonstrate that the metaphysical discipline of cosmology is treated in negative and positive ways by both d’Alembert and Kant. Scholarship on both thinkers has tended to emphasise the negative sides, in line with the common interpretations of d’Alembert as a thoroughgoing sceptic and of Kant as the “all-destroying” critic of metaphysics. Contrary to these prevailing views, both thinkers, I have argued, despite

46. A838/B866. On the contested issue of how to translate *Weltbegriff*, see Ferrarin 2015, pp. 82–4.

certain differences in ambition discussed in section 6, do not merely attack metaphysical cosmology but rather innovatively repurpose cosmological notions for aims foreign to the prior tradition. The bulk of the paper has defended an interpretation of the importance of cosmology for d'Alembert's philosophy, which has implications for our understanding of his views on the Leibnizian ideas that were widely discussed in the 1740s and 1750s in France, and on systematicity. If I am correct that even d'Alembert, who is often taken to represent the most sceptical, anti-metaphysical pole of French Enlightenment thought, has a far more nuanced relationship to metaphysical cosmology, in a broadly Leibnizian mould, than is usually thought, then it should not be surprising that Kant's engagement with cosmology in the critical works is likewise no merely negative critique. Like d'Alembert, Kant rejects much of the specific content of prior metaphysical cosmology, whilst retaining the fundamental orientation towards systematicity provided by cosmological thought. Reading Kant in the light of d'Alembert's work serves to undermine the common view that the Antinomies result in a straightforward rejection of all aspects of the prior tradition of metaphysical cosmology.

Abbreviations

- AA: Kant, Immanuel. 1902–. *Gesammelte Schriften (Akademie-Ausgabe)*, I–XXIII is comprised of the first 23 volumes of the *Akademie-Ausgabe* (2nd edition). Berlin: Georg Reimer
- A/B: Kant, Immanuel. [1781] 1998. *Critique of Pure Reason*, ed. P. Guyer and A. W. Wood. Cambridge: Cambridge University Press.
- DP: D'Alembert, Jean Le Rond. 1751. "Discours Préliminaire." Cited according to the original pagination given in Martine Groult's edition (d'Alembert 2011. *Discours préliminaire de l'Encyclopédie et articles de l'Encyclopédie*. Paris: H. Champion). Also cited according to Richard Schwab's translation (d'Alembert, Jean Le Rond. 1963. *Preliminary Discourse to the Encyclopedia of Diderot*, trans. Richard Schwab. New York: Bobbs-Merrill); modifications of the latter are marked 't.m.'
- E: *Encyclopédie*, cited according to volume and page number. The articles "Cosmologie" and "Éléments des sciences" are in Groult's edition (d'Alembert 2011). There are translations of articles on the website of the University of Michigan's *Encyclopedia Collaborative Translation Project* (<https://quod.lib.umich.edu/d/did/>), but, at the time of writing, the "Cosmologie" translation at least is not adequately accurate, so all translations of articles from the *Encyclopédie* are my own.
- EdP: D'Alembert, Jean Le Rond. 1965. *Essai sur les Eléments de philosophie*, ed. Richard N. Schwab. Hildesheim: George Olms.

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