Chapter 3
Contingency and Causal Determinism from Scotus to Buridan

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In this paper, I intend to present the way in which contingency and causal determinism relate in some major late-medieval views on the metaphysics of causation. I will focus on Thomas Aquinas, John Duns Scotus, William of Ockham, and John Buridan. First, I will show that Scotus's new insights into the metaphysics of modalities had important consequences for the way contingency was related to causality: Ockham and Buridan do not consider contingency as a by-product of the necessary emanation of God any more but as a distinctive property of God as the first cause and, therefore, of the created world as a whole. Second, I will show that the growing interest from Scotus onward in explaining and justifying inductive reasoning led to an extensive analysis of the nature and function of the principle of the uniformity of nature. Third, I will explain why the progressive psychologization of final causes led to the exclusion of final explanations from physics. The consequence of this process is the development of a new way of conceiving chance and hazard, and the separation between free and natural agents. We can speak here of a tendentially mechanistic picture of the world.

3.1 Introduction

The nature and status of causality were a key topic in late medieval philosophy and theology.[1] The acceptance of invariable causal connections between certain phenomena lies at the heart of the medieval understanding of physics and metaphysics

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[1] There is no work of synthesis on medieval views on causation. See however the papers in C. Esposito and P. Porro (ed.), *La causalité/Die Kausalität/Causality*, *Quaestio* II (2002).

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and of central theological issues such as salvation and the sacraments. It also lies at the heart of the medieval theory of science, which is based on the Aristotelian principle that to know something is to know the cause of it.

In the fourteenth century, two shifts occurred in the conception of causality. First Scotus's reflections on modality inaugurated a new way of conceiving of the metaphysics of causation. Until Scotus, the standard view was that God caused the set of causes that exist in the real world, i.e., the so-called secondary causes, by means of a necessary process of emanation. On the contrary, Scotus perceived God as a free agent investigating the set of possibles and choosing the one that He will create. This shift had a major impact on the scholastic conception of efficient causality. For Scotus, contingency characterizes God's will, rather than the action of secondary causes as Aquinas has argued. Much debate has centered on this shift.[2] Scotus's reinterpretation of the metaphysics of modalities had important consequences for the reflection on the relation between causation and determinism, which is a central issue in late medieval philosophy and theology. It also led to an intense discussion about the respective contributions of the so-called secondary and primary causes in a causal process.

Second, from Scotus onward, a new interest emerges in the methodological problem of causality. How do we recognize a causal link and how do we test for a causal hypothesis? Some thinkers, the most famous being Nicholas of Autrecourt, began to ask whether causation is a purely epistemological category belonging solely to our description of experience.[3] This shift affected the way inductive reasoning was conceived, and it led to an extensive analysis of the nature and function of the principle of the uniformity of nature. It was accompanied by a thorough examination of the function of teleological explanations in natural philosophy.

The paper will be divided into three parts. First, I will show that Scotus's new insights into the metaphysics of modalities had important consequences for how contingency was related to causality: Ockham and Buridan do not consider contingency as the result of the emanation of God's causal power anymore but as a distinctive property of God as the first cause. Second, I will show that the growing interest from Scotus onward in explaining and justifying the mechanisms of induction led to

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See especially the bibliography by P. Porro and J. Schmutz, at the end of this issue, 669–698. For an overview of medieval theories of causation, see P. Porro, "Ursache/Wirkung (Patristik; Mittelalter)," in J. Ritter, K. Gründer, and G. Gabriel (ed.), *Historisches Wörterbuch der Philosophie* (Basel: Schwabe, 2001), vol. 384–389.

[2] Some commentators think that it is a necessary step in the development of modern science. There is a tradition coming from Pierre Duhem and continuing with E. Grant, "The Condemnation of 1277, God's Absolute Power, and Physical Thought in the Middle Ages," Viator 10 (1979), 211–244; A. Funkenstein, *Theology and the Scientific Imagination from the Middle Ages to the Seventeenth Century* (Princeton: Princeton University Press, 1986), 121–179.

[3] Nicholas of Autrecourt has sometimes been called a "medieval Hume." He claims that there is no evident cognition of a necessary relation between cause and effect and that what is perceived is only a relation of contiguity between two things. But he does not deny the reality of the relation of causality. The most recent account of Autrecourt's position on causality is C. Grellard, *Introduction*, in Nicolas d'Autrécourt, *Correspondance. Articles condamnés*, (Paris: Vrin, 2001), 56–65; *id.*, "Le statut de la causalité chez Nicolas d'Autrécourt," *Quaestio* 2 (2002), 267–289.

a new investigation into the methodological and epistemological aspects of the problem of causality. Some first principles were recognized as being causal, and the question was asked how they can be known. From Scotus onward, science is concerned with empirical facts. Third, I will explain why the progressive psychologization of final causes led to the exclusion of final explanations from physics. This has as a consequence a new way of conceiving chance and hazard and the separation between free and natural agents. We can speak here of a tendentially mechanistic picture of the world.[4]

3.2   Causation and Determinism

3.2.1   *The Threat of Necessitarianism*

Medieval philosophers and theologians of the Late Middle Ages, following Aristotle, state that the causal relation is a relation among things (primary or secondary qualities, sometimes substances), not among properties, states, or events. The causal relation is not external to things, as are the relations of conjunction, coincidence, and succession. Every effect is produced by its cause as internal to it. Medieval philosophers and theologians go further than Aristotle and explicitly argue that the link between cause and effect is necessary. Causal determinism is a key issue in Latin medieval discussions on causality.[5] The question was asked whether and how the relation between cause and effect is necessary. The question is inherited from Muslim philosophers of the time of classical Islam. Prominent figures in this debate are Avicenna, Ghazali, and the Mutakallimun.[6]

Bunge, p. xxiii

Bunge, p. xxiv

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[4]This does not imply that fourteenth-century natural philosophy led directly to the Scientific Revolution or to seventeenth-century mechanism. First, fourteenth-century natural philosophy was not a unique body of doctrines defended by all thinkers who commented on Aristotle's *Physics* in the Faculty of Arts. Second, the new insights on causality that I will discuss in this paper were conceived independently of other analyses in natural philosophy (concerning motion, matter, and forces), which are quite removed from the features standardly associated with mechanism. These analyses have led some historians of medieval science to speak of fourteenth-century natural philosophy as a "natural philosophy without nature." On this topic, see especially J. E. Murdoch, "The Analytical Character of Late Medieval Learning: Natural Philosophy without Nature," in L.D. Roberts (ed.), *Approaches to Nature in the Middle Ages: Papers of the Tenth Annual Conference of the Center for Medieval and Early Renaissance Studies* (Binghampton, N.Y.: State University of New York Press, 1982) 171–213.

[5]Determinism has been defined in many different ways. G. E. M. Anscombe, in her famous paper "Causality and Determination," in *Metaphysics and the Philosophy of Mind. The Collected Philosophical Papers of G.E.M. Anscombe* (Oxford*:* Basil Blackwell, 1981, 113) gives the following formula for determinism: "If an effect occurs in one case and a similar effect does not occur in an apparently similar case, there must be a relevant further difference."

[6]For a synthesis of the Mutakallimun's view on causation, see J. Marenbon, "The Medievals," in H. Beebee, C. Hitchock, and P. Menzies (ed.), *The Oxford Handbook of Causation* (Oxford: Oxford University Press, 2009), 40–53.

Also cited in Brock, p. 21 (see other parallels w. Brock indicated below, on pp. 32, 33 and 51)

Avicenna's view, often described as "necessitarian," is based on a special connection between causality and modalities.[7] Avicenna explains the idea of necessity in terms of causality. Avicenna believes that what exists is divided into two kinds: the necessary being in itself and the possible being in itself. By definition, a necessary being in itself has no cause.[8] By contrast, anything that is possible in itself exists in virtue of being caused by something else.[9] Avicenna shows that there can be only one being that is necessary in itself. All other beings exist because of it.

For this model of causality to be operative, Avicenna distinguishes two notions of efficient cause: an efficient cause productive of motion (physical, corresponding to Aristotle's efficient cause as it appears in the *Physics*) and an efficient cause productive of being (metaphysical).[10] By so doing, Avicenna incorporates divine causality into Aristotle's account of the four causes.[11] Avicenna drew other distinctions that are recurring characters in later accounts of divine efficient causality: the distinction between accidental and essential causes of being and between helping and essential causes of being. They figure in several late medieval arguments for God's existence and for the common theological claim that God maintains all things in being.[12]

Avicenna seems to endorse necessitarianism.[13] However, he weakens it by saying that, while the action of causes is always necessary, the production of effects may

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[7] See E. Marmura, "The Metaphysics of Efficient Causality in Avicenna," in E. Marmura (ed.), *Islamic Theology and Philosophy. Studies in Honor of George F. Hourani* (Albany: SUNY Press, 1984) 172–187. See also K. Richardson, "Avicenna's Conception of the Efficient Cause," *British Journal for the History of Philosophy* 21:2 (2013), 220–239. For a synthesis, see K. Richardson, "Efficient Causation from Ibn Sīnā to Ockham" in T. Schmaltz (ed.), *Oxford Philosophical Concepts: Efficient Causation* (Oxford: Oxford University Press, 2014), 105–131.

[8] Avicenna, *The Metaphysics of the Healing*, transl. M. Marmura, 1.6.2-6. [now abridged in *Met*.].

[9] Avicenna, *Met*. 4.1.8-11: "Hence, with the existence of the cause, the existence of every effect is necessary; and the existence of its cause necessitates the existence of the effect."

[10] Avicenna, *Met*. 6.1.2: "Metaphysical philosophers do not mean by 'efficient cause' only the principle of motion, as the naturalists mean, but the principle and giver of existence, as in the case of God with respect to the world. As for the natural efficient cause, it does not bestow any existence other than motion in one of the forms of motion. Thus, in the natural sciences, that which bestows existence is a principle of motion."

[11] The importance of this account of efficient causality for late medieval philosophy was highlighted by Etienne Gilson. See E. Gilson, "Avicenne et les origines de la notion de cause efficiente," in *Atti del XII Congresso Internazionale di Filosofia* IX (Firenze: Sansoni, Firenze) 1961, 121–130; E. Gilson, "Notes pour l'histoire de la cause efficiente," *Archives d'histoire doctrinale et littéraire du Moyen Âge* 37 (1962), 7–31.

[12] See S. Menn, "Metaphysics: God and Being," in McGrade (ed.), *The Cambridge Companion to Medieval Philosophy* (Cambridge: Cambridge University Press, 2003), 147–170, for some aspects of Avicenna's influence on later proofs for God's existence, both in the Islamic world and in the Christian West. T.A. Druart, "Avicenna's Influence on Duns Scotus's Proof for the Existence of God in the *Lectura*," in J. Janssens (ed.), *Avicenna and his Heritage* (Leuven: Leuven University Press) 2002, 253–266, traces the similarities between Scotus's distinction between essentially and accidentally ordered series of causes (see below for this concept) and Avicenna's discussion of essential and accidental causes of being.

[13] Avicenna, *Met*. 4.1.10-11: "The effect would then proceed necessarily, regardless of whether [the differentiating state] is an act of will, appetite, or anger, or something originated, natural or other-

be considered in different ways. Each effect is necessary with respect to its cause, but it is contingent in itself, given that it can be prevented from coming into existence by impediments. This idea had a major influence on Latin thinkers in the thirteenth and fourteenth centuries, according to whom the relation between cause and effect is necessary, but can only conditionally be realized.

Ghazali was a strong opponent of the Avicennian doctrine which, he believes, rules out the possibility or miracles.[14] His discussion of causality in Problem 17 of the *Tahafut al-Falasifah* (*The Incoherence of the Philosophers*) finds its starting point is his determination to preserve the possibility of divine interventions.[15] Ghazali claims that there is no absolute necessity: God could have chosen to create and maintain some other order of things.[16] Moreover, a miracle is always possible. Ghazali is also opposed to Avicenna's view that God and the world are coeternal. In his defense of creation in time, Ghazali lays the ground for the view that God's self-determining will is the source of contingency in the natural world.[17] Ghazali's critique of Avicennian necessitarianism had a major influence on Latin medieval philosophy. Late medieval thinkers tend to agree with Ghazali that when cotton is in contact with fire and all conditions required for cotton to burn are met, God could nevertheless prevent the burning.[18] Ash'arite occasionalism goes into the same direction. Its doctrine was accessible through the critical account given of it by the Jewish philosopher Maimonides in his *Guide for the Perplexed*.[19] Against occasion-

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wise, or some external thing. […] Hence, with the existence of the cause, the existence of every effect is necessary; and the existence of its cause necessitates the existence of the effect." For a study of the debate between Averroes and Avicenna on that subject, see especially C. Belo, *Chance and Determinism in Avicenna and Averroes* (Leiden: Brill, 2007); B. S. Kogan, *Averroes and the Metaphysics of Causation* (Albany, NY: State University of New York Press, 1985).

[14] Ghazali was not the first to attack necessitarianism. In the ninth and tenth centuries, a theological reaction emerged against the rationalism and deterministic elements of ancient Greek philosophy. The Mutakallimun rejected the view that nature is eternal and subject to causal determinism. They developed a metaphysics grounded on atomism and emphasizing divine omnipotence. All natural events are caused directly by God, the only being with real causal efficacy. For the impact of this theological movement on the Latin West, see especially W. Courtenay, "The Critique of Natural Causality in the Mutakallimun and Nominalism," *Harvard Theological Review* 66 (1973), 77–94.

[15] Ghazali, *The Incoherence of the Philosophers*, Problem 17, "Refutation of Their Belief in the Impossibility of a Departure from the Natural Course of Events."

[16] Ghazali provides several other arguments to undermine the view that natural things have active power. From observed concomitance, one cannot derive the existence of a relation of causality (*Tahafut* 7.5). He also claims that bodies lack features needed to ground active powers (*Tahafut* 7.5). Ghazali's arguments have given rise to contrasting interpretations. See especially S. Nadler's controversial paper "No Necessary Connection: The Medieval Roots of the Occasionalist Roots of Hume," *The Monist* 79:3 (1996), 448–466.

[17] Ghazali, *Tahafut*, 1.46.

[18] See, for instance, Scotus, Ord. I, d. 8, pars 2, q. unica, n. 306 (ed. Vat. 4), 328: "[…] as fire, in itself, cannot not heat, yet it can absolutely not heat if God does not co-operate with it."

[19] Islamic occasionalism seems to have emerged when the theologians of the Ash'arite school of kalām (Islamic doctrinal theology) began to consider the implications of the integration of Aristotelianism and Neo-Platonism that occurred within the Islamic intellectual world in the tenth and eleventh centuries. See P. Adamson, P. & R.C. Taylor, (eds.), *The Cambridge Companion to*

alism but also necessitarianism, a standard position prevailed in the Latin West, according to which causes necessitate their effects, but only conditionally.[20] Roughly speaking, this means that a cause C is a necessitating cause of an effect E when, if C occurs, E necessarily follows unless something prevents it.

Let us consider Aquinas's position in order to gain a more precise understanding of the state of the question at the end of the thirteenth century.[21] Aquinas uses the two concepts of primary cause and secondary cause to explain God's relation to the causality of created beings. The central question is how God contributes to natural causal processes. Unlike Avicenna, Aquinas makes a distinction between causation and creation.[22] He rejects Avicenna's idea that God is the first cause in a chain of causation in which a being at an upper level brings about a being at a lower level by necessity. God is a free agent who is in no way necessitated to create the way he does. Moreover, God is omnipotent, i.e., able to bring about whatever is possible absolutely.[23] Natural causal processes involve both divine and created causes cooperating. More precisely, God cooperates with the so-called secondary causes as an immediate cause: "God is within each created thing as a co-cause alongside the created power."[24] However, Aquinas holds against the occasionalists that, though all natural causal processes involve the operation of the divine will, secondary causes do have the power to bring about natural effects. Here Aquinas offers a view that Dominik Perler and Ulrich Rudolph, in their study of medieval and early modern occasionalism, have labelled "causal compatibilism."[25] After Aquinas, the

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Arabic Philosophy (Cambridge: Cambridge University Press) 2005, 4–6. Among these Islamic occasionalists, al-Ash'ari (873–935), the founder of Ash'arite school, appears to have been particularly influential. See F. Griffel, "Al-Ghazālī," *The Stanford Encyclopedia of Philosophy* (Fall 2007 Edition), Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/fall2007/entries/al-ghazali/>

[20] Aquinas's view on causality is the only view from the Latin Middle Ages that has been the object of extensive study. For more references on Aquinas's view on causality, see S. L. Brock, "Causality and Necessity in Thomas Aquinas," *Quaestio* 2 (2002), 217–240.

[21] Aquinas includes his criticisms of occasionalism in a chapter of his *Summa Contra Gentiles* entitled "Against those who deprive natural things of the actions that belong to them." See Aquinas, Summa Contra Gentiles III, 9 [abridged in SCG]. For an analysis of this text, see D. Perler and U. Rudolph, *Occasionalismus. Theorien der Kausalität im arabisch-islamischen und im europäischen Denken* (Göttigen: Vandenhoeck& Ruprecht, 2000), 131–145. Except for the commentary on Aristotle's *Metaphysics*, all Aquinas' works have appeared in the critical Leonine edition, which is the one that I shall cite: *Sancti Thomae Aquinatis doctoris angelici Opera omnia iussu Leonis XIII P.M. edita, cura et studio fratrumpraedicatorum, ex typographiapolyglotta et al.* (Romae, 1882ss).

[22] Aquinas, *De potentia*, q. 3, a. 4. Creation is defined in *Summa Theologiae* [abridged in ST] I, q. 45, a. 1 as the "emanation of the whole of what exists from the universal cause."

[23] Aquinas, *ST* I, q. 25, a. 3, c; *Sent.* d. 42, q. 2, a. 2.

[24] Aquinas, *De Potentia*, q. 3, a. 8, ad. 1 & ad 2; ST I, q. 105, a. 5 and ad. 3.

[25] See Perler and Rudolph, 2000, 154. Durandus of Saint Pourçain later protested that Thomas's response to the occasionalists deprives creatures of their causal power. He claimed that occasionalism can be refuted only if God's contribution to natural causal processes is restricted to the creation and conservation of secondary causes. Durandus's "mere conservationism," as Freddoso has called it, was widely rejected in later scholasticism. For the references, see the following note.

co-operation between first and secondary causes in a causal process became a major issue in late medieval debates on the nature of causation.[26]

In answer to both occasionalism and necessitarianism, Aquinas defends a kind of providential determinism. Effects in the created world are contingent relatively to the first cause[27] but necessary relatively to their causes. More precisely, in natural things, the necessity is twofold. First, there is the necessity derived from the form of the things, which determines their end. Thus, given the efficient cause, "the natural thing necessarily tends to its end in accordance with the power of its form."[28] As a result, "every agent which acts by natural necessity is determined to one effect."[29] Following Aristotle, Aquinas mentions "gravity" as an example of formal causality, and not as an instance of efficient causality.[30] Second, there is a necessity that Aquinas calls "natural."[31] It accounts for the uniform behavior of natural things.[32] By saying that "all natural things happen in the same way," Aquinas means that natural causal processes are regulated by a kind of principle of uniformity, according to which things belonging to the same kind act similarly in similar circumstances.[33] By relating efficient causality to natural necessity, Aquinas holds a view representative of thirteenth-century conceptions of causality.[34]

Porro 2013, p. 113

Hulswit, p. 12, 13, 14, 15

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[26] For more on this subject, see the classic papers by A. Freddoso, "Medieval Aristotelianism and the Case against Secondary Causation in Nature," in T. V. Morris (ed.), *Divine and Human Action. Essays in the Metaphysics of Theism* (Ithaca-London: Cornell University Press, 1988), 75–118; *id*., "God's General Concurrence with Secondary Causes: Why Conservation is not Enough," *Philosophical Perspectives* 5 (1991), 553–585; id., "God's General Concurrence with Secondary Causes: Pitfalls and Prospects," *American Catholic Philosophical Quarterly* 68 (1994), 131–156.

[27] Aquinas, *In XII libros Metaphysicorum expositio*, lib. V, lect. 1, §749 and lect. 6, §827: "a cause is that from which something else necessarily follows." [abridged in Met.]

Brock, p. 220, n. 11

[28] Aquinas, *SCG* II, 42, 5.

[29] Aquinas, *SCG* II, 23.2. See especially *SCG* II, 30 for how absolute necessity arises in creation.

Frost, p. 28

[30] Aquinas, *SCG* II, 30, 15.

[31] The notion of natural necessity is defined as follows in *ST* III.14.2 co.: "Another necessity, moreover, is natural necessity, which follows from the principles of nature, as for example it is necessary for fire to heat from its form." Only the necessity that arises from material causes, efficient causes, and formal causes is called "natural." Aquinas distinguishes between *necessitas absoluta ex causa priori*, which depends on material, formal, and efficient causes, and *necessitas ex conditione vel suppositione ex causa posteriori*, which depends on final cause. For this distinction, see *In Phys.* II, lect. 15, n. 270 and P. Porro's paper, "*Lex necessitatis vel contingentiae*. Necessità, contingenza e provvidenza nell'universo di Tommaso d'Aquino," *Revue des Sciences Philosophiques et Théologiques* 96 (2002), 401–450.

Frost, p. 22

Porro 2012, p. 405, n. 8 [Translated into English from Italian]

[32] Aquinas, *SCG* II, 23.2: "[…] the power of every agent which acts by natural necessity is determined to one effect; that is why all natural things happen in the same way, unless there be an obstacle; while voluntary things do not."

Hulswit, p. 15

[33] In *Met*. VI, lect. 3, Aquinas explains that Avicenna's determinist view is right, if the condition "unless there is an obstacle" is added. See the previous note and *Met*. VI, lect. 3.

[34] On the debate about the idea of a necessary relation between cause and effect from Siger of Brabant and Aquinas to Scotus, see P. Porro, "Contingenza e impedibilità delle cause. Presupposti e implicazioni di un dibattito scolastico," *Rivista di storiadellafilosofia* 68 (2013), 113–147.

Aquinas's metaphysics of causation is based on a metaphysics of modalities that depends on God.[35] Aquinas defines contingency and differentiates it from necessity when he answers the question whether God's will makes the things that He wills necessary. He claims that God wills that some things be done necessarily and others contingently. Things are necessary if they have unfailing causes, while things are contingent if they have fallible causes.[36] Causes are contingent if they are indeterminate with regard to their outcome.

To summarize Aquinas's picture of modality, we can say that it is because of differences in causal efficacy that the two kinds of possible being, i.e., necessary beings and contingent beings, arise. Necessary causes always produce their effects, whereas contingent causes are fallible and indeterminate with regard to their outcomes. In the natural world. Contingency arises because a particular contingent cause may have more than one outcome.[37] However, the outcomes that result are those that God intends as part of his ordered design.[38]

Aquinas thus claims that God's direct causal activity in creating and sustaining the world functions perfectly, and thus necessarily and not contingently.

3.2.2 New Directions in Causation and Modal Theories

Aquinas' conclusion was inacceptable to Scotus and other Franciscan thinkers. Scotus is famous for his modal theory, which he elaborates against the Thomist model based on the Aristotelian idea that contingency arises at the level of secondary proximate causes through a failure in causal efficacy. In his modal theory, Scotus puts an emphasis on logical possibility and impossibility. His main aim is to defend the claim that contingency and logical possibility must both characterize God's will.[39] In order to account for contingency, Scotus argues, the first cause must itself

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[35] On this subject, see especially *Sent.* I, d. 43, q. 2. For an analysis, see J.F. Wippel's paper, "Divine Knowledge, Divine Power and Human Freedom in Thomas Aquinas and Henry of Ghent," in T. Rudavsky (ed.), *Divine Omniscience and Omnipotence in Medieval Philosophy* (Dordrecht: Reidel, 1985), 213–41.

[36] See especially *Expositio libri Peryermeneias,* I, 14, Leon., ed., 78–79, l. 437–461. This is dependent on Aquinas's famous doctrine of "triplex gradus causarum" (*Met.* VI, 3), according to which there is one cause that is immutable and incorruptible (God), there are causes that are mutable and incorruptible (the celestial bodies), and there are causes that are mutable and corruptible.

[37] See especially *SCG* III, 92, n. 2668.

[38] The central text on this subject is *Met.* VI, lect. 3, n. 1216.

[39] For an overview, see S. Knuuttila, "Modal Logic," in N. Kretzmann, A. Kenny, J. Pinborg (ed.), *The Cambridge History of Later Medieval Philosophy* (Cambridge: Cambridge University Press, 1982), 342–382. The reference work on the subject is H. Goodenough Gelber, *It Could Have Been Otherwise. Contingency and Necessity in Dominican Theology at Oxford, 1300–1350* (Leiden-Boston: Brill, 2004). For Scotus, see 152 ff. See also the classic study by C. Normore, "Scotus, Modality, Instants of Nature and the Contingency of the Present"; in L. Honnefelder, R Wood and M. Dreyer (ed.), *John Duns Scotus, Metaphysics and Ethics* (Leiden-New York, Köln: Brill, 1996), 161–174.

Gelber, p. 117

Gelber, p. 119

Gelber, p. 120

Gelber, p. 113

Gelber, p. 152

Gelber, p. 128

Gelber, n. 12, p. 114

be contingent.[40] Contingency could not arise at the level of secondary causes unless contingent first causes caused them. In other words, contingency arises directly in the divine will. To make his point, Scotus develops a theory of the will as a simultaneous capacity for opposites.[41] He defines contingency as the logical possibility of something being the case and not being the case at some indexed moment of time. To confirm his point, Scotus appeals to our experience of free choice.[42]

Scotus's reassessment of the relations between causality and modality is central. Since it is always possible for God to break a causal chain, the created causal order as a whole is contingent.[43] Thus, all natural causality is at most necessary *secundum quid*. *Secundum quid* necessity is a kind of logical possibility, since it is always possible for God to do the opposite of what He does at an instant. This view was the dominant one in Oxford in the early fourteenth century.[44]

This new modal theory is at the heart of Scotus's cosmological argument for God as a first cause. Scotus's distinctive contribution to this argument was an analysis of essentially ordered causes.[45] Scotus defined essentially ordered causes as a series of simulta-

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[40] On this subject, see especially M. Sylwanowicz, *Contingent Causality and the Foundations of Duns Scotus' Metaphysics*, (Leiden – Köln – New York: Brill, 1996).

[41] Scotus, *De primo principio*, 4.15, transl. Wolter, 83: "Likewise, something causes contingently. Therefore the first cause causes contingently; consequently it causes voluntarily. Proof of the first implication: Every secondary cause causes insofar as it is moved by the first cause. If the first cause moves necessarily, then every other cause is moved necessarily and everything is necessarily caused. Proof of the second implication: The only source of contingent action is either the will or something accompanied by the will. Every other cause acts by a necessity of its nature and consequently not contingently."

[42] See *Ord* I, d. 38, p. 2 and d. 39, q. 1–5, n. 13–16, Vat. ed. VI, 414–419. Distinction 39 of the first book of the Lectura has been translated into English. See John Duns Scotus, *Contingency and Freedom. Lectura I 39* trans. with commentary Vos, A Jaczn, A. Veldhuis, A. H. Looman-Graaskamp, E. Dekker, and N. W. den Bok (Dordrecht: Kluwer, 1994).

[43] Scotus, *Ord*, I, d. 8, pars 2, q. unica, transl. Gelber, "It Could Have Been Otherwise," 137: "there is no simply necessary natural connection of cause and effect in creatures, nor does any secondary cause cause simply naturally or simply necessarily, but only under a condition [*secundum quid*]. The first statement is apparent because every effect depends on the first cause. Similarly, no second cause causes its effect unless the first cause acts causally with it, and this happens naturally before the proximate cause causes. The first cause only causes contingently, however, therefore the second cause causes simply contingently, because it depends on the causal action of the first, which is simply contingent. The second statement, concerning *secundum quid* necessity, is evident because many natural causes cannot in themselves not cause their effects, and therefore there is necessity *secundum quid*, in regard to them, and not simply: as fire, in itself, cannot not heat, yet it can absolutely not heat if God does not co-operate with it, as is evident, and as appeared in the case of the three boys in the furnace."

[44] This topic was treated in relation with future contingents. For an overview of the relation between modalities and future contingents, see C. Normore, "Future Contingents," in N. Kretzmann, A. Kenny, J. Pinborg (ed.), *The Cambridge History of Later Medieval Philosophy* (Cambridge: Cambridge University Press, 1982), 367–369; *id*. "Divine Omniscience, Omnipotence and Future Contingents: An Overview," in T. Rudavsky (ed.), *Divine Omniscience and Omnipotence in Medieval Philosophy* (Dordrecht: Reidel, 1985), 3–22.

[45] For an introduction to Scotus's proof, see T. O'Connor, "Scotus on the Existence of a First Efficient Cause," *Philosophy of Religion* 33 (1993), 17–32.

neously concurring causes, which belong to different species, where prior causes are more perfect than posterior causes and posterior causes depend on prior causes. Scotus contrasts essentially ordered causes with accidentally ordered causes, such as a series of fathers and sons.[46] The main question is whether there is a first cause, i.e., a cause which is prior to any other cause.[47] Scotus argues that an infinite regress is possible in accidentally ordered series of efficient causes. In such a series, members exercise their causality successively and independently from one another. An example of it is the series of fathers and sons. By contrast, an infinite regress is not possible in essentially ordered series of efficient causes: essentially ordered causes act simultaneously, and they depend on one another in causing. An example of essentially ordered causes is the matter and the forms of a composite substance. If essentially ordered causes were infinite, a created actual infinite would exist, which is unacceptable. In a word, the totality of an infinite series of accidentally ordered causes requires a cause of its coming into existence, and this cause is nothing other than the first cause, i.e., God.

In his argument for the existence of God, Scotus understands the causal influence exerted by a superior cause on an inferior one as transmitted efficacy.[48] By saying

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[46] Scotus provides three criteria for distinguishing essentially ordered causes from accidentally ordered causes. Cf. Scotus, *De primo principio*, transl. Wolter, 47: "Per se or essentially ordered causes differ from accidentally ordered causes in three respects. The first difference is that in essentially ordered causes; the second depends upon the first precisely in the act of causing. In accidentally ordered causes this is not the case, although the second may depend upon the first for its existence or in some other way. The second difference is that in essentially ordered causes the causality is of another nature and order, inasmuch as the higher cause is the more perfect, which is not the case with accidentally ordered causes. This second difference is a consequence of the first, since no cause in the exercise of its causality is essentially dependent upon a cause of the same nature as itself, for to produce anything one cause of a given kind suffices. A third difference follows, viz. That all essentially ordered causes are simultaneously required to cause the effect, for otherwise some causality essential to the effect would be wanting. In accidentally ordered causes this simultaneity is not required." (See also *Ord*, I, d. 2, pars 1, q. 1–2, num. 48–51, Vat. ed. II, p. 154–155.) For an analysis of this distinction, see J. C. Flores, "Accidental and Essential Causality in John Duns Scotus' Treatise *On the First Principle*," *Rercherches de Théologie et de Philosophie Médiévale* 67 (2000), 96–113.

[47] Scotus, *De primo principio*, transl. Wolter, 49: "A son may beget a child just as well whether his father be dead or alive. But an infinite succession of such causes is impossible unless it exists in virtue of some nature of infinite duration from which the whole succession and every part thereof depends. For no change of form is perpetuated save in virtue of something permanent which is not part of that succession, since everything of this succession which is in flux is of the same nature. Something essentially prior to the series, then exists, for everything that is part of the succession depends upon it, and this dependence is of a different order from that by which it depends upon the immediately preceding cause where the latter is a part of the succession." For an analysis of causation in the *De primo Principio*, see especially F.-X. Putallaz, "Efficience et finalité dans le *Traité du premier principe* de Jean Duns Scot," *Revue de théologie et de philosophie* 116 (1984), 131–146.

[48] Scotus, *Ord*. IV, d. 1, q. 1, n. 34, ed. Wadding VIII, 55, my transl.: "The influence, here, is the determinate order that holds between these causes when they produces a common effect." See also Scotus, *Ord*. IV, d. 12, q. 3, n. 5, ed. Wadding VIII, 741: "The influence that an inferior agent receives from a superior agent is not a form thus caused, but is only the determinate order that holds between the causes when they cause together."

this, Scotus opposes Aquinas, who claims that posterior causes are merely moved by prior causes. This influence is not an accident, an entity or something physical such as energy transfer; it is nothing other than a determinate order of causes working together to produce the effect.[49] It is thus a metaphysical notion which is distinct from the physical notion of power or disposition. The relationship between first and second causes was at the heart of the debate on the nature of causality, as it appeared in Ockham, to whom I now turn.

3.2.3   Ockham's Criticism of Scotus

The reception of Scotus's ground-breaking views on causality and contingency was shaped by Ockham's criticism.[50] Ockham does not reject Scotus's cosmological proof for the existence of God; he merely argues that the first cause need not be outside the series of essentially ordered causes itself.[51] Another important criticism regards the shape of God's cooperation in any causal process. Indeed, the heart of his criticism is dedicated to defending against Scotus God's immediate causal contribution in every natural causal process.[52]

Ockham made an important contribution to the discussion over Scotus's doctrine by asking what essentially ordered causes are.[53] What is at stake is the causal contribution of essentially ordered causes.[54] Can they be considered as partial causes together with accidentally ordered causes of the same effect[55]? Scotus' first defenders, with thinkers such as Antonius Andreas, do not, like some later Scotists, equate essentially ordered causes with partial causes. They contend that an effect has a total cause in both the essentially ordered series of causes and the accidentally ordered series of causes. Indeed, there may be more than one total cause of a given effect,

Wood, p. 29

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[49] Scotus, *De primo principio*, 3.11, transl. Wolter 46–47.

[50] My account is dependent on R. Wood, "Ockham on Essentially Ordered Causes: Logic Misapplied," in W. Vossenkuhl and R. Schoenberger (ed.), *Die Gegenwart Ockhams* (Weinheim: VCH Actahumaniora, 1990), 25–50.

[51] Ockham, *Quaest. Phys.* 135, OPh VI, 766–767, transl. Adams, "Was Ockham a Humean?", 46: "the whole multitude [of both essentially ordered and accidentally ordered causes] is caused. But it is not caused by any one thing that is part of the multitude. Rather one is caused by one member and another by another and so on to infinity. Nor can the opposite be adequately proved from production. And in that case, it does not follow that one and the same thing is a cause of itself, since no one thing is the cause of everything."

NB: Not Adams', but Boehner's transl., see Adams 1979, n. 132, p. 46

[52] Ockham, *Rep*. II, q. 3–4, OTh V, 62, my transl: "God is the immediate cause of any effect. God is the first cause by a primacy of perfection and unlimitedness, but not by a primacy of duration, because at the same instant when God acts, the secondary cause acts too."

[53] Ockham offers three alternative interpretations of the dependency criterion in *Ord*, d. 2, q. 10, OTh II, 347–354.

Wood, pp 26, 41, 44

[54] For an example of a reading of Scotus's view in the Scottish school, see G. J. Etzkorn, "John Reading on the Existence and Unicity of God, Efficient and Final Causality," *Franciscan Studies* 26 (1964), 287–301.

[55] Ockham, *Quaest. Phys*. 132–133, OPh VI, 754–759.

provided that the causes belong to different orders. Ockham cannot make sense of this idea: either Scotus accepts the possibility for an overdetermination of causes or not, but he cannot accept ad hoc distinctions. After Ockham, there was a strong tendency to view essentially ordered causes as partial causes, not as hierarchically related inferior and superior causes.

In answer, Ockham contends that all genuine efficient causes are immediate causes. Only something which directly produces an effect is a true cause.[56] A remote cause is a cause in an improper sense.[57] God is not only a partial cause of the effects that he produces by means of secondary causes but also the principal cause.[58] In other words, God is an immediate partial cause of each and every effect, while the created cause is also an immediate partial cause of the same effect.[59]

This has important consequences for the conception of God as a causal agent. Ockham disagrees with Scotus on how to understand the conditional necessity between a cause and its effect. What is at stake here is the concept of contingency and how to relate it to the possibility for an effect to have been caused by another cause than the one that actually caused it. Ockham denies "that the same effect can be produced by two natural causes" acting simultaneously, when the causes are each a total cause of the effect. He contends that "every naturally producible effect by its very nature determines itself to be produced by one efficient cause and not another."[60] The relation between an effect and its total natural cause is necessary in such a way that it cannot have been caused by another cause than the one that caused it de facto. Once an effect has been produced, it cannot have been otherwise, even by God's absolute power.

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[56] Ockham, *Ord*, d, 45, q. un., OTh IV, 665 (my transl.): "Every cause properly speaking is an immediate cause. For that which is such that, whether or not it is posited, the effect follows in the nature of things and when it is posited and everything else is left aside, the effect does not follow, cannot be shown to be a cause."

[57] Ockham, *Rep*. II, q. 3–4, OTh V, 61 (my transl.): "A remote cause is not a cause because the effect does not attend its presence. Otherwise Adam could be said to be a cause of me, which is not true, since what is not a being cannot be a cause of being."

[58] Ockham, *Rep*. II, q. 3–4, OTh V, 60–63. Osborne 1994, n. 16, p. 240

[59] Ockham, *Rep*. II, q. 3–4, OTh V, 66; *Quaest. Phys*. 132 and 133 OPh VI, 756–758. Adams 2013, n. 105, p. 22

[60] Ockham, *Rep*. II, q. 12–13, OTh V, 288–289 (my transl.): "Every naturally producible effect by its very nature determines itself to be produced by one efficient cause and not another, just as it determines itself to be produced in one matter and not another. For if this were so, it follows that the same effect would be produced in different matters by different agents, which is impossible. The assumption is clear: suppose there were two agents, say two equally intense heats and two equally disposed matters of the same kind, and just as close to one as to the other in every respect, and this at the same instant. This is indeed possible. Then, according to your claim – that the heat to be produced does not determine itself to be produced by either of these agents – the heat will either at one and the same time be produced in the two matters by both agents, or neither will produce the heat. For each is a natural agent close to the patient, and there is no obstacle. Given that the effect is no more determined to one than to the other, and each matter is equally close to both, either the same effect will be produced by each agent in each matter or in none. Each consequence is awkward. Therefore, it is necessary that an effect determine itself to one agent of the same kind and not to the other in such a way that it can be produced by one and not by the other."

It is in this context that the status of the famous distinction between God's absolute power and God's ordained power can be understood. God's absolute power designates His power to do whatever does not include a contradiction, while His ordained power designates His contribution following the order that He established during the creation of the world.[61] The dialectic between the two aspects of divine power came to play a central role in philosophy and theology after the condemnations of 1277.[62] In a classic study, William Courtenay explains that two interpretations of God's absolute power existed at the beginning of the fourteenth century[63]: the traditional interpretation following the theological tradition, which treated God's absolute power as what He could have done otherwise, and the juridical interpretation of the canonists and adopted by philosophers such as Scotus, according to which God's absolute power is what He can still do otherwise.[64] On the first view, God's absolute power describes only what could have been otherwise, while on the second view, God's absolute power is a form of direct action in the world.

Both Scotus and Ockham follow the first view and hold that God's absolute power is to be understood in counterfactual terms, which means that God is not bound to follow the laws that He created.[65] For both Scotus and Ockham, God's absolute power only works in conjunction with His ordained power, never separately as an independent mode of action in the world. The relevant difference between Scotus and Ockham does not depend on their understanding of the distinction between the two powers of God but on the way to define the respective contributions of first and second causes in any causal process.

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[61] For a good overview, see Gelber, *It could have been otherwise*, 306–307.

[62] On this subject, see W. J. Courtenay, "The Dialectic of Omnipotence in the High and Late Middle Ages," in T. Rudavsky (ed.), *Divine Omniscience and Omnipotence in Medieval Philosophy* (London: Dordrecht, 1984b), 247. In that year, the bishop of Paris, Etienne Tempier, condemned 219 propositions that various members of the philosophical community at the University of Paris had espoused. See R. Hissette, *Enquête sur les 219 articles condamnés à Paris le 7 mars 1277* (Louvain-Paris: Publications Universitaires-Vander-Oyez, 1977). The classic study on God's absolute and ordained power is E. Randi, *Il sovrano e l'orologiaio. Due immagini di Dio nel dibattito sulla potentia absoluta fra XIII e XIV secolo* (Firenze: La nuova Italia, 1987).

[63] W. J. Courtenay, *Capacity and Volition. A History of the Distinction of Absolute and Ordained Power* (Bergamo: Lubrina, 1990), 102.

[64] Scotus, *Ord*, d. 44, q. un., Vat. ed. VI, 363.

[65] Ockham, *Quodl*. VI, q. 1, trans. Freddoso-Kelley, 491–492: "God is able to do certain things by his ordained power and certain things by his absolute power. This distinction should not be understood to mean that in God there are really two powers, one of which is ordained and the other of which is absolute. For with respect to things outside himself there is in God a single power, which in every way is God himself. Nor should the distinction be understood to mean that God is able to do certain things ordinately and certain things absolutely and not ordinately. For God can do anything inordinately. Instead, the distinction should be understood to mean that 'power to do something' is sometimes taken as 'power to do something in accordance with the laws that have been ordained and instituted by God,' and God is said to be able to do these things by his ordained power. In an alternative sense, 'power' is taken as 'power to do anything that its being does not involve a contradiction,' regardless of whether or not God has ordained that he will do it."

The question is then whether God has motivations to substitute one cause for another by means of His absolute power. This question had a major impact on the epistemological aspect of medieval theories of causation, which is the topic of the second part of this paper.

3.3 Causality and Induction

3.3.1 Knowledge of Causal Principles

At the beginning of the fourteenth century, Scotus elaborated the philosophical apparatus for defending the non-Aristotelian idea that there can be scientific knowledge of contingent objects, which resulted in a shift in the way of conceiving the first principles of science.[66] Aristotle claims that we come to know indemonstrable principles through induction.[67] The indemonstrable principles about which he speaks in the *Posterior Analytics* seem to be restricted to mathematical and metaphysical truths. From Scotus onward, it is emphasized that some of the so-called first principles are causal in nature, such as "fire causes heat" and "a certain herb results in the reduction of fever." These are the principles known through induction. They are often opposed to the principles known per se, such as "a whole is greater than its part" or the principle of contradiction. This classification no longer corresponds to the standard Aristotelian division of first principles of science into two groups, namely theses and axioms.[68]

The starting point of this development is Scotus's treatment of the problem of skepticism that he found in his predecessor Henry of Ghent. Against Henry, he argues that evident knowledge can derive directly from experience through induction.[69] What is at stake is finding a method to be applied to the discovery of the effect

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[66] This shift is highlighted by Anneliese Maier, who claims that one of the most significant results of fourteenth-century natural philosophy is the ongoing discussion of induction as scientific method as such and the quest for proving that it can be the basis of evident knowledge. See A. Maier, "Das Problem der Evidenz in der Philosophie des 14. Jahrhunderts," in *ead.*, *Ausgehendes Mittelalter* (Rome: Edizioni di Storia e Letteratura, 1967), vol. II, 367–418.

[67] Aristotle, *Analytics Posterior* II, 19.

[68] Aristotle, *A. Post.* 72a15. An instance of axiom is the principle of noncontradiction. Thesis is subdivided into two kinds, hypotheses and definitions. For the medieval re-elaboration of Aristotle's classification, see especially J.M.M.H. Thijssen, "John Buridan and Nicholas of Autrecourt on Causality and Induction," *Traditio* 43 (1987), 238–255.

[69] Scotus, *Ord.*, d. 3, pars 1, q. 4, OTh III, 141, transl. Wolter, "Philosophical Writings," 110: "That such an effect occurs frequently through such a cause is a fact gathered from experience. For once we find such a nature associated at one time with this accident and at another with that, we have discovered that despite the accidental differences, such an effect invariably follows from this nature. Hence, such an effect is not the result of what is merely incidental to such a nature but is rather the effect of this nature as such."

of a given cause.[70] Scotus appeals to a special principle to establish the truth of inductive generalization. He maintains that the proposition "whatever occurs in a great many instances by a cause that is not free, is the natural effect of that cause" is self-evident.[71] This is often called a "principle of the uniformity of nature." The basic idea is that natural causes cannot produce effects other than what it is their nature to produce.[72]

Almost all scholastic philosophers after Scotus adopt his position. For instance, Ockham is no less confident than Scotus in the possibility of inductive knowledge of causal processes. Ockham endorses the principle of the uniformity of nature that "causes of the same kind have effects of the same kind,"[73] or more precisely that "all agents of the same most specific species are able to bring about effects of the same kind."[74] He calls it the extrinsic mean of a formal inference,[75] which means that Ockham must regard it as an a priori and necessary truth. Ockham insists that we can have evident knowledge of causal claims on the basis of experience and contends that we use them as premises in inferring the indemonstrable first principles of demonstration. The singular proposition "this herb strengthened

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[70] On medieval views of induction, see J. Weinberg, *Abstraction, Relation, and Induction: Three Essays in the History of Thought* (Madison and Milwaukee: University of Wisconsin Press, 1965) 121–153; E. Serene, "Robert Grosseteste on Induction and Demonstrative Science," *Synthese* 40 (1979), 97–115; S. Marrone, "Robert Grosseteste on the Certitude of Induction," in C. Wenin (ed.), *L'homme et son univers au Moyen Age. Actes du septième congrès international de philosophie médievale* (Louvain-la-Neuve, 1986), 481–499; E. P. Bos, "A Contribution to the History of Theories of Induction in the Middle Ages," in K. Jacobi (ed.), *Argumentationstheorie: ScholastischeForschunge zu den logischen und semantischen Regeln korrekten Folgerns* (Leiden: Brill, 1993), 553–576. For an overview of Scotus's contribution, see Gelber, *It Could Have been Otherwise*, 268. For the fourteenth-century developments, see M. Roques, "Logique de la découverte et rationalité des conduites pré-scientifiques. Induction et uniformité de la nature d'après Jean Buridan," in C. Grellard (ed.), Mélanges offerts à Joël Biard, Paris, Vrin, 2017, 253–270.

[71] Scotus, *Ord.*, d. 3, pars 1, q. 4, OTh III, 141, transl. Wolter, "Philosophical Writings," 109: "As for what is known by experience, I have this to say. Even though a person does not experience every single individual, but only a great many, nor does he experience them at all times, but only frequently, still he knows infallibly that it is always this way and holds for all instances. He knows this in virtue of this proposition reposing in his soul: 'Whatever occurs in a great many instances by a cause that is not free, is the natural effect of that cause.' This proposition is known to the intellect even if the terms are derived from erring senses, because a cause that does not act freely cannot in most instances produce an effect that is the very opposite of what it is ordained by its form to produce."

[72] Scotus, *Ord.*, I, d. 3, pars 1, q. 4, OTh III, 142, transl. Wolter, "Philosophical Writings," 110: "A cause that does not act freely cannot in most instances produce an effect that is the very opposite of what it is ordained by its form to produce. The chance cause, however, is ordained either to produce or not produce the opposite of the chance effect. Consequently, if the effect occurs frequently it is not produced by chance and its cause therefore will be a natural cause if it is not a free agent. But this effect occurs through such a cause. Therefore, since the latter produced by chance and its cause therefore will be a natural cause if it is not a free agent."

[73] Ockham, *Ord,*, Prol, q. 1, OTh I, 42.

[74] Ockham, *Ord.*, Prol, q. 2, OTh I, 87 and 90–96.

[75] Ockham, *Ord.*, Prol. q. 2, OTh I, 91–92. On this subject, see the classical study by Adams, "Was Ockham a Humean?".

this person who was feverish" together with the principle of the uniformity of nature entails the universal proposition "every herb of this species strengthens someone with a fever."[76]

The discussion goes on during the fourteenth century. One of the main representative positions is Buridan's. Buridan defends it in answer to the skeptical scenarios of Nicholas of Autrecourt.[77] Autrecourt denies that we have experience of causal relations. It is always possible for God to take the place of secondary causes, which implies that induction cannot yield certain knowledge. Repetition of these experiences may provoke a conjectural habit (*habitus conjecturativus*), which is the expectation that in the future the same conjunction will be observed. But this expectation yields nothing more than probable knowledge.[78] In response to Autrecourt's skeptical scenario, Buridan appeals to the principle of the common course of nature, which allows him to set aside the possibility of God's intervention into natural causal processes.[79] The principle of the common course of nature grounds Buridan's idea of a natural inclination of the intellect toward truth.[80] On this basis, he describes induction as the generalization of a singular judgment of experience about some-

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[76] Ockham, *Ord.*, *Prol.*, q. 2, OTh I, 94–95, transl. Adams, "Was Ockham a Humean?", 33: "For example, suppose that 'every herb of this species strengthens someone with a fever' is a first principle. This proposition cannot be proved syllogistically from any better known propositions. Rather knowledge of it is derived from intuitive cognition, perhaps of many [instances]. For since he saw that after such an herb is eaten, health follows in the person with the fewer, and since he removed all other causes of the person's health, he had evident knowledge that this herb was the cause of health, and then had experience regarding the singular [proposition]. But it is known to him that all individuals of the same species have the same kind of effect in an equally disposed patient. Therefore, he derives evident knowledge of the principle that every such herb strengthens someone with a fewer." See also *Ord.*, *Prol.*, q. 2, OTh I, 87.

[77] See especially J. Zupko, "Buridan and Skepticism," *Journal of the History of Philosophy* 31 (1993), 191–207.

[78] For more on this subject, see the references given in the introduction.

[79] For more on Buridan's use of the common course of nature principles, see P. King, "Jean Buridan's Philosophy of Science," *Studies in History and Philosophy of Science* 18 (1987), 109–132.

[80] Buridan, *Quaest. Anal. Post.*, I, 2, transl. Economicos, 167: "Although induction, or inductive experience, does not conclude on account of its form, nevertheless, when the intellect repeatedly perceives something to be the case and cannot discover a counterexample, nor does there seem to be a reason why it ought to be otherwise in other cases, the intellect through its natural inclination toward truth grants that a universal principle is known." See also Buridan, *Quaest. Anal. Post.*, II, 11, transl. Economicos, 424: "the intellect […] from its natural inclination toward the truth, forms a universal principle and assents to it as known, namely, that every fire is hot." The translation of Buridan's *Questions on the Posterior Analytics* comes from A. Economicos, *Intellectus and Induction: Three Aristotelian Commentators on the Cognition of First Principles, including an original Translation of John Buridan's Questiones in duos Aristotelis libros posteriorum analyticorum*, unpublished PhD dissertation, Fordham University, 2009. For Buridan's text, see H. Hubien (ed.), *Iohannis Buridani Quaestiones in duos libros Aristotelis Posteriorum Analyticorum*, unpublished typescript.

thing not sensed.[81] Consequently, empirical truths acquired by induction can be said to be evident. However, this evidence is not absolute but qualified.[82] Buridan's appeal to *evidentia secundum quid* is based on a long tradition. It can be found in Aquinas, Scotus, and Ockham.[83] It has two main functions. First, it helps satisfy the theological requirement that there must be room for miracles. Second, it expresses the Aristotelian idea that natural effects take place *ut in pluribus*, that is, that they take place on the assumption of the common course of nature.

Thus, Scotus, Ockham, and Buridan believe that something can be learned from induction. Inductive reasoning is based on the acceptance of a principle of the uniformity of nature which holds that specifically the same causes always have specifically the same effect unless there is some impediment. The principle of uniformity cannot justify induction unless it is grounded in nonempirical truths. Otherwise inductive reasoning would be circular, since the principle of uniformity would itself be the result of an induction. The question is then how to justify the principle. From Scotus onward, a key question was then how we could gain knowledge of a cause's connection to an effect.[84]

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[81] Buridan, *Quaest. Anal. Post.*, II, 11, transl. Economicos, 423: "Therefore, for the acceptance of principles of this second mode by the intellect, sense, memory and experience are prerequisite, in such a way that first you learn from sense that this fire is hot and immediately the intellect consequently judges that fire is hot, and thus many instances are possessed by the memory that these were hot, and then if you encounter another fire, which you do not sense, because of the memory of the previous ones, you will judge this to be hot, and this is now a judgment of experience about something not sensed. Finally, it must be noted that the intellect, noticing that things were in the same way in many instances, and that no diverse circumstances prevented them from doing so."

[82] Buridan, *Quaest. Anal. Post.*, I, 2, transl. Economicos, 163–164: "In a second sense, something is called 'evident' because it is apparent to someone and without any reasoning it could appear otherwise. Natural principles and natural conclusions are evident in this sense. Let us note that this kind of evidentness is not properly called 'evident,' because the intellect can be deceived about such evident principles by a supernatural cause. Since God can make a fire without heat, and can produce and maintain a sensible species in my senses without any object, and though such evidence, one would form judgments as though the object were present, and would judge falsely. However, this natural evidentness is correctly called 'natural' since a person cannot be deceived about it [as long as] he remains within the common course of nature, although he may be deceived by a supernatural cause. This type of evidentness is sufficient for natural knowledge." See also *In Met.* II, q. 1, transcribed in A. Maier, "Das Problem der Evidenz," 298. For an analysis, see J. Biard, *Science et nature. La théorie buridanienne du savoir* (Paris: Vrin, 2012), 17–38.

[83] On this subject, see especially A. Maier, "Notwendigkeit, Kontingenz und Zufall," in *ead.,Die Vorläufer Galileis im 14. Jahrhundert* (Rome: Edizioni di Storia e Letteratura, 1962), 219–250 and L. M. de Rijk, "John Buridan on Man's Capability to Grasping the Truth," in I. Kraemer-Rugenberg and A. Speer (ed.), *Scientia und Ars im Hoch- und Spätmittelalter* (Berlin-New York, De Gruyter: 1994) vol. I, 282–303.

[84] In *The Emergence of Probability* (London & New York, Cambridge. University Press, 1975, 180–181), I. Hacking claims that that skepticism concerning induction could never arise within the context of medieval theories of demonstration and causation. In light of the developments that I have described, it is clear that this interpretation must be revised.

3.3.2   Ockham's Rule for Causal Determination

On this issue, Ockham's scruples lay the ground for the subsequent developments in the fourteenth century.[85] Ockham defends the idea that causation cannot be perceived and that the cognition of a thing cannot be the cause of the cognition of another thing.[86] To know that something is a cause presupposes that one knows another thing which is its effect.[87] But since God can always take the place of a second cause, the appearances being equal, it is impossible to obtain such a knowledge. Ockham nuances his claims by saying that secondary causes are not superfluous, because in the common cases God never acts as much as his power allows.[88] However, this argument has as a consequence that it can never be demonstrated that a given effect is produced by a secondary cause, for such facts are contingent.[89]

Goddu, p. 359

How, then, can we have knowledge of natural causal processes? Ockham makes frequent appeal to correlation as a criterion for identifying what is a natural efficient cause of what.[90] As noted by Marilyn McCord Adams, Ockham suggests that to know that Xs are efficient causes of Ys, it is sufficient to observe that, ceteris paribus, when-

Adams 1987, p. 746

Richardson 2014, p. 112

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[85] See M. McCord Adams, "Was Ockham a Humean about Efficient Causality?", *Franciscan Studies* 37 (1979), 5–48: *ead.*, *William Ockham* (Notre Dame, Indiana: University of Notre Dame Press, 1987), c. 18, 746–758. See also A. Robert, "L'explication causale selon Guillaume d'Ockham," *Quaestio* 2 (2002), 241–267. Here I closely follow Adams's classical studies on this topic.

[86] Ockham, *Ord.*, *Prol.*, q. 9, OTh I, 241, my transl.: "Non-complex knowledge of a thing does not cause non-complex knowledge of another thing. This is made clear first by an argument from experience, because anyone experiences in himself that even if he cognizes something intuitively and perfectly, by means of this knowledge he never cognizes another thing unless he had the knowledge of this other thing beforehand."

[87] Ockham, *Ord.*, *Prol.*, q. 9, OTh I, 244, my transl.: "to cognize a cause under the aspect of a cause presupposes the knowledge of the thing that is the effect."

[88] Ockham, *Rep.* II, q. 3–4, OTh V, p. 72.

[89] Ockham, *Rep.* II, q. 3–4, OTh V, 72–73, transl. Adams "Was Ockham a Humean?", 26: "It follows from this that it cannot be demonstrated that any effect is produced by a secondary cause. For even though when fire is close to combustible material, combustion always follows, this fact is, nevertheless, consistent with fire's not being the cause of it. For God could have ordained that whenever fire is present to a close-by patient, the sun would cause combustion in the patient; just as He ordained with the Church that when certain words are spoken, grace is produced in the soul. Thus, there is no effect through which it can be proved that anyone is a human being – especially through no effect that is clear to us. For an angel can produce in a body everything that we see in a human being – e.g. eating, drinking, and the like. This is clear from the case of the angel in the book of Tobit. Therefore it is not surprising if it is impossible to demonstrate that anything is a cause."

Adams 1987, p. 750 and n. 34

[90] Ockham, *Ord.*, d. 45, q. un., OTh IV, 664–665, transl. mine: "although I do not intend to say in general what an immediate cause is, nevertheless I hold that the following is sufficient for something to be an immediate cause, viz. that when that absolute thing is posited, the effect is posited, and when it is not posited and all other concurrent conditions and dispositions remain the same, the effect is not posited. Thus, whatever is related to something this way is its cause, although perhaps not vice versa. Moreover, it seems obvious that this is sufficient for something's being an immediate cause of another thing." See Adams "Was Ockham a Humean?", 16–17.

Adams 1987, p. 746 and n. 23

ever Xs are posited, Ys are posited or that whenever Xs are not posited, Ys are not posited, or both. His main argument in defense of this idea is an argument from indispensability, which states that if the rule is not accepted, it will be impossible to identify the cause of any effect.[91] But such correlations do not provide a definition of efficient causation. They only serve as our criterion for identifying the causes of a given causal process.[92] However, it should be noted that this criterion is insufficient because of the *ceteris paribus* clause: it involves an indefinite number of factors. The criterion is valid for an ideal situation in which any other causal factor has been removed. It does not state a genetic connection but an invariable coincidence. The criterion says nothing about the active and productive nature usually attributed to causal powers. Let us come now to this virtue or causal power that is not grasped through experience.

3.3.3 Power and Sacraments

It is on the occasion of his discussion of sacramental causality that Ockham gives his most extensive account of the nature of causality.[93] The problem has to do with the causal contribution of the sacraments, such as baptism, to grace. Since Augustine, theologians have claimed that the new-law sacraments differ from old-law sacraments on the grounds that the former "effect what they figure." New-law sacraments are causes of what they signify. This theological idea was given different philosophical justifications. Aquinas contends that if new-law sacraments would only result from a pact between God and men, God alone would be responsible for the production of grace. Sacraments would be useless. Aquinas's view is that sacraments do possess genuine causal power: they have an instrumental causality that enables them to effect grace directly, in virtue of a special power that God gave them.

Aquinas's solution was heavily criticized, especially in the Franciscan order.[94] Ockham follows Scotus and defines sacrament as an "efficacious sign of God's

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[91] Ockham, *Ord.*, d. 45, q. un., OTh IV, p. 665, my transl.: "For if it were not, every way of knowing that one thing is the cause of another thing would perish. For if it did not follow from the fact that when this is posited the effect follows and when it is not posited the effect does not follow that it is the cause of that effect, there is no way in which it can be known that fire is the cause of heat in wood. For one can say that there is some other cause of heat, which nevertheless acts only in the presence of fire."

[92] Ockham states this criterion several times. See especially *Rep.* II, q. 12–13, OTh V, 276, my transl.: "that which, when it is posited, another thing can be posited, everything else being equal, and which, when it is not posited, another thing cannot be posited, is naturally the cause of it."

[93] For the background of the whole issue, see W. J. Courtenay, *Covenant and Causality in Medieval Thought* (London, Variorum Reprints, 1984a).

[94] See especially L. O. Nielsen, "Signification, Likeness, and Causality. The Sacraments as Signs by Divine Imposition in John Duns Scotus, Durand of St. Pourçain, and Peter Auriol," in C. Marmo (ed.), *Vestigia, imagines, verba. Semiotics and Logic in Medieval Theological Texts (XIIth–XIVth Century)* (Turnhout: Brepols, 1997), 223–254.

Richardson 2014, p. 112

Bunge, pp. 34, 42

Richardson 2014, pp. 112-113

Adams 2007, pp. 62, 47, 48

Adams 2007, p. 66

Adams 1987, p. 746 and n. 23

gratuitous effect."[95] Ockham puts a strong emphasis on God's voluntary institution of the sacraments. He refuses to provide a natural explanation of the operation of the sacraments. But this leads to a problem. A sacrament fulfills the criterion for stating that a relation of causality exists between two things: if a sacrament is given, grace is given; and if the sacrament is not given, grace is not given.[96] However, Ockham claims that sacraments are not genuine causes.[97] They are *sine qua non* causes.[98] How then to distinguish genuine causes from mere *sine qua non* causes? Ockham answers that causality operates *ex natura rei*, while sacraments operate only because of God's will.[99] In other words, a genuine efficient cause is a thing endowed with causal powers in virtue of which it acts according to its nature.

A power is usually characterized by a natural inclination, i.e., its being toward something. When it comes to the nature of a causal power, Ockham defends a radical view and argues that what is called natural inclination is nothing other than the agent acting according to natural necessity. Hence a causal power is not an accident but the thing itself acting. Whenever the causal process is obstructed by an impediment, the natural agent is still acting. For example, a heavy object in equilibrium above the ground is not at rest but is actively pushing toward the ground.[100] By reducing natural inclination to the exercise of a causal power, Ockham reverses the traditional explanatory priority of the final cause over the efficient cause. As Ockham says, "You might ask: why does the fire heat the wood rather than cool it? I reply that such is its nature".[101] It is in virtue of its nature that fire heats, not because its end is to heat.

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[95] Ockham, *Rep*. IV, q. 1, OTh VII, 5.

[96] Ockham, *Rep*. IV, q. 1, OTh VII, 3, transl. Adams, "Was Ockham a Humean?", 27: "For that which when it is posited another is posited, is the cause of that thing. This is clear from what the Philosopher says in Metaphysics, Book V: a cause is that at whose existence another follows." But when the sacrament is posited, grace is posited, and when the sacrament is removed, grace is removed."

[97] On this subject, see especially A. Goddu, "William of Ockham's Distinction Between Real Efficient Causes and Strictly Sine Qua Non Causes," *The Monist* 79 (1996), 357–367; M. McCord Adams, "Powerless Causes. The Case of Sacramental Causality," in G. Machamer (ed.), *Thinking About Causes. From Greek Philosophy to Modern Physics* (Pittsburgh: University of Pittsburgh Press, 2007), 47–77.

[98] Ockham, *Rep*. IV, q. 1, OTh VII, 17, transl. Adams, "Was Ockham a Humean?", 28: "[…] ..'a cause is that upon whose existence another follows' can be taken in two ways: One way, when by the nature of the thing [*ex natura rei*], at the existence and presence of one, the existence of the other follows naturally. Another way when at the existence and presence of one the other follows, not by the nature of the thing [*ex natura rei*] but by the divine will to institute something. And this way we maintain that a meritorious act is called a cause of rewards by divine volition alone. And a sine qua non cause is said to be a cause the second way. In the first way, I say that the sacraments are not the cause of grace. […]."

[99] Ockham, *Rep*. IV, q. 1, OTh VII, 17, transl. Adams," Was Ockham a Humean?", 28: "[…] it pertains to the notion of cause [*ratione causae*] that it could by its own power [*virtute propria*] be followed by the effect, by the nature of the thing [*ex natura rei*] and naturally."

[100] Ockham, *Quodl*. III, q. 22, trans. Freddoso, 241.

[101] Ockham, *Quodl*. II.2, trans. Freddoso, 99.

In this understanding of the metaphysics of causal powers, what is the nature and status of final causality?

3.4 The Partial End of Teleological Explanations

3.4.1 The Psychologization of Final Causality

Aristotle famously defends the teleological claim that nature acts for an end, that is, that there are natural processes that are done for the sake of something.[102] The priority of final causes over efficient causes is still defended in the thirteenth century.[103] It was called into question in the fourteenth century. In a classical study, Anneliese Maier describes a gradual process during which, under the influence of Avicenna, it has become accepted that there are no final causes in nature.[104] On the Avicennian model, final causality is possible only in virtue of the mind that grasps the end in question. Avicenna distinguishes between the end as it exists in reality and the end as it exists in the soul. Only when it exists in the soul is an end of a cause. From this point of view, "it is the cause of the causes, whereas from another point of view, it is the effect of the causes."[105] By the end of the thirteenth century, Avicenna's account had become a major reference. Thus, Aquinas says that "for something to be done for the sake of an end, some sort of cognition of the end is required."[106]

This kind of psychologization of final causality helped to solve the main problem related to final causation, namely, the way in which a final cause can be a cause. This question was widely debated in the thirteenth and fourteenth centuries. The problem has to do with the temporal order between cause and effect. It is commonly assumed that the cause is temporally prior to or at least simulta-

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[102] Aristotle, *Physics* II, 9, 199a20–30.

[103] As reflected, for instance, in Aquinas's claim (*De principiis naturae*, cap. 4) that "the end is the cause of the causality of the efficient cause, because it makes the efficient cause be an efficient cause. Similarly, it makes matter be matter and form be form, since the matter would not receive a form except through an end and the form would not perfect the matter except through an end. Hence it is said that the end is the cause of causes, since it is the cause of the causality of all the causes."

[104] A. Maier, "Finalkausalität und Naturgesetz," in *ead.*, *Metaphysische Hintergrunde der spätscholastischen Naturphilosophie* (Rome: Edizione di Storia e letteratura Rome, 1955), 271–335. For a critical evaluation of Maier's interpretation, see C. Trifogli, "Thomas Wylton on Final Causality," in A. Fidora and M. Lutz-Bachmann (ed.), *Erfahrung und Beweis. Die Wissenschaften von der Natur im 13. und 14. Jahrhundert*, (Berlin: Akademie Verlag Berlin 2007), 249–264. I follow Trifogli's paper, as well as the classical study by R. Pasnau, "Intentionality and Final Causes," in D. Perler (ed.), *Ancient and Medieval Theories of Intentionality* (Leiden: Brill 2001), 301–323.

[105] Avicenna, *Met*. VI, 5.

[106] Aquinas, *ST* IaIIae, 6.1c. All causal processes are dependent on God's will. See, for instance, Aquinas, *De veritate*, 22.1c: "All natural things are inclined toward their ends through a certain natural inclination from the first mover, which is God, and consequently that toward which a thing is naturally inclined must be that which is willed or intended by God."

neous with the effect. The doctrine of final causes seems to reverse the order of priority between cause and effect, since the end, although temporally posterior to the effect, is said to be its cause. In answer to this worry, Scotus claims that the causality of the end consists in its being loved or desired by an efficient cause.[107] Ends move only metaphorically by virtue of being loved by the agent.[108] For this account to work, Scotus holds that final and efficient causes are essentially ordered to one another in the production of their common effect. Thus, the efficient cause depends on the end, not for its real existence, but in causing: the final cause explains why the efficient cause acts, but not vice versa.[109] As Scotus says, "the end moves metaphorically insofar as it is loved, so that for this reason the efficient cause gives form to matter."[110] Moreover, Scotus calls into question the status of final causality in natural explanations. Scotus remarks that it is less obvious that natural agents act for the sake of an end than that intelligent voluntary agents do. Given that natural agents act by natural necessity, they would act the same way whether they acted for an end or not. He concludes that, if natural agents act for the sake of an end, this is because a voluntary agent has ordered them to it.[111]

Ockham's account of the causality of the end is similar to Scotus's: he holds that the causality of the end consists in "nothing other than its being loved and desired efficaciously by an agent, so that the effect is brought about because of the thing that is loved."[112] Indeed, when tackling the problem of the posteriority of the final cause with respect to its effect, Ockham says that the distinctive property of a final cause

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[107] Scotus, *Quaest. Met.*, V, q. 1, n. 77, transl. Pasnau "Intentionality and Final Causes," 306: "Embracing the first path, then, that an end is a cause inasmuch as it exists in the thoughts of the agent, we should note that it exists there in the sense that it has objective and formal existence. Objective existence is real existence, and formal existence is that in virtue of which it is now thought of, and this is to exist in thought. For example: if I consider an existing rose, and the object of the intellect is the thing, the species exists objectively and formally in the intellect." See also *Quaest. Met.*, q. 1, n. 20, OPh III, 30. For an analysis of this text, see M. Adams, "Final Causality and Explanation in Scotus's *De Primo Principio*," in C. Koyama (ed.), *Nature in Medieval Thought. Some Approaches East and West* (Leiden-Boston-Köln: Brill), 2000, 153–183.

[108] Scotus, *De Primo Principio* II, sec. 2.21, transl. Wolter, 22: "The causation of the end consists in this that by being loved it moves metaphorically." See also *Quaest. Met.* V, q. 1, n. 39.

[109] Scotus, *Quaest. Met.* V, q. 1, n. 3.

[110] Scotus, *De primo principio* II, sec. 2.11, transl. Wolter, 16.

[111] Scotus, Ord, d. 2, p. 1, qq. 1–2, n. 76, Vatican ed. III, 52.

[112] Ockham, *Quodl*. IV, q. 1, a. 1, transl. Freddoso, 245–246. See also Ockham, *Quodl*. IV, q. 1, transl. Freddoso, 245, and Summula II, 6, OPh VI, 229, my transl.: "an end is 'something intended or desired or loved for the sake of which an agent acts'." For final causality in Ockham, see H. Klocker, "Ockham and Finality," The Modern Schoolman 43 (1966), 233–247; M. Adams, "Ockham on Final Causality: Muddying the Waters," Franciscan Studies 56 (1998), 1–46; S. Brown, "Ockham and Final Causality," in J. Wippel (ed.), *Studies in Medieval Philosophy* 17 (1987), 249–272.

is that it is able to cause when it does not exist.[113] But, for Ockham, this view faces many objections: on final cause "there is greater doubt."[114] The most important one is close to the contemporary "problem of mental causation."[115] The consensus view states that an end as conceived by the mind can be realized by the body, although this production is said to be metaphorical.[116] To solve the problem, Ockham contrasts Avicenna's view that an end moves "in virtue of the existence that it has in the soul" with Averroes' view that "a final cause moves as a final cause in virtue of the existence that it has outside the soul."[117] Ockham favors Averroes. The final cause, in his view, is the external object toward which an action is directed, not the thing as it exists in the agent's thoughts.[118] Ockham is sometimes ambiguous about this but, as Robert Pasnau has pointed out, it is probably the best interpretation of his view.[119]

3.4.2   Banishing Ends from Nature

The process of psychologization of final causality led to a second innovation in fourteenth-century natural philosophy: the banishing of final causality from nature and its restriction to voluntary free agents. Aquinas states that "it makes no difference whether that which tends to an end is knowing or not, for just as the target is

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[113] Ockham, *Quodl*. IV, q. 1, transl. Freddoso, 245–246: "Sometimes an end is a cause when it does not exist, since sometimes an end is desired when it does not exist. […] Hence, it is distinctive of a final cause that it is able to cause when it does not exist…You might object that that which does not exist is not a cause of anything. I reply that this is false. Rather, one must add that the thing in question does not exist and is neither loved nor desired, and then indeed it follows that it is not a cause."

[114] This question is dealt with especially in *De Fine* (*Quaest. Var*. 4), in which Ockham asks whether it follows from the fact that something moves as an end that it has any real extra-mental being.

[115] For an overview of the current account of this problem, see J. Heil and A. Mele, A. (ed.), *Mental Causation* (Oxford: Clarendon Press, 1993).

[116] Ockham, *Quodl*. IV, q. 1, transl. Freddoso, 293: "Nothing is really acquired from it or comes from it, and so it follows that this movement of the end is not real, but metaphorical." See also *Quaest. Var*. 4, OTh VIII, 107–108; *Summula* II, 4, OPh VI, 221.

[117] Ockham, *Quaest. Var*. 4, OTh VIII, 113–114.

[118] Ockham, *Quaest. Var*. 4, OTh VIII, 116, transl. Pasnau, "Intentionality and Final Causes," 313: "An end moves an agent to act in virtue of its reality outside the soul." For a more detailed explanation, see R. Pasnau, "Intentionality and Final Causes," in D. Perler (ed.), *Ancient and Medieval Theories of Intentionality* (Leiden: Brill, 2001), 301–324.

[119] Ockham, *Quaest. Var*. 4, OTh VIII, 115, transl. R. Pasnau, "Intentionality and Final Causes," 313–314: "an end's moving an agent to act is an end's being loved and the agent's acting for the sake of that end, as loved. But an end is loved by an agent in virtue of its reality outside the soul and the agent acts for the love of that end as it is external. For walking is not for the sake of health as it has existence in the soul alone, not because I love health or life in virtue of its existence in the soul, but because I love health and life in virtue of its real being outside the soul. And it is for the sake of such loved being that I walk and abstain and do such things."

the end for the archer, so is it the end for the motion of the arrow."[120] To Ockham and Buridan, the example of the arrow shows that natural agents only appear to act for ends: the end for the motion of the arrow comes from the will of the archer.[121] Both Ockham and Buridan explicitly deny that natural agents act for ends. Only agents who act intentionally and spontaneously (*a proposito et sponte*) act for an end.[122] You do not have to stipulate that it is the end of fire to heat wood in order to explain that wood is heated by fire. You only have to stipulate that it is because of its nature that the fire capable of heating wood.[123] There is no longer any need for final explanations in natural philosophy. As Ockham claims, there is no way to prove philosophically that every effect has a final cause.[124]

> Richardson 2014, p. 129

In the *Brief Summa of the Physics*, Ockham takes over the arguments put forward by the ancient materialists in favor of the view that all beings either exist by chance or by natural necessity and not for the sake of an end. The first two arguments prove that final causes do not have any explanatory value. First, something that happens for an end would happen even if no end were intended. Second, if the same thing can act for the sake of two contrary ends, then it acts for the sake of neither. The last argument states that anything that does not deliberate cannot seek an end because it cannot know it.[125] When we speak of final causality in nature, we use a metaphor to speak of the determinism that rules the natural order.[126] Final causality is thus

> Adams 1998, p. 21

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[120] Aquinas, *SCG* 3.1.2.

[121] See Buridan, *Quaest. Phys*. II, q. 13 and Ockham, *Quodl*. IV, q. 1. transl. Freddoso, 245–250.

[122] Ockham, *Summula* II, 6, OPh VI, 226: "What has been said about the final cause is to be understood of an agent that acts because of a purpose and spontaneously [a proposito et sponte] […]."

[123] Ockham, *Quodl*., II, q. 2, OTh 115–116, transl. Freddoso: "But merely natural causes that are determined by their nature to a certain effect and not to another, do not require anyone to foreknow and direct them – at least natural reason does not conclude that this is required. For example, fire close to wood heats it, whether or not a knower intends this. If you ask why fire heats rather than cools, I reply that it is its nature to do so […]."

[124] Ockham, *Quodl*. IV, q. 2, a. 1, transl. Freddoso, 251: "It cannot be sufficiently demonstrated or known either through principles known per se or through experience, that a thing that acts by a necessity of nature acts because of a final cause fixed beforehand by a will. And this is because the action of such an agent never varies without a change either in the agent or in the patient or in something that concurs with the action. Instead the action always follows in the same way. And so it cannot be proved that such an agent acts because of an end." See also *Quodl*. IV, 1 transl. Freddoso, 249: "someone strictly following reason would say that the question 'for the sake of what' (propter quid) has no place in natural actions, because he would say that there is no question to ask, 'fire is generated for the sake of what?', but that this has a place only in voluntary actions." Ockham, *Quodl*. IV, q. 1, transl. Freddoso, 246: "For it cannot be proved that every effect has a final cause." There is however a debate about this point in Ockham. For an introduction to this debate, see R. Pasnau, "Intentionality and Final Causes."

> Richardson 2014, p. 129

[125] Ockham, *Brevis Summa*, II, 6, OPh VI, 36–39.

[126] Ockham, *Summula* II, 6, OPh VI, 229–230, transl. Pasnau, "Intentionality and Final Causes," 310: "In another way, the end or the final cause is taken as that which follows from the operation of another according to the common course of nature, if not impeded – following just as if it were foreknown or desired by an agent. It is in this way that an end is found in things without souls, even supposing that they were directed or moved by no cognitive being. This is how the Philosopher speaks about final causality, at the end of *Physics* II."

restricted to voluntary agents.[127] Buridan, for instance, claims that common sense recognizes final causality only or principally in voluntary agents.[128]

This new way of conceiving of final causality had an immediate impact on the two Aristotelian concepts of chance and fortune. Aquinas states that chance is a cause that has a result *praeter intentionem*.[129] "Intentio" here means any active tendency toward something. The act of an agent might result in an end other than the intended one, for instance, because of a side effect. By contrast with chance, fortune is restricted to voluntary agents. There is only conditional necessity in voluntary agents[130]: voluntary agents are only necessitated by the end that they freely chose. But often the chosen end can be realized in different ways.[131] The conditional necessity proper to voluntary agents does not determine which particular action will follow from the choice of the agent.[132] Thus, fortune is the result of a voluntary act that was not intended by the agent. Ockham argues that chance presupposes the activity of voluntary agents: chance "can occur immediately because of the causal influence of natural causes, but it nonetheless always occurs mediately and partially because of a free agent."[133] In the case of chance, the act of a free agent concurs with a natural causal process. By contrast, in the case of fortune, it concurs with the act of another free agent. Indeed, Ockham defines fortune as that which occurs "by reason of the fact that an effect that falls outside the intention of the free agent is brought

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[127] Ockham, *Quodl*. IV, q. 1, transl. Freddoso 249: "Someone who is just following natural reason would claim that the question 'for what reason?' is inappropriate in the case of natural actions. For he would maintain that it is no real question to ask for what reason a fire is generated; rather, this question is appropriate only in the case of voluntary actions…Natural agents proceed anew from rest into action at the moment when an impediment is removed. For instance, a fire is now close to the wood and previously was not. On the other hand, a free agent proceeds anew into action because he begins to intend an end."

[128] Buridan, *Quaest. Phys.*, II, 7, fol. 35ra, transl. Pasnau, "Intentionality and Final Causes," 316: "It seems to me that everybody by a natural impulse, as if determined by nature, accepts that an end is the cause of our operations. For example, if you ask a little old lady why she goes to church or to the market, she will say to you that she goes for the sake of hearing a mass or for the sake of buying a tunic, and if you asked why you go to school, you will reply: for the sake of learning. Claims accepted in this way by everyone should not be entirely dismissed, because nothing more plausible and accepted could be brought forward to prove the opposite, as Aristotle says in *Ethics* VII." On this subject, see especially S. Knuuttila, "Necessities in Buridan's Natural Philosophy," in J.M.M.H. Thijssen and J. Zupko (ed.) *The Metaphysics and Natural Philosophy of John Buridan*, (Leiden: Brill, 2001), 65–76; J. Biard, *Science et nature. La théorie buridanienne du savoir* (Paris: Vrin, 2012), Chap. 3, "La science de la nature," 309–367.

[129] Aquinas, *In II Phys.*, lect. 7–10. See also *Sent*. I, d. 43, q. 2, a. 1, c: "chance is nothing other than nature that acts beside the intention, as it is said in Physics II."

[130] Aquinas distinguishes two kinds of possible: the possible that depends on irrational potencies and the possible that depends on rational potencies (*In Met.* IX, lect. 4).

[131] Aquinas, *ST* IaIIae, 13, 1c.

[132] Aquinas, *SCG* II, 30, 15: "in another way, necessity from the end as posterior in actual being; and such necessity is not absolute but conditional. Thus, we say that a saw will have to be made of iron if it is to do the work of a saw."

[133] Ockham, *Quodl*. I, q. 17, transl. Freddoso, 78.

about by a natural cause and a free cause or by two free causes."[134] In both cases of chance and fortune, a free agent introduces contingency into a deterministic chain of events. Teleological explanations are restricted to things that are the product of human activity.[135] Thus, Ockham's view is far from the standard Aristotelian picture, prevalent in the thirteenth century, according to which chance is a failure in a teleological process.

3.4.3   Providence and Laws of Nature

Aristotle's theory of the four causes as it is explained in *Physics* II does not provide an account of the causal functioning of the universe as a whole. To find a principle of unity between causal chains, theologians of the Late Middle Ages appealed to God.[136] Aquinas's famous proofs for the existence of God aim at proving the existence of a providential first cause, which is the ultimate ground of any physical explanation.[137] Aquinas defines "providence" as God's cognition of things in the world insofar as they are ordered to an end.[138] He develops an argument from design, proving that God's providential intellect introduces an order teleologically oriented toward what is best.[139] The key premise is that what does not have cognitive faculties cannot tend to an end without being ordered to that end by someone who can think.

Adams 2013, p. 8

    This view of the unification of causal processes by means of a providential God was widely recognized as one of the most central doctrines until the end of the Middle Ages.[140] It was not restricted to theologians. Some philosophers developed in their commentaries on the *Physics* some key elements of natural theology to account for the unification of causal processes in the universe. For instance, Buridan accepts the doctrine that God designs the universe.[141] He believes that God created

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[134] Ockham, *Quodl*. I, q. 17, transl. Freddoso, 78.

[135] Ockham, *Quodl*. II, q. 2, transl. Freddoso, 99.

[136] On this subject, see especially M. Adams, "Powers Versus Laws: God and the Order of the world According to Some Late Medieval Aristotelians" in E. Watkins (ed.), *The Divine Order, the Human Order, and the Order of Nature: Historical Perspectives* (Oxford: Oxford University Press, 2013), 3–26.

[137] Aquinas, *ST* I, q. 3, a. 2, c.

[138] Aquinas, *De Veritate*, q. 5, a. 1, c and q. 5, a. 2, c.

[139] Aquinas, *Sent*. I, d. 43, q. 2, a. 1, c.

Adams 2013, p. 8, n. 19 and n. 18

[140] Not everybody agreed to speak of God as a lawgiver in nature. For Scotus, laws govern only voluntary agents, not natural agents. There is no law that fire should heat combustibles. Scotus reserves the term "natural law" for practical principles that are necessarily true and self-evident (*Ord*. III, suppl. d. 17, English transl. in A. Wolter, *Duns Scotus on Will and Morality*, 198–207). He recognizes only one natural law, namely, "if God exists, God alone must be loved" (*Ord*. III, suppl. d. 37, English transl. in A. Wolter, *Duns Scotus on Will and Morality*, 176).

Adams 2013, p. 17

[141] Buridan, *QPhys*II, 7, ed. Paris, 35rab, transl. Pasnau "Intentionality and Final Causes," p. 316: "It seems to me that by a natural impulse, as if determined by nature, everyone accepts that an end

an order of natural ends.[142] God is the only free agent in the most proper sense of the term, because only God can decide by himself which ends he wants to realize. However, human beings can be said to be free insofar as they can at least partly decide which ends they want to realize.[143]

Ockham develops a distinctive stance on natural theology. Natural reason cannot prove that there is only one first cause or that the heavenly bodies and separate substances are not sufficient to cause generable and corruptible things.[144] Nor can it demonstrate that God is an immediate partial cause of all things[145], that God is intensively infinite[146], and that the first cause is contingent because free acts of human will are contingent.[147] Only an argument from indispensability can be advanced: "He would be needlessly posited if He could not effectively cause anything in the universe."[148] Ockham goes further and claims that it cannot be proved that God is the final cause of any effect: natural agents could act of necessity as they do whether they would be ordered to an end or not.[149] Just as there could be many first causes in the order of efficiency, so there could be many final causes. Indeed,

— Adams 2013, p. 23

— Maurer, p. 387

— Klocker, p. 45

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is the cause of our operations. So if you ask a little old lady [*vetula*] why [*propter quam causam*] she goes to church or to the market, she will say to you that she goes for the sake of buying a tunic. And if you are asked why you go to school, you will reply: for the sake of learning. Claims accepted in this way by everyone should not be entirely dismissed, because (as Aristotle says in *Ethics* VII) nothing more plausible and accepted could be brought forward to prove the opposite."

[142] See especially J. Biard, "The Natural Order in John Buridan," in J. M. M. H. Thijssen & J. Zupko (ed.), *The Metaphysics and Natural Philosophy of John Buridan* (Leiden: Brill, 2001), 77–95.

[143] Buridan, *Quaest. Ethicorum* X, q. 2, fol. ccvrb, transl. H. Lagerlund, "The Unity of Efficient and Final Causality," 598: "An agent is said to act freely by freedom of final ordering if it acts by chief purpose for its own sake [*sui ipsius gratia principali intentione*] and is said to act like a slave if it acts for the sake of another. Hence God alone acts simply and entirely freely in this way, and in relation to God all other agents act like slaves, because all things that exist and act both exist and act for God's sake; and hence we too ought to be God's slaves – and every external thing God produces and conserves is produced and conserved in its primary and chief purpose for God's own sake, for all existing things are 'finally ordered' to God. Yet despite this, a particular agent is said to act freely if it acts for its own sake more chiefly than for the sake of any other particular end which does not 'finally contain' it according to the natural connection and order of ends."

[144] Ockham, *Quodl*. II, q. 1, transl. Freddoso, 93.

[145] Ockham, *Ord*., d. 45, q. 1, OTh IX, 668; Rep. II, q. 3–4, OTh V, 60–66.

[146] Ockham, *Quodl*. II, q. 2, Freddoso, 96. In particular, Ockham rejects Scotus' attempts to prove that God is intensively infinite (Quodl. III, q. 1, transl. Freddoso, 169; VII, q. 11, transl. Freddoso, 629).

[147] Ockham, *Ord*., d. 43, a. 1, OTh IV, 632–633.

[148] Ockham, *Quodl*. II, 1, transl. Freddoso, 93.

[149] Ockham, *Quod* IV, q. 2, transl. Freddoso, 255: "I say that it cannot be proved that the ends from which natural causes operate are known or intended by some agent. This is true only in the case of those things which can be moved differently to one end or another and are not determined by their very natures to one certain effect. It is only because their ends are known and that they are directed thereto that they can be moved more toward one end than toward another. Merely natural causes, on the other hand, because they are by their very natures determined to a certain effect, do not require foreknowledge in an agent. At least reason alone cannot conclude that such is required."

— Adams 2013, p. 23, n. 111, n. 112, n. 113

— Maurer, p. 387, n. 17

"it cannot be sufficiently proved that God is the final cause of the second intelligence either in itself or in its effects."[150] Ockham seems to be willing to work with a non-intelligent universe ruled by a causal determinism that points to nothing beyond itself.

> Klocker, p. 44

> Klocker, p. 43

3.5   Conclusion

In the fourteenth century, the causal problem is twofold. First, there is the ontological problem of causality, i.e., the answer to the question what is causation. The belief in some form of causal determinism was widely held. This causal determinism was commonly seen as conditional, which left room for contingency in causal processes. The major shift between Aquinas and Buridan came from the fact that contingency was no longer seen as a negative product of secondary causation. In Scotus, it is seen as a positive characteristic of the first cause. The created order as a whole was seen as contingent: God could have decided to create the world otherwise. Moreover, Ockham insisted that God is not only an immediate cause of any natural causal process, but it can also take the place of any cause in any natural causal process. For this reason, it became difficult if not impossible to argue for the demonstrability of particular causal sequences in the strict sense. However, skeptical scenarios did not prevent most late medieval thinkers from asserting the general validity of a conditional form of causal determinism: under the assumption that God does not take the place of secondary causes, causal sequences are necessary.

> Courtenay, pp. 79-80

Second, from Scotus onward, a new interest emerges in the methodological problem of causality. In the fourteenth century, some thinkers began to ask whether causation is a purely epistemological category belonging solely to our description of experience. From Scotus onward, the question was raised how general causal principles such as "fire burns a combustible material whenever it is appropriately close to it" were cognized. In the fourteenth century, the problem of induction had two sides. First, how do we pass from a particular statement about an observed causal process to a general statement? The main characteristic of fourteenth-century reflections on the problem of induction was the acceptance of the principle of the uniformity of nature. Second, how do we know particular statements about causal processes? Some thinkers such as Ockham and Autrecourt challenged the view that causality is perceived. The main reason was that, all appearances being conserved, God could have taken the place of secondary causes. Once again, the new epistemological status given to contingency in causal processes was at the forefront of the reflections on causality.

Finally, under the influence of Avicenna's view of final causation, an important shift away from teleology took place among later medieval philosophers. Final causality is psychologized. Teleological explanations are progressively restricted to voluntary agents. This shift is complete with William of Ockham. Chance and for-

> McDonough, pp. 184-185

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[150] Ockham, *Quodl*. IV, q. 2, transl. Freddoso, p. 251.

tune are both seen as dependent upon the activity of free agents. However, final causality does keep an important place in the explanation of God's providential order, both in theology and in natural theology. On this topic, Ockham must be set apart from his contemporaries. He maintained that God's providence is not a necessary requisite to explain the nature and status of causation in natural events. Even Buridan did not go so far. In this sense, Ockham's view is probably one of the most distinctive among late medieval theories of causality.

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