ALBERTINO RINALDI DA SALSO ON THE MOTION OF ELEMENTS AND MIXED BODIES IN A VOID

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1. Introduction

In the 14th century only few authors unambiguously stated that the motion of a simple body (i.e., an element) in a void would be successive instead of instantaneous, as Aristotle had argued. Among them Richard Kilvington presented the most thorough analysis of this subject in his *questio* "Utrum aliquod corpus simplex possit moveri aeque velociter in vacuo et in pleno",[1] which forms part of a set of four Questions on motion. Little is known about the reception of Kilvington's Questions on motion outside England and Paris.[2]

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1 Ms. Venezia, Biblioteca S. Marco, lat. VI, 72 (2810), ff. 101ra-107vb (JUNG-PALCZEWSKA 1998, 180, n. 11). In this codex Kilvington's Question on the motion of elements in a vacuum and in a medium is the third out of four Questions on local motion and alteration (see JUNG-PALCZEWSKA 1998, 180). On its content see JUNG-PALCZEWSKA 1998, and – in my view with a more reliable interpretation – MAZET 2012. A Polish translation of Kilvington's *questio* can be found in JUNG (*olim* JUNG-PALCZEWSKA) 2014, 249-288. For Kilvington's life and work in general see JUNG-PALCZEWSKA 2000, JUNG (*olim* JUNG-PALCZEWSKA), PODKOŃSKI 2008, JUNG (*olim* JUNG-PALCZEWSKA) 2011, JUNG (*olim* JUNG-PALCZEWSKA) 2016(1), JUNG (*olim* JUNG-PALCZEWSKA) 2016(2).

2 Cf. JUNG-PALCZEWSKA 2000, 203-217.

The purpose of this paper is to draw attention to a *questio* on the motion of elements and mixed bodies in a void[3] discussed by the Italian professor of practical medicine Albertino Rinaldi da Salso di Piacenza (Albertinus de Rainaldis de Placentia, also known as Albertino da Piacenza) in which the author holds the clearly non-Aristotelian view that an element in a void would not move instantaneously, but successively. To prove his conclusion Albertino draws to a large degree on arguments proposed by Richard Kilvington, whose name he explicitly mentions several times[4]. To my knowledge, Albertino's *questio* on the motion of elements and mixed bodies in a vacuum has not yet been studied.

Albertino's principal field of activity was medicine. Most probably, he studied medicine in Bologna, and he certainly taught at the University of Bologna *medicina practica* since 1349.[5]

The earliest known work by Albertino is a medical *questio* composed in 1351 in Bologna in the framework of his lecture on Galen's *De differentiis febrium*.[6] From 1357 to 1361 Albertino taught practical medicine in Florence, from where he moved to Pavia.[7] He died before March 6, 1383.[8]

Albertino's medical works have been intensively studied by Pesenti, es-

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3 Ms. Sevilla, Biblioteca Colombina, 7-7-13, ff. 55ra-60vb. The codex is one of about 300 volumes bought by Hernando Colón during his stay in Padua in April 1531 (BEAUJOUAN 1964, 633). In his alphabetical list of manuscripts (COLÓN 1992) Colón registered Albertino's Question under its incipit "Quoniam quibusdam videtur elementum posse movere [instead of 'moveri'] in vacuo" in col. 1511.

4 Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 56va, lin. 24: «auctoritate […] ricardi clivintonis»; f. 56va, lin. 29: «Avempece autem et ricardus fuerunt illius opinionis»; f. 60rb, lin. 44: «dicit cliventon [*or* clivincton].»

5 BELLONI 1982, 23; cf. LINES 2002.

6 Cf. BELLONI 1982, 23; PESENTI 1990, 467.

7 Cf. PARK 1980, 253-255.

8 See BELLONI 1982, 20.

pecially the polemic between him and Giovanni Santasofia over the interpretation of the term *egrum simpliciter* and its relation to the Galenic latitude of health (*latitudo sanitatis*).[9]

Azzolini, emphasizing the centrality of astrology within the Bolognese curriculum, has criticized Pesenti's thesis[10] that due to Albertino's training at the University of Bologna from his tenure onwards physics largely supplanted astrology at the University of Pavia.[11]

In addition to Albertino's medical treatises and his Question discussed in this paper there is another *questio* of natural philosophic content entitled *De contactu corporum durorum*, ascribed to him in the index of the codex by a 15th century hand.[12] However, Bakker has shown that there are substantial reasons to assume Marsilius d'Inghen as author of the treatise instead of Albertino, although the latter's authorship cannot be definitively excluded.[13]

2. The structure of Albertino's Question on the motion of elements and mixed bodies in a void

Albertino's *questio* is attributed to him by the following remark in its explicit:

> Explicit questio disputata per magistrum Albertinum de Rainaldis de Placentia doctorem[14] in artibus et medicina scripta et completa per me Jacobum de Curte Anno eiusdem nativitatis M° ccc° l° xvi[a] die mensis augusti in festo sancti Leo-

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9 Cf. PESENTI 2000, 159-178, PESENTI 2003, 75-78.

10 Cf. PESENTI 1990, 468-469.

11 Cf. AZZOLINI 2005, 191, n. 17.

12 Ms. Oxford, Bodleian Library, Canon. misc. 177, ff. 75ra-79va (see PESENTI 1990, 468, n. 93; BAKKER 2000, 131, n. 19). The ascription to Albertino is on f. 213r.

13 Cf. BAKKER 2000.

14 doctus *ms*.?

nardi in vesperis. Gloria hec est omnibus sanctis eius. Amen. Amen et cetera.[15]

The *questio* starts not with a title, but with Albertino's general remark that there is much disagreement on the possible behaviour of simple bodies in a vacuum. After that introduction he poses his Question as follows:

> utrum supposito quod elementum sive simplex positum in vacuo possit moveri in tempore et successive et non in instanti, an sit aliquid sive simplex sive mixtum quod possit eque velociter moveri in pleno et in vacuo.[16]

A polemic side blow against «three ignorant people [*ignorantes*] at the University of Bologna»[17] seems to indicate that the disputation was held there. Three times Albertino refers to other works by himself. Twice he speaks of "his first general Question" («in prima mea questione generali»)[18] and in his third reference[19] he generally observes that elsewhere he spoke more clearly about a certain subject. Given that these remarks appear in the context of proportions

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15 Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 60vb. The orthography in this and the following citations from the Sevilla-Ms. has been changed into classical usage, except for the writing of "e" for diphthongs. Personal names have been capitalized.

16 «whether, provided that an element or simple body put into a vacuum could move successively and not instantaneously, there is something, be it a simple or a mixed body, which might move with the same speed in a *plenum* as in a vacuum» (Ms. Sevilla, Bibl. Colomb., 7-7-13, f. 55ra, lin. 6 sqq.).

17 See below, section IV.

18 Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 56ra, lin. 17 sqq. (italics mine): «[…] quia velocitas attenditur in quolibet motu penes proportionem potentie motoris ad potentiam moti sive ad suam resistentiam ut ponitur in quarto physicorum commento 71°, secundo de celo commento 36° *et etiam declaravi in prima mea questione generali prioris anni*»; ibid., f. 57rb, l. 17: «et etiam aliquas [i.e. rationes] posui in prima mea questione generali.»

19 Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 60va, lin. 24 sqq. (italics mine): «illa regula Aristotelis non esset [*corr. in marg. ex* est] universaliter vera quia nisi ubi duplatur proportio, quod contingit solum ubi motor excedit resistentiam in proportione dupla, *et de hoc alibi sum locutus clarius.*»

of motive powers to resistances in the framework of Aristotelian dynamics, and in view of Kilvington's enormous influence on Albertino, one might speculate that Albertino meant by his "first general Question" a *questio* similar to the first out of four Questions on motion by Richard Kilvington.[20] Unfortunately, Albertino's "prima questio generalis" has not yet been identified, which is all the more regrettable as it might allow us to date his Question on the motion in a void precisely, since Albertino informs us that he disputed his "prima questio generalis" the year before[21]. Otherwise, from the explicit cited above we learn that the scribe Jacobus de Curte wrote and completed the text on 16th August, 1350, which serves as a *terminus ante quem*.

As it is not always easy to keep track of Albertino's discussion it is worthwhile to provide an overview over its basic structure. Albertino begins with the statement that there is much disagreement concerning the possible behaviour of simple bodies in a vacuum, as some believe that an element might move in a vacuum successively, while others hold that its motion would be instantaneous. Furthermore, some believe that an element put into a vacuum would rest, whereas some consider both alternatives to be possible. Finally there are those who doubt any of these statements.[22] Albertino does

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20 Kilvington's first Question bears the title *Utrum in omni motu potentia motoris excedit potentiam rei motae* (Ms. Venezia, Biblioteca S. Marco, lat. VI, 72 (2810), ff. 81ra-89rb); see JUNG-PALCZEWSKA 1998, 180, n. 11.

21 See above, n. 18, first citation («prioris anni»).

22 Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 55ra, lin. 1 sqq.: «Quoniam quibusdam videtur elementum posse moveri in vacuo successive et in tempore, quibusdam vero in instanti et indivisibiliter, quibusdam vero neutro modo videtur esse possibile scilicet quod elementum positum in vacuo ubicumque ponatur quiescat, quibusdam vero videtur utrumque esse possibile, quibusdam vero videtur quodlibet predictorum dubitabile, ideo gratia predicti dubii veritatis inquirende fuit proposita disputari questio sub ista forma: utrum supposito quod elementum sive simplex positum in vacuo possit moveri in tempore et successive et non in instanti, an sit aliquid sive simplex sive mixtum quod possit eque velociter moveri in pleno et in vacuo.»

not mention names but uses the unspecific expression, "quibusdam videtur". Therefore it is not clear whether he generally refers to the large spectrum of opinions in this field of natural philosophy at his time or in particular to contemporary lively debates at the University of Bologna or at least at one of the Italian universities that Albertino knew personally. The latter seems probable, as Albertino once refers to "magister Matheus de Gubio" (= Matthaeus de Eugubio [died c. 1347]) and his idiosyncratic style of disputation when it came to discuss the *locus classicus* of Aristotle's proof and Averroes's commentary on it that motion in a vacuum would be instantaneous.[23] Matthaeus de Eugubio was professor of philosophy at the faculty of arts of the University of Bologna from 1334-1347.[24]

Doubtless, Albertino is right when he speaks of a diversity of opinions. Among those who stated that an element's motion in a void would be suc-

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23 Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 55vb, lin. 16 sqq.: «Alia ratio istius doctoris fuit quia recitavit bene sex lineas textus Aristotelis et commenti 71° et postmodum incepit clamare ut sui moris est et dicere: 'tu non habes me', nec voluit intelligi, et hic fuit magister Matheus de Gubio.» As *istius doctoris* refers to the immediately preceding passage, in which Albertino reports some arguments brought forward by an *antiquus doctor*, we can infer that Mathaeus de Gubio was this *antiquus doctor* who argued as follows: The existence of a vacuum implies a logical contradiction, and from something impossible any conclusion follows. Therefore, from the assumption of a void and an element in it, it can be inferred both that the element moves and that it does not move. That the existence of a vacuum implies a logical contradiction is evident from the fact that such a vacuum would constitute a *dimensio et quantitas separata*, and as quantity is an *accidens*, there would be an *accidens sine subiecto* (which was thought to be naturally impossible). Finally, a penetration of the void's and the mobile's dimensions would be necessary, which was refuted by Aristotle. Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 55vb, lin. 9 sqq.: «[…] arguitur ratione antiqui doctoris: ad antecedens implicans contradictionem sequitur quelibet pars, <ut> patet ex logica. Sed quod detur vacuum et quod elementum ponatur in eo, implicat contradictionem, ergo potest sequi quod moveatur et quod non moveatur. Minor probatur ut dicit quia illud vacuum esset dimensio et quantitas separata, et cum quantitas sit accidens, dabitur accidens sine subiecto. Etiam cum in vacuo non sit possibilis cessio corporum, ut ponitur quarto physicorum, ideo oportebit dare ibi penetrationem dimensionum, scilicet vacui et mobilis, quod est reprobatum quarto physicorum.»
24 See MAZZETTI 1847, 204.

cessive or whose views on the nature of motion imply such a statement were Thomas Aquinas, Petrus Johannis Olivi, William of Ware, Johannes Duns Scotus, William of Ockham, and of course Richard Kilvington.[25] On the other hand, Aristotle's and Averroes's deduction that motion in a vacuum would be instantaneous was one of several reasons that led many to the conclusion that there would be no motion at all in a vacuum, whether successive or instantaneous, as they found an instantaneous motion unimaginable. Roger Bacon[26] and John of Jandun[27] can be mentioned as proponents of this view. Others, such as Aegidius Romanus[28] and Walter Burley[29], struggled to explain how an instantaneous motion could be conceived of.

Albertino's *questio* is composed of three main articles:

1. The first article, in which Albertino argues *ad questionem*, contains four major parts. In the first part[30] Albertino exposes Aristotle's and Averroes's view that no element or simple body put into a void would move successively. Accordingly, in the second part[31] Albertino argues that nothing could move with the same speed in a *plenum* as in a *vacuum*. In the third[32] and fourth part[33] of the first article Albertino, following explicitly Avempace and Kilvington, argues in favor of the opposite opinion, proving that an element in a void would by necessity move successively (third part) and that something could move with the same speed in a *plenum* as in a vacuum, and even

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25 For the first five authors see MAIER 1952, 224-234; for Kilvington's view see the literature cited in n. 1.

26 Cf. GRANT 1981, 31; MAIER 1952, 227.

27 JOHANNES DE JANDUNO 1560 *In De physico auditu*, IV, q. XI, 268-271.

28 MAIER 1952, 226-227.

29 BURLEY 1501, ff. 116va – 117ra; cf. CAROTI 2012, 391.

30 Ms. Sevilla, Biblioteca Colombina, 7-7-13, ff. 55ra, lin. 22 – 56rb, lin. 59.

31 *Ibid.*, f. 56rb, lin. 60 – va, lin. 21.

32 *Ibid.*, ff. 56va, lin. 21 – 57ra, lin. 24.

33 *Ibid.*, f. 57ra, lin. 24 – rb, lin. 43.

faster in a *plenum* than in a vacuum (fourth part).

2. The second article consists of two parts. In the first part[34] Albertino answers the question by putting forward 14 conclusions, the most important of which are the fifth, ninth and tenth. In his fifth conclusion[35] Albertino states that an element would move in a void successively and not instantaneously. His ninth conclusion determines the Question, declaring that it is possible that something moves in a *plenum* with the same speed as – and even faster than – in a vacuum. As this statement is only true for certain cases, Albertino emphasizes in his tenth conclusion that, if all conditions are the same, it will never be possible that something moves in a *plenum* with the same velocity as – or even faster than – in a *vacuum*, as to all kinds of resistance responsible for the successiveness of the mobile's motion in a void the resistance of the medium has to be added. Finally, the second part[36] of the second article lists counter-arguments against the conclusions of the first part.

3. In the first part[37] of the third article, Albertino refutes the arguments that he put forward in the first part of the first article in favour of the Aristotelian opinion. In the second part of the third article,[38] he rejects the objections listed in the second part of the second article against his conclusions of the first part of the second article.

3. Albertino's proof of the successiveness of an element's motion in a void

As Albertino's view that the motion of an element in a void would be suc-

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34 *Ibid.*, ff. 57rb, lin. 43 – 59va, lin. 34.
35 Citations will be provided in sections III and IV.
36 Ms. Sevilla, Biblioteca Colombina, 7-7-13, ff. 59va, lin. 34 – 60ra, lin. 5.
37 *Ibid.*, f. 60ra, lin. 5 – va, lin. 11.
38 *Ibid.*, f. 60va, lin. 11 – vb, lin. 15.

cessive, and not instantaneous, is clearly opposed to central Aristotelian tenets, it is appropriate to briefly recapitulate Aristotle's position and the main counter-arguments against it that circulated at the time when Albertino composed his *questio*.

Aristotle had put forward several arguments rejecting the possibility of motion in a vacuum. Among these arguments, his deduction that the speed of a body moving in a void would be "beyond any ratio" exerted the greatest influence on medieval discussions on the possibility of motion in a vacuum.[39] Relying on his principle that motion is the result of the proportion between moving force and resistance, Aristotle argued that because «there is no ratio in which the void is exceeded by body, as there is no ratio of 0 to a number,» it follows that «the void can bear no ratio to the full, and therefore neither can movement through the one to movement through the other, but if a thing moves through the thinnest medium such and such a distance in such and such a time, it moves through the void with a speed beyond any ratio.»[40]

It is safe to assume that what Aristotle meant by «speed beyond any ratio» was an instantaneous motion, a motion of infinite velocity, in short, an infinite motion. Aristotle did not provide a further description of the properties of such an instantaneous motion. Usually an instantaneous motion was considered a motion in which the moving body occupied the *termini* of its motion, and all intervening points, simultaneously.[41] The transmission of light served as a classic example of an instantaneous motion. This opinion dates back to Aristotle, who assumed the speed of light to be instantaneous,

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39 See GRANT 1981, 24.
40 *Phys.*, IV, 8, 215b12-22. The translation is cited from ARISTOTELES 1930. In concordance with the Aristotelian text I have changed «thickest medium» to «thinnest medium».
41 GRANT 1981, 24.

although he knew Empedocles's argument that «light from the sun arrives first in the intervening space before it comes to the eye, or reaches the earth. » Aristotle rejected Empedocles's consideration, raising the objection that, if the transmission of light were finite, there should be a «time when the sun's ray was not as yet seen, but was still travelling in the middle space;»[42] yet, since we cannot distinguish the sun's rays in the prior parts of their path from the posterior parts, the speed of light must be instantaneous.[43]

Aristotle's argument that the speed of a body moving in a void would be instantaneous due to the lack of any medium that could offer resistance made a considerable impression on his later commentators; nevertheless, it did not go unchallenged. In the course of time, various factors were conceived that might cause the motion even of elemental, that is simply heavy or light, bodies in a vacuum to be temporal and not instantaneous. Doubtless, the *distantia terminorum* or *incompossibilitas terminorum* argument was one of the most famous reasonings for the temporality of the motion of elemental bodies in a vacuum.

The *distantia terminorum* argument is based on the fact that a body that is moved from one place to another cannot occupy the *termini* of its motion, and all intervening points, simultaneously. Applied to the motion of a body in a vacuum that is thought to be possessed of dimensions and extension, this argument says that the motion of the body will be finite, that is, temporal and successive, simply because of the fact that a distance has to be traversed that can be divided into prior and posterior parts. Since these prior and posterior parts cannot be traversed except in sequence, the resultant motion must, of

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42 *De sensu*, 446a26-b2; *De an.*, II, 7, 418b20-26. The translations are cited from GRANT 1981, 30, and 282, n. 24.
43 GRANT 1981, 29-30, and 282, n. 24.

necessity, be temporal and successive.[44] As Moody declared, Thomas Aquinas «was the recognized advocate, or even originator, of the thesis that the *distantia terminorum* is the essential and sufficient cause of the temporal character of motion.»[45] Eventually, the origin of the *distantia terminorum* argument lies in Avempace's famous objection, cited by Averroes,[46] that, if the resistance offered by a medium were necessary for motion to be temporal, «then the heavenly bodies would be moved instantaneously as they have no medium resisting them.»[47] As, according to Avempace, the motion of simple bodies in a vacuum would by nature be temporal and not instantaneous, the effect produced by the medium does not consist in making a motion successive which otherwise would be instantaneous, but in reducing the (finite and maximum) speed a simple body would have in a vacuum by affecting the mobile with an accidental slowness (*tarditas accidens rei motae*) which is inversely proportional to the subtlety of the medium.[48]

Already in the thirteenth century the *distantia terminorum* was identified by Pseudo-Siger of Brabant as a kind of resistance,[49] that is, it was no longer the mere fact that a body cannot occupy the *termini* of its motion, and all intervening points, simultaneously, that served as an argument for the finitude of motion in a vacuum. Rather, the *distantia terminorum* was now interpreted as if it were a force or virtue that resisted the motive force of the mobile.

After an elaborate account of Aristotle's and Averroes's views in the first two parts of the first article of his *questio*, Albertino makes intensive use

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44 For a detailed account of the *distantia terminorum* argument, its possible origin and medieval debates on it see GRANT 1981, 27-38.
45 MOODY 1949, 425.
46 AVERROES 1562 *De physico auditu*, IV, t.c. 71, f. 160C-G.
47 See GRANT 1981, 26.
48 MAZET 2012, 240.
49 See GRANT 1981, 28-29.

of the *distantia terminorum* argument in the third part of the first article to prove that an element's motion in a void would be temporal. Or, to be more precise, his reasoning amounts to what is implied by the *distantia terminorum* argument, whereas he uses the term *distantia terminorum* relatively seldom. Kilvington, by the way, never refers to this term when he argues in this direction.

Albertino's line of reasoning is as follows:[50] A *falsum possibile*, that is something that is possible *apud imaginationem*, must not imply a *falsum impossibile*. As it is possible to imagine a vacuum extending from the concave inner surface of the moon's sphere to the world's center and that a heavy body is located at the concave inner surface of the moon's sphere, such an imagining is clearly a *falsum possibile*. However, to state that the motion of this heavy body would be instantaneous rather than temporal implies an *impossibile secundum imaginationem* or a *falsum impossibile*, as it is unimaginable that a big

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50 Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 56va, lin. 36 sqq.: «[…] falsum possibile est illud quod est possibile apud imaginationem, modo ex possibili apud imaginationem non debet sequi impossibile apud imaginationem. Sed consequentiam probo sic: Quia imaginetur vacuum a concavo orbis lune usque ad centrum et quod unum grave sit in concavo in hoc instanti, tunc patet quod illud est possibile apud imaginationem, sed secundum istam opinionem [the view of those who reject the successiveness of motion in a void] illud grave movetur in instanti ad centrum, et ex hoc sequitur impossibile secundum imaginationem scilicet quod illud grave magnum sicut lapis gratia exempli simul et pro eodem instanti tangat superficiem concavam orbis lune et centrum terre, quod nullus potest imaginari esse possibile. Et ita sequitur quod illud grave non citius attingat vacuum aeris imaginatum quam vacuum aque et ignis quam aeris, quod etiam non apprehendit imaginatio [sed add.]. Sed tu dices ut dicunt aliqui quod istud grave movebitur ad centrum subito, non tamen in instanti, sed quia immediate post instans erit in centro ita quod nunc est in concavo et immediate post hoc instans erit in centro. Contra, quia si<t> instans primum in quo est in centro, et tunc illud instans aut est immediatum presenti instanti in quo grave est in concavo orbis lune vel non est immediatum. Si primo modo, contra Aristotelem sexto physicorum, tertio de celo et in primo de generatione. Si secundo modo, ergo cadit tempus medium in quo movebitur illud elementum, et sic sequitur propositum.»

heavy body such as a stone[51] simultaneously touches the inner concave surface of the moon's sphere and resides in the world's centre. Nor is it possible to imagine that this heavy body in its motion does not reach the vacuum in the sphere of air earlier than the vacuum in the sphere of water. Furthermore, it does not help to argue that the heavy body would move *subito* to the world's center, yet not in *instanti*, in the sense that in a certain moment (*instans*) it is at the inner concave surface of the moon's sphere, and immediately afterwards, that is in another instant, it is in the world's centre. It is easy for Albertino to show that this is no valid evasion, as Aristotle has demonstrated several times that two instants cannot immediately succeed one another. Also the alternative assumption that the second instant, in which the body is in the world's centre, is not immediate to the first instant, in which the body is at the inner concave surface of the moon's sphere, is untenable, as it implies that there is time between these two instants, and that automatically involves the temporality of this motion. Of course, Albertino realized that the *distantia terminorum* argument applies to all kinds of local motions irrespective of the composition of the moving body. This leads him to the general argument that, if the temporality of motion follows from the nature of motion or, respectively, from the *distantia terminorum*, then neither an element nor another body will be able to move *in instanti*, be it in a vacuum or in a medium. Rather, local motion is always successive.[52] To

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51 Albertino is not consistent in his argumentation when he mentions a stone as an example, because a stone does not represent an element, but is a mixed body containing different elements behaving differently with regard to their inclination to motion. As Albertino wants to prove that an element's motion in a void would be temporal, his thought experiment makes only sense if we assume the heavy body to be a piece of the element earth.

52 Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 56vb, lin. 2 sqq.: «Si ex natura motus sive ex distantia terminorum contingit motum fieri in tempore, tunc nec elementum nec aliud nec in pleno nec in vacuo potest moveri in instanti, immo successive. Sed sic est, ergo et

corroborate this argument Albertino refers to Averroes, who stated[53] that it is from the nature of motion that the heavenly bodies move successively and not instantaneously, although they are not confronted with any resistance in their motion. Of course, Avempace is also mentioned, whose reasoning that the resistance offered by a medium cannot be the cause of the temporality of motion as otherwise the motion of the heavenly bodies would be instantaneous is drawn upon by Albertino several times.[54]

Albertino brings forward some more arguments in the form of thought experiments to demonstrate that the assumption of an instantaneous motion leads to unimaginable consequences, implying that motion of simple resp. elemental bodies in a vacuum must be successive. Thus, argues Albertino, if we imagine the spheres of fire and air to be void and if we assume a kind of void tunnel (*foramen vacuum*) inside the otherwise full sphere of water extending from the convex to the concave surface of the water's sphere, then a piece of pure earth put at the concave surface of the moon's sphere and instantaneously descending to its natural place would reach the upper end of the void tunnel as fast as its lower end, an absurd consequence that nobody's

cetera. Maior patet de se, et minor est commentatoris septimo physicorum commento 35° ubi dicit quod motus corporum celestium fiat in tempore et non in instanti, istud est ex natura motus. Idem ponit Avempece, ut patet quarto physicorum commento 71°.»

53 AVERROES 1562 *De physico auditu*, VII, t.c. 35, f. 335D.

54 See e.g. Albertino's tenth argument in the third part of the first article. Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 56vb, lin. 46 sqq.: «Si elementum non movetur in vacuo, istud esset, quia non haberet resistentiam aliquam nec intrinsecam nec extrinsecam. Consequentia patet secundum illos. Sed contra, quia tunc corpora celestia moverentur in instanti et non in tempore, quod est falsum. Et consequentia patet, quia in motibus eorum non est resistentia nec contrarietas. Sed tu dices: illud [illic *ms.*?] mobile est in actu [cf. AVERROES 1562 *De physico auditu*, IV, t.c. 71, f. 161v]. Contra: hoc nihil valet ex quo non resistit intelligentie moventi, et ita est quia tunc intelligentia moveret cum fatigatione et sic non ab eterno vel fieret vigoris infiniti quorum utrumque est impossibile octavo physicorum et duodecimo metaphysice, et hec fuit ratio avempece, ut patet quarto physicorum commento 71°.»

mind is able to conceive.[55]

Beside the *distantia terminorum* argument, the assumption of an intrinsic resistance in elemental bodies was one of the main attempts to prove that the motion of simple bodies in a vacuum would be temporal.

For Albertino an elemental body possesses an internal resistance because its quantitative parts resist each other since the smaller parts have less inclination to natural motion than the larger ones or the whole elemental body.[56] The same argument can be found in Kilvington's treatise.[57] As this internal kind of resistance does not impede motion but rather promotes it, Kilvington prefers to speak of a *resistentia promotiva* as opposed to a *resistentia impeditiva*. It is remarkable that Albertino does not use another famous reasoning by Kilvington, namely that each of the infinite parts of a simple body, such as pure earth, tends to descend on the shortest line possible, that is radially, to the world's center. The incompatibility of these different tendencies forms an internal resistance that enables temporal motion.[58]

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55 Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 56va, lin. 60 – vb, lin. 2: «Imaginetur locum ignis et aeris vacuum totaliter, locum aque plenum ubique [ubi quia *ms.*] <et> imaginetur unum foramen [parvum in spera aque *add. et del.*] magnum in spera [et *add.*] aque vacuum procedens a convexa superficie aque ad eius superficiem concavam, et ponatur unum grave, ut puta terra pura, que sit *a*, in concavo. Vel ergo *a* ibit ad suum locum successive et in tempore, et habetur propositum, vel subito quia in instanti sive quia immediate post instans, et sive sic sive sic, contra quia tunc *a* ita cito attingeret finem foraminis sicut principium quod nulla mens capit esse possibile.»; for Kilvington's similar argument see KILVINGTON, Question *Utrum aliquod corpus simplex possit moveri aeque velociter in vacuo et in pleno*, ms. Venezia, Biblioteca S. Marco, lat. VI, 72 (2810), ff. 101ra-107vb, here on f. 102va.

56 Ms. Sevilla, Biblioteca Colomb., 7-7-13, f. 56vb, lin. 13 sqq.: «pars quantitativa resistit suo toti in motu naturali, ergo est verum quod partes quantitative [*illeg. add. et del.*] elementi resistunt sibi et est ratio quod id est quia pars quantitativa minor minorem habet inclinationem ad motum naturalem quam pars quantitativa maior et quelibet pars quam totum.»

57 KILVINGTON, *Utrum aliquod corpus simplex possit moveri aeque velociter in vacuo et in pleno*, ms. Venezia, Biblioteca S. Marco, lat. VI, 72 (2810), ff. 101ra-107vb, here on f. 104va.

58 *Ibid.*, on f. 104va-vb. It is possible that Kilvington's concept was inspired by Robert

4. Albertino's determination of his Question

As has already been mentioned, in the first part of the second article Albertino answers the question by putting forward 14 conclusions representing his own opinion, the most important of which are the fifth, ninth and tenth.

The first three conclusions are quite usual and consist in that (1) for motion to be successive some kind of resistance is necessary (as became clear in section III this need not be the resistance offered by a medium) and that (2) every resistance is sufficient for some motion, but of course not every resistance is sufficient for every motion.[59] Albertino's third conclusion represents the widely held opinion that mixed bodies would move in a void successively and not instantaneously, because mixed bodies are composed of different elements with different and contrary natural motions resp. inclinations to these motions so that an internal resistance exists, which makes sure that the motion is successive.[60] That an element put into a void would not remain at rest is explained in the fourth conclusion,[61] which Albertino proves by a long

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Grosseteste (see JUNG-PALCZEWSKA 2002, 132, n. 60). Also Roger Bacon has already argued that the falling of bodies is – *quoad totum*, that is what concerns the whole body – natural, but *quoad partes* it is at least partly violent, since every part of the body tends by its own towards the centre of the world. Yet, Bacon does not draw any conclusions from this with respect to the motion of bodies in a vacuum (see MAIER 1952, 236, n. 23).

59 Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 57rb, lin. 47-48: «Prima conclusio sit ista quod in omni motu requiritur resistentia»; f. 57va, lin. 24 sqq.: «Secunda conclusio est ista scilicet quod omnis resistentia sufficit ad motum. […] [lin. 44 sqq.:] Scias tamen quod quamvis resistentia sufficiat ad motum aliquem, non tamen omnis resistentia sufficit ad omnem motum.»

60 *Ibid.*, f. 57va, lin. 48 sqq.: «Tertia conclusio est ista scilicet quod omne mixtum sive animatum sive inanimatum positum in vacuo movetur in eo successive et in tempore et non in instanti. Hoc probatur sic: omnis resistentia sufficit ad motum, ut ponit secunda conclusio, et in omni moto [motu *ms.*] mixto est aliqua resistentia, sive illud sit animatum sive non, quia omne mixtum est mixtum [*illeg. add. et del.*] ex contrariis, ergo omne mixtum positum in vacuo movetur in eo successive et in tempore.»

61 *Ibid.*, f. 57vb, lin. 18-19: «Quarta conclusio est ista quod elementum sive simplex posi-

list of arguments.

In his fifth conclusion Albertino states that an element would move in a vacuum successively and not instantaneously. Thus, Albertino definitely sides with Kilvington who more than once pronounced in his Question the same opinion.[62] To prove his central conclusion Albertino refers to the arguments he had put forward in the third part of the first article.[63] As a consequence of the fifth conclusion the sixth conclusion declares that the proportion of an element's motions – or to be more precise their velocities – in two different media does not correspond to the proportion of the different degrees of subtlety of these media, because – to mention only one of Albertino's arguments – otherwise an element's motion in a void would be instantaneous.[64] Therefore, the assertion that a motion can be accelerated infinitely by increasing the medium's subtlety through doubling and then quadrupling it and so on *in infinitum* is only valid if the term *in infinitum* is used syncategorematically and not categorematically (7th conclusion).[65] It is not astonish-

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tum in vacuo non quiescit in illo.»

62 See JUNG-PALCZEWSKA 1998; MAZET 2012.

63 Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 58rb, lin. 19 sqq.: «Quinta conclusio sit ista scilicet quod elementum positum in vacuo non movetur subito in eo, immo movetur successive et in tempore, et hec est conclusio principalis de supposito. Hanc conclusionem probant mihi sufficienter rationes adducte in tertia parte principali primi articuli.»

64 *Ibid.*, f. 58rb, lin. 38 sqq.: «Sexta conclusio sit ista quod non qualis est proportio subtilitatis medii ad subtilitatem alterius medii talis est proportio motus elementi in uno ad motum eiusdem in alio, et per consequens quod motus elementi non potest velocitari in infinitum duplicando scilicet et quadruplicando suum motum ex subtilitate medii in infinitum. Hanc conclusionem probo primo sic: tunc elementum moveretur in vacuo in instanti. Consequentia patet quia pleni ad vacuum nulla est proportio ut probatur quarto physicorum 71° commento, ergo tunc motus elementi <in>finiti in vacuo ad motum eiusdem in pleno nulla esset proportio et per consequens motus eius in vacuo [fin *add. et del.*] fieret in instanti, quia si in tempore, motus ipsius ad motum eiusdem in pleno esset aliqua proportio, cum cuiuslibet temporis ad aliquod tempus sit aliqua proportio.»

65 *Ibid.*, f. 58va, lin. 46 sqq.: «Septima conclusio sit ista quod quamvis non sit possibile quod propter subtiliationem medii elementum velocitat motum suum in infinitum, tamen est possibile quod in infinitum velocitat motum suum quodlibet elementum prop-

ing that the corresponding conclusions can be found in Kilvington.[66]

The main conclusion is the ninth, where Albertino determines the Question by declaring it possible that something ("aliquid") moves in a *plenum* with the same speed as – and even faster than – in a vacuum.[67] Again, he refers to the arguments in his first article, this time in its fourth part.[68] From this reference it is clear that Albertino means with *aliquid* elements as well as mixed bodies, because the fourth part of the first article contains arguments for both cases. However, Albertino seems to have overlooked that some of his arguments in the fourth part of the first article are incompatible with his sixth and seventh conclusions, as these conclusions imply that the velocity of the motion of an element in a vacuum is the maximum speed an element can reach. The problem becomes evident, if we for example consider Albertino's following argument from the fourth part of the first article, where he tries to show that an element might move faster in a medium than in a vacuum. If we assume, says Albertino, that an element moves in a vacuum a thousand times faster than in a medium, then we can imagine the medium to be made more subtle by the factor one thousand so that the element's velocity in the medi-

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ter subtiliationem medii. […] et ideo est concedendum quod in infinitum potest velocitare suum motum quodlibet elementum propter subtiliationem medii, quamvis nullum elementum possit velocitare suum motum in infinitum propter subtiliationem medii, et causa est quia [ly *add. et del.*] ly 'infinitum', ut dicunt sapientes logici, a parte predicati tenetur categorematice, sed a parte subiecti tenetur syncategorematice, et ideo non contradicunt predicte conclusiones 'in infinitum et cetera'.» For a detailed discussion of the medieval distinction between syncategorematic and categorematic concepts and its history see KLIMA 2010.

66 See MAZET 2012, 239, 243.

67 See Kilvington in MAZET 2012, 233.

68 Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 58vb, lin. 37 sqq.: «Nona conclusio sit ista quod est possibile quod aliquid moveatur eque velociter in pleno et in vacuo et etiam velocius. Et hec est conclusio principalis in questione [conclusione *ms.*]. Hanc conclusionem probavi sufficienter in [prima parte *add. et del.*] quarta parte principali primi articuli.»

um becomes equal to that in the vacuum, and of course the medium could be subtilized to an even higher degree, with the result that the element moves faster in the medium than in the vacuum.[69] This argumentation is definitely contradictory to Albertino's sixth conclusion. Concerning mixed bodies Albertino put forward e.g. the following thought experiment, likewise in the fourth part of the first article: Let us take a mixed body containing earth and water, with earth being the dominant part, and let us assume that water offers greater resistance against leaving its natural place than a subtle medium, such as air, tends to hinder the motion of the whole mixed body. If this *mixtum* is put into a void in the region where normally water is located, it will move more slowly than in a *plenum* made of air, as in the first case the water resists leaving its natural place, while in the second case both earth and water in the region of air have an inclination to move downward and the only resistance encountered is that offered by the medium consisting of air, whose power to withstand the motion of the mixed body has been presumed to be lower than the water's resistance against leaving its natural place.[70]

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69 *Ibid.*, f. 57ra, lin. 24 sqq.: «Nunc sequitur quarta [secunda *ms.*?] pars principalis primi articuli in qua oportet probare istam conclusionem scilicet quod aliquid possit moveri eque velociter in pleno et in vacuo et etiam quod velocius in pleno quam in vacuo. Hanc autem conclusionem probo primo sic: elementum potest moveri in pleno et in vacuo, ergo velocius in vacuo. Sit ergo gratia exempli quod in millecuplo <moveatur velocius in vacuo> et tunc subtilietur medium plenum in millecuplo et patet, quia [quod *ms.*] talis sit proportio motus ad motum qualis est proportio subtilitatis medii ad subtilitatem medii, quod elementum in pleno movebitur in millecuplo velocius quam prius et per consequens ita velociter sicut in vacuo quod erat probandum, et per idem argumentum velocius in pleno quam in vacuo quia subtilietur iterum medium et patet intentum.»

70 *Ibid.*, f. 57ra, last line – rb, lin. 8: «Capio *a* mixtum ex terra et aqua et dominetur terra super aquam sic tamen quod illa aqua secum coniuncta [*lectura incerta*] plus resistat sibi quam unum medium subtile toti *a* mixto, et hoc est possibile, nam *a* mixto posito in aliquo aere subtili valde non est resistentia nisi ab aere, cum totum mixtum nitatur ad inferius ratione terre et aque. Et tunc sit vacuum loco aque et ponatur *a* mixtum in illo vacuo aque et patet quod *a* mixtum movetur ibi tardius quam movebatur in aere illo propter maiorem resistentiam, ergo *a* mixtum movetur velocius in pleno quam in vacuo, et per consimile argumentum eque velociter quia ponatur quod aqua in mixto resistat pre-

From examples like these it is obvious that Albertino's ninth conclusion is valid only for certain cases in which the conditions under which the respective body is thought to move in a *plenum* and in a vacuum are different. Accordingly, in his tenth conclusion Albertino makes it clear that, if all conditions are the same (*omnibus existentibus paribus*; e.g. the point where the body starts its motion in a vacuum and in a *plenum*), it will never be possible that something moves with the same velocity or even faster in a *plenum* than in a vacuum, as the resistance of the medium has to be added to all kinds of resistance responsible for the successiveness of the mobile's motion in a vacuum.[71] In other words, the speed something can attain in a vacuum is the maximum speed possible. Thus, the tenth conclusion is at least as important as the ninth conclusion with regard to the determination of the Question.

Although Albertino does not mention it as a separate conclusion, for him, as for Kilvington,[72] a larger piece of element would move faster in a void than a smaller one. His view can be inferred from a complex discussion in which, interestingly, he once even criticizes Kilvington. The context is as follows: Albertino has to refute the counter-argument, that, if it is true that a larger piece of element would move faster in a void than a smaller one, we should expect that two pieces of an element of equal size bound together

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cise tantum quantum ille aer et cetera.» For essentially the same argument by Kilvington see MAZET 2012, 234.

71 *Ibid.*, f. 58vb, lin. 46 sqq.: «Decima conclusio sit ista quod omnibus existentibus paribus non est possibile quod aliquid moveatur eque velociter in pleno et in vacuo nec etiam velocius. Hanc conclusionem satis probant quattuor rationes in secunda parte principali primi articuli, nam omne illud quod movetur in pleno et in vacuo, quando movetur in pleno, habet resistentiam maiorem quam quando movetur in vacuo, quia ultra omnem resistentiam quam habet in vacuo habet resistentiam pleni, ergo omne tardius movetur in pleno quam in vacuo quod est propositum.» Kilvington came to the same result (see MAZET 2012, 239).

72 JUNG-PALCZEWSKA 1998, 191, n. 52.

should move faster than each of the separate pieces, but this contradicts Aristotle's rule that if each of two motive powers moves a resistance with the same velocity, the aggregate of these two motive powers will move the aggregate of the two resistances with the same velocity.[73] In his refutation Albertino criticizes Kilvington, who argued[74] that Aristotle's rule applies only if the resistance is a *resistentia impeditiva*, but it does not apply if the resistance is a *resistentia promotiva motus*, such as the mutual resistance among the parts of a mobile, which only enables the successive motion of an element in a void. Kilvington's solution is, according to Albertino, not good and can easily be charged, as any resistance impedes and slows down motion. Rather, Albertino argues that Aristotle's rule is true only if all conditions are the same, and that does not obtain in this case "propter maiorem additionem

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73 Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 56ra, lin. 54 sqq.: «Capiantur duo simplicia equalia et moveantur in aliquo medio pleno aut in vacuo, tunc illa duo moventur eque velociter, ergo si congregentur, illa duo simplicia <scilicet> totum aggregatum movebitur velocius. Consequentia patet per te qui ponis simplex maius moveri velocius. Sed probo falsitatem consequentis, quoniam probatum est septimo physicorum capitulo <ultimo> quod si duo vel plures potentie motive moveant duas resistentias equaliter et congregentur ille potentie motive et sue resistentie quod potentia motiva congregata movebit precise eque velociter et non velocius resistentiam congregatam, et tunc ex hoc patet intentum.»

74 Ms. Venezia, Biblioteca S. Marco, lat. VI, 72 (2810), f. 105va, lin. 40 – vb, lin. 4: «[…] et ponitur quod *a* et *b* sint due terre simplices equales, tunc arguitur [Aristoteles *ms.*?] sic: potentia motiva ipsius *a* se habet ad suam resistentiam sicut potentia motiva *b* ad suam resistentiam, igitur potentia aggregata ex potentia motiva *a* et potentia motiva *b* se habet ad resistentiam aggregati sicut una potentia ad suam resistentia<m> et per consequens potentia motiva aggregata movebit resistentiam aggregatam eque velociter [et velocior *ms.*] sicut potentia partialis partialem resistentiam et per consequens simplex maius non velocius movebitur quam simplex minus […]. Patet per commentatorem septimo physicorum commento 37º, ubi ponit talem regulam quod si fuerint plures potentie motive et potentia motiva unius se habet ad suam resistentiam sicut potentia motiva alterius ad suam rsistentiam, tunc ipsa aggregata movebit resistentiam aggregatam sicut una potentia movebit suam resistentiam. Ad quod dicitur quod regula ista habet intelligi de resistentia que est impeditiva motus et de velocitate addita motui naturali quam habet simplex in vacuo et non de tali resistentia simplicis in vacuo […].» (by *talis resistentia simplicis in vacuo* Kilvington means the *resistentia promotiva* that arises from the mutual resistance among the parts of the element; see above, section III).

quantitatis in uno quam in alio".[75] Albertino's reasoning is not quite clear, and one wonders how he wants to explain why a big piece of an element shall behave differently in a void than a piece of equal size consisting of two joined halves. Perhaps we should emend Albertino's answer to "propter maiorem *coniunctionem* quantitatis in uno quam in alio", because the only recognizable difference consists in that the first body can be considered homogeneous, whereas the other is composed of two conjoint, yet separate, halves. Thus, Albertino stopped short of discovering the equality of speed of the two bodies falling in a vacuum. As is well known, in the 16th century Giovanni Battista Benedetti, by using a similar thought experiment and appealing to intuition, demonstrated that two bodies of the same weight connected by a line and falling in a vacuum move at the same speed as a single body having their combined weight.[76]

From the list of 14 conclusions in the first part of the second article also the 13th and 14th deserve some attention, although they are only indirectly pertinent to the subject of Albertino's Question. In a notably personal and polemical remark Albertino explains that he has added these conclusions because there are three ignorant people (*ignorantes*) at the University of Bologna who believe that if a single species perished, however weak it may be, such as an ant or a fly, the whole universe would perish and that if de facto the heavens' influence ceased, every action in the sublunary world would come to a

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75 Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 60rb, lin. 44 sqq.: «dicit Cliventon [Clivincton *ms.*?] quod regula illa Aristotelis debet intelligi de resistentia impeditiva motus, sed non de resistentia promotiva motus, qualis est resistentia partium quantitativarum. Ista solutio pro certo non est bona et impugnabilis faciliter, quia resistentia quelibet impedit et retardat motum. Ideo dico quod regula Aristotelis est vera aliis paribus quod non contingit in proposito propter maiorem additionem quantitatis in [vacuo *add. et del.*] uno quam in alio.»
76 Cf. DRAKE 1970, 607.

stop.[77] In his refutation of this view Albertino draws on the motion of elements or mixed bodies in a void as an example of an action that would take place even without the heavens' influence, as it cannot be assumed that the heavens' influence reaches into a void, because a void does not contain anything, so that such an influence would be idle. Moreover, if the heavens exerted an influence in the void, whatever it would influence would be an *accidens sine subiecto*, an assumption that Albertino wants to leave to the stupid ones to concede.[78] Furthermore, Albertino points out that *ille de Anglia* has indicated in one of his Questions that one of the articles condemned in Paris claimed that fire would not burn flax if the heavens stopped moving.[79]

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77 Ms. Sevilla, Biblioteca Colombina, 7-7-13, f. 59ra, lin. 34 sqq.: «Quamvis in hoc finiatur prima pars secundi articuli, tamen gratia quorundam meorum sociorum volo subiunge-re duas conclusiones. Sunt enim tres ignorantes in isto studio [bon *add.*] bononiensi credentes quod si periret una species universi [universit *ms.*?] quantumlibet debilis, ut verbi gratia formica vel musca, quod totum universum [per...et *add. et del.*] periret <et> quod si de facto deficere<n>t motus et influxus celi quod desineret omnis actio in istis inferioribus.»

78 *Ibid.*, f. 59ra, lin. 40 sqq.: «Sit igitur ista conclusio tertia decima quod <si> ita esset quod de facto cessaret motus celi, immo omnis influxus celi, quod adhuc remanerent multe [mille *ms.*] actiones naturales saltem pro aliquo tempore, quia pro [per *ms.*] mense vel anno. Hec autem conclusio demonstrative sequitur ex premissis in hunc modum: elementum potest moveri in vacuo, ut ponit quinta conclusio, vel saltem mixtum potest moveri in vacuo, ut demonstrat tertia conclusio, et celum nullam habet influentiam in vacuo, ergo aliqua actio, puta motus localis, est que non dependet a motu nec ab influxu celi. Et sic per consequens si [des... *add. et del.*] desinat omnis talis influxus, non ergo desinet motus localis hic inferius. Quod autem celum non habeat influentiam in vacuo, illud est planum saltem de vacuo infinito. Probatur: Si celum influeret in vacuo, quidquid influeret illic [ill *add.*], illud [iluc *ms.*; illut *add.*] esset accidens sine subiecto quod relinquo concedi a stultis. Primo. Istud esset otiosum, quia in vacuo nihil est. Influxus autem celi est pro aliquo.»

79 *Ibid.*, f. 59ra, lin. 53 sqq.: «Secunda ratio sit ista: si celu<m> desineret moveri et influere in ista inferiora et hic inferius esset approximatus unus magnus ignis uni stuppe, ille ignis combureret illam stuppam, ergo etsi desineret omnis influxus celi, adhuc remaneret motus alterationis hic inferius. Consequentia patet et antecedens est verum, immo ut dicit ille de Anglia in una sua questione: 'est articulus excommunicatus parisius dicere quod celo cessante ignis approximatus hic inferius stuppe non comburet ipsam'.» The prohibited thesis forms article 156 of the Parisian condemnation of 1277 (see DENIFLE, CHATELAIN 1889, 552).

In the same context Albertino cites again *ille de Anglia* as having said that everybody who believes that fire would not burn flax if the heavens' motion came to a standstill should himself learn the truth by being in that fire while the heavens rest.[80] Finally, *ille de Anglia* serves Albertino a third time as reference when he mentions as a counter-argument against his 13th conclusion a sentence by Rabi Moises (= Maimonides), who had claimed, according to *ille de Anglia*, that just as a human being would die if his/her heart paused for the blink of an eye, so the world would perish if the heavens stopped moving for a moment.[81] These citations have not been identified yet in Kilvington's works, and although they probably refer to Kilvington, it cannot be excluded that in these cases Albertino meant another Englishman, especially as all three citations occur in the discussion about the 13th conclusion, which, as well as the 14th conclusion,[82] has no counterpart in

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80 *Ibid.*, f. 59ra, lin. 60 – rb, lin. 4: «Si celum quiesceret et ignis esset approximatus stuppe, tunc cum unum, puta ignis, esset approximatum suo contrario, puta combustibili, et illud sufficienter excedit et habet virtutem suam activam, puta caliditatem, ergo ignis combureret [se *add. et del.*] ipsam stuppam etsi desineret omnis influxus celi, et qui negant hoc, dignum esset eos esse in igne celo quiescente, et experirentur [experirunt *ms.*] veritatem, ut dicit ille de Anglia.»

81 *Ibid.*, f. 59vb, lin. 52 sqq.: «Decimo. Auctoritate Rabi Moises qui, ut allegat ille de Anglia, dicit quod quema<d>modum si [cor *add. et del.*] cor hominis quiesceret in ictu oculi homo moriretur [moveretur *ms.*], ita si motus celi cessaret per ictum oculi sive per momentum, ea que sunt in mundo perirent.» The origin of this citation from Maimonides can be traced back to his *Dux neutrorum* (I, 71): «sic universum esse, est sicut vnus homo viuus: et celum quod est in eo, sicut cor in homine: licet sint in eo corpora quieta mortua» (cited from HASSELHOFF 2004, 174, n. 227). Obviously, in the course of time, Maimonides's sentence experienced some modification. Thomas Aquinas writes in his *Scriptum super Sententiis* (II, d. 2, q. 2, a. 3): «Unde dicit Rabbi Moyses, quod caelum in universo est sicut cor in animali, cujus motus si ad horam quiesceret, corporis vita finiretur.» (cited from HASSELHOFF 2004, *ibid.*). It is unknown who changed the time of supposed rest of the heavens resp. the heart from an hour to a "blink of the eye".

82 *Ibid.*, f. 59rb, lin. 59 sqq.: «Quarta decima conclusio est quod non est verum quod totum universum corrumperetur, si una tota species eius corrumperetur, immo dico quod, si corrumperentur omnia mixta, non ideo corrumperetur [*illeg. add. et del.*] universum, immo remaneret in sua perfectione in perpetuum.» Needless to say that Albertino proves this conclusion mainly by drawing on common sense arguments and the Aris-

Kilvington's *questio* since Albertino had added both conclusions as reaction to certain local circumstances in Bologna.

5. Conclusion

In his Question on the motion of elements and mixed bodies in a vacuum Albertino sides with Kilvington in all major points. But this is not to say that Albertino slavishly followed Kilvington's line of argument. While Kilvington is known for his sophisticated argumentation and entangled style of presenting and sometimes nearly hiding his own opinions,[83] Albertino's treatise is better structured, and his conclusions are brought out more clearly. Often Albertino puts forward own arguments that differ from Kilvington's and sets personal preferences and focuses, but to describe these details would go beyond the scope of this article. Besides, it would not change the general picture.

We do not know the precise way in which Albertino learnt about Kilvington's ideas. In any case his disputation is an impressive testimony to the impact of Kilvington's views of motion in a void.

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totelian tenet that the heavens are indestructible.

83 Cf. JUNG (*olim* JUNG-PALCZEWSKA), PODKOŃSKI 2008, 61.

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