

ARTÍCULOS / ARTICLES

INTERMEDIATE PARTS OF MOTION ACCORDING TO RAMON LLULL: SOME REMARKS ABOUT HIS MEDIEVAL BACKGROUND*

LAS PARTES INTERMEDIAS DEL MOVIMIENTO SEGÚN RAMON LLULL: ALGUNAS OBSERVACIONES SOBRE SU CONTEXTO MEDIEVAL

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Abstract

Following Aristotle, Averroes rejects atomism and the infinite division of geometric lines. Thus, his arguments deal with the continuity and contiguity of the non-atomic parts of motion. He vindicates the perceptual aspect of physical movement that shows itself like *in-progress-path* between two edge points A and B, in which there are middle parts where qualitative, local, or quantitative changes occur. Ramon Llull takes the lines' geometrical points as "motion parts". Points are intermediate divisions that represent physical phenomena by the continuity of geometrical lines, surfaces, and figures. Also, he appeals to relational logic to spot the middle parts between A and B into the *in-progress-path* of motion. Those middle parts are signified by a dynamic vocabulary, called: *correlative language*. This contribution focuses on the conceptual environment of Llull's assumptions, in which Averroes' Latin readers explored the geometry and the vocabulary of motion intermediate parts.

Keywords

Ramon Llull; Continuous; Motion; Averroes; Aristotle

Resumen

Siguiendo a Aristóteles, Averroes rechaza el atomismo y la división ilimitada de las líneas geométricas. Sus argumentos se enfocaron en la continuidad y contigüidad de las partes del

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movimiento, y reivindicó la observación del movimiento físico que muestra como “un camino” (*via*) entre dos puntos límite A y B entre los cuales ocurren los cambios cualitativos, locales o cuantitativos de una forma instantánea. Ramon Llull asumió estas “partes del movimiento” como puntos geométricos y “unidades” físicas. Estos puntos son divisiones intermedias que representan fenómenos físicos que marcan la continuidad en las líneas, las superficies y las figuras geométricas. Además, apela a la lógica relacional para forjar las denominaciones de las partes intermedias del movimiento entre A y B, así como la ruta de movimiento en curso. Esas partes intermedias están significadas por un vocabulario llamado: lenguaje correlativo. Esta contribución se centra en el entorno conceptual de los supuestos de Llull, en el que los lectores latinos de Averroes exploraron la geometría y el vocabulario de las partes intermedias del movimiento.

Palabras clave

Ramon Llull; Continuo; Movimiento; Averroes; Aristóteles

Introduction

Usually, the image of Aristotelian motion is a continuous line C between the boundary points A and B.¹ The line represents the process of actualization – or accomplishment – of potentialities² which have accidental manifestations according to the categories of place, quality, and quantity. These categorizations involve the extreme points of the line, according to Aristotelian analogy, which should be accidental contraries or at least opposites. In an equivocal way, motion could be signified by the displacement from Athens to Megara, the alteration of a quality (e.g., color, being healthy) or the increase/decrease³ in quantity. Nevertheless, other accidental predications fulfill the motion’s conception as actualization of potentialities. For example, the actions of an

¹ “Utrum ergo causa sit, quia loci mutatio genus est aut quia linea genus”; “Amplius autem aliud est quod est potentia et actu; quare rectitudinis que infra sunt terminorum quodlibet signum potentia quidem est medium, actu autem non est, nisi dividat sic et instans iterum incipit moveri; sic autem medium principium et finis, principium quidem posterioris, finis autem principii”, Aristotle, *Physica*, edited by F. Bossier, J. Brams and A. Mansion, *Aristoteles Latinus 7* (Leiden: Brill, 1990), 271, 320.

² “(...) Aristotle introduces a new general doctrine about continua, which I will refer to as the Potentiality Doctrine. This is the claim that a single continuous thing, such as a motion, line, or time, has parts and middle-points only potentially or in capacity, not in actuality”, Jacob Rosen, “Physics v-vi versus viii: Unity of change and disunity in the Physics”, in *Aristotle’s Physics: A Critical Guide*, edited by M. Leunissen (Oxford: Oxford University Press, 2015), 213; “Aristotle’s favourite model of the continuum is the same as ours, namely a geometrical line, or line-segment”, David Bostock, *Space, Time, Matter and Form: Essays on Aristotle’s Physics* (Oxford: Oxford University Press, 2006), 158.

³ “Non est autem motus preter res; mutatur enim semper id quod mutatur aut secundum substantiam aut secundum qualitatem aut secundum quantitatem aut secundum locum”, Aristotle, *Physica*, 97.

agent on a matter in the case of building a house; the process of learning or teaching; and natural generation.⁴ Even moral choices or passion tendencies could be taken as motions. In the effort of gathering all the possible cases of motion, Aristotle displays the different senses of “being in” motion, but the medieval interpretation of how substances show their accidental manifestations include the border points between A and B. Overall, they tried to answer the question of what the nature of C is and whether it is possible to spot a specific point – or part – of C in which the motion alterations and changes effectively happen.

The well-known example of Kretzmann-Sorabji describes the motion of a train.⁵ The train is in a state of rest (A) before departing to its destiny (B), but if the train suddenly stops at some point between A and B, is the displacement complete, or does stopping in some middle point accomplish a part, or a section, of the original way from A to B? The other question to address is whether the relation between an unfinished activity such as “seeing” or “knowing”, and its parts, takes place as other alterations such as color alterations, building a house. The Aristotelian arguments oscillate between linguistic exposition and the geometrical line analogy. On the one hand, Aristotle established the meaning of the extreme points of motion by the terms potentiality (*dúnamis*) and actualization (*entelécheia*). In some sense, potentiality is the departing point of a motion since it means the disposition to change, to move. Meanwhile, actualization is the arriving point of any movement, or the realization of any disposition to change and to move. But those terms are not enough to explain what exactly happens in the process – the term C in between – of changing in the case of finished alterations, activities as “seeing”, or displacements. Thus, Aristotle introduced a specific expression for “being in motion” (*kinêsis*) that is similar to “being in change” (*metabolé*). Aquinas and Albertus Magnus followed Averroes in the identification of motion and change, because everything that is changing is necessarily moving, therefore any alteration is motion.⁶

⁴ “Quod autem hoc sit motus, abhinc manifestum est. Cum enim edificabile, in quantum huiusmodi ipsum dicimus esse, actu sit, edificatur et hoc est edificatio; similiter autem et doctrinatio et medicatio et volutio et saltatio et adolescentia et senectus”, Aristotle, *Physica*, 99.

⁵ “The train leaves at noon’, says the announcer. But can it? If so, when is the last instant of rest, and when the first instant of motion? (...) Can the train have any first instant of motion, or last of rest, if its atoms are moving all the time, and how would these instants be defined? Yet another doubt concerns the fact that a train is not perfectly rigid. When some parts of the train, or of the engine, have started to move, other parts will be lagging behind, so that there is not a single first instant of motion or last of rest for the train as a whole”, Richard Sorabji, “Aristotle on the Instant of Change”, *Proceedings of the Aristotelian Society* 50 (1976): 69.

⁶ “Postquam ostendit in motu locali, quod movens et motum sunt simul, ostendit idem in alteratione; quod scilicet nihil est medium alterantis et alterati. Et hoc probat primo per inductionem. In omnibus enim quae alterantur, manifestum est quod simul sunt ultimum alterans et primum alteratum. Videtur autem hoc habere instantiam in quibusdam alterationibus: sicut cum sol calefacit aerem sine hoc quod calefaciat orbis medios planetarum; et piscis quidam in reti detentus, stupefacit manus trahentis rete, absque hoc quod stupefaciat rete”, Thomas Aquinas, *In octo libros physicorum Aristotelis expositio*, edited by M. Maggìolo (Turin: Marietti, 1954), lib. 7 l. 4 n. 1, 335.

Over those terms, Aristotle added a term to mean the “capacity of being in motion” or change: *enérgeia*. This capacity is attributed to local motion, the color alterations, and even activities such as seeing, knowing, or building. The readers of the famous lines of *Metaphysica* IX, 6⁷ detected the ambiguity between using two verb tenses: present perfect in the examples that describe the “capacity of being in motion” (*enérgeia*) and the present continuous regarding the motion or change (*kinêsis*), for instance someone who “is walking” (*kinêsis*) and “has walked” (*enérgeia*). Ryle⁸ – who criticized Ackrill’s⁹ interpretation – clearly distinguishes those linguistic patterns in the Aristotelian motion and change descriptions. I will come back to those linguistic patterns about physical conception of motion when addressing Ramon Llull’s language about motion and change.

Beyond the linguistic difference between the use of present perfect in the examples about the disposition of being in motion or change, and the present continuous when something is in fact moving, it is relevant to remark how Aristotle had introduced the temporal sense of physical phenomena through these verb tenses. In the example of building, bricks have the potentiality of being a house and the finished house is the actualization of this material potentiality. But the process of “building” (*kinêsis*) has some parts in which it is possible to spot the material disposition of “being built” or when exactly it “has been built”.¹⁰ To grasp this disposition, we should address the

⁷“(…) ascribing potentiality to that whose nature it is to change something else or to be changed by something else, either without qualification or in a certain manner, we also use the term in another sense, which is what we have been after in discussing these previous senses. Actuality [*energeia*] is the thing being present, but not in the way we speak of when we say it is potentially present (*Met* Θ 6, 1048a 25–30)”, translated by Burnyeat in Myles F. Burnyeat, “Kinêsis vs. energeia: A much-read passage in (but not of) Aristotle’s *Metaphysics*”, *Oxford Studies in Ancient Philosophy* 34 (2008): 221; “Quoniam autem de potentia que secundum motum dicitur dictum est, de actu determinemus quid est actus et quale quid. Et enim possibile simul manifestum erit diuidentibus, quia non solum hoc dicimus possibile quod aptum natum est mouere aliud aut moueri ab alio aut simpliciter aut modo quodam, sed et aliter. Quapropter querentes et de hiis superuenimus. Est autem actus existere rem non ita sicut dicimus potentia”, Aristotle, *Metaphysica*, edited by G. Vuillemin-Diem, *Aristoteles Latinus* 25 (Leiden: Brill, 1995), 185.

⁸“To begin with, seeing and hearing are not processes. Aristotle points out, quite correctly (*Met.* IX, vi. 7–10) that I can say ‘I have seen it ‘as soon as I can say’ I see it’”, Gilbert Ryle, *Dilemmas* (Cambridge: CUP, 1966), 60.

⁹“While Ryle’s account of the present-perfect connection involves that an *energeia* cannot go on through time, this one implies that it must. There may be objections to thinking that seeing, for example, must occupy time, and even objections to thinking that Aristotle thought this. But the passages so far considered do not provide any evidence against the belief that Aristotle did think this”, John Lloyd Ackrill, “Aristotle’s Distinction between *Energeia* and *Kinesis*”, in *New Essays on Plato and Aristotle*, edited by R. Bambrough (London and New York: Routledge, 1965), 121.

¹⁰“Propter quod et nomen dicitur actus secundum opus et tendit uersus endelichiam. Quoniam uero est horum quidem ultimum usus, ut uisus uisio, et preter hanc nullum fit alterum a uisu opus, A quibusdam uero fit aliquid, ut ab edificatoria domus preter edificationem: tamen non minus hic quidem finis, hic autem magis finis potentie est”, Aristotle, *Metaphysica*, 189.

“builder” who is the agent of the building process and its different parts or stages. This process explains how the line analogy is useful to represent physical motion since every motion is divisible in the same way as the substantial parts involved. Nonetheless, this division is not infinite because any motion cannot be permanently in “disposition of being in motion” and “being in motion” during an unlimited time or magnitude. The linguistic description of motion matches the rejection of motion as an unlimited process. Thus, the linguistic patterns – of *Met.* IX.6 – seem to have a counterpart in the Aristotelian discussion about the Zeno paradoxes in the *Physica* VI.¹¹

Save the problem of infinite motion and change, medieval readers accepted the line analogy simultaneously with the linguistic patterns to spot the middle parts of motion and its divisions. Besides, there are rectilinear natural motions and changes that depart from rest and arrive to resting like natural and artificial activities linked with an agent: the fire heats the wood or the artist who extracts Hermes from the stone or the wood.¹² In all those processes, natural and artificial, there are intermediate points, segments, or parts spotted by linguistic means. Aristotle used the verb tenses, either medieval masters, as Ramon Llull and Albertus Magnus, both prefer Latin declensions to describe, on the line analogy, the process of motion or change.¹³ During the 13th century, lines, points, and segments suffered a “semantic enhancement” that also covered other geometrical objects. Overall, in relation to Aristotelian body’s definition, it gathers three dimensions: longitude, latitude, and depth.¹⁴ Thus, the medieval explanation of motion parts acquires a broader scope and eventually become multidimensional. However, before arriving at this point, let me introduce the way the medieval masters grasped the intermediate parts of motion.

¹¹ “Unde et Zenonis ratio falsum opinatur quod est non posse infinita transire aut tangere infinita secundum unamquamque in finito tempore”, Aristotle, *Physica*, 224.

¹² “(...) et quod potestate est dicibile terminorum et quod est actu; et scire similiter : et potens uti scientia et utens; et quiescens : et cui iam inest quies et potens quiescere. Similiter autem et in substantiis; et enim Mercurium in lapide dicimus esse, et medietatem lineae, et frumentum nondum perfectum. Quando uero potens et quando nondum, in aliis determinandum”, Aristotle, *Metaphysica*, 103.

¹³ “(...) in eo quod est aedificabile, quia actus aedificabilis, in quantum aedificabile est, aedificatio est; aut enim aedificatio est actus aedificabilis nondum adhuc aedificati et perfecti secundum formam aedificii aut eius aedificatum iam et perfectum secundum formam aedificii, sicut si esset actu domus”, Albertus Magnus, *Physica* 4/1, edited by T. Marschler, Editio Coloniensis (Münster: Aschendorff, 2015), 160.

¹⁴ “Distantias quidem habet tres, longitudinis et profunditatis et latitudinis, quibus determinatur corpus omne”, Aristotle, *Physica*, 138.

Intermediate sections and motion parts

Averroes vindicated motion as *via ad perfectionem* or *via ad formam*, but also as *via de potentia ad actum*.¹⁵ Those expressions could be, according to him, the most known conceptions of motion. However, if we get back on the motion's vocabulary mentioned above, Averroes had possibly tried to signify the difference between *enérgeia* (the capacity of being in motion), *dúnamis* (the capacity of moving or changing), and *entelékhēia* (the actualization of motion/change). Cecilia Trifogli has shown how Wylton's criticism of Averroes turns around on motion as a way (*via*) of actualization of form or perfection because motion is not exactly the way to perfection.¹⁶ Otherwise, during this intermediate lapse (*via*), accidental alterations take place, for instance, the variation of quantity could have different degrees, the same as qualitative alterations. The instability of the intermediate parts of motion in between potency and actualization suddenly acquired a certain relevance. The question about what happens in the middle term between the point of departure and arriving point of motion become a controversial issue.

Medieval interpreters of Aristotle had faced Averroes' statement – *motus sit in mediis*¹⁷ and his insistence on how the motion's intermediate parts effectively show up as a process (*via*). Averroes' critics emphasized the conception of motion as an actualizing way in which the end of motion or change is the realization of form. However, the Aristotelian vocabulary of motion addresses many senses of natural motion, thus the process, the end, or the starting point, are just different ways of dealing with a continuous process and its different parts. This processing perspective comes from Avicenna, who vindicated *medietas* as motion's form or described it as *transitus*.¹⁸ In some sense, the medieval conceptions of motion depended on the side chosen by the interpreter to

¹⁵ “Motus secundum quod non differt a perfectione ad quam vadit nisi secundum magis et minus, necesse est ut sit de genere illius perfectionis ... secundum autem quod est via ad perfectionem, quae est alia ab ipsa perfectione, necesse est ut sit genus perse. Via enim ad rem est aliud ab ipsa re”, Averroes, *Commentarium magnum in Aristotelis De physico auditu libri octo*, in *Aristotelis Omnia quae extant Opera... Averroes Cordubensis in ea Omnes... Commentarii v. 4* (Venice: Giunta, 1552; repr. Frankfurt Minerva, 1962), 87r.

¹⁶ Cecilia Trifogli, *Oxford Physics in the Thirteenth Century (ca. 1250-1270): Motion, Infinity, Place, and Time* (Leiden and Boston: Brill, 2000) 75-80; and Cecilia Trifogli, “The Reception of Averroes' View on Motion in the Latin West”, in *Averroes' Natural Philosophy and its Reception in the Latin West*, edited by P. Bakker (Leuven: LUP, 2015), 129-132.

¹⁷ “Deinde cum dicit: *ex medio autem mutatur* etc., manifestat quoddam quod dixerat, scilicet quod motus sit in mediis. Et dicit quod contingit mutari ex medio ad utrumque extremorum et e converso, in quantum scilicet possumus uti medio ut contrario respectu utriusque extremi”, Thomas Aquinas, *In octo libros physicorum Aristotelis expositio*, lib. 5 l. 1 n. 11, 648.

¹⁸ “(...) inter principium propositum et finem, scilicet ut, in quo puncto posueris, non sit in eo amplius sicut nec antea nec post, non sicut duo termini extremitatum, Medietas est forma motus, et est proprietas una quae comitatur mobile et non discedit ab eo quamdiu est mobile; Motus enim per partes suas numerat prius et posterior: motus ergo non numerat ex hoc ipsa habet in transit prius et posterior; motus etiam habet mensuram transitus. Tempus autem est hic numerus et haec mensura”, Avicenna, *Liber primus naturalium*, edited by S. Riet, J. Janssens and A. Allard, Avicenna Latinus 10 (Leuven: Peeters, 2006), 155; 325.

point out which is the crucial point of the motion processes. Averroes' conception gathered the linguistic denominations of the extreme points and the intermediate parts of motion according to the Aristotelian line analogy and his vocabulary (*Met.* IX.6). He did not dismiss the intermediate parts of motion as unstable phases, he otherwise endorsed that changes and motions take place "part-by-part" beyond the quality's alterations, quantity's degree variations, and the stops made by a walker.¹⁹ Regarding line analogy, the motion as a process keeping its continuity and its parts is contiguous. There is no discontinuity in between motion processes since this conception opens the door to infinite times or magnitudes.

The conception of motion as "intermediateness"²⁰ is undoubtedly a heritage of Avicenna and Averroes' interpretation of the motion's equivocal nature. Aristotle was conscious about the incomplete vision of motion if someone could not address the relation between the potential form and its actualization. The linguistic constraints introduced in *Met.* IX.6 tried to resolve this issue. Averroes in the *Commentarium Magnum* VI.4, actually explains how motion-change takes places part-by-part through the variations of heat, displacement from one point to another, and color alteration. On the one hand, heat increases part-by-part because, potentially, it warms cold parts. The same as how white color acquires pale parts to become whiter. On the other hand, between two places, there are intermediate points in which one could assess the advancement of displacement. The diversity of states between the motion's two-edge points can be identified because all motion and substances are divisible; however, the divisions represent the motion parts or the phases of changing.²¹ The introduction of how to assess

¹⁹ "Every part of the form that acquires perfection reaches also a part of the [natural] place, unless impeded by some impediment, just as the parts of all other accidents that are consequent upon the form are achieved. For example, when the oil is turned into fire, each part of it that achieves 'fireness' also achieves a part of the [natural] place", Averroes quoted by Ruth Glasner, *Averroes' Physics: A Turning Point in Medieval Natural Philosophy* (Oxford: Oxford University Press, 2009), 91; also, Glasner states: "The original motion-interval is replaced by several intervals, but the interval model is maintained. The structure of the whole and that of the parts is the same. This is no longer so in the long commentary", Glasner, *Averroes' Physics*, 122.

²⁰ "This is the form of motion found in the mobile, namely, an intermediateness (...) Thus this intermediateness is the form of the motion and is a single description that necessarily accompanies the mobile and is not subject to change in any way as long as it is a mobile", Avicenna quoted by Jon McGinnis, "A Medieval Arabic Analysis of Motion at an Instant: the Avicennian Sources to the Forma fluens/fluxus formae debate", *The British Journal for the History of Science* 39, 2 (2006): 13.

²¹ "Similiter autem demonstrabitur et longitudo divisibilis, et omnino omne in quo est mutatio (preter quedam que secundum accidens sunt, quoniam quod mutat divisibile est); uno enim diviso omnia dividuntur", Aristotle, *Physica*, 232; "Although anything that is moved can be divided into parts, this does not imply that a thing's movement is causally dependent on the movement of its parts. In fact, its parts may only move in virtue of being parts of the whole", Ursula Coope, "Self-motion as other-motion in Aristotle's Physics", in *Aristotle's Physics: A Critical Guide*, edited by M. Leunissen (Oxford: Oxford University Press, 2015), 262.

the variations of quantity, the alterations of quality, and the magnitude of displacement is a big contribution of the Arabic interpretation of motion.

Continuity and Contiguity

The motion process represented by the Lullian interpretation of Aristotelean vocabulary: A is *potentia/dúnamis*, B is *perfectio/entelékheia* and C a rivalry between the *kinêsis/agere* and *enérgeia/actus*. All those terms lie on the line's longitude from point A, through line C, to point B. Regularly, everything goes well until Book VI of Physics, in which the revival of the Parmenidean foreign doctrines concerning the discrete composition of a line's quantity appears. That means that if a line is composed of points, every motion/change should pass each point from A through line C to reach B. Thus, motion does not exist in the same manner as in the vocabulary of Physics or the categories that represent it: quality, quantity, and place.

That is the reason behind the medieval concern about the intermediate path between the two extreme limits of Aristotelian motion. In the classic text of *De sufficientia*, quoted by A. Maier,²² Avicenna introduces a clash between the categorization of motion and its relationship with quantity's species. At first glance, the intermediate path between the motion limits – named by the participle of the verbs *transire* and *fluere* – explains the categorizations of motion: quantitative, qualitative, and local displacement.²³ However, only in quantitative motions does the elapsing contain one species, according to Avicenna: continuity. Continuity answers the objections against the use of *transire* and *fluere* as denominations for the consolidated and unique path between the limits of Aristotelian motion. There is a resolution in this quantity species for the issue of the conception of a continuous motion/change path in which the questions about its discrete, or minimal parts, are not relevant. Avicenna states that differences between qualitative alterations, like *nigredo* and *nigrescere*, do not exist, since those qualitative attributions are the same as adding a line segment to a line.²⁴ There are no categorical differences between them.

²² “Et dixerunt quod hac quantitas defluens una est ex speciebus quanti continui (...) Et discordaverunt auctores in hoc nomine pertruasendi, quia quidam ex eis diversificaverunt inter nigredinem et nigrescere diversitate differentiae specificae. Quidam autem ex eis diversificaverunt non diversitate differentiae specificae, sed quia est sicut additio, quae additur lineae quae sit maior, et tamen propter hoc non exit a sua specie”, Avicenna, *Sufficientia* (Venice, 1508) 23; Maier quoted it from Urb. Lat. 186 31r in Anneliese Maier, “Forma Fluens oder Fluxus Formae?”, in *Zwischen Philosophie und Mechanik* (Rome: Edizioni di Storia et Letteratura, 1958), 12.

²³ “Et sequitur etiam aliud cuius extrema contingunt se sic ut videatur esse continuum in comitantia motus unius ad aliud, cuius unitas est quasi sequens unionem motus; hic enim est cohaerentia, et hoc est sicut membra quae sunt composita ex aliis membris, et principaliter id cuius cohaerentia est naturalis, non artificialis”, Avicenna, *Liber primus naturalium*, 109.

²⁴ See n. 22; “Sententiae igitur quae magis attenduntur in hac inquisitione, hae tres sunt, sed media non mihi placet. Nam abhorreo quod dicunt in ea, scilicet quod nigrescere sit qualitas et

Rivers of ink have been flowing around Maier's interpretation of Avicenna's statement to better understand the conception of continuous flowing/elapsing between the limits of Aristotelian motion, whether this path is the way to form realization or the form itself that displays its realization. However, the question of the continuous quantity as the only, and just unique, species that explains the flowing/elapsing of motion categorization was a big question in the Averroes commentaries about Aristotelian natural works.²⁵ In fact, Jean de Jandun – inspired by Averroes' authority – launched his own interpretation around the continuity as the justification of the unity of motion/change path. He embraced the Euclidian definition of point as the extreme limit and divisive conception of the line's parts. According to him, points are parts of a line in two senses: *ex partibus essentialibus* and *ex partibus quantitativis*.²⁶ In the first sense, points are essential to understand the line limits and their divisions that represent the limits of motion, its categorizations, and the different sections of the motion's path. On the other hand, points are lines' minimal parts but their conditions, such as contiguity, unlimited division, or their non-perceptible nature, do not modify the motion as a physical phenomenon or its natural realization. He seems to paraphrase Avicenna when stating that a line's extremes and white human beings do not change essentially if the line gets an additional segment, or the white human being becomes whiter. They are *dispositiones coniunctae* that happen between the two extremes of motion. Jandun endorsed Avicenna's interpretation, but it looks like he did not know the source of his own position since he thought that he was following the Comentator's authority.²⁷

Perhaps the medieval debate around the unity of form's path and path's form dismissed the question of unique species of motion quantity: continuity. Although one can spot a point's divisions and extreme points in any motion/change path, they are not

augeri quantitas, et praecipue hoc quod nigrescere sit nigredo quae intenditur, quia intensio nigredinis est"; "Et dixerunt quod nigrescere et nigredo unum genus sunt (...)", Avicenna, *Liber primus naturalium*, 176, 179.

²⁵ Trifogli, *Oxford physics*, 49; "This position, which Albert attributes to Averroes, means that any motion can itself be essentially categorized in one of the four categories in which motion is found (...) To use Albert's example, taken from Averroes, the process of blackening and blackness are essentially identical: *nigrescere est nigredo*", Steven Baldner, "Albertus Magnus and the Categorization of Motion", *The Thomist* 70, 2 (2006): 212.

²⁶ "Ad euidencia questionis considerandum est quod duplex est compositio quantum ad propositum spectat. Una est ex partibus essentialis. Alia est ex partibus quantitativis. et hec dicitur compositio quantitativa: et istas duas Averroem (...) in primo phisicorum ubi dixit ad cognitionem perfecta compositi oportet cognoscere ex quibus quantitatis sit compositum (...) quod una pars essentialis est potentia uel ens in potenti aliquo modo et alia est actus ut manifestum est de materai et forma que sunt proproe partes essentialis (...) partes uero quantitativae sunt eiusdem rationis sunt aletrum in aliquibus compositis (...) partes quantitativae non sunt in eodem loco; sed diuersos locis aliquo motum", Jean of Jandun, *Quaestiones super octo libros physicorum Aristotelis* (Venice, 1551; re-impr. Minerva, 1964), 379.

²⁷ "Sed cum essentia scire quam essentia lineae est alia ab essentia superficie seu latitudinis lineae uero terminata est quoddam aggregatum essentia lineae et terminis. sicut homo albus quoddam aggregatum ex essentia lineae hominis et albedine", Jean of Jandun, *Quaestiones*, 380.

geometrical assumptions. Otherwise, they would be sections, or intermediate parts, of the elapsing/flowing of physical motion/change. Avicenna and later Jean Jandun, through the Commentator's authority, faced the question on how physical knowledge is built. Averroes' preface to his *Commentarium magnum* on Physics states how important the perceptual access is to physical phenomena. Undoubtedly, physical motion/change usually happens as perceptible phenomena, so Averroes states that there are principles and natural causes which are the background of our knowledge. However, the universal roots of physics science are based on induction, which means a permanent comparison between definitions and general assumptions with the observable facts that one would explain.²⁸

Ramon Llull's linguistic postulate

In the Latin version of Averroes' preface to *Commentarium magnum*, Iacobus Mantinus translates the subject of physics as *proportio* (Harvey translates *Relation*).²⁹ Physics focuses on the proportion-relation between *elementa* from one thing to another, this means a comparative analysis of parts of phenomena. In Book VI of *Commentarium magnum*, Averroes displays this exercise of analytical proportion between the "parts" of physical phenomena on different instances. The revival of Zeno's paradoxes, in Book VI, appeals to the attention of Averroes as the proportional analysis between the intermediate parts of motion/change, its dimensions, and body parts. The paradoxical formulation of the unlimited motion in a limited magnitude or the unlimited time for a limited displacement and how the bodies' parts behave on these paradoxical formulations of change is the perfect plot for Averroes' conception of natural science.³⁰

Albertus Magnus followed Averroes' illustrative method, the analytical and comparative exercise, in his commentary on Physics. Among the many examples of phenomena parts analysis and its proportional relations in Book VI, I'll select a remarkable example: Albert compares the parts between a slow motion in a certain time lapse with

²⁸ "(...) tres modi demonstrationum scilicet signi et demonstratio causae et demonstratio simpliciter, quamvis signum et causa sit plus usitata in hac scientia, et aliquando est usitata demonstratio simpliciter et maneries disciplinae divisionis et diffinitionis et enthymematis et inductionis", Averroes, *Commentarium magnum ... De physico*, 4.

²⁹ "Proportio [relation/Harvey] autem istius libri ad scientiam naturalem est sicut proportio elementorum rei ad rem [elements of a thing to thing/Harvey], quia iste liber comprehendit res, quae sunt sicut principia et radices universales illorum, in quibus vult alloqui naturalis", Averroes, *Commentarium magnum... De physico*, 4; Steven Harvey, "The Hebrew Translation of Averroes' Prooemium to His 'Long Commentary on Aristotle's Physics'", *Proceedings of the American Academy for Jewish Research* 52 (1985): 55-84.

³⁰ "We say that the aim of natural science [physics] in general, of which the aim of this book is a part, is to know the causes of the sensible species and the causes of the accidents that exist in them. lb The subject, then, of this art into which we are inquiring is things that are recognizable to the senses and that change by themselves, i.e. they have within themselves the principle of motion and rest", Harvey, *Prooemium*, 73.

the speed motion. If we carefully observe Albert's exposition through the linear figures divided in proportional parts called *atoma*, it is clear that he spots physical properties of motion (speed differences) in relation to a specific magnitude of time lapse and, in parallel, he introduces an arithmetic proportion of the number's series. All of this to conclude that *atoma* are continuous.³¹ This continuity is demonstrated by the proportional relation between the intermediate parts of motion apart from its properties, but this relation is inherent to both proportional sections inscribed along the magnitudes: speed and time. In this sense, Albert embraces Avicenna's conception of continuous as the unique species of quantitative motion. An idea that departs from the arithmetic relation, represented by linear figures, showing the variations of physical phenomena.

Albertus Magnus vindicates continuity through the arithmetic proportions inscribed on the line longitude comparison, but what about the other substantial dimensions according to Aristotle: latitude (*latitudo*) and depth (*profunditas*)? Do those dimensions accomplish some role in physical phenomena? The irruption of multi-dimensional physical analysis is a big issue regarding the research about the intermediate parts of motion. Though, it was a self-educated layman – Ramon Llull – who wrote his principal works in vernacular, that addressed a linguistic hypothesis on this approach.

As we have seen, those intermediate parts have just one quantity species: continuity. Jandun dealt with this aspect of motion as quantitative perspective that does not modify the actualization of forms and the causal principles: potentiality and act. He followed Averroes' awareness on the ambiguity of geometrical representations regarding physical phenomena.³² Lines resemble motion but their properties are completely different from physical phenomena, and we should check them perceptually to achieve the certainty about our knowledge. On the other hand, Albert uses arithmetical proportion to demonstrate the continuity of motion parts according to some physical properties. This tendency to resemble motion with lines obviously comes from Aristotle, but also from medieval masters – from Arabic to Latin – who contributed to superposing more conceptualization sources on lines, such as arithmetic proportions, science methodology, and linguistic features.

Categorization of motion introduced some linguistic issues in motion predication, among others, the species of quantity whose continuity Avicenna knew very well. If we see a schematic display of Lullian motion (Img. 1), it has a philosophical vocabulary in

³¹ “Et quia nos supra posuimus, quod tempus necesse est dividi secundum divisionem magnitudinis et converso, tunc tempus, in quo velocius transit lineam trium atomorum, necesse est dividi in tres atomos componentes totum tempus motus”, Albertus Magnus, *Physica*, 458.

³² “Manifestum est quod Naturalis et Geometra communicant in consideratione de tribus magnitudinibus, sed diversis modis; et cum ita sit, communicantes sunt in propositionibus et conclusionibus, ergo impossibilia que accidunt a positione falsa de istis magnitudinibus geometricis accidunt etiam naturalibus nisi sint aliqua accidentia existentia in eis in quantum sunt abstracte a materia et non existentia in eis in quantum sunt in materia aut e converso”, Averroes, *Commentum magnum super libro De celo et mundo Aristotelis*, vol. 2, edited by R. Arnzen (Leuven: Peteers, 2003), 493.

which Aristotle shows the relation of extreme points that bordered the elapsing/flowing of motion. This set of “motion” denominations that gathers the potentiality-action realizations through the kinesis/energeia activity suffered a fascinating reform by Ramon Llull’s vocabulary of elemental composition and the influence of divine virtues on natural behavior:

Thus, what has been said on the intellect is true, seems to be provable by means of the definition of Goodness, Greatness, etc., by the second species of the rule CD. Goodness, being of a simple essence and form, has a continuous quantity which is disseminated through other essences by its genus and nature. However, regarding the reason which produces the good, it has a discrete nature through *bonificantem* (the capacity of bonifying), *bonificabile* (the capacity of being bonified), and *bonificare* (the action of bonifying). And indeed, from those [Goodness correlatives] flow discrete, and wandering, quantities through the composition of individual subjects in which Goodness has continuous and discrete quantities.³³

In parallel, Llull adopted – but we still ignore the precise source³⁴– some assumptions from Albertus Magnus’ description of flowing points that build the lines, and their extreme points:

Besides, if we imagine that flowing point makes a line, and this flowing ends at some point, it is manifest that the line’s limit is the point in which point flowing stops, and it is intrinsic and essential regarding the line; and we could not say that the flowing end point has a different essence than the point flowing.³⁵

³³ “Quod autem sit uerum, quod dictum est de intellectu, satis uidetur esse probabile per definitionem bonitatis, magnitudinis, etc., et per secundam speciem regulae CD, quoniam bonitas, in quantum est essentia et forma simplex, habet quantitatem continuam et disparatam ab aliis essentia ratione suae generis et naturae. Sed in quantum est ratio, ut producat bonum, habet naturam discretam per bonificantem, bonificabile et bonificare. Et ab ista quidem influuntur quantitates peregrinae et discretas per compositionem, quam habent in subiecto indiuiduato; in quo bonitas habet continuam et discretam quantitatem”, Ramon Llull, *Ars generalis ultima*, edited by A. Madre, ROL XIV (Turnhout: Brepols, 1986), 34; “Et haec quantitas est sustentata in illa creatura, quae creata est, ut ipsa sit. Sicut bonitas, quae creata est, ut ipsa sit, et magnitudo similiter. Haec quantitas continua exit de parte substantiali continue et discrete. Continue, sicut quantitas bonitatis, quae continua est in sua essentia et in concretis suis, quae sunt bonificatiuum, bonificabile et bonificare; et est continua, quoniam unumquodque illorum est in alio, et sunt ex una et eadem essentia, quae est bonitas”, Ramon Llull, *Arbor scientiae* I, edited by P. Villalba, ROL XXIV (Turnhout: Brepols, 2000), 46.

³⁴ Charles Lohr, “Ramon Llull’s Theory of the Quantification of Qualities”, in *Constantes y fragmentos del pensamiento luliano*, edited by F. Domínguez and J. de Salas (Tübingen: Max Niemeyer, 1996), 9-17; and “Ramon Llull’s Theory of the Continuous and Discrete”, in *Late Medieval and Early Modern Corpuscular Matter Theories*, edited by Ch. Lüthy et al. (Leiden: Brill, 2001), 75-89.

³⁵ “Adhuc autem, si nos imaginemur puncti fluxum facere lineam et terminari fluxum puncti in aliquo puncto, ubi terminatur fluxus eius, constat, quod terminus lineae, in quo stat fluxus puncti, intrinsecus est et essentialis lineae; et non possemus dicere, quod punctus terminans fluxum esset alterius essentiae quam punctus fluens, sed esse est aliud fluentis et stantis per modum termini”, Alberto Magno, *Physica*, 153; Avicenna, *De sufficientia*, 35r.

Ramon Llull took the *fluxum puncti* as a means to explain the reciprocal influence of the elements' minimal parts. That reciprocal influence accomplishes the Aristotelian definition of motion/change that can only happen between opposites or contradictory qualities or quantities. But this contradictory condition of motion is not fulfilled by divine virtues since they are "attributes" that resemble the divine unity.³⁶ However, Llull states that this unity behaves as motion/change, because it usually happens in natural creation where virtues flow and elapse just as the substances in which they have influence. He gave special privilege to intermediate parts of the flowing/elapsing. Medium – flowing/elapsing – is the path in which elemental qualities flow through substances, for example, medium's ignis is *calefacere* (to heat) and its flowing departs from the potentiality of heating, called *calefactibile* (potentially heating) and the activity of heating, *calefactiuum* (the actualization of heating). Medium has three species: the union of extreme points, the 'measure' of flow between extreme points, and the extremes by themselves that limited the flowing of heating activity. This vocabulary tries to 'replace' the Aristotelian terminology: every denomination with the suffix *-bile* is potential, with *-are* or *-ere* is the action by itself, and the suffix *-tiuus* means the formal realization of any motion:

According to the three species mentioned above [*coniunctionis, mensurarum, extremitatum*], the middle [*medium*] is the elemental tree's root, which has in itself several middles [*media*] to drive the natural agents to act. As in the pepper, where there are the aforesaid middles, they exist within the pepper at one point, which is the center of the circumference; and there is still heating in it which connects what heats with what is heated. The same as the lines, which are the middles to delimit the existence of the surfaces' boundaries.³⁷

For Ramon Llull, *medium* is the instrument to delimit flowing motion and its extreme points. Thus, he assumes that medium flowing and its points, regarding elemental composition, should be described as geometrical objects. Points are minimal parts, essential for the elemental composition and motion flowing, but their geometrical properties do not break the motion flowing; they rather allow elemental mixture through the flowing of medium relations (see Chart 1).

³⁶ Josep Enric Rubio, "The Art", in *Raimundus Lullus. An Introduction to his Life, Works and Thought*, edited by A. Fidora and J. E. Rubio, Supplementum Lullianum II (Turnhout: Brepols, 2008), 252-282.

³⁷ "Secundum tres species antedictas [*coniunctionis, mensurarum, extremitatum*] est medium radix Arboris elementalis, quod habet in se plura media disposita ad ducendum per agentia naturalia in actu. Sicut in pipere, ubi sunt media antedicta, existente intra piper uno puncto, qui est centrum ad circumferentias; adhuc in illo est calefacere, quod calefaciens et calefactum coniungit, et lineae, quae sunt media terminata existentia intra extremitates superficierum", Ramon Llull, *Arbor scientiae* I, 25-26.

Aristotle	Verb Tenses (Ryle-Ackrill)	Albertus Magnus	Ramon Llull
Δύναμις Δύναμις	Present Perfect (Finished Motion-Alterations)	<i>aedificabile</i>	-bile (Bonifica-bilis)
Ενέργεια ἐνέργεια		<i>aedificabilis</i>	-tivus (Bonifica-tiui)
Κίνησις κίνησις	Present Continuous (Finished-Unfinished/ Motion-Alterations)	<i>aedificatio</i>	-are (Bonific-are)
Ἐντελέχεια ἐντελέχεια		<i>Formam aedificii- aedificatum</i>	-atum (bonific-atum)/ Bonitas

Chart 1

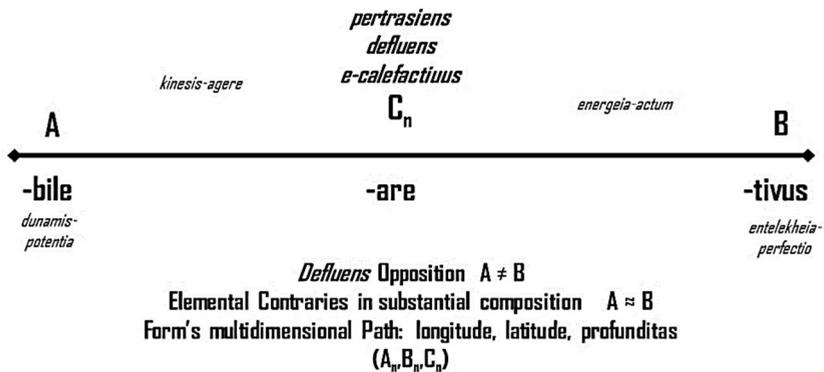
Those reciprocal denominations are called *correlatiua* by Llull, which means: the language of motion flowing and the substantial composition that connotes the Aristotelian vocabulary of physical phenomena. That vocabulary also highlights the realistic conception of points as elemental minimal parts that achieve a breakthrough when Llull states that points are not just lineal longitudes, they are also latitudes (*latitudo*) and depth (*profunditas*). The correlative vocabulary and its flowing points build surfaces and solids. In these dimensions, points are able to spot degree variations, such as decrease and increase, because of the addition of lines to develop surfaces, and the flowing of surfaces to compose bodies does not change the essential nature of substance composition. This addition of lines in Avicenna's continuity conception takes place in other qualities as "becoming black" (*nigrescere*). This is the reason why "getting black" and "being black" are not essentially different, the same as the line and the section added. As Jandun stated later, those additions could be degree variations from minimal to maximal, and the observer should verify these degree variations. According to Llull, the degree' variations characterize latitudes and depths in the multidimensional analysis of motion flowing/elapsing.

Conclusion

The disruption of correlative language was not adhered to much by the masters of the late 13th century, only Jandun criticized the excessive realism of the identification between geometric points and lexical variations: longitude is not latitude just by the

addition of an extra line's segment, since its geometrical properties are different from physical aspects³⁸. Like Averroes, Jandun sought the perceptual contrast of philosophical conceptions. This means that a set of denominations has sense if describing physical phenomena; the phenomena resemblance is not enough without the natural verification. Beyond this critic, Llull developed a specific vocabulary about natural motion and change to mean the Aristotelian awareness about the intermediate parts of motion. The suffixes *-bile*, *tivus*, *-are*, *-atum*, placed at the end of the element's qualities addresses how they behave in the physical world regarding the intermediate parts of a process, such as heating, coldness, dryness, wetness. For Llull, each term represents the parts of those physical actions, perhaps the same as Avicenna had stated: "Alii vero dixerunt quod hoc nomen motus cadit super maneries quae sunt in illo sola *causali participatione nominis*."³⁹ In the following scheme, one can see the matching between Aristotelian vocabulary, the heritage of Arabic interpretation of motion as "intermediateness" and the Lullian suffixation of elemental terms to show a complete linguistic apparatus for the physical knowledge of motion as a process connoting its intermediate parts.

Img. 1



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³⁸ Jean of Jandun, *Quaestiones*, 381.

³⁹ Avicenna, *Sufficientia*, 24v.

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