Absolute Time Before Newton

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Submitted in total fulfilment of the degree of
Doctor of Philosophy

December 2007

History and Philosophy of Science Programme
School of Philosophy

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Abstract

This thesis provides a new analysis of early contributions to the development of the theory of absolute time—the notion that time exists independently of the presence or actions of material bodies and has no material cause. Though popularly attributed to Newton, I argue that this conception of time first appeared in medieval philosophy, as a solution to a peculiar theological problem generated by a widespread misrepresentation of Aristotle. I trace the subsequent evolution of the theory of absolute time through to the seventeenth-century, and argue that Newton, if anything, retreats from a full endorsement of the doctrine.

Unlike absolute space, absolute time was absent from the philosophy of the Greeks, entering Western thought in the thirteenth century. Absolute time was first proposed as a negative thesis in response to a perceived irreconcilability between the popular theory of time, then seen as Aristotle's, that time was an attribute or effect of the motion of the *primum mobile*, and Biblical evidence from Joshua X 13, in which Joshua commands some heavenly motion to stop, but time continues.

A pivotal moment in the development of theories of absolute time came at the close of the Scholastic period, in 1597, when the Jesuit philosopher Francisco Suárez built on these earlier ideas about time and proposed a theory of absolute time startlingly similar to the later absolutism of the neo-Epicurean atomistic philosophers. While Suárez's theory of time was dualistic, and he proposes one kind of time that is unmistakably Scholastic, his *tempus imaginarius*, which he describes as an infinitely extended immutable temporal flux that exists independently of material being, is very much of the early modern period.

It is, however, in the work of Pierre Gassendi, the well known founder of seventeenth century neo-Epicurean atomism, that we see the first, and arguably the only, fully fledged theory of absolute time. Gassendi implanted absolute time into the Epicurean dualism of bodies and the void of absolute space. For Gassendi, time and space are truly absolute, and are ontologically prior to all other existing things—even God.

Gassendi also removed the locus of God from changeless and atemporal extramundane eternity to our everyday world of change and decay, a radical move.

I close the thesis with an investigation of the absolute time of Isaac Newton. Ironically, given that Newton is the most well-known absolutist, he in fact *retreated* from the true absolute time proposed by Gassendi, and instead described time as an affection of substance. For Newton however, following Henry More, this substance was not some mundane body or motion, but the spatially and temporally extended substance of God.

Declaration

This is to certify that
(i) the thesis comprises only my original work towards the PhD,
(ii) due acknowledgement has been made in the text to all other material used,
(iii) the thesis is less than 100,000 words in length, exclusive of tables, maps, bibliographies and appendices.

Emmaline M. Bexley,
December 2007

Acknowledgements

I have had the pleasure of being taught by some incredible teachers who are in many ways responsible for this thesis ever coming to be. I would like to thank them here, though I cannot thank them enough: Helen Derrick, a gifted teacher who introduced me to the pleasure of learning; Dr Don Ferrel, who gave me the wise advice that universities are an intellectual sand-box in which to play; Mark Zangari, who encouraged me to go on to postgraduate study, and Dr Kristian Camilleri, who co-supervised the final stages of this research in the formal sense, but helped me to think my way to some useful conclusions during many good chats all the way through. I thank Professor Brian Ellis, who got me interested in problems of space and time, and who suggested I pursue this research topic. In particular, I would like to thank Dr Keith Hutchison, my primary PhD supervisor, for teaching me by example what it is to be a scholar, and patiently allowing me to find my way.

This research was supported by a Melbourne Research Scholarship, and I thank the University of Melbourne and its benefactors for providing the means to undertake it. Also, I thank Professor Howard Sankey for driving me hard enough in fourth year to win such support. Professor Simon Marginson and Professor Richard James were kind enough to allow me time away from my work to complete this project.

Of course, the long process of writing a doctoral thesis requires the support of a circle of frank and fearless friends. I have been very lucky in this respect to have the support of: Dr Fiona Fidler and Dr Julie Connolly, who gobble up philosophical discussion like crème brûlée, as well as Leslie, Ros, Sharna, Robyn, Christine, Steve and Sarah May and all those who have helped me keep my head screwed on straight through this long process (as well as some very good cats). I also thank Zoltan Feher, with whom I know I shall enjoy what comes next very much indeed.

I also thank my parents. My father, John Bexley, bought me books on cosmology and challenged me as a child to find a triangle whose angles did not add to 180 degrees (unsurprisingly, but after numerous attempts, I failed). I wrote this thesis with him in mind as the reader. Finally my mother, Gretel Bexley, who would have been surprised but delighted to know I had done this, and was always surprising and delightful herself.

Table of Contents

Introduction

The problem this thesis begins to solve was first suggested to me by Professor Brian Ellis (now a Professorial Fellow) of the former Department of History and Philosophy of Science at the University of Melbourne, when I was casting around for a PhD research topic, interested particularly in the ontology of time. Brian suggested that (to paraphrase): "Someone should find out where Newton got his theory of time. Absolute space was around in ancient philosophy, but absolute time seems to be a modern idea." The more I looked into the problem, the less clear cut it became. Explanations like those of Pierre Duhem and Piero Ariotti, which I discuss later in this study, were simply not compelling, and other references in the secondary literature are sparse. This lack of scholarship began to seem less surprising when it became clear that most of the early primary evidence was to be found in works yet to be translated from the Latin, making collecting the evidence for this study a long and laborious process.

This thesis, then, comprises my answer for Brian: absolute time, or the notion that time exists independently of the presence or actions of material bodies and has no material cause, first appears in the medieval period where it was tentatively proposed in response to the irreconcilability of the then dominant pseudo-Aristotelian theory of time (according to which time was an effect of the motion of the *primum mobile*), with biblical evidence from Joshua X 13:

> On the day on which the Lord delivered the Armorites to Israel Joshua said to the Lord in the presence of the children of Israel: "Oh sun, move not over Gibeon, Oh moon, over the valley of Aijalon." And the sun and moon stood still while the nation avenged itself on its enemies. So it is written in the Book of the Just.[1]

In fact, the idea that time is an effect of the stellar motion was not Aristotle's. In the *Physics*, Aristotle argues that time is an effect of motion generally, and that the stellar motion is only appropriate as the primary *measure* of time. It was Aristotle's medieval Islamic commentator, Averroes, who seems to have been responsible for the

[1] *Biblia Latina* (Vulgate) *cum Glossa Ordinaria*. (Latin text on p. 30) My translation.

popularisation of the stellar model of time, which he saw as the only plausible cause for time that Aristotle could have intended.

In response to the irreconcilability of the Joshua passage and Averroes' interpretation of Aristotle, John Duns Scotus and Peter Aureole proposed, at the close of the thirteenth century, that time may in fact have no cause—a negative thesis in response to Averroes. Such partially absolute notions of absolute time were expanded upon by the late scholastic philosopher Francisco Suárez, whose work comprises the pivotal moment in the development of theories of absolute time. In his voluminous *Metaphysical Disputations*, Suárez put forward a dualistic account of time, which retained the relational Aristotelian idea of time as an attribute of being, and which he called 'intrinsic time,' as well as proposing a second kind of time, the all-embracing 'immutable flux,' or 'imaginary time.' It seems probable that Suárez did not consider this second kind of time as 'imaginary' in the sense of 'a figment of the imagination' but rather in the sense that we can only apprehend it through the use of our reason, for while 'real' it is also immaterial and intangible in character. Suárez's account of this immutable flux is highly reminiscent of the work of later philosophers such as Newton. Yet for Suárez it is intrinsic time which we really refer to when we speak of time. Suárez was unwilling to take the final step away from attributive or relational theories of time and to describe it primarily as something physically uncaused and absolute.

It is in the work of neo-Epicurean atomis`t Pierre Gassendi in the mid-17th century that we see the first, and most 'pure,' example of absolute time. Of time, Gassendi wrote that:

> …if God reduced the whole universe to nothing, we comprehend that time would still flow; we also understand that if God would wish to recreate the universe, time would flow in the interval between its destruction and recreation.[2]

One could not have a clearer example of a statement of absolute time. In proposing time to be absolute, a move not made by ancient atomists who saw time as relational,

[2] Gassendi, Syntagma Philosophicum. Translation by Milič Čapek in "The Conflict Between the Absolutist and the Relational Theory of Time Before Newton," Journal of the History of Ideas, vol. 48, 1987, p. 222.

Gassendi revised the old Scholastic categories of being, dividing being into substance, attribute, time and space. For Gassendi, the old metaphysics simply could not accommodate time and space.

After Gassendi, we see a retreat from the idea that time is truly absolute, and that it exists without reliance on anything else. Both Henry More and Isaac Newton claimed that time is in fact an attribute of God's infinity. Unlike Gassendi, who saw time as ontologically prior to being, even God's being, More and Newton paint space and time as attributes of being, asserting that if there is a being it must necessarily have spatio-temporal breadth. Thus Newton says in the General Scholium to the second edition of the *Principia* that God:

> …is not Duration and Space, but he endures and is present. He endures forever, and is every where present; and, by existing always and every where, he constitutes Duration and Space. [3]

Newton and More were in agreement that time is only absolute in respect of created being, but is an accident of the extended spirit of God, and their work represents a *retreat* from full-blown absolutism.
This thesis is structured to observe *key episodes* in the development of theories of absolute time, and thus is not exhaustive. Much of this thesis constitutes new or expanded research on the history of theories of absolute time, as there has been little scholarship on early theories of absolute time to date. Some commentators embrace parts of my story and I discuss them in the relevant sections.

There are, however, two oft-cited scholars of absolute time whom I discuss in some detail. The most prominent is Pierre Duhem, who argued in his very widely read *Système du monde* of 1916 that spatial and temporal absolutism were born in response to the Paris Decree of 1277, along with vacua and the acceptance of the possibility of other worlds. I show that Duhem's story is full of historical errors, for example the requirement for the Decree to have an extremely wide-reaching effect in medieval European philosophy when in fact it was very localised in scope, relating to the

[3] Newton, Scholium to the Definitions, Sir Isaac Newton's Mathematical Principles of Natural Philosophy and his System of the World, translation Andrew Motte (1729), revised Florian Cajori, Berkeley, University of California Press, 1966, p.6.

activities of certain masters at the University of Paris. In Chapter Three I also show how Duhem knowingly mistranslates a key piece of evidence in his work on absolute time. Difficulties such as these reduce the credibility of Duhem's account of the reasons for the introduction of absolute time.

Piero Ariotti is another, more recent, author I discuss and is often cited by those writing about absolute time. Ariotti's thesis is that absolute time was first proposed as a response to the Copernican hypothesis, which, by effectively immobilising the sphere of stars, removed the possibility that time could result from the stellar motion. I show how Ariotti also misrepresents the writings of a number of thinkers whose work he uses as evidence. More compellingly however, Ariotti's thesis cannot account for early examples of absolute time, such as that found in the work of Duns Scotus and Aureole. Nor can he account for proposals of absolute time made by thinkers who embraced the Ptolemaic cosmology, such as Suárez.

At the very end of this study, I also discuss some approaches to Newton's theory of time taken by modern philosophers. John Earman, for example, claimed that: "Newton's reasoning is a paradigm case of scientific theorising; a theoretical construct, absolute space, is postulated in order to make possible a general account of the motion of bodies and in particular to explain certain actually observed phenomena…"[4] Earman refers here to Newton's absolute space, but his remark could equally be aimed at time. Earman has put the cart before the horse; Newton adds little to the theories of absolute time (and space) available to him, and it is more plausible to suppose that his general account of kinematics and dynamics is built upon the metaphysical system he has chosen, rather than vice-versa. This attitude to Newton's metaphysics has been a consistent feature of 20th Century philosophical critiques of Newton, founded on Mach's famous criticism that "this absolute time ... is neither a practical nor a scientific value; and no one is justified in saying he knows aught about it. It is an idle metaphysical conception."[5] I give examples of 20th Century philosophers, in particular Stephen Toulmin, who reinterprets sections of the

[4] Earman, "Who's Afraid of Absolute Space," Australasian Journal of Philosophy, 1970, p. 296.
[5]Mach, The Science of Mechanics, Open Court, 1960, p. 273.

Principia in order to argue away the metaphysical assumptions and provide what he calls “a happier reading” of Newton.

Finally, many of the quotations used as evidence here are my own translations from the original Latin, and in these cases I have included the Latin in footnotes. Where I have been able to access original texts I have relied upon them, unless a recognised translation was available (in which case the translation was checked against the original). However, in a number of instances texts were not available to me in the original language, and in these cases I have had to rely solely on translations by others. All translators are cited in the footnotes.

1.

"*A circle sown amongst the spheres*":

Averroes and early- medieval interpretations of Aristotle on time

In the Physics, Aristotle argues that time must be intimately connected to motion, and result either from motions of the mind (thoughts), from motion generally, or from a single motion such as that of the primum mobile. It seems clear that Aristotle thought time to be caused by motion generally, and he explicitly warns against the view that time might be an effect of the stellar motion. Despite this, his medieval commentator, Averroes, argued that Aristotle did in fact intend time to be an effect of the motion of the primum mobile — an interpretation which, through Averroes' work, became standard amongst medieval philosophers. In order to address properly in Chapter Two the reasons for the introduction of absolute time in the Medieval period, which was as a direct response to Averroes' interpretation of Aristotle, I investigate here in some detail Aristotle's account of time and Averroes' interpretation of it, as well as considering it's reception by selected early medieval philosophers.

In the *Physics*, Aristotle begins his deliberations on time with a celebrated rejection of the possibility that time can exist independently:

> Some of [time] is past and no longer exists, and the rest is in the future and does not yet exist; and all time… is entirely made up of the no-longer and the not-yet; and how can we conceive of that which is composed of non-existents sharing in existence in any way? (*Phys*. 217b 34 – 218a 3[6])

[6] All English translations from the Physics taken from the Loeb edition, London, Heinemann, 1929, translated by Wicksteed & Cornford, unless otherwise noted, as are the Greek examples.

Since time cannot be a substantial entity, Aristotle concludes that it must be somehow related to motion, since we are only aware of the passing of time "when we are aware of some motion or change" (*Physics* 218b20-219a3). Aristotle considers whether time may be ontologically tied to individual changes, but rejects this view on the basis that "when any particular thing changes or moves, the movement or change is in the moving or changing thing itself or takes place only where that thing is; whereas 'the passage of time' is current everywhere and is in relation to everything" (218b10-15).

The denial that time can have independent (substantial) existence is common amongst the various schools of Greek philosophy. Even atomists like Epicurus (and, later, Lucretius), denied that time could have an independent existence,[7] although they thought space to exist independently of material being. Indeed, it is arguable that *none* of the classical philosophers believed time to have an independent existence (Plotinus on occasion seems to be a temporal absolutist, but on close inspection it is obvious he is not[8]). Aristotle's relativistic account of time is not, then, unusual amongst his contemporaries.

After a long examination of possibilities, Aristotle concludes that time results from motion generally. He argues that prior and posterior, or 'earlier' and 'later'—those ideas which are central to our understanding of what temporal transition is—can be drawn as a conclusion from premises about (local) motion. Aristotle begins by proposing the lemmas, a) "the primary significance of 'before and afterness' is the

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[7] Lucretius, *De rerum natura*, 459-63: " tempus item per se non est, sed rebus ab ipsis consequitur sensus, transactum quid sit in aevo, tum quae res instet, quid porro deinde sequatur; nec per se quemquam tempus sentire fatendumst semotum ab rerum motu placidaque quiete."

[8] Time, for Plotinus, is generated by the world Soul, as it seeks to progress towards the perfect eternal 'Unity' which created it. Says Plotinus:

> ...one might perhaps ask time... to tell us how it did come into being and appear. It might say something like this about itself; that before, when it had not yet, in fact, produced this "before" or felt the need of an "after," it was at rest with eternity in real being; it was not yet time, but itself, too, kept quiet in that. But since there was a restlessly active nature which wanted to control itself and be on its own, and chose to seek for more than its present state, this moved, and time moved with it... (Plotinus, *Enneads*, Vol III, chapter 7, s11, 10-15. Translated by A.H. Armstrong.)

Plotinus denies, however, that it is correct to interpret Plato as believing that time is an effect of the motion of heaven (the standard modern interpretation), but rather that we should think of the motion of heaven as that which gives us an idea of the motion of the world Soul, which is time (Plotinus, *ibid*, 13 18-35). So, for Plotinus, time is related to the yearning of the imperfect physical world to attain the perfection of the eternal world. However, he warns, "... if someone were to say that time is in something unsubstantial or unreal, it must be stated that he is telling an untruth..." (*ibid*, 13 49-51). It seems implausible to interpret such passages from Plotinus as being claims that time is absolute.

local one of 'in front of', and 'behind'. There it is applied to order of position;" and b) a motion is the movement of a body between two such positions. Therefore, "since there is a before-and-after in magnitude, there must also be a before and after in movement in analogy with them". Further: "there is thus a before and after in time, in virtue of the dependence of time upon motion" (*Phys*. 219a10-20), the premise he has supported earlier. Concluding that time results from locomotion generally, Aristotle gives his famous definition of time:

> *Time is…the number of motion with respect to the prior and posterior.*
> *(*αριθμος κινησεως κατα το προτερον και υοτερον) (219b2-3)

The meaning of 'number' in this definition is not immediately obvious. For Aristotle, 'prior' and 'posterior' seem to hold significance in the definition of how time 'numbers' motion, insofar as they realise the ontological relationship between the 'before and after' of space, and the 'earlier and later' of time. However, even Aristotle himself does not consistently adhere to his difficult notion of non-temporal before-and-afterness. In contradistinction to his first lemma cited above—"the primary significance of 'before and afterness' is the local one of 'in front of', and 'behind'. There it is applied to order of position"—which occurs in Book iv of the *Physics*, in Book viii he says that in respect of motion, priority (or 'before and afterness') can have three meanings: 1) causal priority (*a* causes *b*); 2) temporal priority (*a* is earlier than *b*); and 3) priority in respect of perfection of nature (*a* is more perfect than *b*) (260b 15-20). There is no mention here of priority in motion being dependent upon spatial priority.

The place of temporal priority in this rather vague set of explanations can be clarified by reference to the *Categories*, Chapter 12, 14a25-14b 23. Here he says: "Primarily and most properly the term [priority] has reference to time: in this sense the word is used to indicate that one thing is older or more ancient than another." He also gives the alternate definitions of 2) sequential priority ('one' is prior to 'two'); 3) order, in the sense that in reading and writing the letters are prior to the syllables; 4) priority of perfection; and 5) causal priority. It seems quite significant that in neither Book viii of the *Physics*, nor in the *Categories* does Aristotle so much as mention place as the 'primary signification' of priority. If it is true that both works were composed later

than Book iv of the *Physics* (as I claim on p. 11, following) then Aristotle must have undergone a change of heart about the dependence of before and after upon space and motion.

Another difficulty is that of the correct translation of κινησις (motion). Although κινησις is generally translated into English simply as 'motion', Aristotle often also uses the term in the *Physics* to mean change generally, equivalent to μεταβολη; indeed, κινησις is used by Aristotle at various times for a) local motion; b) changes other than generation and corruption; as well as c) change generally.[9] Given the range of options, it would seem equally reasonable to interpret Aristotle as saying time is 'the number of *change*...', as the 'number of motion...' However, Aristotle's main argument explaining the relationship between time and κινησις points to the more restricted interpretation of κινησις as 'local motion' (equivalent to φορας) in so far as it is connected with time, as I show below.

The probability that Aristotle believed time to be an accident of locomotion is supported by his further belief that other characteristics of time are a result of its ontological subsistence upon motion. For example, elsewhere in the chapter on time he argues:

> ...movement corresponds to linear magnitude (μεγεθει), and time to movement, in being a quantity, in being continuous, and in being divisible; for it is from linear magnitude that motion takes on these qualities, and from motion that time does. (*Phys*. 220b 24-28)

Here, Aristotle proposes that there is a kind of hierarchy of being. Linear magnitude is a species of being which has certain characteristics—continuity, divisibility, and belonging to the kind 'quantity'—and its attributes, movement and time, share these characteristics.

However, because time is 'a number' of motion, it is not, like motion itself, fast or slow:

[9]See also Ross, *Aristotle's Physics*, Oxford, Clarendon Press, 1936, pp. 7-8.

> ...we do not speak of time itself as 'swift or slow', but as consisting of 'many or few' of the units in which it is counted, or as 'long or short' when regarded as a continuum. It would not be swift or slow, even if we supposed it to be the counter that counts, not the dimension that is counted (which it really is); for abstract numbers are in no case swift or slow...(220b1-5)

This assertion seems to be an attempt to counter the rather obvious objection that time seems to be constant, whereas motions are inconstant. Obviously, for Aristotle, time does not share all of the characteristics of the motions from which it springs.

The connection between time and locomotion is made more explicit in Aristotle's discussion of the moment, or 'now' (νυν), in the temporal continuum. As the argument sketched earlier suggests, it is the motion of the body along the magnitude of its trajectory which lends to time the ever changing aspect of its before-and-afterness. In the following argument, the connection between the mobile moment and the body in motion is made explicit:

> It is evident, too, that neither would time be if there were no moment, nor would the moment be if there were no time. For, just as the body in locomotion and that locomotion belong to each other, so the number of the body in locomotion and the number of the locomotion are to each other. For time is the number of locomotion (φορας αριθμος), and the moment corresponds to the moving body as the numerical monad (μονας αριφμου). (219b34-220a5[10])

Aristotle seems to be attempting to impart the impression of the moving body being 'linked' to the moment, with the moment/body flowing through time/magnitude-of-motion as a kind of inseparable pairing.

This idea of the moment/moving-body being that which counts numerable motion is a little clearer in the following passage:

> ...as stated before...a motion follows a magnitude, and time follows a motion. And a travelling object, by which we know the motion and the prior and posterior in it, follows a point in a similar way. And whatever this may be (whether a point or a stone or some other such thing), it is the same, but its relations alter (just as the Sophists

[10] Translated by the author, with reference to Wicksteed and Cornford.

regard Corsicos in the Lyceum as being distinct from Corsicos in the Agora)...(219b15-22[11])

So, when we say "now", we mean different things depending on the relationship between 'now' and our surroundings. The moment itself remains the same, just as it is the same Corsicos whether he is in the Lyceum or the Agora, yet the conditions under which it is true to use the term 'now' of his situation are continually changing. It is significant that Aristotle links the mobile moment with a moving stone, and Corsicos's change of place. Aristotle's' definition of time—for all its difficulties—is that time is an effect of *locomotion generally*.

A note concerning the Aristotelian texts

Problematically, Aristotle's discussions of time fall throughout his works, and are not always logically in keeping with one another. For example, Aristotle's main treatise on time comprises Chapters X-XIV of Book iv of the *Physics*. The opinions Aristotle expresses here are similar to those expressed in briefer references to time in *On the Heavens*, and *Generation and Corruption*. It seems probable that *On the Heavens*, and *Generation and Corruption* belong to Aristotle's middle period of writings (after the death of Plato, but before Aristotle founded the Peripatos in the Lyceum), and it is plausible that the first four books of the *Physics* were also composed during this time.[12] The similarities in the treatment of time in these works bear out this hypothesis. Discussions of time in these works are characterised by Aristotle's insistence that motion is ontologically prior to time. However, Aristotle expresses quite a different view of time in his brief discussions of the subject in the final books of the *Physics*, as well as in the *Categories*. The final books of the *Physics* probably derive from Aristotle's time in the Lyceum, and certain similarities between Aristotle's treatment of the notion of 'priority' here and in the *Categories* suggest the *Categories* also to date from this time, although this hypothesis is at best uncertain (as I suggested earlier, p.8). In these works, Aristotle seems to think time to be a more independent entity than in the earlier works. Unfortunately, the views he expresses

[11] As above.

[12] Following Ross, *Aristotle's Physics*, pp. 1-19; and Ross, *Aristotle,* London, Methuen, 1960, pp. 7-19; "Volume I: Greece and Rome" of Copleston's *A History of Philosophy*, New York, Newman Press, 1971, pp. 268-76, was also consulted. H. J. Easterling, in "The Unmoved Mover in Early Aristotle", *Phronesis*, vol. 21, 1976, supports Ross's hypotheses.

here are never expounded in full. Such irregularities in Aristotle's treatment of time might well be ascribed to a change of heart concerning the ontological status of time between Aristotle's middle and late periods. Ross, in *Aristotle*, argues that the *Categories*, as part of the *Organon*, belong to Aristotle's middle period, although he notes that the work is possibly not authentic.[13] Conversely, Copleston dates the *Organon* to Aristotle's late period.[14] Although Ross's arguments are convincing, I concur with Copleston, in view of the similarities in the definition of 'priority' in the *Categories* and the final books of the *Physics*.

Aristotle on the Relationship of Celestial Motion to Time

The belief that Aristotle considered time to be caused by the first celestial motion has been popular for some eight-hundred years, and remains so in some recent literature on early theories of time, despite the compelling evidence that he thought time to be an attribute of motion generally. For example, in his *Commentary on Aristotle's Physics*, Thomas Aquinas gives the interpretation:

> …time is consequent upon only the one first motion by which all other motions are caused and measured. And thus there remains only one time.[15]

Writing in 1652, Walter Charleton says:

> And Aristotle, as every Pedagogue hath heard, after a long and anxious scrutiny, positively and magisterially determines Time to be, *Numerum Motus* (*coelestis ac primi*) *secundum Prius et posterius*, the Number of the First Coelestial Motion, according to former and later…16

Writing three-hundred years later, in 1973, Piero Ariotti says:

> For Aristotle... only the heavenly bodies instantiate time. Their motion, and only their motion, is time.[17]

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[13] Ross, *Aristotle*, pp 9-10; p. 18.

[14] Copleston, *A History of Philosophy*, p. 273

[15] Aquinas, *Commentary on Aristotle's Physics*, Lecture 17, 573-574. Translated by R. J. Blackwell, R. J. Spath and W. E. Thirlkel, London, Routledge & Kegan Paul, 1963, pp. 256-7.

[16] Walter Charleton, *Physiologia Epicurio-Gassendo-Charletonia, or a Fabrick of Science Natural, Upon the Hypothesis of Atoms founded by Epicurus, repaired by Petrus Gassendus, augmented by Walter Charleton*, New York, Johnson Reprint Corp., 1966, p. 74.

[17] Piero Ariotti, "Toward Absolute Time: Continental Antecedents of the Newtonian Conception of Time," *Studi Internazionali di Filosophia*, v. 5, 1973, p. 144.

It is this interpretation which was the most common in the medieval period, and it is this interpretation of Aristotle which forms the basis of discussion in the following chapter—it is the interpretation to which some medieval philosophers responded with the first proposals of absolute time. Yet these interpretations are wrong, for in the first chapter on time in Book iv of the *Physics*, before he begins to put forward his own views on time, Aristotle gives a very explicit injunction *against* the notion that time might be caused by the motion of the *primum mobil* (following Plato: *Timaeus*, 38b) or by the existence of the sphere itself:

> ...some have identified time with the revolution of the all embracing heaven and some with the that heavenly sphere itself... [However, in response to the former position] a partial revolution is time just as much as a whole one is, but it is not just as much a revolution; for any finite portion of time is a portion of a revolution, but is not a revolution. Moreover, if there were more universes than one, the re-entrant circumlation of each of them would be time, so that several different times would exist at once. And as to those who declare the heavenly sphere itself to be time, their only reason was that all things are contained 'in the celestial sphere' and also take place 'in time,' which is too childish to be worth reducing to absurdities more obvious than itself. (*Phys*. 218a31-218b9)

The motion of the sphere does , however, play a very important role in Aristotle's understanding of time, but not its progenitor. Towards the end of the section on time in Book iv of the *Physics*, Aristotle discusses the importance of circular locomotion to time, but in terms that indicate quite clearly that such motion is important as measure only:

> And now, keeping local motion (φορα) and especially rotation in mind, note that everything is counted by some unit of like nature to itself—monads monad by monad, for instance, and horses horse by horse—and so likewise time by some finite unit of time. But as we have said, movement and time mutually determine each other quantitively; and that because the standard of time established by the movement we select is the quantitive measure both of that movement and of time. If, then, the standard once fixed measures all dimensionality of its own order, a uniform rotation will be the best standard, since it is easiest to count.

Could Aristotle have stated more clearly that a uniform circular rotation, such as the motion of the *primum mobile*, is significant for measure only?

Aristotle further shows how time can *measure* all change, even though it seems to be primarily connected with changes in place. Locomotion is a species (indeed the prime species) of change generally, and one member of a species can be used to number the other members, even though by genus they are not the same. Time, then, can number other forms of change, just as:

> ...it is correct to say that the number of sheep and of dogs are the same number, if that of sheep and that of dogs are equal; but it is not the same decad in each case, nor are the units of one the same as the units of the other...(*Phys*. 224a2-5)

Thus the heavenly motion is important to all forms of change as their *measure*, even though in his main argument Aristotle connects time primarily with locomotion.

Aristotle has told us that time is an effect of *all* motion, and that one motion does stand above the rest, but not as progenitor of time—as *measure*. Despite this, Averroes' interpretation of Aristotle has worked its way into the minds of philosophers and historians through the centuries and is the way Aristotle is often remembered. In the following section we investigate the apparent beginnings of this myth.

Averroes' interpretation of Aristotle on time

Throughout the first half of the first millennium, Greek thought and writing found homes in cities around the eastern rim of the Mediterranean from Alexandria through Antioch and Edessa to Constantinople. Aristotle's texts were translated into Syriac, and from Syriac to Arabic, as Islam began to grow in the latter part of the first millennium. As Islam spread west around the southern shores of the Mediterranean, the works of Aristotle followed, eventually finding a home across the mouth of the Mediterranean in the Islamic communities of Spain, where they were translated from the Arabic to Latin. So fastidious were these translations that they were often more exact than later Latin translations from the original Greek, which came east into Europe after the fall of Constantinople during the Crusades.[18] Averroes, or Ibn Rusd (c. 1126-1198), is the most significant of Aristotle's Spanish/Islamic commentators.

[18] Charles E. Butterworth, preface to *Averroes' Middle Commentaries on Aristotle's Categories and De Interpretatione*, Princeton, Princeton University Press, 1983, pp. ix-xi.

Just as medieval philosophers simply referred to Aristotle as 'the Philosopher,' Averroes was, for them, 'the Commentator.' Averroes is significant to the history of theories of time not only because of his role as the primary commentator Aristotle in the West, but, more importantly, because of his part in popularising the idea that the causal seat of time in Aristotelian physics must be the motion of the first heaven.

Averroes did not seek simply to explain Aristotle's ideas through his commentary, but to 'fill in the gaps' in what he appears to have conceived of as 'Greek Philosophy.' That he believed 'Greek Philosophy' could be understood as an integrated system of knowledge is evidenced by his willingness to substitute Plato's' *Republic* for Aristotle's *Politics* (which was unavailable to him), and by his integration of Aristotle's physics of motion (from the *Physics*) with Aristotle's celestial mechanics (from *De Caelo*) in his *De Substantia Orbis*.[19] In his attempt to normalise not only Aristotle's own philosophy, but Greek philosophy more generally, Averroes was forced to add pieces of his own devising to the jigsaw of pieces of ancient philosophy at his disposal. His treatment of Aristotle's philosophy of time evidences a partial reliance on Platonic doctrines, as well as a willingness to insert his own ideas where Aristotle's seemed problematic. Given that Averroes' commentaries were often not so much interpretations of Aristotle, as Averroes' attempted *clarification* of Aristotle, one can hardly imagine the impact Averroes' ideas would have had on the reader. The presentation of the work would itself have reinforced this impact, with the passages of Averroes' commentary interpolated with Aristotle's own text.

Averroes believed time to be a result of the motion of the *primum mobile*. He often refers to this simple explanation of the propagation of time, for example in the Latinised *Substantia Orbis*-

> ...the celestial sphere possesses time as something subsequent to it and as one of its accidents...[20]

and in the more recently discovered *Sefer ha-derusim ha-tib'iyim*-

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[19] Stuart MacClintock, "Averroes", *Encyclopedia of Philosophy*, New York: Macmillan, 1967 p. 221.

[20] Averroes, *On the Substance of the Celestial Spheres (De substantia orbis)*, translation by Arthur Hyman, Cambridge, Medieval Academy of America and Israel Academy of Sciences and Humanities, 1986, p. 85, lines 72-6.

> ...the world, that is to say the celestial body, is a condition for the existence of time and prior [in nature] to it...

and:

> If time is imagined to be something abstract[21], outside of the circle [of the celestial body], it is imagined to be something other than it really is. ...When time is imagined to be what it really is...[it is imagined to be] a circle sown amongst the spheres...[22]

But Averroes' conception of time is in fact more complicated than these simple definitions suggest, and it was no doubt the sophistication of his interpretation of Aristotle on time that made his views seem so plausible to so may medieval philosophers.

Averroes begins his commentary and interpretation of Book iv of Aristotle's *Physics* by contemplating Aristotle's argument that we are only aware of time when we are aware of some motion or change. As I discussed earlier, in Book iv of the *Physics*, Aristotle calls time "the number of motion with respect to the prior and posterior." Averroes agreed that time is connected to motion and/or change, but yet is not the same as motion. He pondered three possibilities: 1) that time is motion in the soul; 2) that the perception of time results from any motion whatsoever; and 3) that the perception of time results from one particular motion. He cites Galen as one who believed that Aristotle meant, by his definition of time, that time is a motion of the soul (or an artefact of the thinking soul). Yet he dismisses Galen's view on the grounds that Aristotle has said we are aware of time "when we are aware of some motion or change", and if time were *only* reliant upon motion in the soul it would be sufficient for us to imagine some resting, changeless body, which does not seem to be what Aristotle means.[23] Averroes also dismisses the second possibility, that any motion is time, but his dismissal gives us a clue to his eventual answer:

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[21] Averroes is not here speaking of absolute time, but of time qua the simple duration of an existing thing, in the sense that 'every thing has a time.' This is opposed to 'true' time, which is "a consequence of motion and motion a consequence of the thing moved." See Narboni, "*ad Question V*", cited in Averroes, *Averroes Questions in Physics From the Unpublished Sefer ha-derusim ha-tib'iyim*, Dordecht, Kluwer Academic Publishers, 1991 Quest. three, note 36, p. 67.

[22] Averroes, *Averroes' Questions in Physics,* translation by Helen Tunik Goldstein, pp.5-6.

[23] Averroes, *Aristotelis Opera cum Averrois Commentarius*, Vol. IV, Venetiis apud Junctas, 1562, Frankfurt, Minerva, 1962, Vol. IV, comm 97, 177M-178A. My translation.

> We do not say ...that to sense time is to sense ourselves in the presence of any motion, [or] in the presence of any imaginable change. It is evident that to sense ourselves in the presence of time [being] to sense any motion primarily and essentially is impossible, because if it were so, it would be the case that time is multiplied by the multiplication of sensible motions—indeed of [any] imaginable motions. However to sense time will not be to sense any motion primarily, but rather this—[that] when we sense whatever motion, we sense that one motion of which time is an accident...[24]

Time then, is not simply an action of the mind, nor can it be connected to motion generally, because that would result in a multiplication of times. Averroes is left with the third possibility, that time is connected to one special motion.

But, ponders Averroes, how do those who do not perceive that special motion directly perceive time? He suggests that we must be able to access that unique motion through the perception of any motion—indeed, if this is possible, we will side-step the problem of explaining how someone blind, or out of sight of the unique motion, should understand time. In recognising this possibility, Averroes refers to Plato's allegory of the cave:

> [If time results from] some particular motion, for example the motion of the celestial body, then he who does not perceive some particular hour [of its motion] will not perceive time, or will not perceive it entirely. For, concerning those who were imprisoned underground from childhood, Plato said that if they were not able to comprehend time except through the comprehension of some sensible motion, for example the motion of heaven, then they would not perceive time, because they had never perceived the motion of the celestial body.[25]

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[24]Averroes, *Aristotelis Opera*, Comm 98, 178L-M. "Nos autem dicamus, quem nos sentire tempus est apud sentire quemlibet motum, & apud imaginari quamlibet transmutationem manifestum est.n.quod nos sentire tempus apud sentire quemlibet motum primo, & essentialiter impossibile est. quoniam, si ita esset, contingeret ut tempus multiplicaretur per multiplicationem motuum sensibilium, immo motuum imaginabilium. si autem sentire tempus per sentire quemlibet motum non fuerit primo, & essentialiter, sed pp hoc, quia, cum sentimus quemcunq, motum, sentimus illum unum motum, cui accidit tempus..." My translation.

[25]Averroes, *Aristotelis Opera,* Comm 98, 178G-H. "...si posuerimus ipsum sequi aliquem motum proprium, v.g. motum corporis coelestis, tunc qui non senserit ipsum omnino: ut dicit Pla. de incarceratis a pueritia sub terra, f. quod, si non comprehenderet nisi per comprehensionem alicuius motus sensibilis, v.g. motus coeli, tunc isti incarcerati non sentirent tempus, quia nunquam senserunt motum corporis coelestis...." My translation.

This reference to Plato seems misplaced. Averroes uses the allegory of the cave to show the difficulty in time being a particular motion (the heavenly motion), since those who are unable to perceive that motion seemingly must have no perception of time. Yet in the allegory of the cave

Averroes answers his problem by thinking about what motion and change tell us about time. If we could sense that one unique motion of which time is the accident through the perception of any motion whatsoever, his problem would vanish. His ingenious answer to the problem before him takes into consideration from whence (in an Aristotelian universe) the plethora of motions around us ultimately spring:

> [W]hen motion is sensed, time is sensed primarily and essentially. It is by reason of motion [that] we sense ourselves to be in a changeable existence, and to be changeable ourselves, because we are in this existence. ... It is on that account that we sense time primarily, and it is manifest that we do not sense ourselves to be in a changeable existence except through the transmutation of heaven. If heaven stood still, it would be possible for us to exist in an unchanging existence—but that is impossible.[26]

Averroes has made good use of Aristotle's theory of the cause of motions. Throughout the *Physics* Aristotle refers to the role of the 'prime mover', speculating that since one motion is the mover of another, there must ultimately be some unmoved mover, in order that there be a first cause of all motions. Since the unmoved mover is the primary mover of the stars, the sphere of stars is the first motion in the chain from which any motion springs (thus *primum mobile*). Averroes deduces that since any motion or change that we might observe or experience has the celestial motion as its primary cause, we sense time in any motion, because time is an attribute of that motion to which all motion is causally connected.

What Averroes has concocted is a kind of emanation theory of time. Averroes' early conception of how human thoughts are formed is reminiscent of this line of reasoning. He suggested that the celestial sphere is a being moved by its own intelligence, imparting the 'will' to move to each successive sphere/being, until the lunar sphere inspires thought in the individual. However, he moved away from this 'chain of

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(*Republic* VII), Plato is trying to demonstrate the delusions of the populace and the difficulty in coming to an enlightened understanding of a higher reality—a rather different purpose than that which Averroes ascribed to him.

[26]Averroes, *Aristotelis Opera,* Comm 98, 179B. .″..motus igitur, qui cum sentitur, sentitur primo, & essentialiter tempus, est motus, ex quo sentimus nos esse in esse transmutabili, & nos transmutari, quia sumus in hoc esse...est illud, ex quo sequitur nos sentire tempus primo. & manifestum est quod nos non sentimus nos esse in esse transmutabili, nisi ex transmutatione coeli. &. si esset possibile ipsum quiescere, esset possibile nos esse in esse non transmutabili: sed hoc est impossible...” My translation.

consciousness' theory to the simpler motive theory later in his life.[27] In any case, it is evident that Averroes' idea of time being inherent in any individual motion through that motion's relation to the first motion, is linked to all motions having their ultimate cause in the motion of heaven.

Intriguingly, Averroes seems to have felt obliged to forge his own way in solving the complexities of Aristotle's account of time. He expresses his frustration emotively in a passage from his commentary:

> ...we do not perceive motion, nor time, except when we perceive ourselves to be changed, because we are in a changing existence. ...And in this manner we can consider time to follow the motion of the celestial body, and that he who never perceived the celestial body will perceive time. All men are agreed that time follows the motion of heaven, and I could not reconcile this problem for myself, except after a great time. [In] whatever [else] I have written concerning time, I have acceded to the interpreters, but not in this...[28]

Why was it so difficult for Averroes to understand Aristotle's ideas about the celestial cause of time? Since 'Aristotle's' definition of time as the result of celestial motion was so popular during the medieval period, and was the theory to which early temporal absolutism provided the antithesis, this question needs answering. And the answer seems to be, quite simply, that that Averroes found his interpretation difficult because Aristotle said no such thing, as we have seen earlier.
Plato, however, did hold the view that time had a celestial cause, and came into existence with the universe (*Timaeus*, 38b)—an opinion mentioned by Aristotle as being held by Plato alone (*Physics* 251b 17). Like Aristotle, Plato believed time to be a kind of number, but Plato allowed that only heavenly motion is associated with time. In the *Timaeus*, Plato explains how the creator made time as a mobile image of perfect and changeless eternity, "circularly rolling itself according to number

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[27]See Herbert A. Davidson, *Alfarabi, Avicenna, and Averroes, on Intellect*, *and Theories of Human Intellect*, New York, Oxford University Press, 1992, pp. 223-225; and Barry S. Kogan, *Averroes and the Metaphysics of Causation*, Albany, State University of New York Press, 1985, pp. 250-255.

[28]Averroes, *Aristotelis Opera,* Comm 98, 179F-G. "...quod nos non percipimus motum, neq, tempus, nisi cum perceperimus nos transmutari, quia sumus in esse transmutabili...secundum hunc modum possumus ponere tempus sequi motum corporis coelestis: & quod sentiet tempus qui nunquam sensit corpus coeleste. & ideo omnes conveniunt in hoc, quod tempus sequitur motum coeli. & ista quaestio nunquam potuit dilucidari mihi, nisi post magnum tempore: & quicquid scripsi de tempore, secutus sum expositores, sed hic non." My translation.

(αριθμον)" (*Tim*. 38a).[29] He goes on to argue that the heavenly bodies were created with "natures necessary to the joint *fabrication of time*" (*Tim*. 38e).[30] Plato also writes that the sun, moon, and other planets were created by God "for the making of time, that time might be born..." (*Tim*. 38c).[31] Thus in many ways, Averroes' interpretation of Aristotle is reminiscent of Plato's theory. Plato, however, says in the *Timaeus* that *all* the celestial bodies participate in a "*joint* fabrication of time", rather than the first sphere—an important difference which conflicts with the causal mechanism for the generation of time supported by Averroes. The fact remains, however, that Averroes' attempt to synthesise Greek philosophy, for example feeling able to substituting Plato's *Republic* for Aristotle's then known but unavailable *Politics*, may have encouraged him to follow Plato in his interpretation of Aristotle, despite the seemingly obvious conflict between their two views of time.

Two Responses To Averroean Time

Averroes' works were well known to European philosophers of the medieval period, and are particularly associated with the work of the 'Latin-Averroists,' Boethius and Siger of Brabant, both masters of the Arts Faculty at Paris in the 1270's. While the works of 'radical' Averroists like Siger and Boethius make an interesting story, it is more illuminating, in terms of making sense of the impact of Averroes on the 'mainstream' philosophy of the time, to consider here the writings of two less extreme thinkers, both of whom evidence quite different reactions to Averroes' time-as-of-the-sphere model within the more traditional schools of philosophy. These thinkers were both Dominican theologians, one active in France and Italy, and one in England: Thomas Aquinas and Robert Kilwardby.

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[29]Quotes from the *Timaeus* follow the translation of Thomas Taylor, *Timaeus and Critias*, Washington, Pantheon, 1944, unless otherwise mentioned.

[30]In Greek: συναπεργαζεσθαι χρονον. Calcidus's Latin translation has '*tempori pouenire,*' in Plato, *Platonis Timaeus Interprete Chalcidio cum Eiusdem Commentario*, ed. Ioh. Wrobel, (Lipsiae, B. G. Teubneri, 1876 ed.), Frankfurt, Minerva, 1963

[31]In Greek: "...κρονου γενεσιν, ινα γεννηθη κρονος,..." Chalcidus has, "...*genituram temporis uolentis creari*..." See also W. von Leyden, "Time, Number, and Eternity in Plato and Aristotle", *Philosophical Quarterly*, vol. 14, 1964, p. 48.

Thomas Aquinas

Thomas Aquinas is perhaps best known for his many attempts to reconcile Aristotelian rationalism with Christian revelation. This drive allowed him to achieve such subtle feats of reasoning as showing that the universe could have been created by God without necessarily having a beginning in time (because creation from nothing—*ex nihilo*—does not mean creation *after* nothing—*post nihilum).*[32] Aquinas is significant to this study because he adopted an Averroistic interpretation of Aristotle on time and left that interpretation within the huge legacy of Thomistic thought. This legacy is apparent in many of the thinkers I discuss in later chapters, who follow the dominant (Averroean or indeed Thomistic) interpretation of Aristotle on time, using it as the basis of their rejection of relational models of time.

The identification of Aquinas's sources is significant to our understanding of his choice to champion the sphere model of time. Aquinas had a number of editions of the *Physics* available to him when he wrote his commentary on it—a Greek to Latin translation of the first two books; William of Moerbeke's Greek *Moerbekana*; and three other Arabic to Latin translations, one of which included Averroes' commentaries. Traditionally, Aquinas is thought to have relied on the Greek to Latin translation of the *Moerbekana*, however he is thought to have relied on other editions for the first of the eight books of his commentary of the *Physics*, possibly Bacon's.[33] There is also evidence that Aquinas was influenced in the succeeding chapters by the Christian Latin editions/commentaries of such thinkers as Giles of Rome, Roger Bacon, and Albert the Great, among others.[34] Aquinas was, of course, aware of the Islamic translations, and wrote a number of treatises against the Averroists, Islamists, and pagans. In his commentary on the *Physics*, Aquinas finds a number of occasions to mention the commentaries of Averroes (although he often seems to take a fairly dismissive view of them)—certainly, then, he had studied Averroes' own commentaries.

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[32]Aquinas, *De aeternitate mundi*, in *S. Thomae Aquinatis Opera Omnia*, (vol. 3), Stuttgart, Frommann-Holzboog, 1980; See also Ferdinand Van Steenberghen, *Thomas Aquinas and Radical Aristotelianism*, Washington, D.C., The Catholic University of America Press, 1980, p. 12-15.

[33] Vernon J. Bourke, Introduction to Aquinas' *Commentary on Aristotle's Physics,* J. Blackwell, R. J. Spath and W. E. Thirlkel, London, Routledge & Kegan Paul, 1963, p. xix.

[34]Franz Pelster, 'Die Uebersetzungen der aristotelischen Metaphysick in den Werken des hl. Thomas von Aquinas"; Canon Mansion, 'La theorie arist. du temps.' Both cited in Vernon J. Bourke's introduction to Aquinas' *Commentary on Aristotle's Physics*, p. xix-xx.

Should we assume, then, given Aquinas's hostility to Islam, and evident heavy reliance on the Christian Greek to Latin translations of Aristotle, as well as his often dismissive attitude to Averroes, that Aquinas arrived at his interpretation of Aristotle independently, perhaps influenced by the neo-Platonism also inherent in medieval Christian thought? To do so would seem quite plausible, yet this does not seem to be the case. The following passage from Aquinas's commentary provides—I believe—indisputable evidence that Aquinas relied heavily on Averroes' commentaries for his rendering of 'Aristotelian' time. Aquinas does not cite Averroes as the source of these ideas, so it is worth quoting the passage verbatim, in order to compare the startling similarity to the Averroean passages discussed earlier. In reference to *Physics* 219a2-b8, Aquinas says:

> ...[T]here is a difficulty that arises here concerning the perception of time and motion. If time is consequent upon a sensible motion outside the soul, it follows that he who does not sense that motion will not sense time... But if time is consequent upon a motion of the soul, it would follow that things are not related to time except by the mediation of the soul. And thus time will not be a thing of nature but an intention of the soul, by way of an intention of genus and species. And if time is consequent upon all motion universally, it would follow that there are as many times as there are motions. But this is impossible, because two times are not simultaneous, as was said above [In reference to *Phys*. 218b3].
>
> To answer this it must be known that there is one first motion which is the cause of all other motion. Hence, whatever is mutable in existence is such because of that first motion, which is the motion of the first mobile object. Moreover, whosoever perceives any motion, either existing in sensible things or in the soul, perceives a mutable existence, and consequently he perceives the first motion from which time follows. Hence, whoever perceives any motion perceives time, although time is consequent upon only the one first motion by which all other motions are caused and measured. And thus there remains only one time.[35]

It is difficult to decide the degree of significance to attach to Aquinas's failure to cite this view as Averroes'—because to Averroes it most certainly belongs. The argument is almost identical to Averroes' précis of his own argument occurring at 179 E-G of

[35]Aquinas, *Commentary on Aristotle's Physics*, Lecture 17, 573-574, pp. 256-7.

his 98th commentary, Book IV, Summa III, Cap. III, of Aristotle's *Physics*. There Averroes cites and explores three possibilities, concerning Aristotle's suggestion that we only sense time when we sense motion, and Aquinas does exactly the same:

a) time is a particular motion
b) time is a motion of the soul[36]
c) time is any motion

In both Averroes' précis of his own argument, and in Aquinas's commentary of Aristotle, the same conclusion immediately follows the discussion of these three possibilities—that we sense time in any motion because that motion is ultimately linked to the first motion, of which time is an attribute. Can there be any doubt that Aquinas has based his interpretation of Aristotle exactly on Averroes'? It is possible the two shared a common source, yet Averroes claims to have come to his own interpretation independently, when he says: "In whatever else I have written concerning time, I have acceded to the interpreters, but not in this..."

Although the commentary to the *Physics* contains Aquinas's most detailed explication of the propagation of time, reference is also made to the role of the heavenly sphere as the cause of time in *On the power of God*, and in some of his *Quodlibetal Questions*. For example, in Quodlibet 11, Quest. 4:

> ...it cannot be said that the motion of angels is measured by the continuous time which is the number of the motion of heaven, because the motion of angels does not depend upon the motion of heaven.[37]

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[36]Aquinas' discussions of points *a* and *c* are essentially identical to Averroes'. Aquinas' discussion differs from Averroes' only in the reason for denying point *b*. Averroes refutes the view, which he cites as Galen's, on the grounds that if time were motion of the soul it would suffice to imagine an unmoving body, whereas Aristotle specifically says that we are only aware of time when we sense *motion*. Aquinas, however, refutes *b* on the grounds that if time were motion of the soul it would not be a thing of nature (and therefore not created by God). The difference is not significant to this study—Aquinas has obviously drawn heavily on Averroes in all other particulars. It is interesting to note, however, that the Paris Decree of 1277 censured the view that "eternity and time have no existence in reality, but only in the mind" (article 200). Aquinas' commentary was probably written in 1268-9 (see Bourke's introduction to the *Commentary*, p. xx), but Aquinas' alternative refutation of point *b* shows an awareness of the theological implications of his interpretation of Aristotle. His and Averroes' 'time-as-of-the-sphere' interpretation of Aristotle did not, however, escape censure from other philosophers on theological grounds—this is a subject of a following chapter.

[37]Aquinas, *Quaestiones Quodlibetales*, in *S. Thomae Aquinatis Opera Omnia*, (vol. 3), Stuttgart, Frommann-Holzboog, 1980. "...non enim potest dici quod motus angeli mensuretur tempore continuo quod est numerus motus caeli, quia motus angeli non dependet ex motu caeli." p. 499. My translation.

This example shows how Aquinas incorporates Averroes' 'emanation' theory of the connection between heavenly motion and time into his other doctrines—the motion of an angel is not 'in' time, because angelic motion has no causal connection with the material world. It seems quite clearly evident that Aquinas, who went to great pains to reconcile the Aristotelian science with Christian revelation, was susceptible to the Averroean strands of Aristotelianism.

Aquinas' adherence to Averroes' interpretation of Aristotle's definition of time also allows him to side-step one of the great problems posed by Aristotle's definition of time. Both modern and medieval writers have picked up on the potential for circularity in Aristotle's assertion that we can draw temporal 'before-and-afterness' from a before and after in spatial magnitude. A criticism by the modern writer Denis Cornish sets out the basis of the problem.

Cornish discusses this problem in his 1976 article, "Aristotle's Attempted Derivation of Temporal Order from that of Movement and Space". As I discussed above, for Aristotle, time gains its before-and-afterness through the movement of the 'now,' which in turn corresponds to the mobile body. Although the now is in essence always the same, it is in a sense better described as a string of distinct nows, due to the change in its relations as it moves. Aristotle argues that when there is a change in the now, due to the changing relations of a body in movement, the forward motion of time is the result. At least two *apparent* nows—a 'before' now, and an 'after' now—are therefore necessary for there to be time. Cornish argues that the reduction of the motion of the now through time to the motion of the body through spatial magnitude is untenable, since it is impossible to show an objective, non-temporal before and after in spatial magnitude. Unless this can be done, Aristotle's argument stands guilty of circularity.

Cornish's criticism rests on the argument that even if spatial positions can be considered as an ordered continuum of points, they cannot tell us anything about time, because we cannot specify in which direction a motion from one position on the

continuum to another proceeds—there is no objective 'in front of' or 'behind.'[38] It is only through a consideration of time that we can specify a direction in motion, and therefore a 'before' and 'after'. Cornish concludes that "[t]he asymmetry of movement through space is at least partly a function of time, and cannot be determined merely in spatial terms."[39] The derivation of temporal order—and thereby the asymmetry of time—from an objective spatial order seems markedly problematic.

In his article, Cornish mentions that Aquinas, too, brings up the possibility that unless Aristotle can specify a non-temporal 'before' and 'after' in the premises of his argument that time is anisotropic because motion is, then his argument will stand guilty of circularity.[40] Although Cornish notes that Aquinas believed that there is no circularity, he fails to recognise the significance of Aquinas's denial (although this is not important to Cornish's argument, which is primarily a criticism of Aristotle). The relevant passage from Aquinas is as follows:

> [After outlining Aristotle's argument from magnitude:] If someone objects to the above definition by saying that the before and after are determined by time and thus the definition is circular, it must be said that the before and after are placed in the definition of time insofar as they are caused in motion by magnitude and not insofar as they are measured by time.[41]

The argument put forward by Cornish, that there is no objective direction in linear magnitudes generally, is reasonably clear, and it is unlikely that it would have eluded someone of Aquinas's prowess that this is the case. Yet Aquinas would not have been thinking of the magnitudes followed by general motions, despite it being reasonably clear to us today that this was Aristotle's intention. Aquinas would have been thinking of time as stemming from one specific motion—that of the *primum mobile*. If this is the case, we have a subtly different situation. The sphere of stars follows a motion from east to west. If we accept that this motion is unshakeably uni-directional (as Aquinas quite likely would have), then there *is* a non temporal 'in front of'—to the

[38]Cornish, "Aristotle's Attempted Derivation of Temporal Order from That of Movement and Space", *Phronesis*, vol. 21, 1976, p. 249.

[39]Cornish, p. 249.

[40]Cornish, p. 245.

[41]Aquinas, *Commentary on Aristotle's Physics*, p. 259. Translated by R. J. Blackwell, R. J. Spath and W. E. Thirlkel.

west of a given star; and a true 'behind'—to the east of a given star. Although Cornish's criticism can be fairly levelled at Aristotle, who seems quite clearly to believe time to stem from motion generally, it cannot so clearly be applied to Aquinas's *understanding of* Aristotle, because Aquinas has sided with Averroes' interpretation, which is that time stems from the first heavenly motion only. This example illustrates a way in which Averroes' interpretation of Aristotle is superior to Aristotle's own theory.

Robert Kilwardby

It would be simplistic to suggest that the Averroean interpretation of Aristotle on time held complete sway in the medieval psyche. Many thinkers denied such an interpretation and it is useful to examine the thought of one example of such a philosopher to appreciate the diversity of views on both Aristotle in particular , and his views on time in particular, current during the medieval period.

Robert Kilwardby was an ardent Augustinian, as is evident from even the briefest perusal of his work, *On Time*. Like St Augustine, Kilwardby believed that time "is not one of the things outside the mind."[42] Yet Kilwardby is more than willing to give Aristotle's alternative view a fair hearing. Although he does not necessarily agree with Aristotle, he is confident that Averroes' interpretation is mistaken—a denial which is further evidence of Averroes' influence. This opinion is stated clearly and succinctly in the following passages:

1) In Question 10, "In what way is time the same for everyone if it is only in the motion of the heavens?"

> ...Averroes' statement that the motion of the first heaven is the subject of time and is involved in the definition of 'time', seems contrary to the express word of Aristotle...
>
> ...when [Aristotle] defines 'time' he says that it is the number not of circular motion but of motion simply. This would be an inadequate statement, if Averroes was right about the motion which is the subject of time.

[42]Kilwardby, *On Time and Imagination*, Oxford, Oxford University Press, 1993, translated by Alexander Broadie, p. 25.

Moreover, Aristotle later asks of what kind of motion time is the number, and he replies that it is the number of every kind of motion, so that in so far as motion exists, time is its measure. Hence, time is the number of motion simply and not of some particular kind of motion. He could not have been more explicit on this matter.

2) In Question 11. "On the unity of time."

But ... a difficult question arises concerning the unity of time...

There is an easy answer to this question if we rely on Averroes. For he would say that time is numerically one in respect of the numerical unity of one subject, *viz*. the motion of the first moveable thing, and this is indicated by a remark of Aristotle's towards the end of the chapter on time, where he says that it seems that time is the number of the motion of the sphere, because it is by that motion that other motions are measured.

But in the same chapter there are many explicit statements which are contrary to the foregoing judgement, as was said in the previous question. It should therefore be said that it is possible to consider time so far as it is known and limited and defined by fixed termini, and to consider it simply, so far as it is unlimited and undefined and not yet denoted by fixed termini. According to the first way of considering time, time is numerically one simply from the unity of a subject which is numerically one. According to the second way it is one through the unity of essence and of definition and by the essential unity of the subject, not in respect of number but of essence...

[Aristotle] says [time] 'seems to be' [the number of the motion of the sphere] because he has in mind not every kind of motion of the sphere but every motion of the sphere with respect to an existence which is limited and determinate for the purposes of measuring other motions. But if time is to be considered without qualification and with respect to its unlimited and indeterminate existence then it is one in essence and definition like the changed and continuous existence which is in every motion.[43]

Kilwardby's rebuttal of Averroes' certainly seems far more in keeping with Aristotle's own words than does Averroes' interpretation. Kilwardby is not concerned as to whether Aristotle or Averroes are correct in their assessment of what time is, he is concerned only with seeing whether Averroes' treatment of time is in keeping with Aristotle's. Kilwardby's argument also shows that he recognises the important difference between time itself, and mere measures of time. He correctly

[43]Kilwardby, *On time*, 39-51, pp. 35-37.

argues that when Aristotle speaks of the place of the sphere in understanding time, the sphere is important as measure only, not as the progenitor of time, which has its seat in motion generally.

Conclusion

Aristotle explicitly rejected the notion that time is an effect of the motion of the *primum mobile*, arguing instead that time results from motion generally. In attempting to explain the unity of time, Aristotle's commentator, Averroes, fell upon an interpretation of Aristotle which had the motion of the *primum mobile* as the cause of time. Averroes evidently took some trouble coming to this conclusion, which he seems to have reached through a process of deduction rather than textual analysis. The importance of Averroes' interpretation to the medieval understanding of Aristotelian time cannot be overstated—as 'the Commentator," Averroes was a key conduit of Aristotelian thought to the West. We can see the impact of Averroes' interpretation in the work of Thomas Aquinas and Robert Kilwardby. Aquinas, an influential philosopher of the period in his own right, apparently lifts his own reading of Aristotle on time straight from Averroes. The alignment of these two thinkers on this issue might well have further strengthened the place of the Averroean interpretation in medieval philosophy. Kilwardby rejects Averroes' interpretation, yet his rejection is further evidence that the Averroean interpretation was the 'main game' at the time. In the following chapter we turn to the first proposals that time may be an absolute entity; proposals formed explicitly in response to a rejection of the possibility that time might be caused by celestial motion.

2.

"*Heaven standing still*":

Early Absolute-Like Time

With the idea that time is an effect of heavenly motion firmly set in the medieval psyche, a major problem emerged: this notion of time could not be reconciled with the Bible. Averroes had reasoned that "If heaven stood still ...we would exist in an unchanging existence." Yet in the Old Testament, Joshua (X 13) is said to have fought a battle under an un-moving sky while time continued. Some who used this conflict to reject the theory that time is caused by heavenly motion responded with a novel claim—that time has no physical cause at all.

In the 5th century, St Augustine, who believed time to be a mental artefact, set out an argument rejecting Plato's theory that time results from the celestial motion:

> I once heard a learned man say that the motions of the sun, moon, and stars constituted time; and I did not agree. For why should not the motions of all bodies constitute time? What if the lights of heaven should cease, and a potter's wheel still turn round: would there be no time by which we might measure those rotations and say either that it turned at equal intervals, or, if it moved now more slowly and now more quickly, that some rotations were longer and others shorter? And while we were saying this, would we not also be speaking in time? ...O God, grant men to see in a small thing the notions that are common to all things, both great and small. Both the stars and the lights of heaven are "for signs and seasons, and for days and years." This is doubtless the case, but just as I should not say that the circuit of that wooden wheel was a day, neither would that learned man say that there was, therefore, no time...
>
> Let no man tell me, therefore, that the motions of the heavenly bodies constitute time. For when the sun stood still at the prayer of a certain man in order that he might gain

> his victory in battle, the sun stood still but time went on. For in as long a span of time as was sufficient the battle was fought and ended.[44]

Some believe that the "learned man" St Augustine refers to in the passage is Plato himself—a rhetorical device only, given St Augustine and Plato's historical distance from one another. Regardless, the description of time St Augustine refutes is clearly the Platonic doctrine. The 'certain man' who prays for the sun to stand still is Joshua; the story conveyed in the Bible's Joshua X 12-14. In the biblical passage, Joshua prays for the Sun and Moon to stand still so that his army will have more time to defeat the Amorites in battle, a prayer God answers, and the battle is fought under an unmoving sky:

> On the day on which the Lord delivered the Amorites to Israel Joshua said to the Lord in the presence of the children of Israel: "Oh sun, move not over Gibeon, Oh moon, over the valley of Aijalon." And the sun and moon stood still while the nation avenged itself on its enemies. So it is written in the Book of the Just. Thus the sun stood, in the middle of heaven, and did not set for the space of one day. Neither before nor since has there been so long a day, with the Lord obeying the voice of man, and fighting for Israel.[45]

Although the passage only refers explicitly to the motions of the sun and moon, this disagreement between St Augustine and Plato has very obvious repercussions for

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[44]St. Augustine, *Confessions*, Book 11, Chap. XXIII. Translation by Albert C. Outler, in vol. VII of the *Library of Christian Classics*, Chapters XIV-XVII, XXI-XXVIII. For comparison, the original Latin text is:

"Audivi a quodam homine docto quod solis et lunae ac siderum motus ipsa sint tempora, et non adnui. Cur enim non potius omnium corporum motus sint tempora? An vero, si cessarent caeli lumina et moveretur rota figuli, non esset tempus quo metiremur eos gyros et diceremus aut aequalibus morulis agi, aut si alias tardius, alias velocius moveretur, alios magis diuturnos esse, alios minus? Aut cum haec diceremus, non et nos in tempore loqueremur aut essent in verbis nostris aliae longae syllabae, aliae breves, nisi quia illae longiore tempore sonuissent, istae breviore? Deus, dona hominibus videre in parvo communes notitias rerum parvarum atque magnarum. sunt sidera et luminaria caeli in signis et in temporibus et in diebus et in annis. Sunt vero, sed nec ego dixerim circuitum illius ligneolae rotae diem esse, nec tamen ideo tempus non esse ille dixerit.

"…Nemo ergo mihi dicat caelestium corporum motus esse tempora, quia et cuiusdam voto cum sol stetisset, ut victoriosum proelium perageret, sol stabat, sed tempus ibat. Per suum quippe spatium temporis, quod ei sufficeret, illa pugna gesta atque finita est."

[45] *Biblia Latina* (Vulgate) *cum Glossa Ordinaria*, (facsimile reprint, editio princeps Adolph Rusch, Strassburg, 1480/81), Turnhout, Brepols, 1992, p. 447. "Tunc locutus est io sue si die qua tradidit ammorreum in conspectu filioru israel. dixitquam coram eis. Sol contra gabaan ne mouearis et luna contra vallem baylon steteruntquam sol et luna donec ulciferetur se gens de inimicis suis. Nonne scriptum est hoc in libro iustorum. Stetit ita quam sol in medio caeli et non factinavit occumbere spacio unius diei. Non fuit antea nec postea tam longa dies obediente domino voci homis et pugnante pro israel." My translation.

Averroes' rendering of time, repercussions not lost on the medieval thinkers John Duns Scotus and Peter Aureole, whose negative theses against Averroes and Aquinas comprised the first moved towards modern temporal absolutism.

Duns Scotus' response to the story of Joshua: Potential and privative time

John Duns Scotus (c.1265-1308), a Franciscan academic and theologian, was active at both Oxford and the University of Paris, where he wrote commentaries on the Sentences of Peter Lombard, as was usual for a young academic of the time. The most interesting examples of Duns Scotus' work on time occur in the Oxford commentary (the *Scriptum Oxoniensis*), where he draws much of his inspiration from Aristotle's *Physics*. Unfortunately no overt commentary on the Physics by Duns Scotus is available to us,[46] so we must make do with the *Scriptum*, and some of Duns Scotus' *Quodlibetal Questions*. Although the discussion of time in these works is not extensive, it is adequate, both detailed and revealing. Often critical of both Aristotle and St Augustine, Duns Scotus still manages to find in their ideas inspiration for new thoughts of his own. Such inspiration is especially evident in his rejection of Averroes' interpretation of Aristotle's thoughts on time (although Duns Scotus seems to accept the Averroean interpretation as a correct interpretation of Aristotle).

In Disputation Two of Book Two of the *Scriptum* Duns Scotus alludes to St Augustine's argument to refute the Averroean theory:

> Heaven standing still, Peter could walk after the resurrection, and that walk would not be conceived as existing in any time other than our ordinary continuous time. Similarly, even if the first motion of heaven did not exist, the resting of the motion of heaven itself is measured potentially... by that time by which the first motion would have been measured if it were positive and actual. And in that potential time another motion, which was actually existing, could be measured—thus the motion so measured does not necessarily depend upon the motion of the first heaven for its existence, just as

[46] A direct commentary of Aristotle's *Physics* which had in the past been attributed to Duns Scotus is now considered inauthentic (and is attributed to Marsilius of Inghen). See C.R.S. Harris, *Duns Scotus*, Bristol, Thoemmes Press, 1994, vol. 1, p. 313; and Allan Wolter, *Duns Scotus: Philosophical Writings*, Edinburgh, Nelson, 1962, p. xxi. Indeed, a close examination of the ideas on time represented in that commentary show them to be at odds with those expressed in the indisputably authentic works.

> it was with motions in the time of Joshua... [It] suffices only that that motion, when it exists, can be distinctly known according to its own quantity, by a distinct cognition of time, whether this time is actual or potential.
>
> Therefore I say that when the motion of heaven does not exist, another motion can be measured by a time, which would coincide with as great a part of the motion of the first heaven, if it existed. In the instance [of the heaven being stopped], the amount of rest coincides with an equal length of [the motion that heaven would have], if that motion existed.[47]

The passage above refutes two elements of Averroes' theory of time. Most obviously, Duns Scotus denies Averroes' claim that if heaven stood still we would "exist in an unchanging existence." Duns Scotus also denies the causal connection between the first motion and lesser motions, when he argues that motions in the time of Joshua did not "necessarily depend upon the motion of the first heaven for [their] existence." In refuting the impossibility of a stationary heaven resulting in a changelessness in the world below, and in denying the necessity of the causal connection between heavenly motion and earthly motions, Duns Scotus makes what is a bold new claim: that "motion, when it exists, can be understood clearly according to its own quantity, through a clear understanding of time." In other words, that we understand motion through time, and not the other way around. In the discussion that follows I shall show how Duns Scotus uses the important distinction between a measure and the thing measured to support his claim that time is an quasi-absolute flux, independent of motions for its existence.

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[47]Duns Scotus, *Quaestiones in Quartum Librum Sententiarum (Scriptum Oxonensis)*, in *Opera Omnia—Editio Nova*, (apud Ludovicum Vives, MDCCCXCV), reprinted Westmead, Gregg International Publishers, 1969, lib. II, dist. II, quaest. XI, 'Utrum Angelus possit moveri in instanti?' "...stante coelo, poterit Petrus post resurrectionem ambulare, et tamen ista ambulatio non fingetur esse in tempore quodam alio a communi tempore nostro continuo. Similiter etiam non existente primo motu coeli, mensuratur quidem quies ipsius motus coeli potentialiter ... tempore illo quo motus primus mensuraretur, si esset positive et actualiter, et in illo tempore potentiali potest mensurari motus alius tunc actualiter existens, ita quod non est necesse mensuratum a motu primi coeli dependere in esse, vel essentia a motu illo, sicut fuit motus sub tempore Josue...tantum sufficit, quod motus iste, quando est, possit distincte cognosci secundum quantitatem suam ex cognitione distincta temporis, et hoc vel actualis vel potentialis; et ita dico, quod quando iste motus coeli non erit, poterit tamen alius motus mensurari per tempus hujus motus primi coeli, inquantum scilicet motus ille posset fieri cum tanta parte illius motus si esset, et numc est cum tanta parte quietis cum quanta pars motus posset esse". My translation.

In Disputation XLVIII of Book Three of the *Scriptum Oxoniensis* Duns Scotus refers to St. Augustine's work explicitly, and makes an important point, recognising the observation made by Aristotle, and seemingly missed by Averroes and Aquinas, that time itself is not the same as a mere measure of time, and that the one does not depend for its existence upon the existence of the other:

> If it is argued that the measured cannot exist without the measure, I argue that...this is not true concerning an accidental measure, which measures through application or coextension, as an ell measures a piece of cloth. It is obvious that a quantity of cloth does not depend on the quantity of an ell. In this manner, the first motion, considered according to the relation of measure its successive extension holds to other motions, is a measure of [those other motions] through application or coextension... Book 10 of Joshua supports this view. Joshua fought while the sun and moon stood still, and with those bodies stopping it might seem too great an irregularity for all heaven, and all other motions. [Yet] St. Augustine says in Book 11 of the *Confessions*, "Heaven standing still, the potter's wheel turned."[48]

Duns Scotus demonstrates a clear appreciation of the difference between the measure and the measured (*mensura* and *mensuratum*), arguing again that even without the motion of heaven other motions would continue, as would time itself.

In one of Duns Scotus' quodlibetal questions he goes much further: time would continue even if all motions ceased:

> With no motion existing, there can [still] be a rest, even properly considered... Even the unchanging disposition [of a resting body] corresponds to a proper measure, which is a time, between any two instants of which an extent of flux, or an interceding motion, can be imagined. And in this manner, if time is a measure of motion, or flux, that uniform existence will have a time—perhaps not actual and positive, but potential and privative.[49]

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[48] Duns Scotus, *Scriptum Oxonensis*, lib. IV, dist. XLVIII, queast. II, 'Utrum in judicio vel post, cessabit motus corporum coelestium?' "Si arguatur, mensuratum non potest esse sine mensura, respondeo... non est verum de mensura accidentali, quae per applicationem vel coextensionem mensurat, sicut ulna mensurat pannum. Patet quod quantitas panni non dependet a quantitate ulnae; ex hoc solo modo, motus primus acceptus secundum suam extensionem successivam cum relatione mensurationis ad alios motus, est mensura eorum per apllicationem vel coextensionem... Pro ista responsione adducitur illud *Josue 10.* quod ipse pugnavit stante Sole et Luna, et per consequens toto coelo, ne illis stantibus, et allis omnibus corporibus motis, esset nimia irregularitas in moyu istorum corporum coelestium; et Augustinus, undecimo Confess. *Stante coelo movetur rotula figuli*." My translation.

[49] Duns Scotus, *Quaestiones Quodlibetales*, in *Opera Omnia—Editio Nova*, (apud Ludovicum Vives, MDCCCXCV), reprinted Westmead, Gregg International Publishers, 1969, quaest. XI, 'Utrum

How should we understand Duns Scotus' claim about potential and privative time? It is useful to pause here and consider to Aristotle's position on a similar conundrum, which may shed light upon Duns Scotus' approach to the 'privative' or 'potential' time undergone by resting bodies. In Book *iv* of the Physics, Aristotle says that "the passage of time is current everywhere alike and is in relation to everything" (*Phys*. 218b 13-15), but he does not seem to intend a ubiquitous 'potential' time—as we saw in the previous chapter, Aristotle defines time as an effect of all *motion*. However, Aristotle does consider how a resting body, undergoing no motion, is in time. Aristotle's answer here is a little unsatisfactory, but has important similarities to Duns Scotus' idea, above. Aristotle argues that:

> ...we conceive of time as immanent in everything in earth and sea and sky...because time, being the numerator of motion, pertains to such motion wherever it exists, as an affection or disposition of it (namely, that it is either actually counted in units or potentially countable in such); and all things in the material universe are susceptible of motion (for they all have position [τοπω] which is subject to change), and time and movement run in pairs both potentially [δυναμιν] and actually. (*Phys*. 223a16-22)

Elsewhere in the Physics, Aristotle defines change as "the progress of the realising of a potentiality, qua potentiality, for example, the actual progress of modification in any modifiable thing, qua modifiable" (*Phys*. 201a10-15). This definition implies that changes exist only in virtue of the natural and inherent capacity for change in the thing which is undergoing that change. Because motion is a kind of change, the 'rules' of change apply to motion. Motion, therefore, is the realisation of a *pre-existing potential* for motion. Aristotle further argues that from this it is evident that something which has no capacity for motion could not properly be defined as 'at rest'. Rest is an unactualised potential for motion in a thing which is capable of motion (*Phys*. 221b 12-15). If we are going to define time as ontologically parasitic upon motion, then it seems at least reasonable that it can also be described as parasitic upon unactualised, potential motion, or rest. If temporal transition can be related to both potential motion and actual motion, argues Aristotle, it must exist alike both

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Deus possit facere, quod, manente corpore et loco, corpus non habeat *ubi* sive *esse* in loco.' "...nullo motu existente, posset esse quies aliqua etiam proprie accepta... ...etiam uniformi dispositione correspondet propria mensura, quae est tempus, inter cujus quaecumque duo instantia imaginata posset tantus fluxus sive motus intercipi, et ita si tempus dicitur mensura motus, sive fluxus, illa uniformis existentia habebit tempus, licet non uniformiter actuale positivum, sed potentiale et privitivum." My translation.

everywhere and for all things, since all bodies are necessarily composed of elements which have a natural capacity for motion.

But Aristotle faced a problem. How do we relate time, or 'number' time, in respect of potential motion? It may be that something which is in a state of potential motion is only 'potentially' undergoing temporal transition. This possibility, however, is at odds with Aristotle's assertion that time exists alike both everywhere and for all things. If, on the other hand, something which is at rest is to be actually numbered by time—to undergo temporal transition, and be 'in' time—we must ask just how such an object is to be connected to temporal transition. Let us imagine how we would connect time to a resting object using Aristotle's 'before and after' definition of numbering. We might imagine comparing a photograph of an apple with an actual existing apple. Aristotle says that the 'now', or moment, moves through time in a way analogous to that in which a projectile moves through its motion. The now is therefore always the same, yet always distinct, as "the sophists distinguish between Corsicos in the Lyceum and Corsicos in the market place". It is the moment which gives time its earlier and later, by distinguishing two or more apparent 'nows', as the relations of the moving now alter. We can see, therefore, that in the photograph, the apple is not 'in' time. The photograph represents only one 'now' in the life of the apple, so there is no before and after, and therefore no time. In the case of the real apple, however, we can designate a real-time 'before', say "right now", and a real-time 'after', say "now". In this way, the apple can be said to be in time, as Aristotle seems to suggest, because it has a before and after which can be 'numbered'.
But the apple moves through no magnitude. The before and after of the apple is described in merely temporal terms—a temporal before and after only—again, contrary to Aristotle's argument that we understand time as a number of motion in the sense that the before and after of place and magnitude translate directly to temporal transition via the movement of a body through before and after points in the magnitude of the body's motion. If we can situate the apple in time because we need only designate a temporal before and after, then in this instance, time is treated, in a way, as absolute (this problem is related to that referred to by Dennis Cornish in the previous chapter, page 24). Such a possibility seems to be contrary to Aristotle's idea that the number by which time is counted off is in the before and after of motion through magnitude. Aristotle seems to be confused about how to explain the exact

nature of the relationship between temporal ordering, and motive ordering upon magnitude, as on a line.

We cannot, however, know if it was a problem like this that caused Duns Scotus to shy away from a more Aristotelian answer to the conundrum of the temporality of a resting body. In the passage above, Duns Scotus lays his metaphysical cards on the table much more clearly than Aristotle—he seems to be saying rather explicitly that the temporal flow from a before point to an after point *is* temporal only and has no ontological or causal connection to time, for example when he says: "With no motion existing, there can [still] be a rest, *even properly considered*." Whereas Aristotle stopped short of saying that potential time actually has a flux which can properly be considered as temporal, Duns Scotus seems quite sure that there is a solely temporal flow from instant to instant, even where there is no motion whatsoever.

Duns Scotus also argues that the mobile 'now,' or moment, can be understood by the intellect by virtue of its understanding of time from past experience.

> ...the intellect, having a conception of actual and positive time, can come to know its quantity by applying it to that duration, this being the quantity it would have positively if it were a positive time.[50]

For Aristotle, 'potential time' was time that attached to a body undergoing 'a potential for motion', or what we would call rest. Duns Scotus seems to mean something a little different when he speaks of 'potential and privative' (*potentiale et privativum*) time. Duns Scotus says quite explicitly that a 'normal' time really does exist in the absence of (heavenly) motion—"Heaven standing still, Peter could walk after the resurrection, and that walk would not be conceived as existing in any time other than our ordinary continuous time." So why is this time *privativum*? Of what is it deprived? In the absence of motion, time is deprived of its *measure*. It is no less real than 'our continuous ordinary time', but it is not understood by us in its relation to a known motion, which is the way we normally judge the passing of time. In the

[50]Duns Scotus, *Quaestiones Quodlibetales* quaest. XI, 'Utrum Deus possit facere, quod, manente corpore et loco, corpus non habeat *ubi* sive *esse* in loco.' "...intellectus habens notitiam temporis actualis et positivi, applicando eam ad istam durationem uniformem, potest cognoscere quantitatem ipsius, scilicet quod tantam haberet positive, si esset tempus positivum." My translation.

passage above, Duns Scotus tells us that it is our understanding of positive time which allows us to *measure* a time deprived of motion.

The suggestion that we have some special access to positive time in the absence of motion can be better understood when we have an understanding of Duns Scotus' theory of knowledge. Duns Scotus proposed that we have an intuitive' intellectual understanding of the things in the world around us, based on the relationship that they bear to one another. Thus in the absence of one of two objects, we can still understand the relationship they would bear to one another if both were present, and in the absence of any object, we can still quite clearly conceptualise the object if we have met with its kind before (once we have seen a copse of trees, for example, we can recognise the form in other trees we come upon, or consider a tree in our mind even if no trees are present). Duns Scotus asserts that:

> [It is] helpful to distinguish [an] act of the intellect at the level of simple apprehension or intellection of a simple object. One is indifferent as to whether the object is existing or not, and also whether it is present in reality or not. We often experience this act in ourselves, for universals and the essences of things we grasp equally well whether they exist extramentally in some subject or not, or whether we have an instance of them actually present or not...[51]

In the same way as, for Duns Scotus, we might consider the idea of a tree by reference to physical trees we remember (even of no tree is present), so can we comprehend measures of time, such as that given by the motion of the sphere, even if that motion is stopped:

> ...the intellect, having a conception of actual and positive time, can apply this to the uniform duration [of potential or privative time]...

Our knowledge of motion can be used as a *measure* of the *real and existing time* which passes in the absence of the motions we usually use as a measure. The important point here, though, is that although we might normally understand time as it occurs in conjunction with a motion, we can still perceive that 'ordinary continuous

[51]Duns Scotus, *Quodlibetal Questions*, F. Alluntis and A. B. Wolter (trans), quoted in *Duns Scotus: Metaphysician*, by the same, Lafayette, Purdue University Press, 1995, p. 175.

time' flows even in the absence of any motion whatsoever. In effect, Duns Scotus is arguing for time as an independent flux.

Significantly, the passages above form parts of Duns Scotus' quodlibetal questions. The quodlibetal questions were posed at special bi-yearly disputative sessions in which masters could be asked to answer questions on any topic, by other masters, students, or indeed any interested person. Such questioning was 'off the cuff', and graduating students were required to take part. Thus the question of what would become of temporal passage if there were no motions of bodies can be seen as a topic of interest to others than Duns Scotus—in this instance, at least, Duns Scotus is not speaking of his own thoughts and interests alone, but of issues of interest to many. The quodlibetal nature of these passages of Duns Scotus' demonstrates, again, a serious concern for the implications of Averroes' interpretation of Aristotle's theory of time—a concern shared by those who asked the questions to which the quodlibets form the answer. To accept Averroes' assertion that if the sphere were to stop, time would stop, is to question the literal veracity of the Joshua passages. Duns Scotus' answers, and his use of the Joshua story, evidence the seriousness of such issues to philosophers of his time.

Yet why does Duns Scotus not simply say, with St. Augustine and Kilwardby, that time is a purely mental construct? Or why does he not say that Aristotle merely meant to associate time with motion generally? (Even though Kilwardby disagreed with this idea, he is still able to see it as Aristotle's true intent.) It seems quite reasonable to ask why Duns Scotus has gone to the trouble of constructing a new way of understanding time, why he seems to have taken the step of proposing it to be (in effect) absolute. The answer is surely that he has exhausted all other possibilities. Averroes had proposed that there were only three credible possibilities for the source of time: that it was an artefact pf the thinking mind; that it was an effect of motion generally, or that it was an effect of the heavenly motion. Averroes himself showed that the first two possibilities were not logically possible. Duns Scotus uses St Augustine's story to show that the third is not, either.

In Book IV of Duns Scotus' commentary on the Sentences, before discussing what a cessation of heavenly motion would portend for time, Duns Scotus refers to Averroes:

> ...according to Averroes, in his commentary on the chapter on time in the *Physics*, if someone were not to perceive some change, other than merely in an act of imagining, he would not perceive time, thus time would not exist. And [he says] time is not able to exist without the motion of heaven, because time is a passion of the first motion.[52]

Duns Scotus is referring to the passages of Averroes discussed in the previous chapter. Averroes showed that it was untenable to maintain that time is simply an act of the imagination, or an effect of motion generally, and concluded that time was diffused throughout the world from the motion of the *primum mobile*. Aquinas, also, saw the problem associated with the first two possibilities, and concurred with Averroes' conclusion (Aquinas, *Commentary on Aristotle's Physics*, Lecture 17, and discussion here facing note *33*). Unfortunately, I cannot find a fuller discussion by Duns Scotus of the Averroes passage than that given above, yet it seems quite plausible that Duns Scotus, like Aquinas, would have recognised the difficulties in proposing time to be of the mind, or of motion generally. Since he has himself discredited Averroes' and Aquinas' idea that time is of the motion of heaven, Duns Scotus is left with no other choice but to say that it is an independent flux. The full range of reasonable possibilities for a physical cause of time—one special motion; motion generally; thought—have been exhausted with Duns Scotus' denial that it can be produced be the first motion.

It is unfortunate that Scotus does not go so far as to ask, "would time continue in its flux in the absence of bodies". He only asks about time in the absence of the *motions* of any bodies: one gets the impression, however, that Scotus would answer that time would flow in the absence of bodies. Yet even if this were so, one could not describe Scotus' concept of time as a 'theory' of absolute time. He does not go into the categorical or ontological status of time, or ask any important questions about what it is against which, or through which, time flows (in the way Newton proposes that time is an aspect of God's limitless duration, an idea that we investigate in the final chapters of this study). Yet his thoughts on temporal transition are a fascinating first step in the move away from relational theories of time as caused by physical processes, like those of Averroes and Aristotle.

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[52]Duns Scotus, *Scriptum Oxonensis*, lib. IV, dist. XLVIII, queast. II, "...secundum Averroem 4. *Physics. cap. de Tempore, com. 2.* si quis non perciperet aliquem fluxum, nisi tantum in actu imaginandi, adhuc perciperet tempus; si ergo tunc tempus erit, et tempus non poterit esse sine motu coeli, quia tempus est passio primi motus..." My translation.

The Potter Again: Peter Aureole

Duns Scotus was not alone in using Joshua to reject Averroes' theory of time and to replace it with an absolute-like time. The French theologian, Peter Aureole, like Duns Scotus a Franciscan, put forward a description of time which had much in common with Duns Scotus'—although he relies more heavily on St. Augustine's hypothesis that time has the action of the mind as a significant part of its definition. Like Duns Scotus and unlike St. Augustine, however, Aureole contends that time has a real existence in the world outside of the mind and without the motion of bodies.

Aureole seems not to believe that time is a product of the motion of the first heaven, and in this his reasoning reflects the ideas of St. Augustine before him:

> Even if the movement of the first mobile were not to exist, the mind could still capture time in some particular movement, the movement of a potter's wheel, for example.
>
> Here is confirmation of this: the battle directed by Joshua occurred in time. This time, however, was not the movement of the first mobile.
>
> Every time the mind perceives that there is a changing existence, it perceives time. Time therefore, considered as a continuous quantity and not as determined by measure, has for foundation any movement whatever; in fact, whoever perceives a movement, perceives successive parts. By taking the parts succeeding each other in this movement, he distinguishes the ones coming before and the ones coming after; and the before and after of movement is time.[53]

Aureole's idea seems *very* similar to Aristotle's. He uses the Joshua story to counter Averroes' Platonistic interpretation of Aristotle, and seems also to assert that time is related to *all* motion. He also says, with Aristotle, that the sphere is a good *measure* of time, but is not itself time.

Yet because Aristotle draws time as a conclusion of, and in effect as a product of, the motion of a body through a magnitude, he was at somewhat of a loss to explain the ubiquitous nature of time, or the temporal status of a body at rest. Aureole answers

[53]Peter Aureole, *Commentariorum in secundum librum Sententiarum*, dist. II, queast. I, art. 4, (p.41), quoted in Pierre Duhem, *Medieval Cosmology: Theories of Infinity, Place, Time, Void, and the Plurality of Worlds*, edited and translated by Roger Ariew, Chicago, University of Chicago Press, 1985, p. 304.

this problem by showing how an appeal to the idea of locomotion can assist us in understanding the necessary ubiquity of the instant—though time does not rely for its existence on such motion:

> According to what the mathematicians imagine, a flowing point engenders a line, as the present instant engenders time by flowing. But if there can exist only a single point, there can exist only a single line.

And:

> . . . if there were an infinity of movements, the mind can establish a unique notion of time; thus it measures all the instantaneous changes by the same present instant, all the movements by a single past and a single future.

How do we know that there is only one instant? Aureole calls on simple assertion:

> At the instant in which I am speaking, in this same present instant, the king of the Tartars sits; therefore there is no present instant for us and another for the Tartars.[54]

Aureole certainly seems to be saying that the present instant, or 'now', exists outside of the mind, in the tangible world: the world common to both the Tartars and the writer of the text. He also says that the 'now' is caught up somehow with motion generally, although the above passages do not make that relationship clear. The following passage, however, does help clarify the relationship between the mind, the 'now', and motion:

> Time consists of something that exists outside the mind and of something that does not exist outside the mind. In fact, whether the intellect considers or does not consider them, the indivisibles of time and of movement exist outside the mind. On the other hand, the past and future, between which the indivisibles establish continuity, have no being if the mind does not conceive them. Therefore, if one calls something having a certain positive nature a being existing outside the mind, time and movement are beings only in the mind. The parts of time taken together have no positive nature, except insofar as the mind takes these parts together, conceives them all as in actuality, and concludes from this conception the succession that binds them, that distinguishes what came before and what is coming later. If one understands positive being, or being

[54]Aureole , *ibid*, p. 302.

> external to the mind, in this manner, one must say that time and movement are beings only in the mind.[55]

This passage helps us to understand Aureole a little better. It seems that time, in the sense of temporal transition, exists outside the mind. However, since past no longer exists, and the future is not yet to be (an argument common to Aristotle, St. Augustine and Averroes, which is taken up by Aureole), then they do not have an actual concrete existence as 'things'. As Aristotle said, "that which is composed of nonbeings cannot partake of substance" (*Phys.*, 218a 4). In order for time, which is made up of the nonbeings of past and future, to have 'positive being', Aureole calls on the act of reason drawing these insubstantial instants together. Aureole's suggestion is similar to St. Augustine's. Augustine said time was the action of the mind as "it expects, it attends and it remembers." Yet St. Augustine did not account for the way that this 'temporal continuum' attached to the physical world. Aureole goes farther, suggesting that the moment is real, and independent of motions, or of the action of the mind. It is the role of the mind, however, to construct a feeling of connectedness between past and future. Time then, is 'real' in the world, yet fleeting, and it gains it 'wholeness' from the mind.

The passages of Aureole cited earlier now make more sense. The mind grasps the flow of the objective instant, by seizing upon its flow "along the changing and successive parts of movement."[56] Having thus understood the flowing instant, the mind can then conceive of the succession of instants, giving to time a positive and actual aspect. The 'now', flowing along its continuum, exists separately to the self, and independently of any particular movement; yet the mind only understands time by perceiving in it the union of the instant with a motion.

Aureole seems to see himself mainly as a commentator of Aristotle, and frequently moulds himself on, and refers to, the commentaries of Averroes. In the passages from which the above quotations were taken Aureole treats his subject matter as if he is simply expounding the views of Aristotle and Averroes before him. Yet as we have seen, his ideas are, in actuality, quite different to those of his mentors. Unlike

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[55] *ibid*.

[56] *ibid*., p. 303.

Aristotle, Aureole does not draw time as a conclusion of motion through magnitude, but rather considers the action of a moving body as a kind of synchronous metaphor for the motion of the objective instant; a metaphor by which the mind grasps the instant and understands past and future as real things. Unlike Averroes, Aureole believed that time exists independently of the motion of the sphere, and he denies Averroes' theory on the basis of the evidence from Joshua.

Aureole's idea of an objective instant, which flows along a temporal continuum which is not merely psychological, or dependent for its existence upon physical motion, represents another important step away from the attributive or relativistic theories of time of Aquinas, Averroes, and Aristotle. Like Duns Scotus, Aureole draws his incentive to divorce the seat of time from the motion of the heavens from the story of Joshua, via an argument handed down to them by St. Augustine. Although the two thinkers' ideas diverge on the point of how the mind conceives of the temporal flux, they both agree that time is, in an important sense, independent of actions in the physical world.

The Paris Decree of 1277

I have argued here that the conflict between Averroes' theory of time and the passage from Joshua was a real concern for two medieval philosophers, causing them to move away from physical explanations of the cause of time. The most extensive modern account of the birth of absolute time, Pierre Duhem's 1916 *Système du monde*, holds the Paris Decree of 1277 as the responsible cause. While Duhem agrees that absolute time enters philosophy during the 13th century, he claims that it was proposed for political, not philosophical reasons: the central claim of *Système* is that the Parisian Decree of 1277 was responsible for a wholesale change in medieval thought. For Duhem, indeed, the Decree forced the abandonment of Aristotelianism, and thereby an extremely rapid advance toward modernism (which on Duhem's account started over a quarter of a millennium before the common account), resulting in the acceptance of the possibility of void space, other worlds, and absolute time and space. Duhem also indicates throughout the *Système* that he believes that Aristotle thought time to be generated by the motion of the *primum mobile*.

The two explanations—the Decree and the Joshua passage—are certainly intimately entwined, and Decree refers directly to the passage, yet I think Duhem's thesis is too simplistic. However, both to understand Duhem's thesis, and to further reinforce the significance of the Joshua passage, it is well worth pausing to investigate the Decree itself.

In the eleventh century, the University of Paris had developed as part of the cathedral school of Notre Dame. The bishop's chancellor had been responsible for issuing licenses to teach, initially in demand of a fee. Eventually, licenses to teach became free, and, as the university grew, the balance of power shifted away from the chancellor, as representative of the bishop, and towards the masters and students. Interestingly however, in many of the struggles between masters and chancellor, the papacy intervened on behalf of the masters. In 1212, for example, Innocent III took the side of the masters when the chancellor attempted to have them swear an oath of obedience to himself.[57] By the middle of the thirteenth century the power of the chancellor had been drastically reduced, and it was the rector of Arts who was in many ways the head of the university.

By the 1270's the chancellor, and his immediate superior, the bishop of Paris, would have found themselves in a shaky political situation. That they did feel so is evident in the preamble to the Decree of 1277, issued by Stephen Tempier, Bishop of Paris, on behalf of the insecure chancellor and theology masters, and directed at the ever more powerful arts faculty, on the questionable grounds of Tempier's having been asked by Roman authorities simply to 'investigate' the teachings of some arts masters:

> We have received frequent reports, inspired by zeal for the faith, on the part of important and serious persons to the effect that some students of the arts in Paris are exceeding the boundaries of their own faculty and are presuming to treat and discuss, as if they were debatable in the schools, certain obvious and loathsome errors, or rather *vanities and loathsome follies*, which are contained in the roll joined to this letter... in support of the aforesaid errors they adduce pagan writings that—shame on their ignorance—they assert to be so convincing that they do not know how to answer them. So as not to appear to be asserting what they thus insinuate, however, they conceal their

[57]See David Knowles informative discussion of the beginnings of the university of Paris, *The Evolution of Medieval Thought*, London, Longman, 1988, pp. 148-151; 156-166.

> answers in such a way that, while wishing to avoid Scylla, they fall into Charybdis. For they say that these things are true according to philosophy but not according to the Catholic faith, as if there were two contrary truths...[58]

The Decree of 1277 did not succeed in banishing the ideas of Aristotle, but it still serves as a fascinating record of the ideas in circulation when it was composed. It is difficult to know exactly who each proposition was aimed at, yet the Decree provides a glimpse of the 'threatening' thoughts floating around the campus of the University of Paris in 1277. The stellar theory of time seems to have been one of them as a number of the propositions refer to elements of the theory. For example, the decree forbids one to say:

> [It is forbidden to say . . .]
>
> (80) That the reasoning of the Philosopher proving that the motion of the heaven is eternal is not sophistic, and that it is surprising that profound men do not perceive this.
>
> (156) That if the heaven stood still, fire would not burn flax because God would not exist.
>
> (190) That the theologians who say that the heaven rests at one time or another argue from a false supposition, and that to say that the heaven exists and does not move is to utter contradictories.

These propositions bear, to varying degrees, on Aquinas' and Averroes' assertions that time is a product of the motion of the sphere, and also provide support for those siding with the evidence of the Joshua story, and also demonstrate that the argument between St. Augustine and Averroes was a point of contention in the university of Paris in 1277.

Duhem's argument that the Decree of 1277 was solely responsible for the invention of absolute time (and many other theories) is highly problematic. It relies on often dubious interpretations of the medieval texts in question (as I demonstrate immediately below), as well as an acceptance of the idea that the Decree would have held weight not just in Paris, but throughout Medieval Europe. The first problem, that

[58]All propositions and quotations of the decree drawn from, Fortin and O'Neill (translators) "Condemnation of 219 Propositions," *Medieval Political Philosophy: a Sourcebook*, R. Lerner and M. Mahdi (eds), Toronto, Collier-Macmillan Canada, Ltd., 1963.

of interpretation, is perhaps the most serious, for Duhem's treatment of the primary texts is often misleading. Clagett notes that "Duhem's procedure of presenting only parts of crucial passages—often out of context and then only in French translation without the equivalent Latin passages—[makes] it almost impossible to evaluate Duhem's judgements without an extensive search of the manuscripts."[59] Clagett's criticisms have certainly been borne out in the research for this thesis.[60]

In particular, a mistranslation by Duhem of article 156 of the Decree undermines Duhem's authority on this matter. Consider the article: "[It is condemned to say that] If heaven stood still, fire would not burn flax, because God would not exist" ("*Si caelum staret, ignis in stupam non ageret, quia nec Deus esse*.")[61] Duhem, however, translates this passage as: "Si le Ciel s'arrêtait, le feu n'aurait plus d'action sur l'étoupe, car le **temps** lui-même n'existerait pas," or, "…fire would not burn flax because **time** would not exist." Duhem goes further, providing the Latin, "*...ignis in stupam non ageret, quia nec **tempus** esset*."[62] The careful reader of *Système* will note that next to *tempus* Duhem has inserted a footnote, "Au lieu de: *tempus*, le texte porte: *Deus*, ce qui est un non-sens."[63] The original Latin may not 'make sense' for the purposes of Duhem's thesis, but this is certainly no reason to substitute a more sympathetic phrase for the original. Even more problematically, Ariew's English translation of *Système* repeats Duhem's distortion and puts Duhem's caveat in an endnote, leading the reader even further astray.

Duhem's ostensible reason for changing this translation is that otherwise it makes no sense, but this is not obviously true—for example, given Averroes' suggestion that if heaven stood still the world would be incapable of change, the notion of God's non-existence, *if thought of as God's inability to act*, makes quite good sense.

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[59] Marshall Clagett, *The Science of Mechanics in the Middle Ages*, Madison, University of Wisconsin Press, 1959, p. xxi.

[60] Unfortunately I have had to (carefully) use Duhem for some sources on Aureole , as I have not had access to these texts.

[61] Fortin and O'Neill have grouped the condemnations according to topic. They provide a correct translation, at (their) proposition 79.

[62] Pierre Duhem, *Le Système du Monde: Histoire des Doctrines Cosmologiques de Platon a Copernic*, Tome VII, "Le Physique Parisienne au XIVe Siècle," Paris : Hermann, 1959, vol. VII, p. 367-8, my bolding.

[63] Duhem, *Le Système du Monde*, VII, p. 368, *n.* 1; Duhem, *Medieval Cosmology* (Ariew's translations of *Le Système*), p. 535, *n.* 11.

Furthermore, Duhem's change of translation also undermines his argument that changes in time theory were due to fear of explicit condemnations in the decree, as some of his evidence is clearly dubious.

Another difficulty with Duhem's thesis is the apparently slap-dash nature of the decree itself. Fortin and O'Neil suggest that the Decree was a last minute affair, written by a number of authors and with little or no attempt to adequately express the propositions condemned:

> The work of compiling the syllabus [the condemned propositions] was completed within three weeks after the papal bull ordering the investigation and appears to have been carried out in a somewhat helter-skelter fashion by several masters working independently... No ostensible effort was made to introduce a logical order among [the banned propositions]... Although visibly influenced by Averroism, many of the propositions represent at best a crude version of the genuine Averroistic teaching.[64]

The exceptionally broad swath of propositions banned also undermines Duhem's thesis: the propositions banned were not just those relating to matters of philosophy and theology, but matters of morality and general behaviour. If anything, the mixed bag of banned doctrines and practices suggests that much of the piety insisted upon was observed in the breach:

> Item 179: That one should not confess except for the sake of appearance.
> 155: That one should not care about burial.
> 172: That pleasure in sexual acts does not impede the act or the use of the intellect.
> 169: That perfect abstinence from the act of the flesh corrupts virtue and the species.
> 178: That death is the end of all terrors. The statement is erroneous if it excludes the terror of hell, which is the last.[65]

One may well read these banned propositions as a list of common behaviours at the University—or else why the need for a ban? The point here is that Duhem's claim suggests the Decree was aimed at a reform of philosophical principles, whereas it is more plausible that it was a somewhat panicked attempt to regain control over a too-independent faculty.

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[64] Fortin and O'Neil, "Condemnation of 219 Propiositions, p. 336.

[65] Fortin and O'Neil, *ibid*, pp. 353-4.

The decree did, of course, have grave implications for the individuals singled out by it. Siger of Brabant, the Latin Averroist and 'radical Aristotelian', went to Italy to plead his case, where he was put under house arrest by the papal Curia, and eventually murdered. A similar decree by Tempier several years earlier and condemning only thirteen articles, saw Aquinas leaving Paris altogether, and some have suggested that the Decree was the cause. Some have supposed that the 1277 Decrees of both Paris and at Oxford were aimed largely at Aquinas's work, but this view has since lost much of its credibility. Few of the articles seem to bear much relevance to Aquinas's works, and those which do, target propositions also taught by other masters. It seems much more likely that the decree was proposed to undermine the influence of more radical masters like Siger and Boethius.[66] In any case, after Aquinas's canonisation seventy years later the Church rescinded the condemnation of any articles which "touched on or were asserted to touch on" St. Aquinas.[67]

Certainly, the series of decrees instigated throughout the thirteenth century made life difficult for some. They might have helped to eliminate some of the 'radicals' for a time, but they hardly explain the *raison d' etre* of the philosophies of Duns Scotus and Aureole, for example. Rather, their arguments rejecting Aristotle's theory of time are logical and well reasoned proposals using St. Augustine's evidence from the story of Joshua as a touchstone. It is implausible that they are a consequence of Tempier's decree—they represent a serious cognisance of the problems inherent in Averroes' interpretation, and reflect an apparent concern for literal exegesis. To dismiss the ideas of Duns Scotus and Aureole as demonstrating that they were merely toeing the party line, is to do them an injustice.

Duhem would have it that even English thinkers, like Duns Scotus, were in fear of the Paris decree. Yes the English Kilwardby's involvement in the instigation of a weaker version of the Paris Decree at Oxford in the same year is also interesting. One of the articles condemned was that "time and eternity have no existence in reality but only in the mind" (art. 200). As Archbishop of Canterbury, and Patron of Merton College at

[66]See for example: Calvin G. Normore, "Who was Condemned in 1277," *Modern Schoolman*, v. 72, 1995; and John F. Wippel, "Thomas Aquinas and the Condemnations of 1277," *Modern Schoolman*, v. 72, 1995.

[67]*Chartularium* II, quoted in Wippel, *ibid*., p. 237.

Oxford, with as much to fear from Averroism (or Aristotelianism, as Duhem would have it) as anyone, would Kilwardby himself have espoused a banned proposition (as I showed in the previous chapter) if the Decrees were as heavily policed as they would need to be to bring about a fundamental shift in natural philosophy as Duhem requires?

Leland E. Wilshire raises the possibility that Kilwardby's instigation of the decree at Oxford was only marginally concerned with philosophical issues, let alone problems with Aristotle. Kilwardby's shorter version of the decree deals not just with philosophy, but with "such issues as whether the noun agrees with the verb and the correct way to form syllogistic arguments."[68] Wilshire raises the possibility that:

> Kilwardby, sensing something is astir in the intellectual air but not knowing exactly what it is, tries to get at it by demanding academic excellence. Heresy is pervading the university because students and faculty are intellectually sloppy. Tighten things up in grammar, reasoning, and the right analysis of Aristotle (Natural Philosophy) and this dangerous tendency could be stopped.[69]

If Kilwardby's attack on Averroes' interpretation is anything to go by, he certainly demands a high level of exactitude at least in his own work. Yet the possibility that the Decree was truly an object of real terror for philosophers seems less and less likely.

Given the extreme paucity of scholarship on the history of theories of time generally, and absolute time in particular, Duhem's rather overstretched thesis is especially problematic, however it has not been noticed. For example, writing in 1987, Milič Čapek, in his scholarly and extremely useful précis of early theories of absolute time, states in his concluding remarks:

> There is no mystery about the origin of the concept of absolute time. Its source is the famous decree of the bishop of Paris Etienne Tempier in 1277, according to which God could have created other worlds beyond the sphere of the fixed stars and move the whole spherical cosmos along a straight line into an outside space which obviously

[68]Leland E. Wilshire, "Were the Oxford Condemnations of 1277 Directed Against Aquinas?" *New Scholasticism*, v. 48, 1974, p. 125-6.

[69]Wilshire, *ibid*., p. 132.

> *transcends* our finite geocentric universe. This space received the name "imaginary space" (in contradistinction to the "real" space contained within the celestial spheres), and in analogy with it the concept of *imaginary time* was formed…

Čapek does not give examples of any thinkers who posited an extramundane 'imaginary time' except Francisco Suárez, whom we meet in the following chapter, and who's use of the term 'imaginary' is far more complex than Čapek suggests, and who was born some 271 years after the Decree was invoked. Čapek softens his position somewhat, concluding that:

> …It was certainly an exaggeration on the part of Pierre Duhem to regard 1277 as the birthdate of modern science, but it certainly was an important step in the direction of modern cosmology.[70]

Duhem's thesis is not merely exaggerated: it is founded on misleading evidence. As a final example, one should also be extremely sceptical of Duhem's claim, alluded to in the Čapek passage above, that the Decree of 1277 put an end to the Aristotelian idea that nothing can exist outside the finite universe. The extremely important philosopher Nicole Oresme, writing in 1377, a century after the Decree, claimed:

> There can be no motion without a natural body, and we have already shown that there is and can be absolutely no body and, therefore, no place, no void, and no time outside the heavens. For this reason, the things outside the heavens are not capable of being in a place and time does not age them... [71]

Certainly the Decree did not change Oresme's ideas about what could be outside the *primum mobile*. This claim of Duhem's is indeed a case of extreme exaggeration.

What Of Aquinas?

It was the first premise of this chapter that, if one could provide evidence that the sphere had stopped but time continued, then Averroes' ideas about time would be

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[70] Milič Čapek, "The Conflict Between the Absolutist and the Relational Theory of Time Before Newton," *Journal of the History of Ideas*, vol. 48, 1987, p 607.

[71] Oresme, *Le Livre di ciel et du monde*, Madison, University of Wisconsin Press, 1968, Book I, Chapter 24, 8-18; Translation by Albert D. Menut, p.163. Elsewhere Oresme does grant that *God* could exercise his omnipotence to create a world outside the *primum mobile*, but he argues at length, following Aristotle, that this could never arise from natural causes. He sums up his argument emphatically: "there never has been, nor will there be more than one corporeal world." *ibid.*, p. 177-9.

severely undermined. St. Augustine, of course, provided that all important counter-argument using the evidence from Joshua. So how are we to account for Aquinas's plagiarism of Averroes' interpretation of Aristotle in the light of this patent evidence? In his book, *On the Power of God* (*Queastiones Disputatae de Potentia Dei*), Aquinas addresses directly the question of whether or not it is possible for the sphere to stop, but curiously side-steps the evidence from Joshua. Chapter V of Question V, "On the Preservation of Things by God", has the title, "Will the Heavenly Movement Cease at Any Time?" Aquinas states emphatically that the heavenly movement will not, *cannot*, cease, until the end of the world prophesied in Revelations comes to pass.[72] Aquinas also asks if this cessation will be in time. He replies that, since time is contingent upon the motion of the heaven, that cessation of heavenly motion will not be in time, because, "if the celestial motion cease, just as there will be an ultimate indivisible point of movement, so will there be of time." So, Aquinas argues that the heaven has never stopped,[73] will never stop until the end of the world, and, when that end comes, time will also cease, as it must if the heavens stop moving.

The five-thousand words or so in his chapter are comprised of twenty-one arguments and objections, which are supported by numerous articles of evidence. A breakdown of the evidence shows where Aquinas's prejudices lie: there are sixteen references to passages of Aristotle; ten biblical passages cited; three references to Averroes; and one reference to St. Augustine. Aquinas demonstrates an intimate knowledge of the Bible, also, he cannot possibly have been unaware of St. Augustine's treatise on time and reference to Joshua in the *Confessions*. Not only is St. Augustine's treatise directly relevant to Aquinas's ideas about time, but he could hardly have failed to realise the significance of the Joshua passage himself. Although Aquinas refers to diverse historical evidence from the Bible, he fails to mention the Joshua passage, even in order to refute it, and fails to mention St. Augustine's reference to it. The work, *On the Power of God* invites the conclusion that he deliberately side-stepped St. Augustine's evidence from Joshua.

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[72]Aquinas, *On the Power of God*, (*Quaestiones Disputatae de Potentia Dei*), translation by the English Dominican Fathers, London, Burns Oates and Washbourne Ltd, 1933, p. 114.

[73]Aquinas, *On the Power of God*, p. 104.

Conclusion

The theory of time being an effect of the motion of the heavens, popularised by Averroes and Aquinas, suggests that time is constant and uninterrupted because the motions of the heavens are also, and thus that if the sphere stopped its motion, yet time continued, Aquinas and Averroes' theory would be disproved. That vital counter-argument was provided by St. Augustine over five-hundred years before the ideas of Averroes and Aquinas were put forward. St. Augustine's counter-argument took the form of a piece of biblical evidence: the story of Joshua. St. Augustine drew the conclusion that time cannot be an effect of the motion of the heavens, since time clearly continued for Joshua, even though some heavenly motions had ceased.

This evidence relies on one holding to a literal exegetic explanation of biblical events. Various propositions in the Decree of 1277 demonstrate that the irreconcilability of St. Augustine's evidence to Averroes' interpretation of Aristotle's theory of time were being seriously discussed. Further evidence is provided by the nature of the Quodlibetal questions directed at John Duns Scotus, at the close of the 13th century.

In response to the question of whether time is an effect of the motion of the sphere, Duns Scotus replied that time is a kind of independent flux, which does not rely on the motions of the heavens. Significantly, his main evidence in support of his case is the story of Joshua also put forward by St. Augustine. Duns Scotus argued that even if all motions were to cease, time would still flow. Further, he believes that we could perceive the passing of time even in the absence of a motive measure, basing this idea on his theory of cognition. Duns Scotus' contemporary, Peter Aureole, likewise uses the stopping of the sphere in the story of Joshua to dispute Averroes' interpretation of Aristotle. Aureole also makes time independent of motion.

The ideas of both Duns Scotus and Aureole are based on the assumption that the Bible is a valid historical record. While they both obviously emulate Aristotle, they are keen to subject his ideas, as well as those of his commentators, Aquinas and Averroes, to the litmus test of literal exegesis. Their use of the story of Joshua as a foundation to an understanding of temporal passage as unreliant upon motion can be interpreted

as a reflection of the clash between the naturalistic, rationalist philosophies of both Aristotle and Averroes, and the theosophy of the time.

Pierre Duhem argues that Averroes' interpretation of Aristotle's theory of time (or Aristotle's actual theory, as Duhem would have it) was killed off by the Decree of 1277, and that fear of the decree prompted rebuttals of Averroes' interpretation of Aristotle. Rather, the decree itself might be seen as evidence of the seriousness with which biblical literalism, in this case the story of Joshua, was considered by late medieval philosophers. It seems more likely that Duns Scotus and Aureole proposed their new way of understanding time because, with the removal of the motion of the sphere as a contender for the possible seat of time, there were no other suitable possibilities remaining, than that Duns Scotus and Aureole were simply toeing Tempier's party line.

The ideas of Duns Scotus and Aureole both have aspects similar to some of those of later absolutist theories of time. Both, for example, believe that time exists independently of the motions of bodies. Also, both *seem* to believe that time exists independently of bodies generally, although neither goes so far as to admit this explicitly. Perhaps the thought just did not occur to them. Their ideas are significant steps towards the more developed theories of physically absolute time which would come after them. St. Augustine's example of the story of Joshua is a useful piece of arsenal for any Christian thinker to whom Averroes' interpretation of Aristotle's theory of time seems unpalatable.

3.

"If the motion of heaven is made twice as swift…"

Ockham's nominalist response to the problematic nature of time

William of Ockham was unsatisfied with both the relational account of time, which proposes that it is an accident of some other entity (for Averroes, the motion of heaven), as well as the suggestion that it may be absolute. Ockham's own solution to the problem of time, which was that time does not exist at all, but is a kind of psychological artefact, was itself prone to a number of logical deficiencies, forcing a revision by succeeding philosophers of the traditional Aristotelian categories.

William of Ockham was probably born in Ockham, Surrey, at some time in the ninth decade of the 13th century and was thus a contemporary of Peter Aureole. In his time at Oxford, Ockham studied the works of Duns Scotus, so it is plausible that he was aware of Duns Scotus' work on time, and his rejection of time as an independent 'flowing thing' (*res fluens*) is quite likely directed at Duns Scotus. Certainly both Duns Scotus and Aureole are widely recognised as two of Ockham's most important philosophical influences. Indeed, Ockham's theory of time seems to be, like theirs, that of an absolutist—seems to be, but is not. For he also claimed that time is a mere 'name' for something which does not exist at all outside of the mind. The conflict between his tendency to absolutism in some thought experiments and his insistence on a nominalist account of time laid the groundwork of some key problems of time that would need to be addressed by later thinkers. Ockham's argument against absolutist accounts of time, such as those of Duns Scotus and Aureole, is not simply an attack on the physical independence of time *per se*. Ockham was concerned with the suggestion that time 'really exists'—whether as a substance *or* as an accident.

However, Ockham's account of time becomes logically incoherent when he insists *both* that time has no 'real' existence (but is rather an intellectual artefact), *and* that there is a 'real' regular flux underlying all motions and events in the world—a position he is drawn to on the basis of the Joshua evidence we met in the previous chapter.

Ockham argues that to say 'time is', signifies something completely different than to say 'man is', or 'white is'.[74] Rather, Ockham believed that 'time' is just a way of thinking about motion:

> I say that this is true: 'time is'; by which it should be understood through that proposition 'time is', this proposition: 'something is moved, from which the soul measures some motion'. And the Philosopher does not intend anything else through the proposition 'time is'.[75]

The nominalist description of time as an intellectual artefact is common throughout the history of the philosophy of time. Similarly, Lucretius said of time:

> Time also exists not of itself, but from things themselves is derived the sense of what has been done in the past, then what thing is present with us, further what is to follow after. Nor may we admit that anyone has a sense of time by itself separated from the movement of things and their quiet calm. [76]

As we saw in the previous chapter, St Augustine called time an action of the mind as "it expects, it attends and it remembers." Later Descartes, in the 17th Century, described time as merely a "mode under which we shall consider a thing in so far as it continues to exist…"[77]

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[74]An example used by Ockham, 'Utrum Haec sit Concedenda de Virtute Sermonis 'Tempus est Ens'', *Quaestiones in Libros Physicorum Aristotelis*, *Opera Philosophica et Theologica*, vol. 6, edidit Stephanus Brown, St. Bonaventure, Franciscan Institute, 1984, Q. 39, p 500. My translation.

[75]Ockham, *Quaestione*, Q. 39, 'Utrum Haec Concedenda de Virtute Sermonis 'Tempus est Ens'' "Sic igitur dico quod haec est vera 'tempus est', intelligendo per istam propositionem 'tempus est' istam propositionem 'aliquid movetur, unde anima mensurat motum alterius'. Et nihil aliud intelligit Philosophus per illam propositionem 'tempus est'." p 502. My translation.

[76] Lucretius, *De rerum natura*, , I 445-6, translated by R.E. Latham, p. 459-63.

[77] Descartes, *The Principles of Philosophy*, in *The Philosophical Works of Descartes*, translated by Elizabeth S Haldane and G.R.T. Ross, , Cambridge, Cambridge University Press, 1967, Prin. LV, p. 241.

Ockham's rejection of the reality of time is couched within his well known nominalist philosophy. For Ockham, only substances, and some kinds of quality, could be considered 'absolute entities'. Ockham defined a substance as that essence of a thing which makes it what it is, and without which it would cease to be. A substance, for Ockham, signifies one particular individual: 'a man', not 'mankind'.[78] Further, just as 'a man' is a distinct being, so too can some of his accidents be considered as having such a distinct existence. In Question Two of his seventh Quodlibet, Ockham provides the general rule that any quality that can only be successively predicated as true of the same subject through an act of local motion, should not be considered to be a distinct being (departing from the Aristotelian metaphysics).[79] Thus, because a subject can change from red to green without local motion, we can consider these things ('this redness', or 'this greenness') to be distinct beings. For a subject to change from a state of 'curved', to 'straight', however, at least some of its parts must undergo local motion, so the qualities of 'straight' and 'curved' cannot be considered distinct beings—they are only a description given by us to the arrangement of the parts of a thing.

Another way of looking at the problem is to consider that it is only by an act of the substance that 'straight' and 'curved' can exist—they cannot signify something separate from straight *things* and curved *things*, therefore they are inseparable from substance and cannot be considered distinct beings. Conversely, Ockham says designations such as 'white' and 'non-white' cannot be successively true in a subject unless that subject gains or loses something—'whiteness'—which for Ockham is evident because the transition cannot be accounted for by the subject undergoing a motion, or simply passing through some space of time.[80] Therefore 'white' must be something distinct from substance, and thus distinct in its own right.

Ockham argued that those words which do not refer to substances or absolute accidents are merely 'names', or mental concepts, rather than 'real' beings (hence 'nominalism'). To be more precise, some terms signify distinct beings—substances

[78]Ockham treats terms such as 'mankind' as secondary substances, which, as designations of genera or species, etc., exist only in the mind. See Quod. 5, quest. 23, *Quodlibetal Questions*, translated by Alfred J. Freddoso and Francis E. Kelly, New Haven, Yale University Press, 1991, p. 477.

[79]Ockham, *Quodlibetal Questions*, pp. 597-8.

[80]*ibid*.

and absolute accidents—and are referred to by him as terms 'of first intention'. Other terms signify groups of real individuals—'men'; 'species'—and still others relations between absolute existents or their parts—'double'; 'curved' etc. These secondary terms are mere 'names', not absolute beings. Ockham's logic is notoriously intricate, but for the purposes of this discussion it is enough to note the clear distinction between the absolute existents signified by terms of first intention, which are individual, distinct entities, and those things signified by the various other kinds of terms, which signify absolute existents only distantly, and are for Ockham mental 'names' only—including 'time.' Ockham's theory can be considered as diametrically opposed to Plato's, which places the conceptual priority of substance in the universal concept (which Plato saw as existing in the truest sense), and treats the individual as a secondary 'copy'.

Against the Reality of Time

For Ockham, theories like those of Duns Scotus and Aureole which treat time, and/or the instant, as if it is a kind of distinct substance, *as well as* Aquinas/Averroes' theory, which treats time as a kind of accident of the first motion,[81] can be placed in the same class of theories about time: namely, those which propose that time, or the instant, is a 'real' individual existent, or an *ens*. Ockham's discussions of time fall throughout a number of his works. Those used here are primarily the *Quaestiones in Libros Physicorum Aristotelis*, the *Tractus de Successivus*, and the *Philosophia Naturalis*. It should be noted that there has been some doubt in the past about the authenticity of the *Philosophia Naturalis*, a work used extensively throughout this study. It is now, however, generally considered authentic. Herman Shapiro (in 1957), declared it "indisputably authentic",[82] while André Goddu (1984) was more tentative, suggesting however, that the work is "a faithful version of Ockham's opinions in natural philosophy even if it was not written by the master himself".[83] Goddu notes that the contention centres on C. K. Brampton's "Ockham and his authorship of the *Summulae in Libros Physicorum*" published in 1964[84]—however in Goddu's opinion,

[81] What Ockham calls an 'absolute accident' since the accident has true existence.

[82] Shapiro, *Motion, Time and Place According to William of Ockham*, St. Bonaventure, Franciscan Institute, 1957, p. 3

[83] Goddu, *The Physics of William of Ockham*, Leiden, E. J. Brill, 1984, p. 6

[84] Goddu, *ibid*.

Brampton's case against the *Philosophia Naturalis* being Ockham's work is "supported with such an incredible array of conjectures, that his suggestion could hardly have been taken seriously." Goddu also cites the Reverend Gideon Gal as considering the work authentic.[85] Gordon Leff (in 1975) raised no doubts about the authenticity of the work, suggesting it was produced while Ockham was at Avignon.[86] The work is included in the 1984 critical edition of Ockham's *Opera Philosophica et Theologica* as Ockham's own work, and is assumed in the current study to be genuine.

Ockham denies that an instant is something "distinct from all permanent things" (*distincta ab omni res permanentes*) "as the moderns say", whether it is a single indivisible mobile moment, flowing through time, or whether it is one in a string of indivisibles (imagine a continuum of 'nows' making up time like a string of pearls). Ockham argues that if the moment were to be something distinct, then it must be either a substance or an accident. Yet a substance (for Ockham) must be either matter or form, or a composite of these, and the moment does not fit this description. If, however, it is not a substance, but an accident, then that thing of which it is an accident must itself be either a substance or an accident. But what could the subject of the instant be? The subject must itself be indivisible (since only indivisible subjects can have indivisible accidents), but the only indivisible substances are the intellective soul, or substance separated from matter (as God separates the substance from the matter of the bread in the Eucharist). Yet the subject of the instant is neither the soul, nor substance separated from matter, so the subject itself must be an accident. We are then left to find this accident's subject, "*et sic in infinitum*."[87]

Just as the instant cannot be shown to have a distinct existence, says Ockham, neither can time itself. Ockham gives a number of pieces of evidence to support his case. Ockham sees the heaven[88] as the only plausible subject for time. Yet, he argues, this would mean the parts of time were distributed throughout the parts of heaven, and

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85 *ibid*., p. 6

86 Leff, *William of Ockham*, Manchester, Manchester University Press, 1975.

87 Ockham, *Quaestiones*, Q. 55, 'Utrum Instans Importet Aliquam Rem Distinctam a Rebus Permanentibus.' pp. 543-45.

88 '*mobile*' in the *Quaestiones*; '*caelum*' in the *Philosphia Naturalis,*in *Opera Philosophica et Theologica*, vol. 6, edidit Stephanus Brown, St. Bonaventure, Franciscan Institute, 1984.

there is no great reason why one part of time should be in one part of the *mobile* rather than another. Also, this hypothesis results in the parts of time existing simultaneously, just as the parts of heaven through which they are distributed exist simultaneously (because a subject must have accidents which are divisible in the same manner as the subject). Nor does it make sense that all the parts of time should be in only one part of the mobile. If this were the case, two accidents of the same species would exist simultaneously in the same subject.[89] The problem is reminiscent of Aristotle's assertion that:

> ...a partial revolution [of the heaven] is time just as much as a whole one is, but it is not just as much a revolution; for any finite portion of time is a portion of a revolution, but is not a revolution. (*Phys.* 218a31-218b9)

Ockham also attacks Aquinas' and Averroes' notion of time, when he states that it is not even safe to suppose that it is not heaven itself, but the motion of heaven, which is the subject of time. Because the motion of heaven is an accident of the extended body of heaven, the motion of heaven is itself extended, as an accident of heaven, by mobile parts existing simultaneously, rendering the same conclusion: that time, as an attribute of motion, which is an attribute of heaven, has parts existing simultaneously, and, again, this cannot be.[90] All three rejections of an attributive time reflect the fact that the parts of any possible physical subject for time exist concurrently, while time must have *sequentially existing* parts.

Ockham also calls on Aristotle and St. Augustine in his argument that time cannot really exist *at all*. Ockham argues that if one part of a whole is not in existence, then it cannot be said that the whole exists. If this is true, then it is even more evident that if no part of a whole exists, most certainly that whole does not exist at all. Yet no part of time exists—because the past has ceased to exist, and the future is not yet in existence, and even a moment can only really be called the division between past and future (via St Augustine, *Confessions*, XI, XV). Time cannot be composed of ordered

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[89]Ockham, *Quaestiones*, Book IV, Chap. 2, Q. 37, 'Utrum Tempus sit Aliquid Distinctum a Rebus Permanentibus', pp. 493-495. Also, Ockham, *Summula...*, p 348.

[90]Ockham, *Summula...*, Book IV, Chap. 2. "Nec valet dicere quod caelum non est subiectum temporis sed motus caeli, nam ille motus est extensus ad extensionem caeli, nam quaelibet pars caeli movetur; igitur et accidens suum sic est extensum, et ita redit idem quod prius, quod tempus est extensum secundum partes simul existentes, et ita tempus esset longum, latum et profundum," p348.

parts, because that which does not exist cannot *have* ordered parts; nor can it be continued by successive instants, because past and future instants do not exist, and what does not exist cannot be continued to make something which does exist.[91] The argument alludes to Aristotle's assertion that "that which is composed of non-existents cannot partake of substance (ουσιας)" (*Phys.* IV, X, 218a2-3). Thus, concludes Ockham, time cannot truly exist.

Time Qua A Concept

We have seen above that Ockham finds fault with pretty much every realist ontology of time proposed by his predecessors. All his denials are based on demonstrations that the range of accounts proposed are subject to sever logical incapacities. So, what is Ockham's answer? He seems rather smug as he wields his famous razor:

> ...all that which can be preserved [*salvari*] through such manner of things [i.e. these unfortunate logical impasses], can be understood through this: that the heaven, according to its parts, is in such a place. For if the primum mobile is continuously moved locally, without any acquisition of other things, all things are understood, just as [well as] through that thing...[92]

While superficially reminiscent of Averroes' account of time, Ockham's theory is very different. For Ockham, time is not the movement of the heaven itself, but our consideration of that movement. He subtly shifts the grounds of explanation away from the ontological and toward the epistemic. Time is just a 'mind-tool,' which helps us to measure motion. If time is to be considered a kind of mental tool, and a tool is only a tool in so far as it has a use, it is best to begin with an understanding of what Ockham sees as the principal uses of time:

> [The first use for time] is that time is the measure of motions whose quantity is unknown to us, it is through time that we ascertain for how long something is moved, and that one *mobile* is moved longer than another, for we say that that thing is moved

[91]Ockham, *Quaestiones*. "...si una pars totius non est, totum non est; igitur multo magis si nulla pars totius est, totum non est. Sed nulla pars temporis est, ut patet inductive; igitur etc." p 494. Ockham draws here from the *Physics*, 217b 33-218a 8, as well as St. Augustine's *Confessions*, Book 11, Chapter XV.

[92]Ockham, *.Summula...,* Book IV, Chap. 1, "...quia omnia quae possunt salvari per talem rem, possunt salvari per hoc quod caelum secundum suas partes est in tali situ. Si enim primu mobile continue movetur localiter absque omni acquisitione alterius rei, omnia salvantur, sicut per illam rem...," p. 347. My translation.

longer, which is moved in a greater time. Another is that just as motion is measured by time, so too is time a measure of all changeable things,[93] for we ascertain through time that one thing, in maintaining its state, lasts, or endures, longer than another. Another is that just as motion is measured through time, as are changeable things, so also time is the measure of rest, since it is through time that we ascertain which things rest longer, which less, and which equally with others. And those are the principal, or chief reasons, on account of which time is proposed, and because of which an understanding of time is necessary to us.[94]

Ockham extends this theme in the *Natural Philosophy* in his *Tractus de Successivis*:

> [The definition of time] is only a definition that expresses the sense of the word, as the definition one can give to verbs, conjunctions, adverbs, etc. That is so because time cannot receive any other definition.
>
> In fact, as we have stated several times, the word *time* does not signify something single, distinct in its totality from all permanent things, whose nature or being can be expressed by means of definition. But we must imagine that this word signifies the first continual and uniform movement, and that it also signifies at the same time, the soul that conceives the before and after and what is in between the two in this movement. That is to say that this word designates something moving in a continuous and uniform fashion with great speed, and about which the soul says that such a part was first in such a situation and then in such and such other situations. All this is expressed by the word *time*; some of this is expressed directly and some indirectly—some of it is signified by a verb and some is signified in some way by an adverb.[95]

So for Ockham, time is both an action (measuring), and the thing by which the action is achieved (the thing used as measure); we posit time simply because we have need

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[93] *"temporalium"*. Probably meaning 'wordly thing', ie. 'subject to change', the conceptual opposite of an eternal thing, which is changeless in the Platonic sense. From *temporalis*, used in the 11th and 12th centuries to signify things which are not eternal.

[94] Ockham, *Summula...,* Book IV, Chap. 1. "...unum est quod tempus est mensura motuum quorum quantitas est nobis ignota, hoc est per tempus certificamur quamdiu aliquid movetur, et quod unum mobile diutius movetur quam aliud: illud enim dicimus diutius moveri, quod in maiori tempore movetur. Aliud est, quod sicut per tempus mensuratur motus ita tempus est mensura omnium rerum temporalium, per tempus enim certificamur quod una res permanens diutius permanet sive durat quam alia. Aliud est quod sicut per tempus mensuratur motus et res temporalis, ita etiam tempus est mensura quietis, quia per tempus certificamur quae res diutius quiescit et quae minus et quae aequaliter quiescit cum alia. Et ista sunt principalia, vel praecipua, propter quae ponitur tempus et propter quae cognitio temporis est nobis necessaria". p. 349-50. My translation.

[95] Ockham, *Tractus de Successivus*, cap. II, fol. 139, col. b, p. 120. Passage translated into English by Duhem, *Medieval Cosmology*, p. 306.

to measure and understand motion, change, and rest. Ockham relies on a kind of conceptual positivism. From the true statement, "something moves", the mind can conceive of a relationship of comparison between that object and another. If the first object has a regular motion, it can be used to understand the motion of the second. Accordingly, the motion of the heaven is the primary basis for measuring such motions. It is this conceptual comparison which is 'time'.

Ockham provides another reason for considering the first motion to be the primary seat of this conceptual time. In considering Aristotle's claim that time exists alike both everywhere and for all things (*Phys.* IV, 10, 218b 14), and that "we conceive of time as immanent in everything in earth and sea and sky" (*Phys.* 223a 16-17), Ockham claims that it was the Philosopher's intention simply that all things can be measured by time. This, again, supports his claim that it is the primum mobile which is most properly time-qua-measure, since:

> ...not all motion is time because not any motion is that, through which all things which are in the earth and sea can be measured. But the first motion is that through which all things which are themselves in the earth and sea can be measured.[96]

Ockham chooses the primum mobile as the appropriate motion to call time because it encompasses the whole world, therefore any movement can be measured by it. This interpretation of Aristotle again evidences Ockham's commitment to describing time in purely conceptual terms, as a human construct to be *used*, rather than as a distinct thing which *is* of itself. Whereas Aristotle said time was 'that which is counted', not 'that which counts', Ockham reverses these words in his interpretation and proposes that time is *mensura* only, not *mensuratum.*

[96]Ockham, *Summula...*, Book IV, Chap. 11. ..."quando Philosophus dicit quod tempus est simititer ubique et apud omnes, non intendit quod tempus realiter sit apud omnes illo modo quo motus localis illius corporis est realiter ibi ubi est hoc corpus, sed intendit per istam propositionam 'tempus est ubique et apud omnes' istam 'tempus est illud per quod omnia quaecumque sunt mensurabilia quantum ad durationem motuum et quietum, possunt mensurari',...

Ex quo sequitur quod non omnis motus est tempus, quia non quilibet motus est illud per quod omnia quae sunt in terra et mari possunt mensurari. Sed motus primus est illud per quod omnia quae sunt in terra et in mari possunt mesurari," p. 372. My translation.

The relationship between the measure and the act of measuring is born out in Ockham's denial that we should be tempted to consider the motion of the mobile itself as time qua a thing:

> In the same manner as the Commentator, I say that not all motion is time, nor even that motion is always time, because the primum mobile is not actually time, except when the parts of its motion are numbered; that is, except when the intellect comprehends that the primum mobile is first in one place, and later, in another.[97]

In this passage, Ockham is essentially saying that a tool is only really a tool while it is being used—the heaven is only time when it is acting as our clock. Ockham refers to Averroes, citing the Commentator as a fellow believer in the principle that time is an act of measuring accomplished through the comparison of an unknown motion with the motion of heaven, yet, as we have seen, this is a mistaken interpretation of Averroes.

Ockham's definition of time is epistemic, rather than ontological. Rather than explaining why time qua a thing is constant, Ockham simply assumes that there *is* something constant (the motion of the *primum mobile*), and tells us how we can use this constant motion as a tool to describe and understand unknown motions. Ockham's discussion of why an understanding of time is necessary to us sums up his epistemological guidelines: time is for knowing "How fast?", "How slow?", "How long?". These questions are all answered by comparing the unknown quantity to the known, which is why Ockham describes time as a measure.

A Problem For Ockham?

Ockham's account of time becomes logically incoherent when he reveals some of his assumptions about time in a passage on the possibility of a change in the motion of heaven. These assumptions are at odds with his otherwise nominalistic account of

[97]Ockham, *ibid*., Book IV, Chap. 11"Ad Commentatorem eodem modo: [the 1637 ed., *Philosophia Naturalis Guillielmi Occam*, facsimile of the edition of 1637, Vaduz-Liechtenstein, Gregg Press, 1963, has *dico*] quod non omnis motus est tepus, nec etiam semper motus est tempus, quia motus primus non est actualiter tempus nisi quando partes motus numerantur, hoc est nisi quando intellectus considerat quod mobile prius est in uno loco et posterius in alio." , p. 374. My translation

time, suggesting he actually believes time to be something 'real' and, furthermore, absolute.

In the *Quaestiones* Ockham carefully lays out an argument showing how we use a known regular motion to measure the regularity of other motions:

> I say that any lesser motion, through which we are able to divine an understanding of a heavenly motion which was unknown to us, can be called time. This conclusion is made evident through many experiences: by the known motion of a clock we measure [both] the motion of the sun and our works, particularly when it becomes known to us that the motion [of that clock] is uniform and regular. For by making a clock we know how far the sun has passed through its circuit, even if it remains under a cloud. Furthermore, the motion of the sun measures the motion of the clock, [which is] regulated so that [while] the primum mobile passes through the diurnal motion, the clock will pass through its circular course, and in this way one measures the motion of the clock through the diurnal motion. For which reason the known motion of the clock can be used thereafter to measure other motions, for example the motion of the sun. Consequently, each of these motions can be called time in respect of the others.[98]

The argument is so far straightforward—once we have set our clock by the motion of the sphere, we can use it to measure other motions, even other heavenly motions. The important point here is that it is the motion of heaven which is our primary clock—the motion which, by convention, is the standard by which other measures are set.

Yet elsewhere in the same text Ockham proposes a thought experiment concerning the relationship between time and the motion of the sphere, which seems to undermine the simple notion of measure laid out above. One assumption is central to this thought experiment, and that is that the motion of the *primum mobile* might vary. We have seen in the previous chapter that a literal reading of the story of Joshua's battle

[98]Ockham, *Quaestione*, Q. 43. "Ad istam quaestionem ('Utrum Aliquis Motus Inferior sit Tempus') dico aliquis motus inferior, per cuius notitiam possumus devinire in cognitionem alicuius motus caelestis nobis ignoti, potest dici tempus. Haec conclusio patet per experientias mults: tum quia per motum horologii nobis notum mensuramus motum solis et operationes nostras, maxime quando innotescit nobis quod iste motus est uniformis et regularis, nam facienti horologium est notum quantum solis transivit de circulo, etiam si sol continue sit sub nube. Per motum etiam solis mensurat motum horologii et ordinat ipsum sic quod cum primum mobile complet motum diurnum, horologium comlebit circulum suum, et ita mensurat motum horologii per motum diurnum, quo motu horologii noto potest postea mensurare alios motus, puta motum diurnum et motum solis, et per consequens uterque motus potest vocari tempus respectu alterius." pp. 510-11. My translation.

requires that God has the power to stop some heavenly motions. In his thought experiment, Ockham asks what would happen if the speed of the first motion were to vary:

> I say that if the motion of heaven is made twice as swift, it would occur in half the time in which it now occurs, because some other lesser motion which is regular and uniform is the time and measure of the motion of heaven. And because the motion of heaven [would be] twice as swift as now, it [would] coexist with a succession twice smaller than that of the uniform and regular motion measuring the motion of heaven; and if the motion of heaven [were] now more tardy, it [would] coexist with a succession twice greater. Therefore a swifter motion of heaven would have occurred in a twice smaller time than the motion of heaven which occurs now.[99]

This seemingly obvious passage provides an interesting insight into the assumptions behind Ockham's understanding of time. The inferior uniform motion must be one such as the clock discussed above, since Ockham implied in that passage that we can use any motion as time, so long as it has been first checked against the known regular motion of heaven. Even the wheel of the potter, which St. Augustine discusses in reference to the battle of Joshua, might be used to measure time, as Ockham later states:

> ... if all the celestial bodies stood still, as it was at the time of Joshua, still some lesser motion would have been able to measure other motions, for instance the potter's wheel, and any other imagined motion. But on that supposed occasion, time was not then the same with celestial motion.[100]

Thus any regular motion which has been checked against the standard motion of the *primum mobile* can be called 'time', since any regular motion can serve as a measure of another, less known motion. Yet if it is the motion of the *primum mobile* which, by

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[99]Ockham, *ibid*., Q. 40, 'Utrum Tempus sit Motus Secundum Rei Veritatem'. "...Dico quod si motus caeli fiat in duplo velocior, tunc fiet in mediate temporis illius in quo modo fit, quia aliquis alius motus inferior qui est regularis et uniformis est tempus et mensura motus caeli. Et quia motus caeli in duplo velocior quam nunc sit coexsistit minori successioni in duplo quam motus regularis et uniformis mensurantis motum caeli, et motus caeli tardior nunc coexsistit maiori successioni in duplo, ideo motus caeli velocior fieret in duplo minori tempore quam motus caeli qui nunc est." pp. 503-4. My translation.

[100]Ockham, *ibid*., Q. 42. "Ad argumentum principale ('Utrum Secundum Intentionem Philosophi haec sit Vera 'Motus Caeli est Tempus'') nego consequentiam quia si omnia corpora caelestia starent, sicut fuit in tempore Iosue, adhuc aliquis motus inferior posset mensurare alios motus rotae figule et aliquis motus imaginatus. Sed isto casu posito, tunc non esset tempus quod esset idem cum motu caelesti." p. 510. My translation.

convention, we call ‘time’ (and use as the standard against which we test other potential ‘clocks’), how can we say that the motion of the *primum mobile* can vary?

Strictly speaking, all Ockham *should* want to say is that the sphere can *appear* to be slower or faster than other known regular motions. If we are to say that there is an absolute, rather than simply comparative, change in the motion of heaven, it must be a change in respect to some absolute flux. In Ockham’s case, he needs a third regular motion—a regular *mutans* by which real changes in the motion of the sphere, as opposed to changes in other regular earthly motions, can be differentiated. When he says, “if the movement of the heaven were to become twice as fast, it would be accomplished in half the time it now takes it”, and “[at the time of Joshua] time was not then *the same with* the celestial motion”, it seems that Ockham wants the motion of the sphere to be variable *against time*.

The fact that Ockham says a faster motion of the sphere would be measured by some earthly motion is a moot point. The sphere would be twice as fast as an earthly motion whether or not we suppose an absolute background time. From a relativistic perspective, it would be twice as fast whether we say that ‘the motion of sphere has become faster’, or, ‘earthly motion has become slower’. Because Ockham frequently calls a motion ‘time’ in the simple sense that it can be used as a measure, it is tempting to understand the words, “half the time it now takes it”, to mean simply ‘half the time measured by an earthly clock’, and make of Ockham a true relativist. However, elsewhere in the *Quaestiones* Ockham says of the *primum mobile* that “God is able to make motions swifter, and perchance of greater regularity, than the diurnal motion of heaven.”[101] So we must ask of Ockham’s discussions on heavenly motion, “More regular in comparison to what?,” and “Faster in comparison to what?” ‘Faster’, ‘slower’ and ‘regular’ are relative values, and if the sphere is to become *absolutely* faster, that must be in comparison to some absolute *mutans*. It is certainly tempting to understand this *mutans* to be some kind of absolute temporal flow.

[101]Ockhma, *ibid*., Q. 45. ‘Utrum Secundum Intentionem Philosophi Quilibet Percipiens Tenpus Percipiat Motum Caeli.’ "...secundum intentionem Philosophi, licet Deus posset facer motum velociorem et forte magis regularem quam sit motus diurnus caeli." p. 519. My translation.

Further, if Ockham were a true relativist, he would have no cause to speak of a variation in the speed of the sphere. Once the sphere has been chosen by convention as the prime regular motion, it makes no sense to say it varies. If the regular motion of the sphere varies *in comparison* to a regular motion on earth, the fact that we have decided that the sphere has priority as the regular motion which is time, means, by convention, that it is the earthly motion that will be said to have 'changed'. We would not say, "The sphere has become twice as fast", but, "Earthly motion has become twice as slow". If even our conventional regular motion can be said to vary, then there *must* be a third *mutans* implied—yet at no point does Ockham recognise this.

The problem can be illustrated by comparing Ockham's words: "God is able to make motions swifter, and perchance of greater regularity, than the diurnal motion of heaven", with those of Newton more than 350 years later. In the Scholium to the *Principia*, Newton says:

> Absolute time, in astronomy, is distinguished from relative, by the equation or correction of the apparent time. For the natural days are truly unequal, . . . [and] astronomers correct this inequality that they may measure the celestial motions by a more accurate time. *It may be, that there is no such thing as an equable motion, whereby time may be accurately measured*. All motions may be accelerated or retarded, but the flowing of absolute time is not liable to any change.[102]

When Newton questions the regularity of the known motions, the statement makes sense, *precisely because* a truly 'equable' motion would be one which agreed with the perfect flow of absolute time (disregarding other ontological problems with absolute time). When Ockham makes what is essentially the same statement, that there could be a more equable motion than that of heaven, the statement makes no sense, because Ockham denies the real existence of an objective and equable *mutans* for comparison—he denies the existence of an absolute temporal reference frame. The differing cosmological systems of the two thinkers, and Newton's more precise understanding of the equability of the apparent heavenly motions, makes no difference to what is basically an ontological statement: that 'regular', or 'equable', when used of motion without supplying another *ens* with which the comparison of

[102]Newton, *Principia,* Motte Cajori translation, p. 8. My italics.

regularity or equability is made, *must* imply an assumed standard. We are left wondering just what standard Ockham could supply.

Pierre Duhem notices this problem in Ockham too, and argues that it can be explained by referring to Ockham's cognitive theory of our understanding of time. As discussed previously, Averroes believed that we have an intuitive knowledge of the time generated by the motion of heaven, even if we cannot see that motion (in a blind man, for example). Averroes explained this by referring to the way in which the motion of heaven imparts motion into the whole universe. Thus we understand time because the heavenly motion is, in a sense, 'in' us. Ockham tried to reconcile Averroes' words to his own theory. Ockham suggests that, although a blind man cannot know the concept 'heaven moves', he can, once he is aware that he "exists in an existence subject to change", see that he must also exist in coexistence with a body moving uniformly and continuously. This understanding is "a concept proper to the movement of heaven", so that although the blind man cannot know time directly, he understands the first motion through a 'composite concept'.[103] It is not clear, however, how a blind person should feel it to be immediately obvious that he coexists with a continuous uniform motion, simply because he exists in a changing environment. It is difficult to see how the statement, "There is a regular uniform motion", follows from, "I perceive that I am in a changing environment." In Averroes, of course, such a statement makes much more sense. Averroes assumes that the 'feeling' of change is in us because it is ultimately caused by the regular movement or change of the first motion. Thus the 'real' time, which actually exists for Averroes, and which is an attribute of the first motion, comes into our soul because the motions of our soul are distant relatives of the motion of heaven. Ockham wants to make a similar connection, but still to say time has no 'real' existence.

Duhem believed that this cognitive theory of Ockham's removes the apparent anomaly in the passages discussed above, but he is wrong. He seems to believe Ockham had a cognitive theory of time similar to Aureole's, such that we grasp absolute duration through observed motion and change, and can therefore understand

[103]Ockham, *Quaestiones*, Q. 45, 'Utrum Secundum Intentionem Philosophi Quilibet Percipiens Tempus Percipiat Motum Caeli'. pp. 517-20.

time in the absence of motion. Duhem calls this idea of the cognition of time, 'Ockham's absolute clock''—*l' horologe absolue*. However, Duhem's argument rests largely on a questionable translation of the passage in which Ockham discusses a possible change in the heavenly motion. Ockham says that (in the instance of the heavenly motion ceasing) "*some other lesser motion* which is regular and uniform is the time and measure of the motion of the heavens." Duhem translates this passage as "un certain mouvement d'ici-bas, qui est régulier et uniforme…," or, "*a regular and uniform motion here bellow . . .*",[104] which he believes implies a particular motion—that in the mind. Ockham's Latin, *quia aliquis motus inferior, qui est regularis et uniformis*, can for the most part take this translation, but Duhem seems to disregard the import of the indefinite pronoun, *aliquis*, meaning 'some', 'something', or indeed 'any other', replacing it with *certain*—and indeed it is removed altogether in Ariew's English edition. Duhem's translation, though only a subtle variation on the Latin, has serious implications. Problematically for Duhem, Ockham does generally seem to mean that *any* regular (tested) motion can 'be' time, and not a 'particular' motion, or *certain mouvement*. Although Duhem does provide the Latin for this particular phrase (perhaps suspecting he is going to far here?), a reader without recourse to the full text of Ockham's *Quaestiones in Libros Physicorum Aristotelis*,[105] one would be hard pressed to refute Duhem's central claim. This problem with Duhem's account is similar to the one we met with in the previous chapter.

Further, Duhem's simplistic argument fails to account for two important and basic factors: 1) Ockham believed mental concepts, other than terms of first intention, do *not* signify real beings; and therefore, 2) time, as Ockham argues at length, has no distinct existence. Duhem's argument paints Ockham as a hypocrite, making an implicit reference to the existence of something he has explicitly denied. I think Ockham has simply found it impossible to divorce a sense of time as 'something real' from the formal demands of his nominalism. Is seems implausible that Ockham would make such long and frequent efforts to argue that time is not a *res absoluta* if he overtly holds a theory of absolute time. Ockham's absolute time is implicit, and in conflict with his broader theory of time, not explicit and in tandem to it.

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[104] Duhem, *Le Système du Monde*, VII, p. 381; Duhem, *Medieval Cosmology*, p. 311. My translation.

[105] See, in particular, Quaestione 40, *Quaestiones*, 'Utrum Tempus sit Motus Secundum Rei Veritatem.'

The significance of Ockham's contribution to the development of an ontology of absolute time

Ockham's significance to the history of theories of time lies both in the manner of his rejection of time as a *res absoluta*, as well as in his 'mistake' in speaking of real changes in the temporal flow. Ockham clarified the difficulties that a theory proposing time to have primacy of existence—to be a 'substance'—had to overcome within Scholastic metaphysics. Time is not a kind of matter, nor is it a form. It does not seem to fit into the traditional metaphysical categories at all. Nor can time be an accident. Ockham goes beyond the exegetical difficulties Duns Scotus and Averroes find with the relational theory, and points out that time, if it is an accident of heavenly motion, does not share the qualities of that motion in the way Scholastic metaphysics requires of an accident. However, Ockham's own solution to the problem, that time does not in fact have 'real' existence of any kind, again fails the 'Joshua test.' If we want to be able to say that God can effect a 'real' change in the motion of heaven, it does not do to consider that motion to be our conventional clock.

The first problem is significant because it suggests that, in order to define time as a real and independent entity, a reworking of the traditional metaphysical categories will be necessary. In the 17th Century Pierre Gassendi, perhaps the most significant absolutist we study here, did just that. Gassendi accepted that time (and space) are special sorts of entities, separate from the traditional categories of being. However, before we examine Gassendi's absolute notion of time, we must turn our attention to one of the most important and intriguing thinkers in the transition from Medieval Scholastic thought to the early modern era—Francisco Suárez. His conception of time marks a crucial turning point.

4.

"*A flowing and successive space*":

Francisco Suárez and Imaginary Time

Francisco Suárez's dualistic account of time charts a path between the medieval and the modern, placing a scholastic account of time within an absolutist framework. While insisting that the temporal nature of created being is an attribute of the being itself, he also situates such beings in an absolute temporal reference frame similar that of later thinkers. Suárez's proposal of a recognisably modern absolute temporal reference frame comprises a pivotal moment in the story of absolute time.

At the close of the Scholastic period, theories of time had accumulated a number of problems. Averroes had argued that all possible physical causes for time, save the motion of heaven, were subject to logical inconsistencies. Duns Scotus and Aureole had demonstrated that Averroes' theory conflicted with biblical evidence. Ockham had argued that all these accounts conflicted with traditional metaphysics. Francisco Suárez, to whom we turn here, reworked the traditional metaphysics and proposed a new kind of time, an 'immutable flux,' which had many of the hallmarks of mature temporal absolutism of later thinkers such as Gassendi and Newton.

Although Francisco Suárez (1548-1617) is not primarily recognised for his work on time, his work is, undoubtedly, of great significance to the history of the development of absolutist theories, since his discussion is one of the earliest long treatises on time (extending over sixty pages), and includes detailed arguments supporting the view that physical actions take place within an absolute temporal reference frame. Whereas some of the thinkers discussed in previous chapters (Duns Scotus, Aureole) contributed to this idea by suggesting that time exists independently of physical

changes, their ideas were mainly negative theses responding to perceived problems with the dominant view that time is caused by the celestial motions. Unlike Duns Scotus and Aureole, Suárez provides a positive thesis which is based on his revision of traditional, Scholastic metaphysics. He argues that the ordering of earlier and later events can only be understood by conceiving events as existing within the embrace of a "flowing and successive space" which he refers to as "*entirely necessary and immutable in its own flux*" (*omnino necessarium et immutabile in suo fluxu*)—something at least very like an absolute temporal reference frame.

Yet it would be simplistic to describe Suárez only in terms of his absolutism, since for him, there is a second kind of time, a 'real' time, which is still tied to material being. He sees this kind of time as something which is ontologically tied to the most intimate existence of objects, so that for him there is no 'global time' but rather a plurality of individual continua of time—one for each distinct being. He calls this kind of time 'intrinsic time' (*tempus intrinsecum*). Suárez's theory of time is thus dualistic. He proposes an 'intrinsic time', linked to beings, which exists within a second order absolute temporal reference frame, or 'immutable flux'. Most of the literature referring to Suárez's rendering of time, however, fails to account for intrinsic time, and this creates a distortion in the way Suárez's description of time is perceived. Because Suárez's description of the *immutable flux* is so similar to many later seventeenth century accounts of absolute time, such as Newton's, his comparatively early contribution to the popularisation of absolute time is of obvious importance, yet too frequently simplistically rendered. A fairer rendering also must provide an account of the reasoning behind his proposal. Both strands of his dualistic account of time need to be taken into consideration.

Here, I shall detail both pieces of Suárez's account of time, investigating its conceptual links to previous accounts of time, such as Aristotle's, Duns Scotus', Aureole's and Ockham's. Especially important here is Suárez's use of Joshua X13 to support his proposal of the immutable flux. Is he is proposing an absolute spacetime? Can he deal adequately with resting bodies in his account of time where previous thinkers had failed? These questions are central to an understanding of the historical significance of Suárez's work to the development of theories of time.

Suárez's Metaphysical Disputations

Born in Granada in 1548, Suárez joined the Jesuit order in 1564, and went on to study philosophy, and later theology at the University of Salamanca. In 1571, while a professor of philosophy, he was ordained to the priesthood, and went on to teach at Salamanca, Segovia, Valladolid and Coimbra, and held the chair of theology at both Rome and, later, Alcala. In 1593 Philip II of Spain appointed him to the chair of theology at the University of Eurora where he published the voluminous *Metaphysical Disputations*[106]—his major work. As well as this work on metaphysics, Suárez wrote important treatises on law and theology, including a counter-reformationist attack on James I. The *Metaphysical Disputations*, Suárez's *opus magnus*, is comprised of fifty-four disputations totalling over two-thousand pages in the modern (Latin) edition—a huge work by any standard. In the work, Suárez not only gives his opinion on a vast array of metaphysical topics, but reflects on the views of practically every major philosopher before him, over seventy-seven hundred citations of two hundred and forty five authors, generally with reference to the specific primary source material. Both the breadth and depth of the topics discussed by Suárez, as well as the amazing number of other thinker's ideas referred to, lead Schopenhauer to laud his work as "an authentic compendium of the whole scholastic wisdom"[107]—and this is no exaggeration. Schopenhauer also mentions a rumour that Descartes always carried a copy of the *Metaphysical Disputations* when he travelled.[108] The work was one of the most widely read text books of its time in both Catholic and Protestant universities, and continued in its popularity for over two-hundred years after its publication.[109] It is a great shame for the non-Latin reader that it has never been fully translated into English,[110] and, outside of specialist circles, has been largely forgotten as a foundation stone of early-modern learning in introductory university courses.

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[106]For further biographical details see Jorge Gracia, "Francisco Suárez: the Man in History," *American Catholic Philosophical Quarterly*, vol. 65 (3), 1991.

[107]Doyle, "Introduction" to Suárez, *On Beings of Reason*, Milwaukee, Marquette University Press, 1995, p. 14.

[108]For a discussion of opinions on Descartes' knowledge of Suárez's work, see Doyle, *ibid*., p. 14, note 80.

[109]Stephen H. Daniel, "Seventeenth Century Scholastic Treatments of Time", *Journal of the History of Ideas*, vol. 42, 4, 1981, p. 589.

[110]Disputations 5-7, 10, 11, 17-19,31 and part of 23 are available in English. See, for fuller bibliographic detail, Freddoso's bibliography to Suárez, *On Efficient Causality*, Yale University Press, 1994, pp. 409-11.

As its title suggests, the *Metaphysical Disputations* is a work solely focused on the nature of being. The most immediate thing the reader will notice is Suárez's approach to writing a comprehensive treatise on metaphysics. Rather than merely providing a commentary on Aristotle's *Metaphysics* following Aristotle's ordering, as previous writers had done, Suárez attempts a more systematic approach to the topic, an intention he states clearly in his prefatory note.[111] The decision was a near first in treatments of metaphysics and created a fashion for following the Suárezian ordering.[112]

Suárez orders his work by beginning with a discussion of being and existence at its most general level, and those properties of being which can apply to it in any of its forms. He then moves on to consider the causes of being, and the manner of existence of God ('eternal', or 'infinite' being) and God's creations ('created', or 'finite being'). Suárez is then at liberty to divide finite being into substances, accidents and their kinds. Finally, Suárez closes with a discussion of those forms of being which appear to have no substantial existence at all, and which can only be divined by reason. These include imaginary beings, as well as the privation and negation of being, and the relationships which may hold between beings but which are solely artefacts of reason.

Suárez's treatment of time, mostly to be found in the sixty or so pages of Disputation Fifty ("Concerning the Predicate 'When' and the Duration of Things Generally"), is highly original while still retaining strong links to earlier scholastic authors. Conversely, some passages would be quite at home in Newton's "De Gravitatione et Equilibrium". The extent to which Suárez's treatment of time manages to capture much of the essence of two such disparate modes of thought as scholasticism and modern philosophy is impressive. "If one looks at Suárez carefully," Jorge Gracia remarks, "it becomes evident that he is both the last major medieval theologian and

[111]Suárez, *Disputationes Metaphysicae*, (Editio Nova, Paris 1866), Hildesheim, Georg Olms Verlagsbuchhandlung, 1965, "Ratio et discursus totius operis. Ad lectorem." pp. lxv-vi.

[112]For a listing of comments on this topic by a number of historians, as well as a discussion of possible precursors to the 'non-Aristotelian' ordering, see Doyle, *ibid*. p. 8, note 50. For an overview of the topic ordering of the Suárezian categories see Fredosso, p. xvi-xvii of his "Introduction", to Suárez, *On Efficient Causality*, *ibid*.

the first major modern philosopher."[113] This remark is aimed at the *Metaphysical Disputations* as a whole, but I shall seek to demonstrate how well Suárez's treatment of time, in particular, also justifies this opinion.

Although we are primarily concerned here with Suárez's absolute-like 'immutable flux', the problem of intrinsic time should be addressed first, for the role of the immutable flux in Suárez's account of time is to *contain* the intrinsic durations of bodies. Suárez's 'intrinsic time' is worth discussing not simply because it seems to be the 'kind' of time Suárez himself considers to be of primary metaphysical significance, but because the logic Suárez uses to explain intrinsic duration is transferred by him into his portrayal of the immutable flux. Most importantly, however, without a thorough discussion of intrinsic time, any discussion of the immutable flux will fail to capture completely the elegance of Suárez's detailed rendering of time.

Although there are a great number of articles and volumes focusing on Suárez's general metaphysics, there are very few scholarly works addressing his account of time.[114] For the most part in this study I rely on translations, sometimes rather lengthy, from the original Latin.

The Connection Between Time And Being: Intrinsic Time

Disputation 50, the disputation on time, is the seventh largest disputation of the fifty-four—good evidence for the importance Suárez placed upon the complex problem of time. Throughout the disputation, Suárez is continually at pains to show that an object does not undergo temporal transition in a purely passive way—that it is not simply floating in a temporal continuum to which it holds no real ontological connection. Suárez proposes that there is an "intrinsic time" (*tempus intrinsecum*) which inheres in each individual body, and is peculiar to it, allowing the 'when-ness'

[113]Gracia, "Francisco Suárez, the Man in History", p. 262.

[114] Milič Čapek in his brief but extremely useful "The Conflict Between the Absolutist and the Relational Theory of Time Before Newton," discusses Suárez's importance as an early contributor to theories of absolute time and Stephen H. Daniel mentions Suárez in his "Seventeenth Century Scholastic Treatments of Time," although Daniel does not fully address the import of imaginary time. Piero Ariotti discusses Suárez on time in a number of articles, but Ariotti's work is prone to many errors and misinterpretations of key writers, as I discuss below.

of a moment in a body's history to be actively predicated of something 'in' the body. By describing time as intrinsic to a body, Suárez avoids defining the 'when' of a body simply as a merely nominalistic description of a relationship between that body and some accepted regular motion, as Ockham does, for example. Indeed Stephen Daniel argues that Suárez's account of time is a conscious rebuttal of earlier nominalist accounts of time.[115]

Because, for Suárez, intrinsic time is ontologically connected to being itself, intrinsic time is divided into the same categories as being, and each kind of being has a kind of intrinsic time suited to it. Suárez describes God as an instance (the only instance) of eternal being, with an eternal intrinsic duration unique to him (*aeternitas ... per essentiam est attributum solius Dei*). Here, however, we are primarily interested in the duration of worldly things, or created, changeable being. For our purposes this means moving or 'successive' beings, as well as resting beings—what Suárez refers to as *permanentia* (Suárez also discusses the intrinsic time of angels, but that need not concern us here). An analysis of intrinsic time is perhaps simpler to understand in respect of successive beings—or what we would simply call mobile bodies. (Though it is worth noting that Suárez sees moving and resting bodies as exhibiting quite different states of being. Below, I shall primarily focus on moving bodies, and will discuss resting bodies towards the end of this chapter.)

To begin his discussion of what kind of being successive time has, Suárez asks what kind of physical existence best exemplifies true succession. For him, this is the moving body. A moving body most truly undergoes a successive existence, because by its motion it is continually changing and becoming 'new':

> …nothing is a successive being, which can be subjected to successive duration, except motion… And this is because nothing is of itself in a state of continued succession except insofar as it is in the act of becoming: not all at once, but acquiring its being by degrees. Therefore continuous succession, primarily and of itself, only exists in motion.[116]

[115]Daniel, *ibid*., p. 591, referring to Suárez, Disputation 50, XII, 13-16.

[116]Suárez, *Disputatione Metaphysicae*, 50, VIII, 4. "...in rerum natura nullum est ens successivum, quod supponi possit ad durationem successivum, nisi motus ... Et ratio est, quia nihil est per se in

Suárez's conception of motion, which "acquires its being by degrees", has the act of successive change as its defining attribute—it can never realise its 'whole being' at once.

Although this idea of an act of successive being is relatively easy to grasp, Suárez's explanation of how intrinsic duration inheres in motion is much more difficult. Because such duration is 'intrinsic' to the being, Suárez refuses to define it with respect to anything *outside* the existence of the motion, and only in respect of the relationship one part of such intrinsic time bears to another, and to the parts of the motion itself. Thus Suárez's description of intrinsic time can be explained in the manner of an ordered temporal continuum, which exists in concert with the ordered continuum of the motion it inheres in—"...in motion", says Suárez, "there are as many parts of duration, as ... there are parts of motion."[117]

We usually think of time as something which allows us to say that something is fast or slow, or of 'a long time', or 'a short time'—a comparative relation. Intrinsic time is defined purely in terms of an ordered succession *within* the motion. The parts of time inhering in a motion are only considered in relation to each other—the Aristotelian 'before and after.' The intrinsic time of one motion cannot be compared with that of another.[118]

This becomes clearer when we consider the path of a motion in purely spatial terms. Consider the whole motion of a heavenly body's orbit simply in terms of the path it describes through space. In the kind of Ptolemaic system Suárez pursues we could consider the orbit of the sun as represented by a completed circle. This image of the sun's path is similar to the time-lapse photographs of the apparent motion of the stars which we often see. When Suárez talks about a body's 'motion' (*motus*) separately from its intrinsic time, he refers to something like the completed circle of stellar light in such a photograph; to mean the *entire* motion considered at once. Considered this way, we can see how two 'motions' of the same body will have the same intrinsic

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continua successione, nisi quatenus est in fieri, per quod non simul, sed paulatim aquirit suum esse; ergo continua successio primo ac per se est tantum in motu." My translation.

[117]Suárez*, ibid*., 50, IX, 5. "... sunt in eo motu tot partes durationis, quot sunt partes motus..." p. 952. My translation.

[118]*ibid*., 50, IX, 4, p. 951-2.

duration regardless of their relative speed. Regardless of whether a planet was moving quickly or slowly on its circular path, two orbits are, in a sense, the same. They have the same 'whole motion.' Thus, since intrinsic time is linked to this *esse* of such motion, both a fast and a slow orbit have the same amount of intrinsic time:

> ...there is no distinction in a thing between [its] duration ...and that existence of which it is the duration... For in the same motion, for example in one circulation of heaven, there is the same real duration, because it is the same real existence of such a motion...[119]

Intrinsic time lends the quality of succession—or successiveness—to motion, and nothing more. It exists, in a metaphysical sense, to explain the temporality and transience of non-divine being—being which has change quintessential to it; being which is not eternal.

To make this difficult point clearer, we might imagine a person running. Suárez says that in the same motion there is the same amount of intrinsic duration, or as many parts of intrinsic duration as there are parts of motion. We might think of the path along a race track down which a runner runs as equivalent to that runner's 'motion' (in the Suárezian sense), and, for convenience's sake, of the runner's footfalls as the parts of time/motion. Imagine the following line is the 'motion', or path of the runner, and the asterisks the parts of time/motion, or the runner's steps:

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Whether the runner were moving quickly or slowly, the spatial dimension of his motion would be the same. Similarly, the footfalls, or parts of time, would also occur in the same places. Suárez uses intrinsic time to show how motions contain succession. Each part of the motion only exists during its allotted part of intrinsic duration. In this ordered continuum, the parts of time only bear relation to their corresponding parts of motion, and to each other. One part proceeds from the next, and no two exist simultaneously. Thus intrinsic duration is basically the ordered

[119]Suárez, *ibid*. "...non colligitur distinctio in re inter durationem illam, ...et illud esse, cujus est duratio... Nam in eodem motu, verbi gratia, unius circulationis coeli, eadem est realis duratio, quia idem est reale esse talis motus..." My translation.

continuum of the parts of a body's existence, each part of which only exists alone such that for the given moments *x, y* and *z* in the intrinsic duration of a body, then:

~(x R x) and
if (x R y) then ~(y R x) and
if (x R y) and (y R z) then (x R z)

where R is the relation 'exists earlier than'. Thus intrinsic duration signifies *only* the existential succession of the parts of a motion. All that is needed for the motion to become truly four dimensional, and to have 'successive existence', is that each 'part' of the motion takes part in a continuum of actualisation, and actively exists only in unison with its corresponding 'part' of intrinsic duration, like a spark running along a fuse wire.

Suárez sees his idea of intrinsic time as the act of the ordered successive existence of the parts of motion, as being in line with Aristotle's doctrine which we met with in chapter 1:

> Nor does this differ from the definition of time given by Aristotle, that time is the number of motion according to prior and posterior, that is, that it is the number of the parts of motion succeeding themselves according to prior and posterior. Therefore the parts of motion themselves exist, which compose time according to that manner of existence, which they have in the nature of things, which is according to the succession of prior and posterior alone...[120]

Suárez seems to see the main feature of motion 'acquiring its being by degrees', through the joining of the parts of motion to the parts of that motion's intrinsic duration, as lying in the act of ordering of its prior and posterior parts of being. Thus he appeals to Aristotle's terminology of time as a 'number' of motion, seemingly insofar as, in the set of numbers, each unit holds the same logical relation to the others, as do the parts of a successive intrinsic duration to one another. 'Four' comes after 'three'—it is in the definition of 'four' to come after 'three.'

[120]Suárez, *ibid*., 50, IX, 1. "Neque ab hoc discordat definitio temporis ad Aristotele data, quod sit numerus motus secundum prius et posterius, id est, quod sit numerus partium motus sibi succedentium secundum prius et posterius; ergo ipsamet partes motus sunt, quae tempus componunt secundum illum existentiae modum, quem habent in rerum natura, qui solum est secundum successionem prioris et posterioris..." p. 951. My translation.

There is an important difference, however, between Aristotle's rendering of time and Suárez's. As I discussed earlier, Aristotle saw time as ontologically dependent upon motion. For Aristotle, motion has a more basic place in the 'family tree' of being than time does. This results in the difficulty that it seems impossible to define a non-temporal 'prior and posterior' in motion, upon which time can establish its own 'before and after.' Unlike Aristotle, who derives the temporal succession from a supposed pre-temporal succession in motion, Suárez sees intrinsic time as that which *allows* motion to be successive, such that "time has succession apart from movement, but not vice versa."[121]

It seems that Suárez took the idea of the relative ordering of the parts of intrinsic duration from his interpretation of Aristotle's idea of time as 'the number' of motion. However, by making time in this respect internal to a motion, as expressing the same kind of ordered continuum as the set of numbers, he yet takes a radically divergent path from Aristotle, Averroes, and the medieval scholastics discussed previously. In the *Physics*, Aristotle concludes (somewhat problematically) that time cannot be synonymous with motion, because "when any particular thing changes or moves, the movement or change is in the moving or changing thing itself, or takes place only where that thing is; whereas 'the passage of time' is current everywhere alike and is in relation to everything" (*Phys.* 218a 25-30). Likewise, Averroes feels: "[It is impossible] that time is multiplied by the multiplication of sensible motions."[122] Duns Scotus and Aureole also try to render time as a single entity, for example Aureole says: "At the instant in which I am speaking, in this same present instant the king of the Tartars sits; therefore there is no present instant for us and another for the Tartars."[123] Similar sentiments are apparent in Aquinas and Ockham. While Suárez takes the ideas of his medieval and ancient colleagues quite seriously, by defining intrinsic successive times as internal to each individual motion he must here take a step in a different direction.

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[121]Suárez, 40, IX, 4. Translated in Daniel, *ibid*., p. 592.

[122]Averroes, *Aristotelis Opera cum Averrois Commentariis*, vol. 4, Liber Quartus, Summa Tertia "De Tempore", Caput 3, comm 98, 178L-M.

[123]Peter Aureole, *Commentorium in secundum librum Sententiarum*, dist. II, Quaest. I, art. 4, (p. 41), quoted in Pierre Duhem, *Medieval Cosmology* , p. 304.

Significantly, Suárez takes his lead on this problem from St. Augustine's discussion of the story of Joshua, in his *Confessions*. Suárez argues that each individual motion must have its own unique intrinsic time, because:

> ...in all continuous motion there is intrinsic and real successive duration, and consequently, if the name of time signifies this kind of duration alone, it follows that there is not one and the same time for all motion, but [that time is] multiplied according to the number and multitude of motions, and is various according to the diversity of motions. For this reason, many philosophers have said that there is not one single time, but a plurality. St. Augustine agrees with this opinion when he says: "I have heard from a certain learned man that the sun and the moon, and the sidereal motion, are themselves the times and years. But why not rather should all bodies not be moved by time? Or if the lights of heaven stopped, and the wheel of the potter moved, is it not time?" And further down: "Let no one say to me, therefore, that the heavenly bodies are time, because with the wish of a certain man that the sun should stop, victorious Joshua completed his battle—the sun stopped, but time continued. Through its own space of time, which was sufficient to it, that battle was waged and ended."
> ...[E]verything, which endures in real existence, endures through a real and intrinsic duration, therefore...it endures through a real duration intrinsic to itself, and therefore these durations are multiplied according to the multitude of those things which endure in this manner.[124]

Unlike Duns Scotus and Aureole, who use the story of Joshua to argue that time is a unified flux unreliant upon motion, Suárez uses the same passage to argue that there is a unique time for each individual motion, and that in this sense time is multiplied by the multiplicity of motions. Both arguments spring from the same premise, that the St. Augustine/Joshua passage shows that time is not the result of a single and particular motion (that of the heaven). The conclusions drawn, however, are in each

[124]Suárez, *ibid*., 50, IIX, 6. "...in omni motu continuo esse intrinsecam et realem durationem successivum, et consequenter, si nomine temporis sola hujusmodi duratio significetur, sequitur non esse unum et idem tempus omnium motuum, sed multiplicari juxta numeram et multitudinem motuum, et variari etiam juxta motuum diversitatem. Quo sensu dixerunt multi philosophi, tempus non esse unum tantum, sed plura. Cui sententiae consonat D. August., lib 11 Confess. c. 23, dicens: *Audivi a quodam homine docto, quod solis et lunae, ac siderum motus, ipsa sint tempora et anni. Cur enim non potius omnium corporum motus sint tempora? An vero si cessarent coeli lumina, et moveretur rota figuli, non est tempus?* Et infra: *Nemo ergo mihi dicat coelestium corporum motus esse tempora, quia et cujusdam voto cum sol stetisset, ut victor Josue praelium perageret, sol stabat, sed tempus ibat; per suum quippe spatium temporis, quod ei sufficeret, illa pugna gesta atque finita est.* ...omnis res, quae in esse reali durat, per durationem realem et intrinsecam durat; ergo quaelibet ex his rebus durat per durationem reali sibi intrinsecam; ergo multiplicantur hae durationes juxta multitudinem earum rerum, quae sic durant." p. 950. My translation.

instance very different. With intrinsic time, Suárez is able to say that there is a real ontological relationship between temporal flow, and actual existence. A separate intrinsic time inheres in the motion of each body, so that it is not merely floating passively in some temporal stream.

But can Suárez escape Ockham's difficulties with the differentiation between fast and slow? Well, yes—and no. And it is this question which lies at the heart of Suárez's model of time. The answer lies here—what should we make of this?:

> [It] is denied that in a same or equal motion there can be more or less duration so far as the actual entity [is concerned]... [An] equal motion is able to endure more or less, but this does not result from its having more or greater parts of duration, but rather from its having those parts more or less transiently [*transuentes*] (so to speak) *or more or less, as it were, compressed and conjoined* [*compressas et conjunctas*], which results from the swiftness of the motion.[125] (My italics.)

Yet mightn't we ask, "more or less compressed and conjoined in relation to what?" Having just said that intrinsic duration is purely internal to the motion, and that otherwise identical fast and slow motions have the same amount of intrinsic duration, this new idea of the parts of intrinsic duration being 'compressed and conjoined' in some apparent medium sounds nonsensical. It is at this point of his discussion that Suárez brings in the notion of the 'immutable flux', or 'imaginary succession'.

Extrinsic Time: 'The Immutable Flux'

Having investigated Suárez's 'intrinsic time', we can now turn to the other half of his dualistic account of time, the 'imaginary succession', or 'immutable flux'.[126] For Suárez, the immutable flux is the extrinsic counterpart of the internally defined time of intrinsic durations. Whereas intrinsic time predicated a 'when' of something *in* a

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[125] Suárez, *ibid*., 50, IX, 5. "...negatur in eodem seu aequali motu esse majorem aut minorem durationem quoad realem entitatem ejus... ...aequalem motum posse magis vel minus durare, quod tamen non provenit ex eo quod habet plures, vel majores partes durationis, sed ex eo quod illas partes habet magis aut minus transeuntes (ut ita dicam) vel magis et minus quasi compressas et conjuntas, quod provenit ex velocitate motus." p. 952. My translation.

[126] I shall refer to this kind of time (which Suárez generally refers to as the imaginary succession, or *successio imaginaria*) as the 'immutable flux' for the time being, so as not to confuse the reader with the term 'imaginary' until later in this chapter when what Suárez means by the term will be more fully investigated.

moving body—the ordering of the existential parts of a body's motion—extrinsic time can be defined only in terms of its own continued existence, and bears only a passive relation to bodies and motions. As will become apparent, the imaginary succession is quite surprisingly similar to later accounts of absolute time familiar to us from Newton's work, for example. The most important difference is that Suárez's metaphysics limit his ability to describe this kind of time as having 'substantial' existence—a necessary element of a 'full blooded' theory of absolute time.

The immutable flux can be thought of as the medium in which the intrinsic durations of bodies reside. It will be remembered that the intrinsic duration of a successive body is merely that counterpart of its motion which allows it its successive existence. Intrinsic duration does not allow us to designate one motion as 'faster' or 'slower' than another since it describes only the relationship of the parts of a particular motion to one another internally, not to the parts of another motion. In the previous section, however, I quoted Suárez as saying:

> [An] equal motion is able to endure more or less, but this does not result from its having more or greater parts of duration, but rather from its having those parts more or less transiently [*transuentes*] (so to speak) or more or less, as it were, compressed and conjoined [*compressas et conjunctas*], which results from the swiftness of the motion.

With the immutable flux, Suárez defines the medium in which this compression and unification of the parts of an intrinsic successive duration occur.

The way Suárez uses the immutable flux as the medium in which intrinsic durations reside can be illustrated by comparison with a similar issue in Ockham's work. In the previous chapter, I discussed what I called 'Ockham's mistake.' Ockham tried to show that the term 'time' does not in fact denote something which has a distinct existence, but rather that when we speak of 'time' we are merely comparing some unknown motion to a known motion, which is defined as our standard regular measure of 'time', by convention. Ockham then suggested that there can be a real, rather than a merely relative, change in the motion of the first sphere. The nub of the problem was that there can only be a real change in the rate of motion of a body that is called 'regular' by convention, if that motion changes in respect of some other conventionally defined *more* fixed and regular flux, or *mutans*. It can only be

assumed that Ockham had some form of absolute time in mind, even though he expressly forbade the existence of time as a real, independent entity (although, of course, Ockham's metaphysics limited his willingness to describe time as either attribute *or* subject).The following passage from Ockham is the one in question:

> I say that if the motion of heaven is made twice as swift, it would occur in half the time in which it now occurs, because some other lesser motion which is regular and uniform is the time and measure of the motion of heaven. And because the motion of heaven [would be] twice as swift as now, it [would] coexist with a succession twice smaller than that of the uniform and regular motion measuring the motion of heaven; and if the motion of heaven [were] now more tardy, it [would] coexist with a succession twice greater. Therefore a swifter motion of heaven would have occurred in a twice smaller time than the motion of heaven which occurs now.[127]

However, if Ockham truly thought that the motion of the sphere was the regular mutans which we use by convention to judge the speed or regularity of other motions, we should only be able to say that "Earthly motion has grown twice slower", not "The heavenly motion has grown twice faster", if the heavenly motion were seen to differ with some 'lesser' earthly motion.

Suárez seems to refer directly to Ockham's 'mistake' in his discussion of the immutable flux, although he does not mention Ockham's name. The following passage provides an interesting comparison between Ockham's conundrum, and Suárez's elegant solution of it. Suárez argues that when we consider the 'motion' of the stars in isolation (remembering the time-lapse photographs of stellar motion) a circulation is a circulation: regardless of speed, the 'motion' is the same. However, in the case of a fast orbit of the *primum mobile*, the sphere would express that same motion in only half as many units of immutable flux:

> ...if the primum mobile were moved with a twice faster velocity, the unchanged circulation of the equal motion of the sun would be as it is now, for it would be passing unchanged over an equal motion through an equal space; its time, however, would not be the same as that which now is, for now it is the unchanged time of a day, then, however, it would only be half a day. Thus the same motion can exist in an infinitely

[127]Ockham, *Quaestione*, Q. 40, 'Utrum Tempus sit Motus Secundum Rei Veritatem'. pp. 503-4. See previous chapter pp. 64-5.

> small time, just as the same motion can occur infinitely faster. And conversely, if the sun were moved more slowly, it is able, for example, to consume two unchanged days in one circulation. Then the motion would be equal to it, which then is in one day—time, however, would be twice greater. Therefore there is, in a thing, something distinct from motion, since the same motion can occur in an increased or diminished time.
>
> First it is responded that it is one thing for there to be more or less real duration in a motion, but quite another that motion itself should endure more or less in accordance with its coexistence with some extrinsic time, whether this be true time, or a concept of the imagination. ...For in the same motion, for example that of one circulation of the heaven, there is the same real duration, for it is the same real existence of such a motion, and consequently it is its same real lasting [in the intrinsic sense], although that whole duration, through a comparison to extrinsic time, or to the imaginary succession, is able to endure more or less, in consequence of that motion's faster or slower passage.[128]

Thus the imaginary succession is defined as the medium in which the successive instants of intrinsic duration are 'compressed and conjoined'. It is through an extrinsic coexistence with this immutable flux that one of two otherwise identical motions can be said to be 'faster' than another, even though their intrinsic times are identical. I have drawn the following chart to explain the relationship between two otherwise identical intrinsic times (say, of the motion of one revolution of the sun), and their comparative existence within the extrinsically defined immutable flux:

[128]Suárez, *ibid*., 50, IX, 3-4. "Nam si primum mobile duplo majori velocitate moveretur, circulatio integra solis aequalis motus esset ac nunc est, nam esset integer transitus aequalis mobilis per aequale spatium; tempus autem ejus non esset idem quod nunc est; nunc enim est tempus integrae diei, tunc autem solum esset semidiei, et ita potest tempus in eodem motu in infinitum dimimui, sicut potest idem motus in infinitum velocior fieri. Et e converso, si sol tardius moveretur, posset duos, verbi gratia, integros dies in una circulatione consumere, et tunc motus esset aequalis ei, qui tunc est in uno die; tempus autem esset duplo majus; ergo est in re aliquid distinctum a motu, quandoquidem eidem motui fit additio vel diminutio temporis.

Respondetur primo, aliud esse in aliquo motu esse plus vel minus durationis realis, aliud vero quod motus ipse plus vel minus duret, secundum coexistentiam ad aliud tempus extrinsecum, aut verum, aut conceptum sen imaginarium. ...Nam in eodem motu, verbi gratia, unius circulationis coeli, eadem est realis duratio, quia idem est reale esse talis motus, et consequenter eadem est realis permanentia ejus, quanquamtota illa duratio per comparationem ad extrinsecum tempus, vel ad successionem imaginarium, majis vel minus durare posset, juxta velociorem vel tardiorem transitum illius motus." pp. 951-2. My translation.

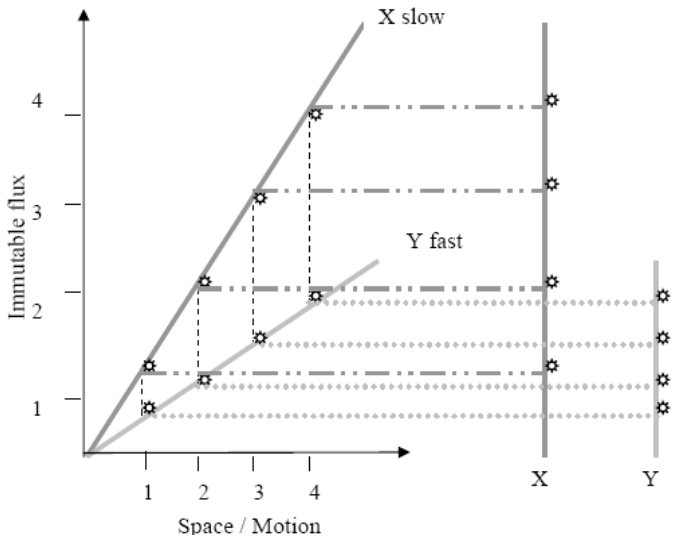

Illustration 1. Motion in the Immutable Flux

In the illustration above, both X and Y have the same 'motion' (or, move through the same amount of space) and thus the same parts of intrinsic duration. However X, the slow motion, coexists with a greater part of the immutable flux. In the lines representing the coexistence with the immutable flux only (to the right), the parts of intrinsic time for Y, the fast motion, are more "compressed and conjoined" within the medium of the immutable flux than those of X, the slow motion.

One can hardly deny the elegance of Suárez's solution to Ockham's conundrum. Not only can he define a 'when' in a moving object's history, in respect of the 'before and after' of the parts of its successive existence, as something predicated of the object's real being, but he neatly separates the comparative relations of 'fast' and 'slow' from such intrinsic durations by postulating an extrinsic medium in which intrinsic motions reside.

But what is this extrinsic flux in and of itself? In order to give a clear impression of just what Suárez intends by postulating this 'immutable flux', it is worth quoting Suárez at some length, so that his argument can be illustrated without interruption. A commentary on the passage follows on the next page. Here, Suárez is discussing the problem of whether God could recreate a past time.

Francisco Suárez, *Metaphysical Disputation 50*, Section IX[129]

"Whether the Time in a Thing is Distinguished From Motion"—Extract from 'Vera Responsio'

"15. However, in order to make better sense of this problem [of how God could reproduce a past unit of time], a distinction must be made between that interval, or, if you will, the imaginary space which our intellect conceives as if necessarily flowing from eternity, and real duration of motion, which is called true and real time [i.e. 'intrinsic time']. This real duration can be considered in two ways: in one manner, absolutely and according to its own reality; and in another manner, as coexisting, and as if filling (or so I say), some part of that imaginary succession with which it is understood to coexist. For, just as we conceive some permanent space in bodies, of which some body existing in a place fills some part, so in a succession of times do we conceive some flowing and successive space, of which some part fills all real flowing motion, such that it might have been motion from eternity. [Such flux] is understood as filling all that space, and coexisting with it. Therefore, if real duration of motion is understood as coexisting with such a part of that imaginary succession, which passes by, and is thus called time past, it is impossible under this connotation, and by the apprehension of reason, that it is brought forth anew, certainly not out of its own part [of the succession], but even from a part of the other extreme. And the reason is, because that flowing imaginary space is conceived as entirely necessary and immutable in its own flux [omnino necessarium et immutabile in suo fluxu], and therefore its part, once understood as past, cannot be understood as returning. For that space, since it is conceived as entirely necessary and uncaused [non causatum], ought even to be conceived as having an intrinsic necessity in flowing, by the order of its own parts, and accordingly, once that part is past it cannot be conceived as returning again. From which if happens that a part of real [intrinsic] time, once it coexists with a past part of that imaginary succession, is unable to coexist with [that part] again. And therefore time past, under this concept of coexisting, or, if you will, of filling every part of successive imaginary space, cannot return.

"16. But in truth, the actual real [intrinsic] duration of past motion, which was likewise time past, is able to occur again, as coexisting with another part of that imaginary

[129] So as not to allow footnotes to become too unwieldy, the Latin for this passage, not otherwise available in English to my knowledge, is given in the Appendix.

> succession. And because duration is conceived by us as greater or lesser when coexisting with a greater or lesser part of that imaginary succession, even if in itself it is not more or less in truth, so it is clearly evident that it is indivisible in duration. Therefore, even if the same duration of the same motion is twice extended, whether it is conceived as extending through two parts of that imaginary succession, and so conceived as a greater duration, or as equal to two, for example, or to three days, certainly it is not really greater in itself, or distinct according to parts, but is in fact the same again. ...[A brief reference to other forms of time follows.]... And indeed, whenever we speak of time past as unrecoverable, or as being unable to return again, either we apprehend that continuous imaginary succession which is entirely necessary and immutable, or, if at the same time we conceive some real duration or circulation of the heaven, we apprehend that as existing in some particular part of that successive interval which is not able either to have been before, nor to be again. It seems St. Augustine spoke similarly in chapter 23 of Book 11 of the Confessions. For when he had related how the battle waged by Joshua existed through its own space of time which was sufficient to it, by the stopping of the motion of heaven, he concluded saying: "I see therefore that time is something extended."...[Other brief references follow.]"

In this passage Suárez proposes a universal succession, uncaused and immutable, which provides the temporal 'container' for the myriad intrinsic successions of individual beings. This 'immutable flux' is truly absolute, so that a repeated intrinsic motion can only coincide with a single portion. Suárez's argument here is that while God could cause an intrinsic time to be repeated, he could only do so in a later part of the immutable flux, which, once a part of it has passed, will not and cannot recur. Is not this idea of Suárez's quite different from the partial theories of Duns Scotus and Aureole? Where these medieval thinkers made only vague suggestions about the need to describe the apparently universal succession which seems to embrace all physical actions, without reliance on those very actions as the cause of the succession, Suárez gives what can easily be called a real (metaphysical) theory of time, accounting for both the temporal succession of individual moving bodies, as well as the temporal 'container' in which the relative durations of various motions take place.

The most striking element of Suárez's treatment of the immutable flux is the way in which he seems to have borrowed his description of its successive existence from his

description of successive intrinsic times. Just as a successive intrinsic duration allows a motion to "acquire its existence by degrees", so the immutable flux is "conceived as having an intrinsic necessity in flowing, by the order of its own parts". When Suárez speaks of the impossibility of an intrinsic duration residing more than once with any given part of the immutable flux, it seems that he intends that, 'by the order of its parts', the immutable flux has a similar kind or ordered relation of successive existence amongst its 'moments' as do successive intrinsic durations. By defining successive intrinsic duration as having a kind of existential flux purely by the relation of active existence which its parts hold to one another, Suárez constructs a way of explaining ordered existence which can be extended to his description of extrinsic time—again, like the ordered 'flow' of numbers.

An obvious criticism which can be levelled at ideas such as the flow of absolute time in an empty universe is that concepts such as flow presuppose a relation between that which flows and that which it flows *against*. A river, for example, flows in relation to its banks. The statement, an "intrinsic necessity in flowing, *by the order of its own parts*", implies that the relation of 'flow' is more properly described by Suárez as a relationship of *existing before or after* in the parts of the immutable flux. No outside entity is strictly necessary as that to which the 'flow' corresponds. The flow is a result of successive existence in the parts of this extrinsic time.

An important difference between intrinsic and extrinsic durations, however, is that intrinsic durations are 'elastic'—they can be 'compressed and conjoined', or, indeed, expanded, within the realm of the immutable flux. This extrinsic time, on the other hand, is "conceived as entirely *necessary and immutable* in its own flux". The distinction is important. With intrinsic times, there was no way of saying that they were 'fast', or 'slow', since fast and slow are relative terms, terms designating an external comparison between two motions. The parts of an intrinsic duration bear relation only to the other parts of that same intrinsic duration. In an important sense, the immutable flux is a 'bottom line' for successive existence. Its parts are ordered in their existence amongst themselves, and the parts of intrinsic durations reside, in their own ordered continuum, within the embrace of the immutable flux. The important metaphysical distinction is that the parts of an intrinsic duration have an active ontological relationship to the motion of which they are a kind of attribute. Their

relationship with the extrinsic immutable flux, however, seems only to be a passive one.

An absolute space-time?

Another relatively important point the reader may have noticed in the long passage cited above, is Suárez's brief mention of a spatial counterpart of imaginary time: "*just as we conceive some permanent space in bodies, of which some body existing in a place fills some part*, so in a succession of times do we conceive some flowing and successive space…" Suárez does propose a spatial counterpart to imaginary time, the *spatium imaginarium*, or 'imaginary space', and this concept is worth some consideration. It is important to point out, however, that this linking of the ideas of an immutable space and an immutable time probably ought not to be considered in the modern sense of a 'spacetime'. Suárez treats the ideas of 'time' and 'place' in separate disputations, rather than as interrelated entities (as Minkowski does, for example). Further, just as the imaginary succession, which I have been referring to as the immutable flux (generally *imaginaria successio*), is seen by Suárez as a subject to be discussed in conjunction with *Quando*—'Time-when', imaginary space is discussed under *Ubi*—'Place-where'. Again, things take up a certain 'place' within them (as intrinsic time is 'in' a body), and this place is embedded in the 'container' of 'imaginary space'. However for Suárez, space and time, even imaginary space and time, are to be discussed *in relation to the things they contain*, not as an independent arena which ought to be considered separately to, and before, those things (as Newton considers absolute space and time in the "Scholium" to the *Principia*). This is not a coherent, absolute 'spacetime'.

Resting Bodies and the Immutable Flux

In previous chapters, I argued that many philosophers, most particularly Aristotle, had difficulty explaining the temporal transition that a resting body undergoes, within their metaphysics of time. The problem is a frequent feature of explanations of time, such as Aristotle's, which explain time as an ontological effect of motion.

Suárez seems to side-step this problem of Aristotle's as easily as he does Ockham's problem. As I mentioned in the introductory section, Suárez explains the intrinsic

duration of a body as being of the same kind as its *esse*. Thus successive existence (motion) has a successive intrinsic duration suited to it. Resting bodies (what Suárez refers to as *permanentia*), can therefore be thought of as having a non-successive intrinsic duration—they must have an unchanging duration which is suited to their unchanging existence. And this is just how Suárez describes bodies at rest. (In the following passage, remember that when Suárez refers to 'duration' simply, he means 'intrinsic duration'. 'Imaginary time' is always more specifically defined):

> ...for just as rest [*quies*] is called lasting in the same place, so the duration [of a resting body] is called lasting in the same existence. Therefore just as rest in a thing is no more than the privation of motion, so [its] duration is no more than a negation [of intrinsic duration].[130]

A resting body has no change in its intrinsic duration, its intrinsic duration is a 'negation'—a nothing. If we return to the chart above which showed comparisons of intrinsic time to the immutable flux, we can see how Suárez's description of intrinsic durations and their place in the immutable flux appears to work as well for resting bodies as moving ones. As well as the two moving bodies, X and Y, imagine a motionless body, Z. The motionless body would not have multiple parts of intrinsic duration, because it does not move through space, and it would not "acquire its being by degrees". Yet there is an important sense in which the resting body *is* successive. When a resting body is coinciding with *t2* of the immutable flux, it is clearly 'earlier than' it is at *t3*. And Suárez clearly does want the resting body to be able to be described as lasting *through* the succession of the immutable flux:

> ...by reason of the power of its own actual existence [a thing] happens necessarily in its own imaginary time, or in some of it. And ... if the same unchanging existence is maintained, it is able to coexist to all of that [imaginary succession], even if it is extended in an infinite succession or is conceived as so extending.[131]

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[130]Suárez, *ibid*., 50, II, 16. "...nam sicut quies dicit permanentiam in eodem loco, ita duratio dicit permanentia in eodem esse; ergo sicut quies in re non addit, nisi privationem motus, ita duratio non addit, nisi negationem." p. 921. My translation.

[131]Suárez, *ibid*., 50, II, 20. "...res quaelibet ex vi suae actualis existentiae, ut sic, incidit necessario in tempus ipsum imaginarium, vel in aliquid ejus, et ... si eadem existentia immutata perserveret, potest coexistere toti illi, etiamsi in infinitum successive extendatur, seu extendi concipiatur..." p. 922. My translation.

Thus, there is a sense in which a resting body undergoes succession—succession cannot only be explained as an internal, intrinsic attribute of moving bodies. There can be a 'before and after' in resting bodies, and indeed even a moving body can have its successive existence described solely by reference to the immutable flux, and without regard to any 'intrinsic time'.

It may seem that Suárez does not need the difficult theory of intrinsic durations at all. This is certainly a problem. Yet we must remember that Suárez postulated intrinsic time so that a body's *Quando*—its 'time-when'—could be described as something that was a real attribute of it. Suárez wanted to ground the successive 'coming to be' of a motion in something internal to beings. And the answer to our conundrum lies just here. The chart above represents extrinsic comparisons of motions and resting bodies with the immutable flux, and it was as an extrinsic comparison only that Suárez proposed that flux. In a metaphysical sense, a moving body is quite different from a resting one. It is undergoing an apparent change specific to it, and seems to have a different 'kind' of being. This is why only it is described as successive. The resting body, considered on its own, is not changing. Its intrinsic time can reasonably be considered as not successive. The only succession in the resting body is a *comparative* change of earlier and later. Thus the immutable flux is reinforced as a merely extrinsic kind of temporality. It itself signifies no change in the body, but only a changing extrinsic coexistence with the temporal flow. Only intrinsic times tell us about changes in bodies. The intrinsic succession of moving bodies, as well as the unchanging existence of the *esse* of resting bodies, which have a non-successive intrinsic duration, are both at home in Suárez's dualistic account of time. They can either be considered in respect of their intrinsic durations, which describe a state of change, or lack of it, which is predicable of the kind of existence the body itself has, or in respect of an extrinsic comparison with the absolute reference frame of the immutable flux, which allows us to make statements about relative order of occurrence, or respective speeds, which are both likewise extrinsic denominations.

Measured Time

As well as the immutable flux, which, being extrinsic to bodies, is labelled a kind of 'extrinsic time' by Suárez, there is a second, less metaphysically important, extrinsic

time which Suárez describes—the measured time of heavenly motion. As most thinkers of his time did, Suárez espoused a geocentric system of the world.[132] While the postulation of a motionless heaven does not preclude the use of the *apparent* motion of heaven as a time-keeping device, a 'real' motion might seem more useful still, and Suárez often speaks of the use of the heavenly motion as a *measure* of time.[133] Unlike Averroes and others, however, Suárez does not use this fact to support an hypothesis that the heavenly motion *creates* time. Thus, when Suárez speaks of extrinsic comparisons of time, which are either "real or imaginary", the 'real' time is the *measuring* of time provided by the real motion of heaven, whereas the 'imaginary' is the quasi-absolute temporal 'container' of the 'immutable flux'. The motion of heaven, however, is of no importance in Suárez's ontological description of time, and though it is spoken of as an example of an 'extrinsic' time, as the immutable flux is also, measured time should not concern us here.

Beings of Reason and 'Imaginary Time''.

The notion of 'imaginary time,' and 'imaginary space' require some consideration, at it is difficult to ascertain just what is meant by 'imaginary.' Milič Čapek, for example, believes that references to imaginary space and time refer to the space and time outside of the sphere of fixed stars required by some theologians to allow God to move the cosmos should he wish to do so (as was required in the Decree of 1277 for example). Čapek, however, gives no reference to works which might provide evidence for such a claim.[134]

Suárez's continued references to the immutable flux as 'imaginary', and as 'a concept of the imagination', may rather seem to imply that it should not be considered as a part of physical reality, but rather as a purely mental construct. This sentiment is evident in Stephen Daniel's overview of Suárez in his précis of seventeenth century scholastic treatments of time:

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[132] The *Metaphysical Disputations* was published some fifty years after Copernicus's *De Revolutionibus*, though some one and three decades respectively before Kepler's *Astronomia Nova* and Galileo's *Dialogues Concerning Two Chief World Systems*. (I have found no mention of Copernicus in the disputations I have researched for this study, nor has Daniel found any in the work as a whole, Daniel, *ibid*., p. 588.)

[133] See especially, Suárez, Disp 50, X, 11, p. 961.

[134] Milič Čapek, "The Conflict Between the Absolutist and the Relational Theory of Time Before Newton," p 607.

> Though such a description of the imaginary succession might sound like an anticipation of the description of some concept of *absolute* time (in a Newtonian sense), it is primarily an imaginative construct. ...The positing of a duration in a particular *time-when* reflects the existence of a successive enduring entity which does not encompass the total extent of eternity. As such, this imaginary succession can be interpreted as imaginary in itself, but real insofar as it is the *relationship* of successive durations seen as paralleling eternity.[135]

Yet Daniel believes that "the determination of whether the imaginary succession is in any sense 'real' apart from its perception by finite minds ultimately depends on the status of the predicate [When] itself."[136] Daniel's point is fair, as long as a reading of Suárez on time is mainly restricted to the disputation on time, which *is* primarily concerned with the predicate *When* (remember, the disputation is entitled "Concerning the Predicate When, and the Duration of Things in General"). Because this disputation is fundamentally an attempt to provide an explanation of what the term 'time-when' signifies, and because, for Suárez, 'time-when' is primarily predicated of something intrinsic to the object in question (hence 'intrinsic time'), any attempt to solve the question of the 'reality' of imaginary time by appeal to the predicate will necessarily lead back to the idea of time only being 'real' in its intrinsic sense. If, however, we are concerned with the status of imaginary time, it seems more reasonable to me that we should consider what Suárez himself has to say about the nature of being of imaginary time qua *esse*. To do this, we must instead look to Disputation 54, "On Beings of Reason", since it is primarily as a being of reason that Suárez sees imaginary time (hence its description as a *conceptus imaginarius*—an 'imaginary/mental concept').

A perusal of Disputation 54 reveals that imaginary time should not be considered as a mental construct in the sense of 'figment of the imagination', but rather that it can only be apprehended through appeal to reason because it is lacking in substantial form.[137] Conversely, intrinsic time can also only be apprehended by reason, but in this case because it is so intertwined with motion that it can only be understood as a

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[135]Daniel, *Seventeenth century scholastic treatments of time*, p. 595.

[136]Daniel, *ibid*.

[137]Suárez, *On Beings of Reason (De Entibus Rationis): Disputation LIV*, Milwaukee, Marquette University Press, 1995. Disp. 54, IV, 7, p. 95. Translated by John P. Doyle.

separate entity through reasoned analysis.[138] Thus intrinsic time is not a 'being of reason', as imaginary time is, since it is ontologically 'linked' to substantial being.

If we take into consideration Aristotle's opinion that: "that which is composed of non-existents cannot partake of substance (ουσιας)" (*Phys*. IV, 218a 2-3.),[139] then we can begin to see what manner of being of reason imaginary time is. Suárez divides beings of reason into three categories: relation, which is any relation invented by the intellect but not absolute[140]; as well as privations and negations. These last two both represent 'negative being'. "[P]rivation expresses a lack in a naturally apt subject, but negation expresses a lack in a subject absolutely and without qualification."[141] Thus 'blind' in a man is a privation—it is a lack of sight in a subject with an aptitude to see. Negation is more difficult. 'Nothing', 'unicorn', and 'imaginary time' would all, for Suárez, be negations, since they all represent a non-existence with no corporeal form of being. Yet, if we think on these three terms, they each seem to be 'non-existences' in quite different ways. So, is imaginary time a negation in the way a unicorn represents a negation of being—it is a mere figment of the imagination—or is it a negation in the way we might call a void a negation—something which has no substantial existence, but can, in some sense, be said 'to be'?

Suárez gives us a hint at the answer to this question when he provides an alternative way of categorising beings of reason. As I mentioned earlier, Suárez primarily divides such beings into relations, privations and negations of being. When he attempts to answer the question of *why* we posit beings of reason, however, he strikes at the heart of the problem of just what we intend when we mention them. He provides a division of beings of reason into three acts of the intellect:

> [1] First, there is the knowledge which our intellect tries to pursue concerning those negations and privations which are nothing. For since being is its adequate object, our intellect can conceive "nothing" only in the manner of being, and therefore when it tries to conceive negations and privations it conceives them in the manner of being.

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[138]Suárez, *Disputatione Metaphysicae*, 50, IX, 1-2, p. 951.

[139] Suárez investigates this idea with respect to successive existence—i.e. intrinsic time (Dips. 50, IX, 19-23, pp. 956-8), but alas not directly in respect of imaginary time.

[140]Suárez, *On Beings of Reason*, VI, 1-8, pp. 116-121.

[141]Suárez, *ibid*., III, 8, p. 89.

> [2] ...[A] second cause [derives] from the imperfection of our intellect. For since it sometimes cannot know things as they are in themselves, the intellect conceives them by comparison with one another, and in this way forms relations of reason where there are no true relations.
>
> ...But these two [sources or occasions] are founded somehow in [extra-mental] things, or they are ordered to knowing something which can truly be said about those things.
>
> [3] However there is a third cause resulting from a certain fecundity of the intellect, which can construct figments from true beings, by uniting parts which cannot be united in reality. In this way it forms a chimera or something similar, and thus it forms those beings of reason which are called "impossibles" and are said by some to be "prohibited" beings. In these conceptions, however, the intellect is not in error, since it does not affirm those things to be in reality as it conceives them by a simple concept—in which there is no falsity.[142]

These distinctions show that a negation, such as 'nothingness', which must represent a negation since it lacks substantial form, can be separated from a unicorn or chimera, which has no substantial form because it is a mere 'figment' of the imagination. The first, 'nothingness', is a negation "ordered to knowing something which can truly be said" of it—for example, "There is nothing in this room". The second, quite differently, is a negation formed by the intellect where it "does not affirm [the being] to be in reality."

The above division of beings of reason shows that imaginary time, of possibility, might be said to have some kind of objective being, even though it has no substantial form. It may not be a purely mental construct, as Daniel would have it—indeed Niermeyer's *Mediae Latinitatis Lexicon Minus* suggests a reading of the medieval use of *conceptus* as a "physical conception", as well as a "thought or idea."[143] The following passages from Disputation 54 provide good evidence that Suárez does indeed consider imaginary time to be a negation of the former kind:

> [1] [I]maginary space [is conceived] as having dimensions. But, although it is true that space of this kind, when it is so conceived, is a being of reason, it is, however, included

[142]Suárez, *ibid*., I, 8, pp. 64-65.

[143]Niermeyer's *Mediae Latinitatis Lexicon Minus*, Leiden, E.J. Brill, 1993, suggests a reading of the medieval use of *conceptus* as a "physical conception", as well as a "thought or idea".

> under negation or privation taken in a broad sense. For, that space, apart from dimensions, is something negative. But, in order to explain it, we conceive it and speak of it as if it were something positive. ...This is also the case in the example of imaginary succession, which we conceive apart from real time [i.e. intrinsic time], for which the same reasoning holds as for imaginary space.[144]
>
> [2] [I]maginary space, which we conceive as having dimensions, is ...a kind of negation. For no subject or real capacity is presupposed for it. ...And the same is true for imaginary succession, which is pictured outside all subjects.[145]
>
> [3] ...[I]n imaginary succession [there is] a relation of prior and posterior. [146]

Just as imaginary space has depth, width and breadth, so imaginary time has a quality of immutable flux. Yet apart from these merely logical or geometrical attributes, neither have tangible properties, although it seems that Suárez believes that they do 'exist'. We might consider the problem from the point of view of the way we speak of a vacuum. We might be discussing a real vacuum existing in a vacuum chamber, yet what are we really speaking of? There is nothing in the chamber. We use the term 'vacuum' to describe something that perhaps doesn't really exist, in any substantial sense. Yet it is 'really there'. In this instance we are treading on the toes of nominalism—there is a sense in which our 'vacuum' is a name only, and could be thought of as an artefact of the intellect. I think by labelling imaginary time a 'being of reason' Suárez is hinting that there is an important sense in which this is true. Yet in his talk of 'no real subject or capacity being supposed of [imaginary time]' 'apart from dimension' there is another sense in which it is "founded somehow in [extra mental] things, or [is] ordered to knowing something which can truly be said" about it.

I believe the discussion in Disputation 54 provides sound evidence that, so far as Suárez's metaphysics allow, he really does mean that imaginary time 'exists'. Yet his metaphysics deny him the ability to claim that it is a substance, a claim we would want to be able to make about a true theory of absolute time. When we consider imaginary time, we really are merely considering a 'nothingness', a negation of being, just as we are if we speak of a 'real vacuum'. We can only really speak about

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[144]Suárez, *ibid*., IV, 7, p. 95.
[145]*ibid*., V, 23, p. 114.
[146]*ibid*., VI, 3, p. 118.

imaginary time by using our imagination to conceptualise it, and so it is, quite literally, 'imaginary time'. The writings of the anonymous Coimbra Jesuits give further support to the probability that we should consider 'imaginary' time to be real. Speaking of their own references to imaginary time and space, they say:

> [These spaces] are habitually called "imaginary," not because they are fictitious, or because they depend only on the idea in the mind and do not exist outside the intellect, but because we imagine them in space as having proportions corresponding to the real and positive dimensions of bodies.[147]

It would be good hermeneutic etiquette to deny that we could really be sure just what Suárez really intended by the term 'imaginary time', yet some sort of conjecture on the subject is quite important. Suárez's theory of time is quite impressively comprehensive, and his proposal of imaginary time significant to the later development of theories of absolute time. I believe that the evidence that he thought imaginary time in some sense 'real' is quite sound, and that Daniel is incorrect when he says it is merely an imaginative construct. As a detailed account of the logic and metaphysics underlying a non-physically-causal representation of temporal flow, Suárez's work seems quite clearly to represent an important and new voice in the history of theories of absolute time.

Historical Significance Of Suárez's Account Of Time

Obviously the most significant aspect of time in the *Metaphysical Disputations* is, for the purposes of this study, Suárez's detailed and cogent account of an uncaused, absolute, immutable temporal 'arena', or reference frame, in which all worldly actions and bodies reside. Because the *Metaphysical Disputations* was so widely read, to the extent of being used as a textbook in many Catholic and Protestant universities for up to two centuries after its initial publication, the disputation on time is quite evidently a

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[147] Brundell, *Pierre Gassendi: From Aristotelianism to a New Natural Philosophy*, Dordrecht, D. Reidel Publishing Company, 1987, p. 66. Brundell further notes that Gassendi makes an identical misinterpretation of St. Augustine as accepting the theory of imaginary space as the Jesuits make, further suggesting his reliance on their commentary. *ibid*.

It is also interesting to note that by 1689 the trend of calling absolute time 'imaginary' had slipped away somewhat. In John Locke's *Essay Concerning Human Understanding*, published that year, Locke says: "[Men] term what is beyond the limits of the universe, "imaginary space;" as if it were nothing, because there is no body existing in it. Whereas duration, antecedent to all body, and to the motions which it is measured by, they never term "imaginary..." Locke, *Essay*, Book II, Chap. XV.

very important factor in the subsequent popularisation of absolute models of time both in England and on the Continent. While Suárez himself seems most concerned with providing a non-nominalistic account of the 'when-ness' inhering in all being, through his proposal of an intrinsic form of duration, the other half of his dualistic account of time, the imaginary succession, provides a significantly more articulate and logically insightful positive depiction of an uncaused temporal succession than the earlier negative proposals of medieval scholastic writers such as Duns Scotus and Aureole. However, besides this important contribution to the evolution of time theory, a number of other factors bear mention.

Ties to Medieval Scholasticism

Gracia's remark that Suárez is "both the last major medieval theologian and the first modern philosopher" is well supported by the disputation on time. As well as providing a broad philosophical base for later seventeenth century accounts of an absolute temporal succession, Suárez's account of time also exhibits strong links to his thirteenth and fourteenth century colleagues. A number of factors evidence Suárez's debt to some of the thinkers before him who were discussed in previous chapters of this paper.

1. Use of St. Augustine's Evidence from Joshua X13.

Like the medieval Franciscan philosophers, Duns Scotus and Aureole, Suárez uses St. Augustine's reference to Joshua's battle under an un-moving heaven as the most important piece of hard evidence in support of his proposal of an extrinsic, immutable and successive temporal flux. However, whereas Duns Scotus and Aureole fail to provide a detailed logical account of this flux, preferring to simply suggest that temporality is, in effect, merely the dimension of succession, and does not have a physical cause, Suárez goes further. Duns Scotus and Aureole see the Joshua passage as evidence that temporal succession cannot be the result of the motion of heaven, and reply to the problem by removing the basis of explanation of the temporal flow away from quasi-mechanical physical explanations, such as Averroes', to simply suggesting temporal succession is sufficient to itself and does not require a worldly cause for its propagation. Suárez, conversely, draws two quite separate conclusions from the biblical evidence raised by St. Augustine. On the one hand, he concludes that the

evidence from Joshua shows that time cannot result from the action of the heavenly motion, but that, just as a potter's wheel could continue to turn while the heavenly motion was stalled, every motion contains its own intrinsic succession, and time is therefore multiplied according to the multiplicity of motions—a conclusion Aristotle, Averroes, Duns Scotus and Aureole took pains to avoid. Alternatively, however, Suárez argues that time can also be considered extrinsically as an immutable succession embracing all bodies and motions, and uses St. Augustine's argument about the Joshua passage as support.

In his account of this extrinsic succession, the main discussion of which concludes with the Joshua passage, Suárez seems quite clearly to be drawing on the ideas of Duns Scotus and Aureole. However, because Suárez's dualistic account of time goes beyond this extrinsic succession, he refuses to describe time as succession *only*. In one passage, he criticises Aureole for describing time as succession simply, since God himself has an intrinsic duration, yet he is eternal (unchanging), and does not admit of successive existence.[148]

2. Ockham's 'Mistake'.

Suárez also seems to refer to what, in the preceding chapter, I called 'Ockham's mistake', when he shows that, as well as intrinsic durations, the possibility of a change in the rate of the heavenly motion (as per the example of Joshua) also necessitates a description of an extrinsic temporal 'arena' in which such changes can take place. However, although the parallels between the respective passages in Ockham and Suárez are very close, Suárez does not, in this instance, directly mention Ockham's name.

3. The Influence of Medieval Proposals of a Quasi-Absolute Time.

Suárez's strong ties to the works of Aristotle, St. Augustine, Duns Scotus, Aureole and Ockham, and his awareness of the ideas of these thinkers, is more quantitatively evidenced by the number of times he cites their ideas in the disputation on time:

Aristotle: 32

[148]Suárez, *ibid*., 50, III, 2, p. 923.

St. Augustine: 18
Duns Scotus: 14
Ockham: 7
Aureole: 4

Of the thirty-one authors cited by Suárez in Disputation 50, Aristotle, St. Augustine, and Duns Scotus appear in the top five (along with Aquinas and Bonaventure, who are mainly discussed in relation to their work on changeless eternity and the *aevum*), while all five appear in the top eleven.
Both such quantitative analysis, as well as textual analysis more generally, and the importance placed upon the Joshua passage as a support of the immutable 'imaginary succession', demonstrate strong links between Suárez's work and the ideas of these other thinkers.

The Significance of the Uncaused Temporal Reference Frame.

It seems rather obvious that Suárez's immutable flux fits into a category with Duns Scotus' and Aureole's accounts of time, but is very different to Aristotle's, or to Averroes' and Aquinas's. It seems easy to label the side of the line on which Suárez, Duns Scotus and Aureole sit as 'absolutism', and Aristotle, Averroes and Aquinas as being on the side of kinds of relational models of time. Yet they do all have one thing in common. All believed, as Aristotle puts it, that time is "alike everywhere and for all things" (discounting Suárez's intrinsic time for the moment). In other words, that the temporal reference frame is fixed and immutable. It is important to note this similarity, as well as the factor which differentiates these two views. The differentiating factor is simply that Suárez's immutable flux, as well as the renderings of time of Duns Scotus and Aureole, describe physically *uncaused* immutable temporal reference frames, whereas those of Aristotle, Averroes and Aquinas, are each, in their own ways, *causal* theories of time. If we consider a 'yes' answer to the hypothetical question, "Would time continue to flow in an empty universe?", as a criterion of an absolute theory of time, we must exclude Aristotle, Averroes and Aquinas, because the cause of time would be absent in such a universe. While Duns Scotus, Aureole and Suárez fail to pose such a question for themselves, it seems evident that their answer could well be "Yes". Thus Suárez's 'immutable flux' should be seen to be of historical importance, not just because of the depth and quality of

argument Suárez employs in proposing his immutable temporal reference frame, but because this reference frame is not caused by any physical body or motion.

Most of the items of significance listed above look back to Suárez's predecessors: 1) that Suárez seems to draw inspiration for his extrinsic imaginary time from Duns Scotus and Aureole's ideas of time as an extrinsic succession; 2) that Suárez, like Duns Scotus and Aureole, sees St. Augustine's use of the Joshua story as evidence for an uncaused successive temporal 'container' for motion; and 3) that Suárez's account of an immutable extrinsic succession solves Ockham's conundrum. Yet clearly the most significant aspects of Suárez's work for this study as a whole, are the forward looking ones: the strong foundation his metaphysical account of time provides for subsequent seventeenth century accounts of absolute time. Indeed, Milič Čapek feels that, "There is no question that Suárez's concept of "imaginary succession" containing concrete changes and motions differs only terminologically from that of the independent and uniformly flowing time of Newton."[149] I think Čapek goes a little too far in this claim. Suárez's account of time is very different from Newton's. Most obviously, Suárez sees the simple term 'time' as implying the intrinsic durations of bodies—'imaginary time' is always strictly differentiated from true, intrinsic time, and is always discussed in the sense of a container which holds *things*, not simply and in its own right and conceptually *prior* to bodies, as Newton discusses times absolute time in the "Scholium" to the *Principia*.

Further, one must always differentiate between the significance of an idea or theory in respect of the developments leading up to it, and its significance to the historian, who has the privilege of seeing what was to grow out of it. For Suárez, his treatment of time takes account of the ideas of his predecessors, and solves problems such as Ockham's conundrum of the possibility of a change in the rate of motion of the first sphere. It is also a radically more detailed and concentrated account of time than those provided by his forebears. To the historian, however, Suárez's treatment of extrinsic imaginary time can be seen to provide the logical and philosophical tools necessary for the further separation of time from physical bodies and motions exemplified by later seventeenth century thinkers, such as Gassendi and Newton.

[149] Čapek, *ibid*., p. 607.

Suárez's account of time is quite evidently of great historical importance as a reaction to, and systematisation of, the ideas of his predecessors, resulting in a new and more exact way of speaking about time. Further, it provides a new set of tools for later thinkers to use in their own attempts to explain the problem of temporal succession.

A last look at Scholastic theories of time in the secondary literature: Piero Ariotti

Before moving on from the Scholastic period to consider absolute time in early modern natural philosophy, I shall pause briefly to consider the work of an historian of theories of absolute time whose proposals about the beginnings of absolute time are quite different to my own. Piero Ariotti, who wrote extensively on the genesis of absolute time in the 1970's, is still frequently cited in the literature.[150] I have not referred to Ariotti's work much in the preceding chapters, which contradict his claims, as his work has a simplistic conceptual style, and relies too often on misleading evidence, including decontextualised quotations of primary sources. Ariotti's thesis is that a 'celestial reductionism of time'—the idea that time can be reduced, ontologically, to the motion of the first sphere—was present in Aristotle's work and generally accepted until Copernicus effectively immobilised the first sphere, forcing the invention of absolutism. The thesis is presented in three main papers: the 1972 "Celestial Reductionism of Time"; the 1973 "Toward Absolute Time: Continental Antecedents of the Newtonian Conception of Absolute Time", and the 1973 "Toward Absolute Time: the Undermining and Refutation of the Aristotelian Conception of Time in the Sixteenth and Seventeenth Centuries." Unfortunately, recourse to the primary source materials used by Ariotti to support his claims often turns up evidence that the selections he cites have been taken out of context (sometimes to the extent that in their original context they mean precisely the opposite of what Ariotti implies) and his work must necessarily be dismissed.

[150] Two recent publications citing Ariotti's views are Henryk Anzulewicz's "*Aeternitas – aevum – tempus*. The Concept of Time in the System of Albert the Great," in the 2001 collection: Porro (ed.) *The Medieval Concept of Time: The Scholastic Debate and its Reception in Early Modern Philosophy,* Leiden, Brill, 2001; and T. M. Rudavsky's 2000, *Time Matters: Time Creation and Cosmology in Medieval Jewish Philosophy*, Albany, Suny Press, 2000.

It would be odd to spend time here uncovering these difficulties were it not for the frequency with which Ariotti is cited. This frequency of citation should not be surprising, for medieval temporal absolutism is an obscure area of study, and writers needing to make mention of such theories within the context of broader or different discussions must often necessarily rely on secondary studies such as Ariotti's because there is so little else. I shall only provide a selection of problems with Ariotti's work here, to show why the work of this apparently popular writer has not been made use of in this study.

Ariotti seems to misunderstand a number of key ideas in medieval and early modern thought, often conflating various ideas one with another. An example is his discussion of Nicole Oresme. After demonstrating how Oresme followed the neo-Aristotelian theory of time as a product of the stellar motion, he goes on to suggest that Oresme also held, concurrent with the stellar theory, a belief in an absolute time. He begins in a quite straightforward manner:

Oresme maintained the celestial reductionism of time of the Aristotelian tradition. Time—he agreed with most of the late scholastics—is the number or measure of the motion of the fixed stars. Oresme, however, was also of the view that duration could be regarded in three different ways. The first way is as duration of successive facts pertaining to changeable things and it is time. The second way is also as succession and pertains to things which are in motion but not undergoing changes and it is called *aevum*. The third type of duration is as the duration of God. As he put it:

> And of necessity, the third type is without beginning or end and without succession, but it is at once complete as a whole; and this is the duration of God. [151]

The three-way understanding of time Ariotti sees in Oresme is common throughout scholastic thought, and has strong neo-Platonic overtones. For Plato, there are two time-like things, the unchanging eternity of perfect forms apprehended by reason, and the mutable time here on earth, in which change, generation, and corruption take place. For the scholastics, this view fit nicely with Christian tradition. The unchangeable realm of eternity seemed the perfect 'place' for God, who is himself

[151] Ariotti, "Toward Absolute Time: Continental Antecedents of the Newtonian Conception of Absolute Time", *Studi Internazionali di Filosophia*, v. 5, 1973.p. 145.

unchanging and eternal, leaving the 'temporal world' of change and decay for us humans. All that was left was to suppose another kind of time for created but unchanging beings—angels, for example. This kind of time was sometimes called *aevum* and sometimes *sempiternitas*, and its precise nature was a matter of disagreement between scholastic philosophers.[152] It is reference to these three 'times' that Ariotti has located in Oresme. The quotation from Oresme nicely explains the eternal realm, which is changeless and ageless, and exists all at once.

However, Ariotti completely misses Oresme's point. Perhaps because Newton (and More and Barrow) often equate absolute time with God, Ariotti misconstrues what seems quite plain in the Oresme passage, and concludes that Oresme is talking about absolute time. Ariotti continues:

> The anticipation by Oresme of the Cambridge conception of absolute time is not limited to calling this type or way of viewing time the duration of God. For in spite of the Scholastic-theological vocabulary used by Oresme, it is clear that he saw this type of time in the same way as Newton saw absolute time: utterly uniform, isotropic and isomorphic as we would say:
>
> …this is the duration of God, as the scripture states: God the exalted and sublime, that inhabits eternity. And the Scripture speaks thus of God himself: For with Him *there is no shadow of mutability. God is without past or future*, completely in the present: Because neither any moments of past time is lost nor any anticipation of the future. [Italics by Ariotti]

It is rather bizarre that Ariotti chooses to italicise the very phrase which makes clear the difference between Oresme's eternity and Newton's absolute time: *there is no shadow of mutability…[it] is without past or future*. It seems pretty uncontroversial that Newton thinks of absolute time as being *the* regular *mutans*. Further, it would be plainly ridiculous to imagine that time, for Newton, has no past or future. Were time thus changeless (in Oresme's sense of having no before or after), it is unclear how any of Newton's Laws of *motion* could be accommodated. This confusion about the scholastic idea of eternity is present throughout Ariotti's work, and also colours his discussions of early neo-Platonic theories of time—doubly odd, since his key claim is

[152] Pasquale Porro (ed.) *The Medieval Concept of Time* (*ibid.*) has a number of useful articles exploring the idea of *aevum*, *sempiturnitas* and similar kinds of duration.

that it was the heliocentric universe which necessitated the development of theories of absolute time.

Ariotti also seems to misunderstand the difference between mere measures of time by motion, and theories of time as ontologically dependent upon motion. Worryingly, this misunderstanding, if viewed unsympathetically, could also be seen as misrepresentation of evidence. The most surprising example occurs in all three of the articles I have mentioned above. It surrounds Ariotti's claim that the celestial reductionist account of time was so compelling that even Copernicus himself believed in it.

Ariotti cites an extract from Copernicus' *Letter Against Werner* as evidence: [153]

> [The celestial] view of time was retained by Copernicus in spite of his revolutionary heliocentrism. In the words of the first of modern astronomers:

If one is still in doubt… he should remember that time is the number or measure of the motion of heaven…

However, if one turns to the work in question it is exceptionally clear the Copernicus is merely discussing the efficacy of the apparent celestial motions for calculating the seasons (for the purposes of planting crops, etc). Rather unfortunately, Ariotti so constantly conflates talk about mere measures of time, with talk about the actual ontology of time, that he concludes that Aristotle, Ockham, and Suárez, joined Copernicus in holding a reductionistic theory of time.[154] I agree with Ariotti that Averroes and Aquinas held such a view, but when one investigates Ariotti's sources for the others, it is clear that, like Copernicus, they are only agreeing that time is best *measured* by the motion (or apparent motion) of heaven.

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[153] Ariotti, "Toward Absolute Time," p. 145.

[154] See Piero Ariotti, "Celestial Reductionism of Time," *Studi Internazionali di Filosophia*, August 1972; and "Toward Absolute Time: the Undermining and Refutation of the Aristotelian Conception of Time in the Sixteenth and Seventeenth Centuries," *Studi Internazionali di Filosophia*, v. 5, 1973.

Ariotti's conflation of the measure of a thing and the thing itself is particularly evident in his reading of Suárez on time. He takes the following passage from the disputation on time to support his views:

> ...there is only one time and it is given in the movement of the heavens ... for this movement is the only one in which all the required conditions for measurement are given. This is seen sufficiently in the use that we make of it, for whenever we wish to judge the duration of an action or an inferior movement, we compare it with the movement of the heaven insofar as we can know it.[155]

Ariotti concludes: "Clearly, Suárez's view of time is reductionistic."[156] It seems pretty clear, even just from this passage taken out of context, that Suárez is here only speaking of the measure of time, and if we check the context of the passage in question, this is evidently the case. The only part which sounds odd, is the first sentence, that "there is only one time". This doesn't sound Suárezian at all. Ariotti takes his English translation of the passage from a Spanish translation from the Latin. However, if we move straight from Latin to English, this sentence, too, falls into place:

> ...it is concluded that there is only one time in general, which is a suitable manner of extrinsic measure, and that is in the motion of heaven. (...*concluditur unicum esse tempus in universo, quod propriam rationem extrinsicae mensurae habeat, illudque esse in motu coeli*.)[157]

I think it is reasonably clear that Ariotti has not only taken Suárez out of context, but also chosen to ignore the great bulk of the treatise on time, and only to mention Suárez's thoughts on the *measurement* of time, re-inventing these as his thoughts on the *ontology* of time.

Further, Ariotti's claim that the 'celestial reductionistic' view of time was only dislodged when it became apparent that the lack of motion of the *primum mobile* (via Copernicus/Galileo), and the inconstant orbits of the other heavenly bodies (via

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[155]Francisco Suárez, *Disputationes Metaphysicae*, Disp. L, Sect.X, 11; Text and Spanish translation, S. Rabade Romeo, S. Caballero Sanchez and A. Puigcerver Zanon, *Disputaciones Metafisicas*, Madrid, 1966, vol. vii, p. 246. Quoted in Ariotti, "Toward Absolute Time", p. 34.

[156]Ariotti, *ibid*.

[157]Suárez, *Disputationes Metaphysicae*, 50, X, 11, p. 961.

Kepler), precluded the view that time was generated by heavenly motion, is further rebuffed by the fact that Suárez, Duns Scotus, and Peter Aureole, all of whom propose (to varying degrees) that time is absolute, supported a Ptolemaic theory of celestial motions. Suárez, in fact, fails even to mention Copernicus in his work at all, even though the *Metaphysical disputations* was published some 50 years after Copernicus' publication of *De revolutionibus orbium coelestium*.

The conflation of the Scholastic, neo-Platonic idea of unchanging eternity with absolute time has a broad reach in the secondary literature and is not confined to Ariotti's work. Milič Čapek, for example, proposes that Bernardino Telesio held a theory of absolute time,[158] but it is very difficult to decide, after studying Telesio's text, if he really believed in an independent *mutans*. The first book of Telesio's *De rerum natura iuxta propria principia*, which contains the chapter on time ("*Quid sit tempus*") was published in 1565—in the historical context, a few decades before Suárez's *Metaphysical disputations*. The chapter on time is extremely brief (two pages). Towards the end of the chapter, Telesio denies the Scholastic/Aristotelian theory of time, and proposes time to be independent of motion, saying: "Time in no way depends upon motion, but, it exists by itself, as has been said, and what characteristics it has, it has [them] all from itself, and none from motion."[159] This passage, taken alone, would seem to justify Čapek's claim that Telesio accepts the concept of absolute time. But what 'characteristics,' as Telesio puts it, does this time-independent-of-motion have? Telesio says it is a delay (*mora*), a duration (*duratio*) or an interval or space (*spatium*[160]). This duration does not seem to have a successive quality, but rather time seems 'more or less' to us when bodies move fast or slow. The discussion is brief, and Telesio seems not interested in putting forward his own view of time as much as criticizing Aristotle's. In her overview of Renaissance critiques of Aristotle's theory of time (by which she means what I here call the celestial/Averroean model), Sarah Hutton interprets Telesio's time as "denuded of all

[158] Čapek, *ibid*., p. 606.

[159] Bernardino Telesio, *De rerum natura iuxta propria principia*, Naples edition of 1586. Book I, Chap. 29, "Quid sit tempus." "Nihil enim a motu cum pendeat tempus, sed per se (ut dictum est) existat, quas habet conditiones, a se ipso habet omnes, a motu nullam prorsus."

[160] Čapek, *ibid*., p. 606, has "*extensio*." This is probably a typographic error as he also uses the 1586 Naples edition, which has "*spatium*". Both plausibly translate to 'interval,' however—the translation Čapek uses.

succession and unencumbered by the movements of physical objects."[161] Such a time has more in common with changeless eternity than with flowing absolute time.

Ariotti's conflation of absolute time and extra-mundane non-successive eternity shows a negligence in his treatment of the primary materials, as does Čapek's, to a lesser extent. Further, Ariotti's thesis does not survive a careful analysis of his sources, nor does it account for pre-Copernican, and non-Copernican proposals of absolute time—and it simply cannot.

We now leave the scholastic philosophy behind and turn to early modern theories of absolute time in the work of some key neo-Epicurean atomists—thinkers who do indeed place God's locus in absolute time (and space), but by denying that eternity is an extramundane and changeless place, and insisting it is worldly absolute time (and space) itself.

[161] Sarah Hutton, "Some Renaissance critiques of Aristotle's Theory of time," *Annals of Science*, 34, 1977, p 353.

5.

"*If God reduced the whole universe to nothing, time would still flow*":

Gassendi and 17th Century Epicureanism

Pierre Gassendi is well known for self-consciously introducing neo-Epicureanism into 17th Century natural philosophy. In doing so, he made a key revision of Epicurus' atomism: implanting absolute time into the Epicurean dualism of bodies and void. Gassendi also denied the Scholastic notion that God exists in changeless extramundane space, and made the radical proposal that eternity is successive, and that the locus of God is the temporal world, where he is immanent in absolute time and space.

In this chapter, I examine the development of Gassendi's atomistic cosmology and its differences and similarities to ancient atomism, focusing in particular on Gassendi's novel addition of absolute time to the Greek notion of an absolute space, as well as the transition of these ideas of Gassendi's to English philosophy via the work of his English apologist, Walter Charleton. Here I also introduce Gassendi's equation of God's eternity with absolute time, an idea which is examined in greater detail in the next chapter, especially insofar as it was accepted in and adapted to the English atomistic philosophy. In this chapter, however, my key focus is on Gassendi's ideas about time and eternity, rather than their later influences.

The atomism of the 17th Century began as a revival and revision of the much earlier atomism of Lucretius, Democritus, and Epicurus. While the Greek atomists were agreed that space has independent or absolute existence, absolute time was absent from their philosophy. Epicurus' (341-270 BC) work is best known to us through the obscure biographer and compiler, Diogenes Laertius, whose *Lives and Opinions of the*

Eminent Philosophers (circa 3rd century AD[162]) contains what are judged to be copied extracts of Epicurus' work. Epicurus' ideas about time are preserved in Laertius' transcription of Epicurus' "Letter to Herodotus," in Book X of his *Lives*, where Epicurus calls time a kind of accident.

After discussing the nature of the soul, which Epicurus deduces must be material and composed of atoms (since for him the only primary substances are atoms and void), he turns to the nature of accidents. For Epicurus, accidents are those attributes of the primary material substance (atoms) which give it form, and differentiate one entity from another. For example, an Epicurean might say that while both fire and ice are composed of atoms, fire has the attributes of heat and being rarefied, while ice has the attributes of coldness and solidity. For Epicurus, it is "inconceivable" that an accident could have an existence independent of its subject (Laert. X 71). This is a view with which we might still be sympathetic today, perhaps denying that 'redness,' for example, can exist independently from 'the red thing' (as opposed to Ockham, for example, for whom redness has substantial being, as we saw in Chapter 3). Epicurus similarly considers time to be a kind of accident. For him, though, it is a little different from the other kinds of accidents which inhere in individual entities. Time, he argues, subsists in everything which moves and changes, or is at rest:

> We must not investigate time as we do the other accidents which we investigate in a subject, namely by referring them to the preconceptions envisaged in our minds[163]… We must chiefly reflect upon that to which we attach this peculiar character of time, and by which we measure it. …we have only to reflect that we attach the attribute of time to days and nights and their parts, to feelings of pleasure and pain and to neutral states,[164] to states of movement and states of rest, conceiving a peculiar accident of these to be this very characteristic which we express by the word time.[165]

This passage is perhaps made clearer by reference to Lucretius on time. Lucretius saw himself not as an innovator, but as a faithful disciple of Epicurus, saying: "…you

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[162] The approximate date of the composition given by R. D. Hicks, "Introduction" to Diogenes Laertius, *Lives and Opinions of the Eminent Philosophers*, Loeb, 1925, p. xii.

[163] Epicurus seems here to propose a nominalistic approach to understanding accidents, which have no 'real' existence in themselves.

[164] He argues that pleasure and pain are themselves the result of the motions of the atoms of the soul.

[165] Laertius, *Lives*, X, 72-3.

I follow, O glory of the Grecian race, and now on the marks you have left I plant my own footsteps firm, not so much desiring to be your rival, as for love, because I yearn to copy you…"[166] Following Epicurus, Lucretius says of time:

> …besides void and bodies no third nature can be left self-existing in the sum of things…
>
> Time also exists not of itself, but from things themselves is derived the sense of what has been done in the past, then what thing is present with us, further what is to follow after. Nor may we admit that anyone has a sense of time by itself separated from the movement of things and their quiet calm. [167]

It is deemed likely that both Epicurus and Lucretius borrowed this description of time from Democritus, the father of atomism. None of Democritus works survive, and it is mainly through the works of later philosophers like Epicurus and Lucretius that we can get a sense of his philosophy. However, we can describe the Greek atomistic definition of time as decidedly relativistic.[168]

The idea of space in Greek atomism is very different, however. For early atomists, space had substantial existence, and could usefully be considered as absolute. It would be difficult to find a more succinct statement of this idea than that attributed by Plutarch to Democritus: "No-thing exists just as much as thing."[169] Aristotle gives a fuller description of Democritus's idea of bodies and void:

> Leucippus and his associate Democritus say that the elements are the full and the empty. They call the one being and the other not-being; being is full and solid, not-being is empty and rare. And since *the void exists no less than body*, not-being, they say, exists no less than being. And these are the material causes of existing things. [My italics][170]

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[166] Lucretius, *De Rerum Natura*, Latham translation, 3 3-6.

[167] Lucretius, *De rerum natura*, I 445-6; 459-63.

[168] See also Milič Čapek, *ibid*., who claims that "in the ancient Greco-Roman world there was no general conflict between the absolutist and relational theory of time for one simple reason that the latter theory did not have a rival," p. 596.

[169] Plutarch, Adv. Coloten 8, p. 110 F (DK 68 B 156), quoted in John Mansley Robinson, *An Introduction to Early Greek Philosophy: the chief fragments and ancient testimony, with connecting commentary*. Boston, Houghton Mifflin, 1968, p. 197.

[170] Aristotle, *Metaphysics*, i. 4. 985b 4 (DK 67 A 6), quoted in Robinson, *ibid*., p. 196.

Lucretius, too, insists that "all nature as it is in itself consists of two things—bodies and the vacant space through which they move in different directions."[171] So in the early atomistic philosophy we find an absolute space, or at least a forerunner to absolute space, but, as was the norm until the middle ages, a relational theory of time.

We find a very different treatment of time to that of the Greek atomists in the work of the important 17th Century neo-Epicurean atomist Pierre Gassendi:

> If God reduced the whole universe to nothing, we comprehend that time would still flow; we also understand that if God would wish to recreate the universe, time would flow in the interval between its destruction and recreation.[172]

So our question here is, how and why did absolute time enter the 17th Century neo-Epicurean philosophy?

Pierre Gassendi

Gassendi's philosophic program began as a radical critique of Aristotelian Scholasticism:

> I considered that I should strive with might and main to blunt the spearhead of all this credulity [in favour of Aristotle] and try to do something at the same time to lessen the arrogant presumption of the Aristotelians themselves.[173]

Elsewhere, chastising the Scholastics for their concern with Aristotelian naturalism, he says that:

> [The Schoolmen] examine nothing in this world. When they enter into their Schools they enter into another nature which has nothing in common with this nature outside.[174]

Gassendi's early critiques of Scholastic Aristotelianism eventually produced a positive alternative to Scholasticism, through his development of a Christianised Epicureanism. His intellectual journey from critique of Aristotelianism to the

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[171] Lucretius, *De rerum natura*, I 419-421.

[172] Gassendi, Syntagma Philosophicum*, Opera Omnia I*, p. 222. Translation by Milič Čapek in "The Conflict Between the Absolutist and the Relational Theory of Time Before Newton," p. 600. Note that Čapek mis-cites this passage as occurring on p. 322 of v. I of the *Opera Omnia*.

[173] Gassendi, *Opera Omnia III*, 100. Translation Brundell, *Pierre Gassendi*, p. 19.

[174] Gassendi, *ibid*., p. 16.

provision of a revised Epicureanism is aptly and simply illustrated by observing that Gassendi's first major work, published in 1624, was the *Exercitationes paradoxicae adversus Aristoteleos*, a work following Sextus Empiricus' critique of Aristotelian and Scholastic philosophy; while his final, posthumous work, was the *Syntagma philosophicum*, a holistic physics and ethics based heavily on that of Epicurus and the Stoics.

No doubt aware of the problems inherent in introducing what was rightly notorious as a pagan philosophy, Gassendi argued that the Epicurean philosophy should be seen as no more antithetical to Christian belief than that of Aristotle, who had himself been seen as unorthodox by early medievals:

> The early Church Fathers were particularly opposed to Aristotle and his philosophy, and they displayed extreme animosity against the followers of Aristotle. But when some philosophers were converted to the faith they began to set aside the more serious errors of Aristotle. …Therefore, I say, just as it was possible in the case of Aristotelian philosophy, which is now taught publicly, so it is possible with other philosophies such as the Stoic and Epicurean. …This is the task that I am attempting...[175]

Gassendi consistently claimed that he held the sanctity of Church doctrine above his pagan mentor:

> Whenever I come upon not only those more serious subjects of disagreement between Epicureanism and the Faith, but even things that might seem in only a minimal way out of harmony with Christian Doctrine, it is my intention to oppose Epicurus to the utmost of my ability and to uproot his doctrine with all the power of reason that I can muster.[176]

While the extent of the hostility by the Church to the new sciences may have been overstated by some 19th and early 20th century historians, it is unsurprising that Gassendi would have been keen to distance himself from some of the more extreme pagan or atheistic claims of Epicurus and Lucretius. For example, *De rerum natura* was widely available in the 17th century, and one can well imagine how the following extract from Lucretius would have been viewed by many:

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[175]Gassendi, *ibid*, p. 52.

[176] Gassendi, *Opera Omnia*, vol. V, *ibid*, p. 54.

> Poor humanity, to saddle the gods with such responsibilities and throw in a vindictive temper! What griefs they hatched then for themselves, what festering sores for us, what tears for our posterity! This is not piety, this oft-repeated show of bowing a veiled head before a stone; this bustling to every altar; this kow-towing and prostration on the ground with palms outspread before the shrines of the gods; this deluging of altars with the blood of beasts; this heaping of vow on vow. True piety lies rather in the power to contemplate the universe with a quiet mind.[177]

Gassendi's Christianised Epicureanism avoided pagan ideas and ideals such as these.

An example of Gassendi's attempt to Christianise Epicureanism was his unwillingness to subscribe to the atheistic belief of the ancient atomists that the world is formed through mere chance. The Greek atomists insisted that chance alone was responsible for the all actions in the world—and for them this included not just the motions and shapes of things, but the existence of the soul, which was thought to be material and, worse, mortal.[178] Lucretius felt that it should be no surprise that chance forms all the variety of the universe:

> So many atoms, clashing together in so many ways as they are swept along through infinite time by their own weight, have come together in every possible way and realised everything that could be formed by their combinations. No wonder, then, if they have actually fallen into those groupings and movements by which the present world through all its changes is kept in being.[179]

Importantly, the same variety which is so totally unsurprising for Lucretius, is for Gassendi evidence *in favour* of God's existence and active providence. After considering the variety and utility of nature, he exclaims, "Oh how weak to be, or how dull an understanding to have, if while such a thing is before one [i.e. the varied world], still chance alone is praised!"[180] Such motivations seem to have encouraged Gassendi's radical revision of Epicureanism which saw him implant God as an active

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[177] Lucretius, *ibid*, V, 1193-1203.

[178] For Epicurus on the nature of the soul, see Laertius, X 71, *ibid*. Also Book III of Lucretius' *De rerum natura*.

[179] Lucretius, V, 186-196.

[180] Gassendi, *Styntagma philosophicum (pars secunda, quae est Physica), Sectio Prima, Liber II, De Loco & Tempore, seu spatio, & duratione Rerum*. *Opera omnia*, I. Faksimile-Neudruck der Ausgabe von Lyon 1658, Stuttgart-Bad Cannstatt, F. Frommann, 1964. "O quam oportet hebetem esse, aut quam reclamantem habere conscientiam, si dum ad ista attenditur, sola interim fortuna laudatur!" p. 315. My translation.

agent into the very fabric of the temporal world. We can see this in Gassendi's discussion of the actions of atoms as directed by God. For Gassendi, the motions of atoms are far from random:

> …atoms are the primary form of matter, which God created infinite from the beginning, which he formed into this visible world, which, finally, he ordained and permitted to undergo transformations out of which, in short, all the bodies which exist in the universe are composed. …[Atoms have] the power of moving and acting which God instilled in them at their very creation, and which functions with his assent, for he compels all things just as he conserves all things.[181]

Again, rejecting chance as the cause of the motions of atoms, Gassendi could side-step the inherent paganism of the ancient atomists. [182]Elsewhere, rejecting chance as the cause of the world's variety, he exclaims: "Truly from an agent most wise, most powerful and most free, such as God surely must be, nothing [else] need be required."[183] While God's active participation in nature was not an unusual assumption amongst thinkers of Gassendi's era, Gassendi, as I show below, took a new turn by making God immanent in the world, and in infinite space and everlasting time.

In the *Syntagma*, Gassendi lays out his argument against the Aristotelian notion of time as causally or ontologically prior to motion, saying:

> It seems that Aristotle …correctly guessed the true nature of time, but he missed it when he defined time as the number of motion. For if time is a kind of flow, …it is independent of motion no less than of rest. …Also it is false to say that time is the measure of the celestial motion; but rather the celestial motion itself is the measure of time for the reason that the measure ought to be better known than the measured.[184]

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[181] Gassendi, *Syntagma philosophicum*, Physics, Sect 1, Bk. 3; translated by Craig B. Brush in *The selected works of Pierre Gassendi*, p. 399.

[182] Lisa Sarasohn, "Motion and Morality: Pierre Gassendi, Thomas Hobbes and the Mechanical World-View," *Journal of the History of Ideas*, Vol. 46, No. 3., Jul. - Sept., 1985, pp. 336-7.

[183]Gassendi, *Syntagma philosophicum*, *Opera omnia*, p. 317. "Verum ab Agente sapientissimo, potentissimo, ac liberrimo, qualem Deum esse par est, nihil tale est requirendum." My translation.

[184] Gassendi, *Syntagma philosophicum, Physicae Sectio I, Liber II*; translated by Milič Čapek and Walter Emge, in Čapek (ed.) *The concepts of space and time*, Boston, Reidel, c1976, p. 198.

For Gassendi, Aristotle was correct to associate time with motion, but he had things the wrong way around—time is prior to motion and thus can be measured by motion; it is not the case that motion is causally prior to time.

Significantly, in proposing absolute time, Gassendi abandons the traditional categories, going farther than Suárez, and speculating that time (and space) have a unique kind of being deserving a separate place in the categorisation of being:

> ..the common opinion holds place and time to be corporeal accidents, and consequently that if there were no bodies upon which they depended there would be neither place nor time. ...[However,] place and time do not depend upon bodies and are not corporeal accidents... [since] even if there were no bodies there would still remain both an unchanging place and an evolving time. [All being] is either substance or accident, or place, in which all substances or accidents exist, or time, in which all substances and all accidents endure.[185]

He introduces his definition of what time is by saying that time has a separate kind of being to other things, and noting how close many of the ancients came to recognising this:

> That there is a certain affinity [between time and space] was recognised by Aristotle when he explained in the same book together place, void and time; but even much more by Plato [who] distinguished place and time as two different genera from all other things. Thus he, after dividing the properly existing things into five genera, added the sixth genus, in the sense of the passage following Seneca...: "There is the sixth genus of the things existing in a certain fashion such as the void and time." It also seems that Chrisippus had some inkling of it when, according to Stobaeus, [he] he compared these two things... This seems to be true also of Philo...[186]

For Gassendi, absolute time and absolute space have a unique kind of being and are dissimilar to other worldly things—if anything, Gassendi believed, that which they are most similar in nature to is God, as I shall show below.

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[185]Gassendi, *Syntagma philosophicum*, Sec. 1, Bk. 2, Chap. 1, translated by Craig B. Brush *ibid*., p. 384. See also Edward Grant, *Much ado about nothing: Theories of Space and Vacuum from the Middle Ages to the Scientific Revolution*, Cambridge, Cambridge University Press, 1981, p. 209-10 and see note 182, p. 392, for a detailed discussion of influences on Gassendi in his rejection of the traditional categories for space.

[186]Gassendi, *Sytgama philosophicum*, in Čapek (ed.), *ibid*., pp 198-9.

It is clear that Gassendi draws heavily on Suárez's account of time. Nearby in the text to the passage above, Gassendi criticises those who propose 'intrinsic' or 'imaginary' time, but are coy about defining it precisely. He begins his critique with a reference to intrinsic times such as Suárez's:

> Perhaps you will distinguish, as is customary, intrinsic time from external time; [saying that] the particular motions of inferior things have times which are intrinsic and proper to them and beyond these there is external and universal time...

This passage likely to refers to the long passage from Suárez in the previous chapter, in which Suárez argues that there is an immutable flux which embraces the intrinsic time of bodies and motions. Gassendi goes on, criticising the belief that there are two kinds of time (however Gassendi reduces intrinsic time to the *heavenly* motion, not the motion of bodies generally). His parting shot, however, that imaginary time is the one true time, again echoes the passage from Suárez:

> ...those who discern and admit the so-called imaginary time... admit that time flowed even before the creation of the heavens and furthermore, they concede that the world could have been created before it was created; and that time flows when the world will cease to exist.
>
> But since they are prejudiced, they immediately retreat and claim that besides that imaginary time there is still another time which is truly real in the sense defined by Aristotle… They are prejudiced, I say; for if you look at this matter seriously, there is clearly no other time except that which is called imaginary and which is necessary and which, they admit, continued to flow alone when the heavens were standing still as long as Joshua was fighting the kings of the Armorites.[187]

Where Suárez, for example, is shy of calling anything but intrinsic time 'real,' Gassendi is quite sure that it is only the immutable flux of so-called imaginary time that is real.

[187] Gassendi, *ibid*., p. 198.

Elsewhere in the same text he revisits the Joshua passage, this time clarifying the way we know time when our celestial clock is not moving. Here he seems to recall Duns Scotus' 'potential and privative time':

> No one really believes that while Joshua was fighting with the Armorites, and the heaven stood still, that no time passed and that the number of hours almost equivalent to the full day did not elapse. As the Scripture testifies: "Never before, nor after there was such a long day." But this length cannot be understood in any other way than as a passage of time. Supposing now the heaven stood still (doubtless it can be stopped by God), do you not see that time would flow in the same way as when the heaven was in motion? You might ask: how could there be hours if the motion of the sun would not mark them off? They would exist, not because they were marked off by the motion of the sun, but because they could be marked off by this motion which then could exist.[188]

Thus Gassendi ticks off the great themes in the debate about the independent reality of time: it is connected to motion, as Aristotle says (but Aristotle is wrong to make motion ontologically prior to time); it is an immutable flux, as Suárez says (yet Suárez is wrong to propose two kinds of time); following Duns Scotus, it can be thought of as measurable, even when there is no motion existing, through it's inherent *potential* for measurement by coextension with motion (whether real or imagined). Elsewhere he debunks Ockham's difficulty with a change in the rate of motion of the Sun in a similar manner to Suárez, but without the confusing addition of intrinsic time to his immutable flux.[189]

The most radical aspect of Gassendi's absolutism, as I mentioned above, is that he describes eternity—the locus of God—as equivalent to absolute time, declaring eternity to be a successive entity permeating mundane reality. Before investigating his claims about the spatiotemporal locus of God it is worth pausing to consider the ideas which he was replacing. In previous sections of this study we have met with the scholastic understanding of eternity only tangentially. The extremity of Gassendi's departure from previous thinking on the place of God is well illustrated through a comparison with the ideas of Nicole Oresme, which are arguably representative of the

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[188] *ibid*. p. 201. It is worth noting here that Gassendi subscribed to the Copernican model of the world and was an apologist for Galileo. His reference to the motion of the sun is presumably one made in principle about motions which may be thought by some to cause time.

[189] *ibid*., p. 200.

majority opinion of the Scholastics. In the following passages from *Livre du ciel et du monde* (1377) Oresme paints a typical picture of a neo-Platonic heavenly eternity as the locus of God, which is changeless and exists outside of the celestial spheres:

> There can be no motion without a natural body, and we have already shown that there is and can be absolutely no body and, therefore, no place, no void, and no time outside the heavens. For this reason, the things outside the heavens are not capable of being in a place and time does not age them...
>
> In saying "the things that are outside the heavens," Aristotle refers to the intelligences and principally to the first of these, that is to say, to God. This corresponds to the scriptural passage: For with him there is no change.[190]

For Oresme, eternity is a changeless state, inhabited only by the perfect—by God—which is also changeless. Because Oresme believed, like most Scholastic philosophers, that time results from the motion of bodies, for him it is impossible for change or decay to exist in God's kingdom.

Oresme's rendering of time harmonises with his portrait of the eternal realm. In a longer passage, we see how Oresme divides time into three types: changeless eternity, the temporal world of generation and corruption, and a Scholastic addition to the two Platonic worlds, the 'aevum,' or the time of those things which are created but changeless (such as angels and souls):

> Generally speaking, with regard to the duration of things, one kind of duration is successive or one part after another, concerning things which are actually in the process of change, and this kind of duration is called time. Another type of duration is successive with respect to things capable of motion which are not actually undergoing change, for example, certain incorporeal creatures [such as the soul]. This kind of duration has no special name, but in Latin may be called *aevum*. The third type of duration is not successive, but refers to the continuity of everything together and of things which cannot be altered; it is called eternity.[191]

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[190] Oresme, *Le Livre di ciel et du monde*, Book I, Chapter 24, 8-18; Trans. Albert D. Menut, p.163.

[191] Oresme, *ibid*, I, 24, 29-40; p. 163. See also the my comments on Piero Ariotti in the previous chapter of this thesis. Ariotti misinterprets Oresme's eternity as absolute time itself.

Thus for Oresme duration forms a kind of trinity of the material, the spiritual and the divine, and God acts in our world transcendently rather than immanently.

Gassendi's view of time and God could not be more different from Oresme's. He paints space and time themselves—the very fabric on which, for him, nature is woven—as God's immediate realm, an extremely radical departure from most previous thought:

> How are we properly to explain ourselves as coexisting with God, or (if you will) as lasting a very small part of the duration in which God endures? For indeed, while we exist, we do not imagine two distinct durations [i.e. the temporal and eternal, but] really only one, which with regard to our nature (which begins, and slips away, and moreover is finally ended), is bounded by designable limits; but with regard to the divine nature (which does not begin, nor is it changed, nor is it able to cease) has unlimited extension before and after us.

Elsewhere he says:

> ...as it is proper for created things to be only *somewhere* with respect to place and *sometimes* with respect to time, so it is proper for the Creator to be *everywhere* with regard to place and *always* with regard to time; and so these distinct attributes belong to him: immensity by which he is present in every place, and eternity by which he persists through every time. [192]

With these statements, Gassendi makes clear his belief that there are not *two* (or indeed three) temporal realities—the duration which marks out this changing world, and the changeless, extramundane eternity in which God dwells—but one: that God's eternity and our changing temporal world are one and the same. By describing God's eternity as interwoven with our natural duration, Gassendi places God in the heart of the actions which take place in the world. Of course, I do not mean to suggest by this that previous thinkers denied that God is omnipotent, but rather to highlight the way in which Gassendi paints God's very domain, his eternity, as right here with us in this

[192] Gassendi, *Syntagma philosophicum, Opera omnia*, vol. 1. p. 227. " Quam foret satius dicere, coexistere nos Deo, seu durare parte aliquantula durationis, qua Deus durat? Nempe, dum sumus, non duas distictas durationes imaginamur, verum unicam, quae cum respectu naturae nostrae, quae coepit, & labitur, ac desitura tandem est, designabileis terminos contineat; respectu tamen divinae naturae, quae nec coepit esse, nec mutatur, nec cessare potest, diffusionem ante, & post nos, illimitatem habeat." My translation.

world. We should also note that by bringing the locus of God into the temporal world, 'eternity' in Gassendi's idiom (and many of those after him) comes to mean something more akin to 'never-ending' and 'changeless.'

If God exists *in our ordinary time*, as Gassendi believed, one last great shift away from the Scholastic understanding of time is implied. If God has existed eternally (for ever), so too has time, and it is not the case that it was created with the world. Gassendi argues that:

> We comprehend that even before there were any things time flowed; and from this we acknowledge that they could have been created by God earlier than they were created—that is, either a short time or a long time or even an eternal time earlier. Even now, while they exist, we understand that time flows in the same tenor as it flowed before; and if God reduced the whole universe to nothing, we comprehend that time would still flow; we also understand that if God would wish to recreate the universe, time would flow in the interval between its destruction and recreation.[193]

These passages paint a very different picture of reality to the quasi-Platonic mundane temporal world and extra-mundane changeless eternity which Scholastic thinkers saw as God's true kingdom. Where once we had two worlds, we now have but one.

It seems at least highly plausible that Gassendi's theory of God's mundane existence is borrowed from Jesuit philosophy—we saw hints that eternity may be temporal in Suárez. Throughout his life, Gassendi seems to have been in intellectual contact with the Jesuits. His first teaching positions at Aix—two years as official diocesan teacher of theology and superintendent of theological education, followed by six years as Chair of Aristotelian Philosophy—were brought to an end when the local Bishop put

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[193] Gassendi, *Syntagma Philosophicum, Opera Omnia I*, p. 222. Translation by Milič Čapek in "The Conflict Between the Absolutist and the Relational Theory of Time Before Newton," p. 600. Note that Čapek mis-cites this passage as occurring on p. 322 of v. I of the *Opera Omnia*.

This passage is also fascinating in that it undermines the novelty of Leibniz's claim that Newton's absolute time is nonsensical for implying that God could have made the world earlier—a supposedly irrational state of affairs. Gassendi is quite open on this point. Indeed he says elsewhere: "it is enough to say that God created the world at whatever moment of infinite time it pleased him; for although he would have had a reason, it would be unknowable to us." *Syntagma*, *Opera Omnia*, p. 317 (translated Margaret J. Osler in "Providence and Divine Will in Gassendi's Views on Scientific Knowledge," *Journal for the History of Ideas*, vol. 44, 1983p. 553). This highlights the difference between philosophers emphasising God's omnipotence (Gassendi, Newton), and those interested in his rationality or omniscience (Leibniz).

the Jesuits in charge of the college (apparently belatedly implementing the directions of the council of Trent).[194] Despite this, he was in correspondence later in his life with such Jesuit natural philosophers as Christopher Scheiner, Athanasius Kircher and Pierre Cazree.[195]

Comparing Gassendi's treatment of God's immanent presence in time and space to similar discussions by the earlier Jesuit Suárez shows up further obvious similarities in the ideas of these thinkers. Consider Suárez as he explains the difference between duration and eternity:

> ...to make sense (*ad explicando*) of the present locations, and durations of things, two infinite spaces are conceived by us: one as if continuing, and everywhere infinitely extended without end; another as if successive, which stretches forth, enduring for ever. And [we understand] both these spaces as if filled, actually and necessarily, by God. Indeed the former [is filled] with his immensity, the latter, with his divine eternity.[196]

Taken alone, this passage mirrors Gassendi's remarkably closely. But note the tone of caution in Suárez's treatment of eternity:

> For, just as we conceive some permanent space in bodies, of which some body existing in a place fills some part, so in a succession of times do we conceive some flowing and successive space, of which some part fills all real flowing motion, such that it might have been motion from eternity [*quod si fuisset motus ab aeterno*].[197]

The symmetry between Gassendi's God and Suárez's is remarkable, and at least good indirect evidence of some kind of influence.

It is noticeable that in the words of Gassendi, as with Suárez, we come across the description of time (and space) as somehow imaginary. While the case for the reality of imaginary time (and space) is not completely clear-cut with Suárez, Gassendi is quite explicit, saying of 'imaginary' beings such as these:

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[194] Brundell, *ibid*., p. 1.

[195] *ibid*. p. 17.

[196] Suárez, *Disputationes Metaphysicae*, L, II, 18 (see previous chapter).

[197] *ibid*. For a discussion of the common use of *si fuisset* as a past potential verbal form, see William Cranston Lawton, 'Fourth Class Conditions,' *The Classical Review*, Vol. 13, No. 2, Mar., 1899, p.104.

> [We call them imaginary] not because they do not really exist outside the imagination, but because we imagine their spatial dimensions as being like the bodily dimensions that we are used to observing in corporeal things.[198]

Elsewhere he makes even clearer that imaginary space and time are real entities in the everyday sense. He describes them as:

> …real things, or genuine entities, that actually exist even when no one is conscious of them, and may be distinguished from fictions, such as chimeras and the like, which have no existence except in the mind.[199]

Where Suárez is a little coy about the reality of time and space, Gassendi is clear. Absolute time is real, and no mere concept of the imagination. Our coexistence with God is also literal and takes place in the one, true, absolute time. This belief comes close to the heresy Bruno was so famously executed for holding, so it is useful to pause and consider theological position of Gassendi's claim.

Side-stepping heresy: Pantheism and the 'whole in every part' doctrine

While Gassendi believed God to be immanent in absolute space and time, he was cautious about the nature of God's being. For Gassendi, "We perceive in God... an infinity as if of extension, which we call immensity."[200] God is immanent in the fabric of the world, yet we should only consider this immanence "as if" it were an example of physical extension. Gassendi warns: "I say, *as if* of extension, lest we imagine that the divine substance were extended through space like bodies are"[201] While Gassendi radically transformed the idea of eternity from an extramundane reality to a temporal and successive one, thus moving the locus of God from beyond the world to within the world, he nevertheless retained the common understanding of God's manner of being: Gassendi held only time and space to be extended in the physical sense, saying

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[198] Gassendi, *Opera Omnia*, vol. 1. Quoted in Brundell, *ibid*., p. 66.

[199] Gassendi, *Syntagma philosophicum*, The Physics, Sect. 1, translated by Craig B. Brush, *ibid*., pp 383-4.

[200] *ibid*., p. 384.

[201] *ibid*.

of God: "the divine substance is supremely indivisible and is whole at any time and at any place."[202]

Edward Grant, in his extensive study of the history of theories of space, gives a detailed history of this conception of God as being wholly present in every moment or position, which he calls the "whole in every part" doctrine. The idea that God, as spirit, and is wholly present in every moment and place was the common doctrine throughout the neo-Platonic and scholastic traditions, and was mirrored by the idea that the human soul was similarly whole in every part of the body. A very early example of the idea can be found in Plotinus, who said: "That the Soul of every individual is one thing, we deduce from the fact that it is present entire at every point of the body—the sign of veritable unity—not some part of it here and another part there,"[203] and similarly for God. The idea was likely transmitted to medieval philosophers through translations of the work of John Damascene,[204] from which time, says Grant, it became common in the scholastic philosophy. Oresme, who, it will be remembered, described God's eternal domain as extramundane, nevertheless described God's *transcendent* being as present wholly in every part of the world, saying: "God in his infinite grandeur without any quantity and absolutely indivisible, which we call immensity, is necessarily in every extension or space or place which exists or can be imagined."[205] The idea supported the common scholastic doctrine that for (divine or human) spirit to act on corporeal substance a co-presence of the two was necessary.[206]

The primary role of the whole in every part doctrine is to escape the heresy of pantheism: to suggest that God is physically extended in space and time is to suggest that God can be divided into parts, and that there is a part of God in each created thing. In 1553, Michael Servetus wrote in his *Christianismi restitutio*, "God fills all

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[202] Gassendi, *Syntagma philosophicum*, in Čapek *ibid*., p. 94. See also Grant, *ibid*., p. 210.

[203] Plotinus, *Enneads*, 418 (enn. 4, tr. 9, §1). Quoted in Jasper Reid, "The Evolution of Henry More's Theory of Divine Absolute Space," *Journal of the History of Philosophy,* vol. 45, no. 1, 2007, p. 88.

[204] Grant, *ibid*., note 127, p. 350; see also Reid, *ibid*., p. 88-9.

[205] Oresme, *ibid*., Bk. II, ch. 2, p. 279.

[206] Reid, *ibid*., p.89.

things, even Hell itself....."[207] Servetus was burned at the stake later the same year *Christianismi restitutio* was published for the further heresies of Antitrinitarianism (the denial of the trinity and belief that God is one) and anti-paedobaptism (the rejection of infant baptism). Giordano Bruno was also famously burnt at the stake in 1600 for a wide variety of heresies, amongst them pantheism.

The notion that God must be whole in every place was still current as late as 1688, when Nicholas Malebranche insisted in his *Entretiens sur la Métaphysique et sur Religion*:

> The immensity of God is His substance itself spread out everywhere, and all of it is present everywhere, filling all places without local extension, and this I submit to be quite incomprehensible. ...[But] if you judge of the immensity of God by means of the idea of extension, you are giving God a corporeal extension, [from which it would follow that] the substance of God will no longer be all of it wherever it is.[208]

In the *Syntagma*, Gassendi is careful to make clear that while God is immanent in space and time, this does not mean he is physically extended, saying:

> It is sufficient that God be incorporeal and that he pervade and support the universal machine of the world, but it is not necessary … that his substance is pulled apart, as it were, and cut up into little pieces which become the individual souls, or forms, not only of men, but also of beasts, even of plants, even of metals, of stones, and every single thing, a theory that is not only impious to mention, but also most absurd, as if an incorporeal being, immeasurable and eternal could be broken up, transferred, and enmeshed and affected by bodies![209]

One could not have a clearer rejection on pantheism, as Gassendi, walking so close to the edge with his support of the notoriously pagan philosophy of atomism, evaded the added difficulty of appearing to adopt the heresy of pantheism.

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[207] M. Servetus, *Christianismi restitutio*, quoted in Stephen Mason "Religious Reform And The Pulmonary Transit Of The Blood," *History of Science*, vol. 41, 2003. p. 463.

[208] Nicholas Malebranche, *Entretiens sur la Métaphysique et sur Religion*, trans Morris Ginsberg, quoted in Grant, *ibid*., p. 222.

[209] Gassendi, *Syntagma philosophicum*, in Brush, *ibid*., p. 412.

I return to the theme of God's possible extension in space and time in the following chapter, below, I focus on the introduction of Gassendism to England by his English apologist Walter Charleton.

Walter Charleton: The Popularisation of Gassendism in England

The idea of time being coexistent with God's eternity was taken up with great gusto, along with the neo-Epicurean philosophy more generally, by a number of important English philosophers during the 17th Century. The original source seems to be Gassendi, with the mediator the too often forgotten figure, Walter Charleton (1620-1707). While Charleton's dissemination of the Gassendist philosophy was unashamedly populist, it would be a mistake to underestimate his importance to 17th century philosophy. Indeed Deason notes that, "In an early notebook entitled *Queastiones Quaedam Philosophicae* Isaac Newton … reveals that during his years at Cambridge he read Gassendi, Charleton, and Boyle. [One] entry is taken almost verbatim from Charleton, and the entire notebook exhibits a commitment to the tenets of mechanical philosophy."[210] While Charleton is not an original writer, but more of an intermediary for Continental thought into England, it is worth overviewing the way in which he made Gassendi's philosophy available to a broad English readership, before moving on to a close examination of more original thinkers in the following chapter.

Unlike Gassendi, the Protestant Charleton never missed the opportunity for a snide comment about the Catholic Church. Blessed with what would with understatement be called a healthy ego, Charleton constantly pokes fun at the Scholastic philosophers, to whom he refers as the 'Female Sect', since they are like "women [who] constantly retain their best affection for those who untie their Virgin Zone"—doubtless here referring to Aristotle—"and will never be alienated from immoderately affecting those Authors who had the Maiden head of their minds." He is much kinder to those who pursue 'Truth,' among whom he classes Brahe, Kepler and Galileo. He defines these thinkers as those "whose breasts being filled with true Promethean fire… scorn to submit to the dishonourable tyranny of the usurper, Authority, and will admit of no

[210] Deason, "Reformation Theology and the Mechanistic Conception of Nature," in D.C. Lindberg and R.L. Numbers eds, *God and Nature: Historical Essays on the Encounter Between Christianity and Science*, Berkeley, University of California Press, 1986, p. 181.

Monarchy in Philosophy, besides that of Truth." He also esteems "those who dig for truth in the rubbish of the Grecian Patriarchs," including "the immortal Gassendis." However, recognising his own unoriginality, he refers to himself as a member of the "electing sect" who "above no Authority, pay a reverend esteem, but no implicit adherence to antiquity, nor erect any fabric of natural science upon foundations of their own laying."[211]

Charleton's *Physiologia Epicurio-Gassendo-Charletonia, or a Fabrick of Science Natural, Upon the Hypothesis of Atoms founded by Epicurus, repaired by Petrus Gassendus, augmented by Walter Charleton* was first published in 1652, some six years before the first public edition Gassendi's *Syntagma* and three years before Gassendi's death.[212] Following Gassendi, Charleton dismisses the idea of time being consequent upon physical actions, and presents it as an independent flux, "the twin brother of space."[213] He reserves some praise for the Jesuits, whom he does not mention by name, but rather as:

> ...those Worthies... who confest time to be IMAGINARY, such as flowed infinitely in duration before the Creation, and shall continue its flux after the Dissolution of the World.[214]

We can see already, both in Charleton's disdain for the Aristotelians (in his own case seemingly coupled with a more general anti-Catholic fervour) and in his in some ways incongruous recognition of the contributions of Jesuit philosophy, a parallel sentiment to Gassendi's. His treatment of time is taken straight from Gassendi, although his biting wit makes him far more readable.

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[211] Charleton, *Epicuro-Gassendo-Charletoniana, or, A fabrick of science natural, upon the hypothesis of atoms founded by Epicurus, repaired by Petrus Gassendus, augmented by Walter Charleton*, New York, Johnson Reprint Corp., pp. 94-5. See also Thomas M. Lennon, *The Battle of Gods and Giants: the Legacies of Descartes and Gassendi*, Princeton, Princeton University Press, 1993. pp 97-8.

[212] Charleton is thought to have relied on Gassendi's *Animadversiones in Decimum Librum Diogenis Laertii* (1649), which has an almost identical treatment of space and time to the *Syntagma* (Mc Guire and Tamny, *Certain Philosophical Questions: Newton's Trinity Notebook*, p. 20, note 17.) The *Syntagma* was published posthumously in the 1658 *Opera Omnia* under the same title, in Gassendi's handwriting, heading the three *Tours* manuscripts (*Tours* 706-8). See Brundell, *ibid*., p. 3.

[213] Walter Charleton, *Physiologia*, p. 75.

[214] Charleton, *ibid*., capitalisation appears in the original work.

Charleton begins the chapter on time in his *Physiologia* by surveying the ideas of previous thinkers. He then puts forward his (and Gassendi's) preferred theory of time. The passage is worth quoting at some length, including as it does numerous points of interest to the current study. He begins with a clear and succinct portrait of the eternal (ever-lasting), absolute, constant temporal flow with which we are familiar from Suárez and Gassendi (all italics in the following passages are from Charleton's original):

> As Place, or Space, is the total, is *illimitate* and *immense*: so is Time, in its totality, *non-principiate* and *interminable*. As every *Moment* of Time is the *same* in all places: so is every *canton* or part of Place the *same* in all times. As Place, whether any, or no Body be *collocated* therein, doth still persist the same immovable and invariately: so doth unconcerned Time flow on eternally in the same calm and equal tenor, whether any or nothing hath *duration* therein, whether anything be moved or remain quiet. As Place is uncapable of *expansion, interruption* or *discontinuity*, by any Cause whatsoever: so is Time uncapable of *acceleration, retardation*, or *suspension*...

He goes on to reinforce this understanding of time as absolute by, significantly, turning to the passage from Joshua, which, as we have seen, was so important to medieval statements of independent time, as well as Gassendi's:

> ...[time moved] on no less, when the Sun was arrested in the midst of its race in the dayes of *Joshua*, when the Hebrews vanquished and pursued the Amorrhites, than at any time before, or since. As God was pleased, out of the *Infinite Space* to elect a certain determinate *Region* for the *situation*: so hath He, out of *Infinite Time*, elected a determinate *part* for the *Duration* of the World.

It is also interesting to note that Charleton uses the biblical story to highlight God's freedom to choose when and where actions can take place.

Following Gassendi closely, he goes on to describe how this way of thinking allows us to specify the precise location of an event in space and time:

> And therefore, as every Body, or Thing, in respect to its HERE or THERE, enjoyes a proportionate part of the *Mundane Space*: So likewise doth it, according to its NOW and THEN of Existence, enjoy a proportionate part of the *Mundane Duration*. As, in

> relation to Place, we say, *Everywhere*, and *Somewhere*: so, in relation to Time, we say, *Always*, and *Sometimes*.

As well as declaring that every body and action has a distinct time and place, he emphasises the relationship between God's infinity and immensity, and absolute time and space:

> Hence, as it is competent to the *Creature* to be only somewhere, in respect of Place, and sometimes, in respect of Time: so it is the praerogative of the *Creator*, to be Everywhere as to Place, and Forever, as to Time. And therefore those two illustrious Attributes, *Immensity*, whereby He is praesent in all places, and *Aeternity*, whereby He is existent at all Times, are proper only to God.[215]

The long passage sketched above sums up, in a single argument, all the important ideas about time which have been discussed in the preceding chapters of this study.[216] While Charleton is drawing here on a number of disparate passages from Gassendi's extensive work, he provides us here with a succinct manifesto, of sorts, for absolutism.

Before turning to the reception of atomism in England, it is worth noting a small but important difference between Gassendi and Charleton's understanding of the extended soul. Gassendi's desire to avoid pantheism by falling back on the whole in every part doctrine was not shared by Charleton. Gassendi's refusal to describe God as extended in the *Syntagma*, published posthumously in 1658 (though circulated in manuscript form before then), is not mimicked in Charleton's colloquialisation of the *Syntagma*. Charleton is cavalier in his denial of the whole in every part doctrine for God's temporal eternity, saying:

> Concerning this grand Doubt [the idea that the whole of eternity is present in every 'now'], would Truth have connived, we could most willingly have past it by untouched; because most of our *Christian Doctors* have fully assented unto them in this particular;

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[215] Walter Charleton, *Physiologia*, pp. 75-6.

[216] For the sake of the flow of narrative here, I have not included a discussion of Charleton's treatment of what, in Chapter 4, I called "Ockham's Problem"—of the difficulty of the Sun increasing it's speed. Those interested in the issue might compare Charleton's text, p. 76 of the *Physiologia*, with the passages from Ockham in Chapter 4. Charleton, as an absolutist, makes much more sense than Ockham when he pursues a paraphrase of Ockham's argument. See also Gassendi's *Syntagma philosophicum, Physciae Sectio I, Liber II*; translated by Milič Čapek and Walter Emge, in Čapek (ed.) *The concepts of space and time*.

> but since the convulsion of this their opinion doth stagger no Principle of Faith, or Canonical Document made sacred and established by the Authority of the Church; we shall not deserve Excommunication, nor suffer the expurgatory Spunge of Rome, if we question the Congruity of the Definition, and affirm that *No man can understand it*...
>
> [Those who support the whole in every part doctrine say] that the reason why these Anthropopathical Phrases are tolerable, is because *Eternity is Coexistent to our Time*: but this is *Ignotum explicare per ignotius*; for the manner of that supposed *Coexistence* hath been never explained, and seemeth laid by till the advent of Elias... Nor did they bestow one serious thought upon the consideration of it; for had they, doubtless they must have found their Wit at a loss in the Labyrinth of Fancy... How much better it were said, that we are Coexistent with God; or, that we exist in a small part of that Duration, in which God infinitely existeth? For, while we are, certainly, we cannot imagine *Two* distinct durations; but *one*, which in respect to our Nature, that is principiate, mutable, and terminable, doth contain designable Terms; and in respect of the Divine Nature, which is nonprincipiate, immutable, interminable, hath its Diffusion or Extension infinitely long before, and long after us.[217]

Charleton's words, though elsewhere extremely close to Gassendi's, leave little doubt that for Charleton the idea of the infinite being contained in a point, at least for time, is nonsensical.

Charleton's main interest in presenting his apologia of Gassendi's *Syntagma* appears to have been to popularise Epicureanism while demonstrating that it was 'theologically pure.'[218] As we note above, Charleton's transmission of Gassendi's work into England was read by Newton.[219] There is also excellent evidence that Charleton's work was closely paraphrased in places by Boyle in his work on atoms—although Boyle could not reconcile himself to absolute time and space.[220] These influences are tracked more closely in the following chapter of this study.

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[217] Charleton, *Physiologia*, p. 80-81. Notice how Charleton has drawn directly from the Gassendi passage (quoted in the preceding chapter): "For indeed, while we exist, we do not imagine two distinct durations [i.e. the temporal and eternal, but] really only one, which with regard to our nature (which begins, and slips away, and moreover is finally ended), is bounded by designable limits; but with regard to the divine nature (which does not begin, nor is it changed, nor is it able to cease) has unlimited extension before and after us." Gassendi, *Opera Omnia*, vol. 1, p. 227.

[218] See also Robert Kargon, "Walter Charleton, Robert Boyle, and the Acceptance of Epicurean Atomism in England," *Isis*, 55, 1964, pp 184–192.

[219] See Deason, *ibid*.

[220] Kargon, *ibid*.

Conclusion

Pierre Gassendi's role in the development of the theory of absolute time is perhaps greater than that of any other thinker. In reworking Epicurean atomism into a plausible replacement for Scholastic Aristotelianism, Gassendi implants the tentative absolutism of Jesuit philosophy into the old Greek dualism of bodies and the void. Gassendi's rendering of absolute time is, however, much stronger than Suárez's, for example. In Gassendi, there is no hint that absolute time is anything other than real.

Most radically, Gassendi (followed closely by Charleton) did away with the scholastic notion of an extra-mundane, changeless eternity from which God directs activities in the world transcendently, and this theological shift is central to Gassendi's thought. For Gassendi, eternity and successive absolute time are one and the same. God's 'time' and our time are differentiated only by their respective extents: "we do not imagine two distinct durations really only one, which with regard to our nature (which begins, and slips away, and moreover is finally ended), is bounded by designable limits; but with regard to the divine nature (which does not begin, nor is it changed, nor is it able to cease) has unlimited extension before and after us". Thus Gassendi's, and following him, Charleton's, revision of Epicurean atomism allows—indeed provokes—a parallel revision of the locus of God in the cosmos. In the following chapter, I show how this understanding of God as immanent rather than transcendent affected the development of absolute time in More and Newton's philosophy.

6.

"*The permanent Expansion or Amplitude of the radical Essentiality of God*":

The retreat from independent absolute time: From Gassendi to More and Newton

In closing this study I shall focus on a perhaps surprising claim: that in the philosophy of some English thinkers, most notably Isaac Newton, we see a *retreat* from Gassendi's claim that time is an independent and absolute entity. For Newton, and preceding him Henry More, time is an *effect* of being—and in particular of the spatially and temporally extended being of God. While Newton's portrayal of time and space as aspects God's substantial being is well documented, the arguments underlying his ontology of time and space (and that More) and the relationship of time and space to God's being is not, yet it is of particular interest in the context of the development of theories of absolute time. Newton's famous definition of time, that, as is "well known to all," "...of itself and from its own nature, flows equably without relation to anything external" must be considered in the context of what was in Newton's day a broadly held ontology of time as an effect of divine being.

In *De gravitatione et æquipondio fluidorum* (c.1670) Isaac Newton, perhaps the most famous absolutist of all, retreated from the truly independent absolute time and space of Gassendi. Newton very explicitly proposed that time and space are, after all, accidents of being:

> Space is an affection of a being insofar as it is a being... [and] an emanative effect of the primarily existing being, since if any being whatsoever is posited, space is posited. And the same may be asserted for duration: for certainly both are affections or attributes of a being according to which the quantity of each individual's existence is

> denominated with respect to amplitude of presence [for space] and to persistence in its being [for duration].[221]

Newton could not state more clearly his belief that time and space are effects of being—in the simple sense, of any existing being. However, he goes on to argue that, from an ontological perspective, time and space are not the 'emanative effects' of any ordinary being, or even of the motion of being. They are attributes of God:

> Space has an *eternal duration* and an *immutable nature*, and this is because it is the emanative effect of an eternal and immutable being...[222]

This claim is fundamentally different to Gassendi's. Gassendi claimed that time (and space) precede being, even God's being, "for the reason that the measure ought to be better known than the measured." He makes God's infinity and immensity attributes which he has by virtue of his immanence in space and time, and which are in turn primary categories of being. Here, we look at reasons for this retreat from true independent absolute time in the work of More, and, following him, Newton.

Henry More on God as an extended being.

The development of the idea of (quasi-) absolute time and space as attributes of God's being is clearest in the work of Henry More (1614-1687). Through a number of works written late in his career, More develops the two claims which lead him to consider God as the subject of space and time, the first metaphysical and the second theological: 1) he denies Gassendi's claim that time and space constitute a new class of being, and insists that they must in fact be attributes of something, either corporeal or incorporeal (spiritual); and 2) he denies the whole in every part doctrine, that he believed lead to atheism, leading him to claim that God is necessarily locally extended. From these two lines of thought, More concluded that the entity of which

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[221] Isaac Newton, *De Gravitatione et æquipondio fluidorum*, Add. Ms. 4003, Cambridge University Library, UK. "Spatium est entis quatenus ens affectio... spatium sit entis primariò existentis effectus emanativus, quia posito quolibet ente ponitur spatium. Deque Duratione similia possunt affirmari : scilicet ambæ sunt entis affectiones sive attributa secundum quæ quantitas existentiæ cujuslibet individui quoad amplitudinem præsentiæ et perseverationem in suo esse denominatur." My translation.

[222] Newton, *ibid.* "Denique spatium est æternæ durationis et immutabilis naturæ, idque quòd sit æternis et immutabilis entis effectus emanativus..." My translation and italics.

time and space are attributes must be an incorporeal being, and that that incorporeal being must be God himself.

In a 1648 letter to Descartes, More clearly proposed time to be absolute with reference to material being, arguing that an absolute vacuum must (*contra* Descartes) be possible, since just as time can exist in an empty universe, so measurable space must be able to exist in a vacuum:

> ... if God annihilated this universe and then, after a certain time, created from nothing another one, this *intermundium* or this absence of the world would have its duration which would be measured by a certain number of days, years or centuries. There is thus a duration of something that does not exist, which duration is a kind of extension. Consequently, the amplitude of nothing, that is of void, can be measured by ells or leagues, just as the duration of what does not exist can be measured by hours, days and months.[223]

More's ideas about the nature of God and the human soul shifted markedly over the course of his career,[224] yet his acceptance of the theory of absolute time and space is common throughout his work. In the *Enchiridium metaphysicam* of 1671, in particular, we see that More did not believe, with Gassendi, that time and space could be considered as new and separate categories of being. More instead followed the majority opinion in insisting space and time (or as he puts it, eternal extension) must belong to the traditional categories of being as either subjects, or as attributes depending on a subject:

> ...something that is a real attribute of some real subject can be found nowhere else except where in the same place there is some real subject under it. And, indeed, extension is the real attribute of a real subject (namely matter), which however is found elsewhere [where there is no matter, for example in a void] and that independently of our imagination. Indeed, we cannot not conceive a certain immobile extension

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[223] Henry More, Second letter to Descartes, translation by Alexandre Koyré, *From the closed world to the infinite universe*, Baltimore, Johns Hopkins University Press, 1968. p. 120. The letter in its original Latin is included in *Henry More: A Collection of Several Philosophical Writings, in Two Volumnes*, (Cambridge, James Flesher, 1662. Facsimile copy, New York, Garland Publishing Company, 1978) under the title "Clarisimo Viro, Nobilisimoque Philosopho, Renato Descartes, Henricus Morus Anglus," vol. I, pp 71-81. The passage is on pp 73-4.

[224] The most thorough investigation of the evolution of More's thought is to be found in Jasper Reid's "The Evolution of Henry More's Theory of Divine Absolute Space," *Journal of the History of Philosophy,* vol. 45, no. 1, 2007, 79–102.

> pervading everything to have existed from eternity, and which will exist to eternity (whether we think of it or not) and really distinct, finally, from mobile matter. Therefore it is necessary that some real subject be under tis extension, since it is a real attribute. This argument is so solid that nothing can be more solid. For, if it be shaky, we can indeed conclude the existence of absolutely no real subject in the universe. [225]

It is impossible for More to imagine a world devoid of space and time (which he collapses into a single extension which is both 'eternal' and 'infinite' in the quote above). As extension is an attribute, it is obvious to More that there must be some subject to support it. Says Koyré of this passage: "Henry More is perfectly right. On the basis of traditional ontology—and no one in the seventeenth century (except, perhaps, Gassendi, who claims that space and time are neither substances nor attributes but simply space and time) is so bold or so careless as to reject it or to replace it by a new one—his reasoning is utterly unobjectionable."[226]

Yet while More's insistence that spatial and temporal amplitude cannot be attributes without a subject to support them may well have been unobjectionable to his contemporaries, the problem of finding a subject (and it should be clear by now that More is heading towards God for this task) which might have space and time as properties is a difficult one. It is not a matter of simply asserting a subject for a given attribute; the metaphysical requirements of explanation of the connections are inherently complicated. For example, earlier in this study, I described how William of Ockham took a nominalist approach to the problem of time because he could not find what he saw as a necessarily corporeal subject with appropriate properties to have time as an attribute, and could not accept claims, such as those of Duns Scotus and Aureole, that time could exist somehow *per se*. Suárez dealt with the problem by proposing *two* kinds of time, a 'real' intrinsic time which is properly attributable to bodies, and an 'extrinsic flux' about the categorical place of which he was rather vague. Gassendi was forced to admit absolute time (and space) in fact constituted separate categories of being, since he could find no suitable subject—God could not be the subject of space and time because Gassendi denied that God, like space and

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[225] Henry More, *Enchiridium metaphysicam*, c. viii, 6. Translated by Alexander Jacob, *Henry More's Manual of Metaphysics: A Translation of the Enchiridium metaphysicam (1679) with an Introduction and Notes*, pp 56-7.

[226] Koyré, *ibid*., p. 146.

time, was locally extended. Nor could he find an appropriate metaphysical category under which to place time and space themselves as subjects. This, however, meant Gassendi was left with three perfect and absolute existents: time, space, and God—a problematic position to take on the uniquity of the Divine.

In the earlier *Immortality of the Soul* (1659), More had proposed a refined definition of substance, dividing it into two kinds: the physical, 'Body', and the spiritual, 'Spirit':

> I will define... a *Spirit* in generall thus: *A substance penetrable and indiscerpible*. The fitness of which definition will be better understood, if we divide *Substance* in generall into these first Kindes, viz. *Body* and *Spirit* and then define Body *A Substance impenetrable and discerpible*. Whence the contrary Kind to this is fitly defined, *A substance penetrable and indiscerpible*.[227]

With his denial of Gassendi's claim that time and space constitute a new class of being, and an insistence that they must in fact be attributes of something, More set himself up for his claim that the subject of these infinite attributes must be God himself. But since space and time are locally extended, surely their subject must locally extended also. In order to make such a claim about God—one which was too much even for Gassendi—More had also to deny the widely accepted whole in every part doctrine.

The second line of argument underlying More's idea of God as locally extended in space and time, the rejection of the 'whole in every part' doctrine, is much clearer in More's writings than in the passages from Charleton discussed in the previous chapter of this study—indeed the explicit denial of the doctrine is a hallmark of More's later writings. More was initially a believer in the whole in every part doctrine,[228] but

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[227] Henry More, *The immortality of the soul*, bk 1, chap iii, i, p. 21, in *Henry More: A Collection of Several Philosophical Writings, in Two Volumnes*, (Cambridge, James Flesher, 1662. Facsimile copy, New York, Garland Publishing Company, 1978), vol. II, p. 21.

[228] For example More, in his *Philosophical Poems* of 1647, wrote that:

For in each Atom of the matter wide
The totall Deity doth entirely won,
His infinite presence doth therein reside,
And in this presence infinite powers do ever abide.

became in his later years a great advocate against it, calling it "holmerianism" (from the Greek for "whole in parts"). Jasper Reid, in his extremely thorough history of the development of More's conception of absolute space ("The Evolution of Henry More's Theory of Divine Absolute Space") describes how by the publication of his *The Immortality of the Soul* in 1659, More openly denied holmerianism, at least for created spirit, calling it: "the Scholastick riddle, which, I must confess, seems to verge too near to profound Non-sense, That the Soul of man is *tota in toto*, and *tota in qualibet parte corporis*."[229] More's denial of holmerianism for created spirit (that the soul can be whole in itself, and also exist in its totality in each part of the body) and the sentiment underlying it, is not dissimilar to Charleton's dismissal of the holmerianism of eternal spirit seven years earlier.

Reid argues that More's eventual denial of holmerianism was made in response to Hobbes' use of the whole in every part doctrine to deny the existence of the immaterial soul. In 1651, in his *Leviathan*, Hobbes wrote:

> ...the essence of a man, which (they say) is his soul, they affirm it, to be all of it in his little finger, and all of it in every other part (how small soever) of his body; and yet no more soul in the whole body than in any one of those parts. Can any man think that God is served with such absurdities? And yet all this is necessary to believe, to those that will believe the existence of an incorporeal soul, separated from the body.[230]

More responded in his *The Immortality the Soul* of 1659. More quoted the Hobbes passage directly, using it to deny holmerianism as a threat to the belief in the material soul. Reid comments:

> More could no longer view holmerianism as possibly a foolish but ultimately a harmless eccentricity of the Schools. It was now actually beginning to injure the reputation of spiritualism in general, and threatening to bring about a rise in materialism; if a spirit was going to have to be like *that*, the materialists felt, then it would surely be far more reasonable not to believe in any such things at all. It thus suddenly became extremely important for More either to provide the theory with a

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More, *The Argument of Democritus Platonissans or the Infinitie of Worlds*, in *A Platonick Song of the Soul*, pp 425-6. See also Reid, *ibid*., p. 90.

[229] Henry More, *The Immortality of the Soul*, quoted in Reid, *ibid*.

[230] Thomas Hobbes, *Leviathan*, quoted in Reid, *ibid*. p. 98.

> rigorous defense against Hobbes' charge of absurdity, or else to distance himself from any association with it. But More decided that, as a matter of fact, the theory was indefensible.[231]

By 1662, in the Preface General to his *A Collection of Several Philosophical Writings*, More was openly claiming that Spirit must be substantially extended:

> ...it being so mathematically demonstrable that there is that which is properly called *Spirit*, and that no Being at all can be *totally present* in distant parts of Matter at once, it does unavoidably follow, that a Spirit is in some sort extended.[232]

Why should More, and Charleton, not be perturbed by the heresy of pantheism inherent in the claim that spirit is locally extended? Certainly Charleton seems rather playfully snide in his doubt that he must "suffer the expurgatory Spunge of Rome," and no doubt the threat of heresy against what was traditionally a Catholic dogma may have been of little or lesser concern in Protestant England. Indeed, Reid surmises that More saw his support of the theory of God's local extension as an act in accordance with faith:

> Like most seventeenth-century philosophers, More took Acts 17:28 ["For in him we live, and move, and have our being; as certain also of your own poets have said, For we are also his offspring"[233]] very seriously indeed, and he was inclined to interpret that text in an extremely literal sense. As far as More was concerned, we could be understood to "live, and move, and have our being" in God *locally*, to the extent that the various regions of His own amplitude were what constituted the internal places of His creatures.[234]

By 1668 More was content to pronounce everlasting extension as an attribute, with the divine spirit as subject:

> ...that *inmost extension* or *amplitude* which will necessarily remain after we have imagined all matter, or whatever else is removeable, removed or exterminated our of

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[231] Reid, *ibid*., p. 99.

[232] More, *A Collection of Several Philosophical Writings*, quoted in Reid, *ibid*., p. 99.

[233] Acts 17:28, King James Version

[234] Reid, *ibid*.

> the world, is to be look'd upon as the *permanent expansion* or *amplitude* of the *radical essentiality* of *God*.[235]

Three years later, in the *Enchiridion metaphysicum* of 1671, More put forward his famous argument that the similarities in the qualities of both God and everlasting extension point to their being one and the same thing:

> For this infinite and immobile extension will be seen to be not something merely real (which we have noted in the last place) but something divine after we shall have enumerated those divine names or titles which suit it exactly, and with the greatest certainty make it not possible to be nothing, seeing that so many and such excellent attributes fit it. Of which kind are those which follow, which metaphysicians specifically attribute to First Being. Such as one, simple, immobile, eternal, complete, independent, existing from itself, subsisting by itself, incorruptible, necessary, immense, uncreated, uncircumscribed, incomprehensible, omnipresent, incorporeal, permeating and encompassing everything, Being by essence, Being by act, pure Act. There are not less than twenty titles by which the divine numen should be designated, which most aptly suit this infinite internal place which we have demonstrated to be in the universe.[236]

More's claim for the spirituality of absolute space and time (or temporally everlasting infinite extension, as he saw it) is yet another argument against the feared ranks of

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[235] More, *Divine Dialogues, Containing the Attributes and Providence of God*, (Glasgow, Robert Foulis, 1743). Dialogue III, pp 448-9. In a letter to Descartes written much earlier that this passage, in 1648, More had written "Now, for my part, I consider it to be evident that God is extended in His own manner from this: that He is certainly omnipresent, and He intimately occupies both the entire mundane machine and each individual particle thereof. For how could He impress motion onto matter, as He once did, and as you claim He still does even now, unless He closely touched the matter of the universe, or at least had once touched it?" Jasper Reid, who quotes this passage in his "The Evolution of Henry More's Theory of Divine Absolute Space," argues that "what we find when we look a bit more closely at this correspondence overall is that this so-called "extension" did not amount to His being spread out with parts outside parts. Instead, it referred *merely* to His being substantially present in the spatial world," Reid p. 92. Reid argues many authors have misunderstood this passage as being an early denial of holmerianism, citing a number of writers (Brian Copenhaver, "Jewish Theologies of Space in the Scientific revolution: Henry More, Joseph Raphson, Isaac Newton and their predecessors," *Annals of Science* 37 (1980): 489–548, esp. 519–21; Michael Boylan, "Henry More's Space and the Spirit of Nature," *Journal of the History of Philosophy* 18 (1980): 395–405, esp. 398–400; J. E. power, "Henry More and Isaac Newton on Absolute Space," *Journal of the History of Ideas* 31 (1970): 289–96, esp. 289–90; Grant, *Much Ado*, 223—cited Reid, note 53, p. 93). It is possible Reid is right about More's intent, indeed Reid's argument is convincing. Descartes, however, in his reply to More, appears to believe that More is contending that God is locally extended, saying: "I am ... surprised... that you suppose that God has *partes extra partes*, and that He is divisible, and, in short, attribute to Him all the essence of a corporeal being." Descartes, *Descartes to Henry More*, 5, ii, 1649, quoted in Koyré, *ibid*., p. 117.

[236] More, *Enchiridium metaphysicam*, c. viii, 8. Translated by Alexander Jacob, *ibid.*, p. 57.

atheists. Just as he could not accept Hobbes' flirtation with the non-necessity of the human soul, nor could he stomach the clockwork world of the Cartesians, who merely asserted the necessity of God rather than providing for it in their mechanics. Before making this important claim, above, in the *Enchiridion metaphysicum* More contextualises it as one which ensures God's place in a universe from which Descartes would seek to "expel him":

> [Descartes] tries to conclude from this argument that the Space, which is said to be a void, is the very same thing as that corporeal substance that is said to be matter. I, on the contrary... [conclude from the same reasoning] it to be a certain incorporeal substance, or spirit... And so, through that very dor by which the Cartesian philosophy is seen to wish to exclude God from the world, I, on the contrary (which I am confident will attend me with the happiest success) strive and strain to bring Him back.[237]

As John Henry has shown, however, there is rather a large flaw in More's conflation of God with space: More's metaphysics require spirit to have the opposite attributes to body, with the result that God is hardly in a position to act upon bodies as he must, as spirit, be entirely passive:

> [There is a] serious failing in More's theory of space which, as far as I know, has never been pointed out. His painstaking efforts in the *Enchiridion metaphysicum* to establish his concept of empty space were undertaken because More regarded empty space - extended but immaterial -as the perfect exemplar of spirit. Indeed, his claim that the attributes of infinite space show a one-to-one correspondence with the attributes of God is well-known. During his discussion of the attributes of empty space, however, More glosses quickly over the fact that his supreme exemplar of spirit (the active principle in his universe) is so completely passive and inert that it is totally noninteractive.[238]

This is a big problem, and one with which Newton, following More, also struggles as I discuss below.

More's denial of holmerianism, which he came to see as so absurd as to furnish atheists with an argument against the existence of spirit, left him with little choice but to support the local spatial and temporal extension of soul within body, and, by logical

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[237] Henry More, *Enchiridium metaphysicam*, viii, 7. Translated by Alexander Jacob, *ibid.*, p. 57.

[238] John Henry, "A Cambridge Platonist's Materialism: Henry More and the Concept of Soul," *Journal of the Warburg and Courtauld Institutes*, Vol. 49, 1986, p. 178.

progression, God within the universe. In imagining God as physically extended, More was able to side-step the problem which had lead Gassendi to cast absolute space and time as infinite existents separate from both God and the accepted categories of being. Space and time were restored to their old position as accidents of being. But with More's division of being into the spiritual and physical, time no longer needed a physical subject, such as motion in general, motion of the soul, or the motion of heaven—the three possible subjects which had been the focus of earlier attempts to define time, and which had lead Duns Scotus, Aureole and Suárez to propose a metaphysically problematic quasi-absolute time. Of course, More's time is only absolute in respect of material being, in the sense that it has no material cause. Gassendi, perhaps, is the only thinker (who gives a detailed theory of the ontology of time) to believe time to be properly absolute.

In the work of Henry More we can see the detail of the development of his ideas about time in a way we cannot with other English thinkers of his time, who have left us much less in the way of extant texts, for example Newton, with whom it seems appropriate to conclude this study. Not, however, as the thinker whose work is the hallmark of absolutism, but as the thinker whose writings on absolute time are the best known.

Newton's absolutism

My discussion of Newton here may seem surprisingly brief, considering that it is Newton of whom we probably most often think when speaking of absolute time. Here, I discuss the elements in Newton's work that show his indebtedness to the philosophers I have discussed in previous chapters, but focus primarily on the most interesting aspect of Newton's absolutism—that it forms, in fact, a *retreat* from the full-blown absolutism of his predecessor, Gassendi. In Newton's ontology of time we see a development and refinement of More's idea that time is an effect of the ever-lasting existence of God.

As is well known, Newton was influenced by More's work on a number of matters. More was Newton's teacher at Cambridge and they shared a friendship until More's death; certainly, there is a well-established direct influence of More's work on

Newton's understanding of time and space, and of God.[239] In his unpublished papers, Newton builds upon an understanding of God as extended which is very similar to More's, closing the circle, in a way, back to older ideas about time as an accident.[240] As I show below, More was forced, eventually, to admit that God must be locally extended, and thus divisible, Newton shows that time and space are not themselves divisible, and thereby avoids claiming the divisibility of God.[241]

One cannot but begin any discussion of Newton's work on time without quoting the famous passage in his Scholium to the Definitions of the *Philosophiae Naturalis Principia Mathematica*, where he characterises time (and space and place) as absolute entities:

> Hitherto I have laid down the definitions of such words as are less known, and explained the sense in which I would have them to be understood in the following discourse. I do not define time, space, place, and motion, as being well known to all.

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[239] For some examples, see Westfall, *Never at Rest: The life of Isaac Newto**n***, Cambridge, Cambridge University Press, 1993; as well as Koyré, *ibid*, especially p. 190; J. E. Power, "Henry More an Issac Newton on Absolute Space," *Journal of the History of Ideas*, 31, no. 2; and G. A. J. Rogers, "Locke, Newton, and the Cambridge Platonists on Innate Ideas, *Journal of the History of Ideas*, Vol. 40, No. 2. (Apr. - Jun., 1979), pp. 191-205.

[240] I have not included discussion in this study of Barrow's use of absolute time, nor his (possible) influence on Newton, for the focus of this study is key developments in the idea of absolute time, and I find little in the work of Barrow that is not also to be found in the work of Gassendi.

[241] Another possible influence on Newton in his account of time is the anti-Aristotelian philosopher J.B. Van Helmont. Walter Charleton translated a number of van Helmont's tracts, Boyle is known to have used some of his arguments and Newton is said to have studied his works closely (see Allen G. Debus, *Man and Nature in the Renaissance*, p. 130). Van Helmont's treatise on time is thought to have been a response to, and rejection of, the philosophy of Suarez and the Spanish Jesuits (see Walter Pagel, "J.B van Helmont, De Tempore, and Biological Time," p. 380), and it is probable that he was directly influenced by Plotinus' work (ibid., pp. 389-91). Van Helmont's *De tempore*, published in 1648 as part of his *Ortus Medicinae*, provides another case of a neo-Platonic account of time which may initially sound absolute but turns out, on closer inspection, not to be so (as we have seen with Oresme and Plotinus), for example in the following passage:

> I first considered that when the heaven stood still, no other time existed while the sun stood still than exists now... For even if this detention of the sun was miraculous, duration was certainly not likewise... From that I soon learned that the Duration which they call Time is a real Ens. Also, if time was from the beginning before a creature was made, it cannot be among the created objects (van Helmont, *de Tempore*, translated by Walter Pagel in "J.B van Helmont, De Tempore, and Biological Time," passages XXV-XXVII, p. 363-4).

So far we could be reading from Duns Scotus. But then comes a jarring note:

> I... believe that true time is pure, without blemish of creature, is everywhere and always immutable and *in no way successive* (ibid, XXXI, p. 365, my italics).

For van Helmont, time is only successive when it is in a motion. Time itself is not successive, but inheres in beings, and their motion gives time its apparent succession. Van Helmont may have influence other aspects of Newton's work, but not this. Van Helmont's time is another example of the belief that perfect and changeless eternity is the primary 'kind' of time; a belief which could not be more different from Newton's insistence on a time which "flows equably without relation to anything external."

> Only I must observe, that the common people / the vulgar [vulgus] conceive those quantities under no other notions but from the relation they bear to sensible objects. And thence arise certain prejudices, for the removing of which it will be convenient to distinguish them into absolute and relative, true and apparent, mathematical and common.
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> I. Absolute, true, and mathematical time, of itself, and from its own nature, flows equably without relation to anything external, and by another name is called duration... [242]

(After this he goes on to differentiate between absolute and relational space place, and motion also.) This passage can be read in a number of ways: at face value, Newton appears to be saying that his characterisation of time, space and place as absolute is something new, and a better characterisation than that usually given (by the common people). In the context of this study, however, it is the claim that time, space and place are materially absolute may be read as that which is "well known to all." Indeed, as has been the main contention of this thesis, a significant number of then well-known thinkers, including those who are known to have influenced Newton's ideas, such as Gassendi and Charleton, believed time and space to be absolute. Further, his explicit characterisation of time as absolute at the end of the passage above, if read with reference to Newton's unpublished works, suggests that he is contrasting his characterisation of time (and space and place) as absolute with those of other philosophers whom he considers 'vulgar,'[243] and that he is likely referring to Descartes. Indeed, in *De gravitatione* he refers to Descartes' and the Cartesians' ontology of extension, motion, space and time is terms such as "absurd," "confused and contrary to reason," "repugnant to reason," and "fallacious and unsound."[244]
In the General Scholium added to the second, revised edition of the *Principia* in 1713, Newton gives a fuller account of his view of time, space and of God. It is likely that these additions were in part a response to attacks by philosophers such as Berkeley on

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[242] Newton, *Sir Isaac Newton's Mathematical Principles of Natural Philosophy and his System of the World*, translation Andrew Motte (1729), revised Florian Cajori, Berkeley, University of California Press, 1966, p. 6.

[243] Koyré agrees with this reading, saying that here "the relational character of the Cartesian conception of space and time is branded 'vulgar' and as based upon 'prejudices.' Koyré, *ibid*, p. 167.

[244] Robert Rynasiewicz, "By their Properties, Causes and effects: Newton's Scholium on Time, Space, Place and Motion—II. The Context," *Studies in the History and Philosophy of Science*, Vol. 26, No. 2, 1995, pp 229-300, gives a more lengthy analysis of Newton's contempt for Descartes as it is expressed in *De gravitatione*.

the unmitigated absolutism implied in the first edition.[245] Berkeley argued that time and space must be relational, saying, in a criticism that could also rightly have been levelled at Gassendi's absolutism, that if space and time are truly absolute, then "there is something besides God which is eternal, uncreated, infinite, indivisible, unmutable."[246] These additions also make clear Newton's opposition to Descartes' vortices and, though more veiled, Leibniz's idle God.

Going some way towards meeting criticisms such as Berkeley's, Newton explicitly builds God into his description of space and time in the General Scholium, making clear that time and space are secondary effects of God's being, not separate entities:

> [God] is Eternal and Infinite, Omnipotent and Omniscient; that is, his duration reaches from Eternity to Eternity; his presence from Infinity to Infinity; he governs all things, and knows all things that are or can be done. He is not Eternity and Infinity, but Eternal and Infinite; he is not Duration and Space, but he endures and is present. He endures forever, and is every where present; and, by existing always and every where, he constitutes Duration and Space. Since every particle of Space is always, and every indivisible moment of Duration is every where, certainly the Maker and Lord of all things cannot be never and no where…

Newton also asserts that God is substantially present in the world, saying:

> God is the same God, always and everywhere. He is omnipresent, not virtually only, but also substantially; for virtue cannot subsist without substance. In him are all things contained and moved; yet neither affects the other: God suffers nothing from the motion of bodies; bodies find no resistance from the omnipresence of God.[247]

Here, Newton refers explicitly to Acts 17:28 ("For in him we live, and move, and have our being"), no doubt to deflect accusations of pantheism. This reference is made immediately after his claim that God is substantially omnipresent. Claiming space and time as attributes of God's spatial and temporal omnipresence, Newton's words are reminiscent of More's: "...that *inmost Extension* or *Amplitude* which will necessarily remain after we have imagined all Matter, or whatever else is removeable,

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[245] Power, *ibid*., p. 291.

[246] Berkeley, *A treatise concerning the Principles of Human Knowledge*, Part 1, quoted in Power, *ibid*.

[247] Newton, General Scholium to the *Principia Mathematica*; *ibid*.

removed or exterminated out of the World is to be look'd upon as the *permanent Expansion* or *Amplitude* of the *radical Essentiality* of *God*." Yet, importantly, *unlike* More, Newton does not seek to engage at length in a discussion of the occult properties of nature, or of the divine, although he concedes later in the General Scholium that "to discourse of [God] from the appearances of things, does certainly belong to Natural Philosophy."[248]

In the General Scholium, Newton is a little vague about the manner in which God's substantial presence is manifested in space and time. He says:

> Every soul that has perception is, though in different times and in different organs of sense and motion, still the same indivisible person. There are given successive parts in duration, co-existent parts in space, but neither the one nor the other in the person of a man, or his thinking principle; and much less can they be found in the thinking substance of God. Every man, so far as he is a thing that has perception, is one and the same man during his whole life, in all and each of his organs of sense.[249]

The implication here is that God is indivisible, since the human soul is explicitly described as indivisible. This seems like a return to Gassendi's holmerianism, and a step away from More' extended God.

The *Principia* is a notoriously ambiguous work if we are looking for Newton's ontology and metaphysics, and his more detailed thoughts on the ontology of time are to be found elsewhere, particularly in the unpublished *De gravitatione et aequipondio fluidorum*, which I discussed briefly above. *De gravitatione* (1670) comprises a sustained critique of Descartes' conception of motion. Newton's discussion here is mainly directed at extension and motion, yet he also reveals much about his ontology of space and, more rarely, time.

Pillorying Descartes' claim that body does not differ from extension, Newton makes a claim about extension/space which initially sounds very similar to Gassendi's conception of space and time as being neither substance nor accident but rather comprising a new category of being:

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[248] Newton, *ibid*.

[249] *ibid*.

> ...it may be expected that I should define extension as subject or accident or else nothing at all. But by no means, for it has its own manner of existence which fits neither substances nor accidents.[250]

Immediately, however, Newton diverges from the Gassendist path, arguing that because extension "is not absolute in itself, but is as it were an emanative effect of God..."[251] it cannot be a substance.[252]

Yet neither does Newton allow that extension can be considered an accident in the simple sense, nor even a 'nothing at all' (*a la* Ockham):

> Moreover, since we can clearly conceive extension existing without any subject... and we believe [extension] to exist wherever we imagine there are no bodies, and we cannot believe that it would perish with the body if God should annihilate a body, it follows that [extension] does not exist as an accident inherent in some subject. ...And much less may it be said to be nothing, since it is rather a something, and approaches more nearly to the nature of a substance. ...I shall now enumerate not only to show that it is a something, but what it is.[253]

In showing what kind of a 'something' extension is, Newton explicitly geometricises extension as an absolute infinite which exists independently of material bodies, and by its everlasting existence constitutes both space and time. He shows that space and time are, in fact, special forms of attribute: attributes of God's existence. In doing so, he also rectifies the key problem inherent in More's ontology of time: whether God, as the subject of time (and space) is therefore divisible. Newton's enumeration of the 'something-ness' of extension is given in six postulates.[254] I set them out here with a commentary on their significance to the debate about the nature of time (substance, attribute, or something else) begun by Gassendi and continued by More:

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[250] Newton, Newton, "De gravitationione et aequipondio fluidorum," in *Unpublished Scientific Papers of Isaac Newton*, ed. and translation, A. Rupert Hall and Mary Boas Hall, Cambridge, Cambridge University Press, 1962, pp 131-2.

[251] *Ibid*., p. 132.

[252] Nor, of course, did Gassendi claim time or space to be substances—yet he did believe them 'absolute in themselves.'

[253] *Ibid*.

[254] *Ibid*., pp 132-38.

1. We can imagine a space extending in all directions, in which we can distinguish parts whose common limits we might call surfaces; similarly these may be divided with a common limit of a line, and these lines divided to show a point. Neither surface nor line nor point have depth, breadth or dimension. Furthermore this space can be conceived of as containing any number of figures.
2. This space is infinite and unlimited. (During his discussion of this postulate Newton reassures the reader who may fear that such a space is necessarily God, because of the perfection of infinity: "...by no means[is this so] for infinity is not perfection except when it is an attribute of perfect things."[255])

3. The parts of space are motionless. Here, Newton shows that the order and relations of the parts of time and space are an essential part of the definition of their being:

> ...the immobility of space will be best exemplified by duration. For just as the parts of duration derive their individuality from their order, so that (for example) if yesterday could change places with today and become the later of the two, it would lose its individuality and would no longer be yesterday, but today… [so, the] parts of duration and space are only understood to be the same as they really are because of their mutual order and position; nor do they have any hint of individuality apart from that order and position which consequently cannot be altered.[256]

The important implication here is that if space and time are, indeed, accidents of God's existence (as Newton goes on to claim), we need not suppose that God is a changeable being just because he exists in time. The parts of space and time are themselves necessarily unalterable. In an unpublished draft of the Scholium, Newton makes this claim more explicitly:

> ...the Duration of a thing is not its flow [*ejus fluxio*], or any change, but its permanence and immutability in flowing time. All things endure in so far as they remain the same

[255] *Ibid*., pp 135-6.

[256] Newton, *ibid*., p. 136. Note the similarity in this line of argument to Suárez's statement that: "that flowing imaginary space is conceived as entirely necessary and immutable in its own flux [*omnino necessarium et immutabile in suo fluxu*], and therefore its part, once understood as past, cannot be understood as returning. For that space, since it is conceived as entirely necessary and not caused [*non causatum*], ought even to be conceived as having an intrinsic necessity in flowing, by the order of its own parts, and accordingly, once that part is past it cannot be conceived as returning again." (See Chapter 4)

at any time. <The duration of each thing flows, but> its <enduring> substance does not flow, and is not changed with respect to before and after, but always remains the same.[257]

4. Space is a disposition of being *qua* being. Further:

> No being exists or can exist which is not related to space in some way. God is everywhere, created minds are somewhere, and body is in the space that it occupies; and whatever is neither everywhere nor anywhere does not exist.[258]

This passage is similar to parts of Gassendi and Charleton, yet where they conclude that space and time must, therefore, precede being (even God's being), Newton's draws a very different conclusion:

> And hence it follows that space is an emanative effect of the primary existence of being, because when any being is invoked, a space is supposed. And the same can be established for duration: plainly both are affections or attributes of being [entis affectiones sive attributa] according to which the quantity of existence of any single thing [*individui*] is designated in terms of the breadth and continuity of its being.[259]

In this section of *De gravitatione* Newton also provides an extremely elegant solution to the conundrum of God's essential unity in an extended space-time (More's difficulty). He simply denies that space and time are themselves divisible. To divide is to 'cut out' a piece of something—and one can no more 'remove' a piece of space or time than 'move' a number to a different place when counting, as Newton argues:

> ...lest anyone should... imagine God to be like a body, extended and made of divisible parts, it should be known that spaces themselves are not actually divisible, and furthermore, that any being has a manner proper to itself of being in spaces. For thus there is a very different relationship between space and body, and space and duration. For we do not ascribe various durations to the different parts of space, but say that all

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[257] Newton, Manuscript Add. 3965, Portsmouth Collection. Translated under the title "Tempus and Locus" by J.E. McGuire. Original Latin with translation provided in McGuire's "Newton on Place Time and God: an Unpublished Source," *British Journal for the History of Science*, vol. 11, 1978. This passage paragraph 2, McGuire p. 117. '<>' denote additons in Newton's handwriting.

[258] Newton, "De gravitationione et aequipondio fluidorum," *ibid*., p. 136.

[259] Isaac Newton, *De Gravitatione et æquipondio fluidorum*, Add. Ms. 4003, Cambridge University Library, UK. "Et hinc sequitur quod spatium sit entis primariò existentis effectus emanativus, quia posito quolibet ente ponitur spatium. Deque Duratione similia possunt affirmari : scilicet ambæ sunt entis affectiones sive attributa secundum quæ quantitas existentiæ cujuslibet individui quoad amplitudinem præsentiæ et perseverationem in suo esse denominatur." My translation.

> endure together. The moment of duration is the same at Rome and at London, on the Earth and on the stars,[260] and throughout all the heavens. And just as we understand any moment of duration to be diffused throughout all spaces, according to its kind, without any thought of its parts, so it is no more contradictory that Mind also, according to its kind, can be diffused through space without any thought of its parts.[261]

5. The positions, distance and local motions of bodies are to be referred to the parts of space. This postulate is aimed directly at Descartes' conception of motion, and forms the basis of Newton's mathematicisation of motion in the *Principia*.

Finally, Newton gives his sixth postulate, that space and time are not accidents in any simple sense, but are the necessary effects of the existence God:

> Lastly, space is eternal in duration and immutable in nature, and this is because it is the emanative effect of an eternal and immutable being. If ever space had not existed, God at that time would have been nowhere; and hence he either created space later (in which he was not himself), or else, which is no less repugnant to reason, he created his own ubiquity.[262]

Thus time is a being which is immutable and infinite, and is extended without being divisible. It is a special kind of accident which shares its properties with its subject: God. Being an effect of God, the first existing being, time (and space) pre-exist material being, and thus, as Newton says, they approach "more nearly to the nature of a substance."

Newton, if anything, *retreats* from full blown temporal absolutism, and his popular standing as absolutist *par excellence* is undeserved.

Some treatments of Newton in contemporary philosophy

While this study is concerned with the history of philosophy, and not with more recent philosophy, an understanding of the intellectual history of absolute time goes quite some way toward solving some problems with Newton's absolutism which have been

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[260] Note the similarity to Peter Aureole, which I discussed in Chapter Two: "At the instant in which I am speaking, in this same present instant, the king of the Tartars sits; therefore there is no present instant for us and another for the Tartars." Peter Aureole, *Commentariorum in secundum librum Sententiarum*, dist. II, queast. I, art. 4, (p.41), quoted in Duhem, *Medieval Cosmology*, p. 304.

[261] Newton, *ibid.*, p. 137.

[262] *Ibid*., p. 137.

the focus of a number of modern philosophers. By ignoring the importance of absolutism to earlier philosophy (prior to and outside of Newton's work), these accounts skew the intellectual history of the period, resulting in a misreading of the role absolutism played in the *development* of Newton's philosophy. The following discussion is primarily about space (the key concern of Newton's twentieth century critics) but has obvious bearings on time also.

John Earman provides a typical example of the kind of argument often pursued in 20th century philosophical literature on absolutism:

> … Newton's reasoning is a paradigm case of scientific theorising; a theoretical construct, absolute space, is postulated in order to make possible a general account of the motion of bodies and in particular to explain certain actually observed phenomena…[263]

Such a view is at odds with what I would argue is the more reasonable description of events: absolute time and space were, by Newton's time, a regular feature of the Gassendist atomistic philosophic program within which Newton was working. That Newton also took up absolute space and time is totally unsurprising. Newton, however, was able to use the tools he had inherited (absolutism) to make much better sense of certain dynamical entities—such as the law of inertia—than previous thinkers had been able to achieve. Mach's criticism, that "this absolute time ... is neither a practical nor a scientific value; and no one is justified in saying he knows aught about it. It is an idle metaphysical conception,"[264] is trite from the perspective of the historical context. Absolute time and space were integral parts of the metaphysics of Newton's philosophy and, if the way they make sense of the law of inertia is brought into consideration, they are extremely practical. Consider how neatly Newton, with an absolute spatio-temporal reference frame at his disposal, is able to undermine Descartes' attempted law of inertia:

> Lastly, that the absurdity [of Descartes' relationalism] may be disclosed in full measure, I say that thence it follows that a moving body has no determinate velocity and no definite line in which it moves. And, what is worse, that the velocity of a body

[263] Earman, "Who's Afraid of Absolute Space," *Australasian Journal of Philosophy*, 1970, p. 296
[264] Mach, *The Science of Mechanics*, Open Court, 1960, p. 273.

> moving without resistance cannot be said to be uniform, nor the line said to be straight in which its motion is accomplished. On the contrary, there cannot be motion since there can be no motion without a certain velocity and determination.[265]

Within the absolutist strain of the atomistic philosophy, motion becomes something that can be dealt with mathematically and exactly—something which can, indeed, be 'real.'

Other 20th century philosophers try to 'excuse' the few overt examples of Newton's metaphysics among his published papers by interpreting them as mere illustrative devices used it for the purposes of exposition only. For example, Stephen Toulmin, in his 1959 "Criticism in the History of Science: Newton on Absolute Space, Time and Motion (I & II)," proposes that Newton's absolute space and time serve a merely axiomatic purpose within the *Principia*. Toulmin proposes that, in the *Principia*, Newton is at pains to distinguish between relative or apparent motion, and true motion (the kind which effects, and is affected by, forces and so on). Toulmin contends that Newton only posited absolute time and space as entities in so far as they help us distinguish between these two types of motion—there is no need to suppose they held a deeper meaning for Newton:

> …one need no more assert that Newton was committed by his theory of dynamics to the objective existence of a cosmic substratum called "absolute space" than one need say that a geometer, in formulating his axiom-system, is committed to the quasi-material existence of an invisible network of geometrical entities interpenetrating the material world, which alone are for him the true straight lines and circles. In either case the question of "objective existence" is a red herring.[266]

For Toulmin, this is a "happier" reading of Newton than those which have him attributing real existence to absolute space and time.[267] The idea that Newton believed in a real difference between kinds of motion ('apparent,' and 'true'), but did not believe in the objective reality of space and time, is, certainly, an interesting thesis. It is, however, mistaken.

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[265] Newton, De gravitationione et aequipondio fluidorum," in *Unpublished Scientific Papers*. Translation Halland Hall, *ibid*., p. 140.

[266] Toulmin, "Criticism in the History of Science: Newton on Absolute Space, Time and Motion (I & II)," *The Philosophical Review*, Vol. 68, January and April, 1959, p. 24.

[267] Toulmin, *ibid*. p. 10.

His discussion of Newton's rotating bucket experiment makes Toulmin's position clear. Toulmin argues that the experiment is designed only to show that there are two different situations we can be speaking of when we discuss motion. We are familiar with Descartes' assertion that *all* motion is relative. With the bucket experiment, Toulmin argues, Newton seeks to show that this is not the case, but rather that 'true' motions have a different ontological status to the merely relative. Sometimes motion is only apparent (in which case we will detect no forces at work in the apparently moving body), and sometimes motion is 'real' (in which case we detect forces such as that which makes the surface of the water in our rotating bucket more or less concave). This part of Toulmin's argument should be uncontroversial.

Toulmin goes on to assert, however, that this experiment in no way implies, or is intended to imply, that absolute space and time are themselves real. They are merely tools for discussing and thinking about real and apparent motions. Toulmin chastises Mach and other critics of Newton for suggesting the experiment is designed to demonstrate "the objective existence of a bogus entity, whereas nothing in the passage itself claims more than the dynamical indispensability of a conceptual distinction."[268] For Toulmin:

> The problem of absolute space, which is so often treated as though it were a metaphysical one, has in fact been bedevilled by the injection of metaphysical issues… Both Newton's disciples and his critics have been free in their use of the blanket-nouns "Space" and "Time," and have used them with little circumspection: they have, in particular, allowed themselves to become preoccupied with one question whose consequences have been only obfuscating—the question whether absolute space and absolute time really *exist*.[269]

Nor should the aether be understood as a realisation of absolute space:

> …no natural reference-frame, however perfect, could properly be identified with Newton's 'absolute space.' Even supposing that there were an ether… this would be, logically speaking, only one more possible reference-frame providing measures of

[268] *ibid*., p. 27.
[269] *ibid*., p. 23.

> position, velocity, and the like. It could never, without a category mistake, be said to *be* absolute *space.*[270]

In Toulmin's view, Newton's use of an absolute, real spatiotemporal reference frame should only be understood as a best-case approximation of the conceptual arena in which his theoretical dynamics takes place. Absolute space and time are "the common ideal toward which both terrestrial and celestial motions—pendulums and satellites—are found to approximate."[271] Toulmin also makes use of Newton's language in the Scholium to support his thesis, suggesting Newton's use of phrases such as "if the expression may be allowed," "as it were," and the constant differentiation between speaking of 'sensible' or 'mathematical' measures suggests that he is shying away from any suggestion that space and time be considered real.[272]

Toulmin's argument is philosophically plausible. It relies, however, on an argument to the best explanation: 1) the metaphysical basis of absolute space and time is distasteful to us 20th century philosophers; 2) it is possible to interpret Newton in such a way as to avoid seeing him as committed to the reality of space and time, therefore, 3) let us suppose that Newton was not, in fact, a believer in the reality of space and time. As we have seen, many of Newton's predecessors, as well as his contemporaries, were, in fact, committed to the reality of space and time, as was Newton, as the historical evidence shows. Toulmin's thesis is fascinating, and it is perhaps unfair to criticise him too heavily as it was written before important unpublished works by Newton, such as *De gravitatione* came to light.

Toulmin's argument, however, is mirrored in a more recent article, Robert Rynasiewicz' 1995 "By their Properties, Causes and effects: Newton's Scholium on Time, Space, Place and Motion." Rynasiewicz does not refer explicitly to Toulmin, but his own claim is somewhat similar. Like Toulmin, Rynasiewicz targets critics of Newton's apparent absolutism, like Mach, drawing his bow wider to including both philosophers and historians: Reichenbach, Sklar, Earman, Jammer, Burtt, Westfall and Koyré. Says Rynasiewicz: the criticisms posed by these writers have "been

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[270] *ibid*., p. 21-2.
[271] *ibid*., p. 17.
[272] *ibid*., pp 10-18.

largely wasted effort if what is at stake is an understanding of Newton himself rather than the construction of some fictitious advocate of absolutism."[273]

Like Toulmin, Rynasiewicz argues that all Newton wants to show in the Scholium to the *Principia* is that there are 'real' motions and 'apparent' motions—that "the main object is to adduce grounds for believing that the absolute quantities [of motion] are indeed distinct from their relative measures and are not reducible to them."[274]

Rynasiewicz takes a very close reading of the Scholium, paragraph by paragraph. He also goes to great lengths to substantiate his thesis through an examination of Newton's language. This discussion centres on Newton's use of the Latin *definire*, which is often translated in Motte's English edition of the *Principia* as 'to determine,' but could, arguably more properly, be rendered as 'to define.'[275] This difficulty of language presents an interesting problem. Rynasiewicz shows that 17th Century English allowed an even greater overlap in meaning between the verbs 'to define' and 'to determine' than modern English usage.[276] Further, it seems that Newton himself was not systematic in his choice of the Latin *determinare* and *definare*. Rynasiewicz believes that Newton is not trying to distinguish absolute motion from relative motion (and to prove by deduction the existence of absolute space) in his well known thought experiment with the rotating bucket, but rather, *contra* Descartes, to show that true motion is not a special case of relational motion, and thus cannot be *defined* with reference to relational motion. There is certainly no doubt that in some sections of the Scholium, the choice of 'to determine', in the sense of 'to distinguish empirically,'[277] and 'to define,' in the sense of 'to differentiate [from some other thing],' has an important bearing on our understanding of what Newton is trying to do. Rynasiewicz ends up having a bet each way—saying it is "fictitious" to paint Newton as an "advocate of absolutism" but equivocating about the true metaphysical nature of the at least geometrically absolute space Newton espouses.

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[273] Robert Rynasiewicz, "By their Properties, Causes and effects: Newton's Scholium on Time, Space, Place and Motion—I. The Text,", *Studies in the History and Philosophy of Science*, Vol. 26, No. 1, 1995, p. 133. Note that this is a different article to "By their Properties... —II. The Context," cited earlier.*ibid*.

[274] Rynasiewicz, *ibid*., p. 151.

[275] *ibid*., pp 138-9; 151-3.

[276] *ibid*., p. 152.

[277] *ibid*., p. 138.

There certainly seems to be something to these claims. It is uncontroversial that Newton had his sights set on Descartes when he fired off the General Scholium to the *Principia*. Unpublished sources such as *De Gravitatione* make it clear that Newton's problem with Descartes' physics was his unsatisfactory discussions about motion, which Descartes considered to be purely relational in all its forms, making his attempted law of inertia all but senseless. Works such as those of Toulmin and Rynasiewicz remind us that it is not the existence *per se* of absolute space and time which Newton is at pains to make clear in the Scholium to the *Principia*. What he wants us to take away from his discussion of these entities is an understanding of the difference between 'real' accelerations which require forces, and purely relational motions, which serve descriptive and comparative purposes only.

Lamenting the proclivity of some modern philosophers to treat historical works of philosophy in theoretic isolation may seem trite, and arguing that philosophers do not share the interests of historians may be somewhat of a straw man. The issue is not so simple however: for how is one to properly attempt an analysis of a philosophical claim without couching that claim in its (historical) philosophical conceptual scheme? In contradistinction to the interpretations of Newton's treatment of absolute time sketched above, for example, consider the efficacy of the more nuanced understanding of Newton's metaphysics provided by Richard T. Arthur in his paper on Newton's fluxions.[278] After a considered examination of the theories of substantial time inherited by Newton from Gassendi/Charleton, as well as a discussion of a possible debt to Barrow, Arthur shows how Newton's fluxions, like his physics, stem from his understanding of time and space, which in turn can in no way be considered a Machian "idle metaphysical conception." Argues Arthur:

> By comparing [Newton's] work with its precedents in Gassendi and Barrow …one can see that this mathematical work [i.e. the fluxions] is not independent of his physics, but rests on the same ontological framework: Newton's neo-Platonic concepts of space and time, his geometric physics, and his new mathematics of continuously generated flowing quantities are all bound together in one seamless whole.[279]

[278] Richard T. Arthur, "Newton's Fluxions and equably Flowing Time," *Studies in the History and Philosophy of Science*, vol. 26, no. 2, 1995, pp. 323-451.

[279] Arthur, *ibid*, p. 326.

Arthur demonstrates, for example, that it is only with an understanding of Newton's ontology of time that we can appreciate the important differences between his fluxions and Leibniz's differentials. Whereas Leibniz must invent infinitesimals that he himself regards as fictitious, and then derive real ratios between them, Newton, because of his understanding of time as an absolute flow, is able to derive sequential ratios between real temporal points,[280] as Newton himself recognised:

> I found the method not upon sums & differences, but upon the solution of this probleme: *By knowing the Quantities generated in time to find their fluxions*. And this is done by finding not *prima momenta* but *primes momentorum nascentium rationes*… This Method is derived immediately from Nature her self, that of indivisibles, Leibnitian differences or infinitely small quantities not so.[281]

Arthur's approach, which takes seriously the metaphysics supporting Newton's mathematics and physics, adds to our understanding of Newton's ideas, unlike the work of Toulmin and Rynasiewicz, which leads us further astray.

Toulmin and Rynasiewicz remind us that too many commentators on Newton's work mis-aim their critiques by narrowing their focus to the existence of the absolutes to the exclusion of all else. By not appealing to the broader intellectual milieu of Newton's time, the arguments of Toulmin and Rynasiewicz (and Mach, Reichenbach, *et al*) expose their weak spot. Why should we believe that Newton spoke of absolute space and time in a special, limited sense (which has the benefit of not offending modern metaphysical sensibilities), when his writing is almost indiscernible from that of more obvious absolutists—Gassendi, Charleton, More?

Conclusion

There are a number of comments worth making about the radical shift in the definition of time of More and Newton. Firstly, what is radical about it is that it is a reversion to models of time which have time as an attribute of real being. Because (thanks to Gassendi), the eternal realm is now co-located with our own everyday world of generation and corruption, God is himself a 'real' being in our normal sense

[280] *ibid*., 343.

[281] Newton, from a 1714 draft of a peice later published posthumously in *Philosophical Transactions*, quoted in Arthur, *ibid*., p. 343.

of the word. His ubiquity is as real—and of the same ontological class of 'real'—as our being. For Gassendi, More and Newton, God is immanent, not transcendent. While the scholastics defined space—or more properly place—as the extension of a body, so too do More and Newton define it as mere extension. For them, however, it is an attribute of the divine extension. Equally, just as earlier thinkers believed time to be the duration of a mode of existence (the motion a body undergoes), so for More and Newton duration is an attribute of the mode of continued existence of God. Thus More and Newton's time and space are not radical as being the first considered espousals of a truly independent and absolute space and time—that honour goes to Gassendi.

More is most concerned with the spiritual properties of being, and Newton publicly shy of supporting a definitive metaphysics, yet between them we can find a concept of substantial being (God) capable ontologically of supporting time as an attribute. Thus the journey started by early scholastic philosophers, who moved away from relational theories of time as they could not find a suitable subject for it, comes to its end when that subject is found, by removing God from the neo-Platonic eternity where he was thought to rule transcendently, to the physical world of change and decay where he was still described as perfect, but said to rule nature through his immanent contact with it in space and time.

Conclusion

Newton's characterisation of absolute time in the *Principia*, and his claim that time "…from its own nature, flows equably without relation to anything external…," as well as his corresponding characterisation of absolute space, have been seen by a number of modern philosophers as a *post hoc* metaphysical claim made to justify the dynamical requirements of aspects of his physics, for example the law of inertia, which requires the existence of absolute equable motions, which in turn presuppose an absolute spatiotemporal reference frame. Such a view is incorrect. Rather, the success of Newton's dynamics can more plausibly be seen as resting on his early acceptance of an absolutist metaphysics of space and time which was popular among a number of his contemporaries, and of which he was neither the originator, nor even the most radical proponent. This study investigated key moments in the long development of the theory that time is absolute, from early proposals in the thirteenth century up to the popularisation of the theory in the seventeenth century.

The history of the idea of absolute time is characterised by two key concerns, evident throughout the development of the concept, the one metaphysical and the other theological. The metaphysical concern relates to the problem of finding a place for time in the scholastic and post-scholastic categories of being. The theosophical concerns encompass biblical exegesis, the description of God as transcendent or immanent in nature, and the physical attributes of God (if any). The five century long philosophical tussle over these problems saw a move away from the notion that time is an attribute of physical motion(s) to the radical absolutism of Pierre Gassendi, and finally the acceptance by More and Newton that time is in fact an attribute after all—an attribute of the immanent and extended God.

The problem of finding a place for time within the categories of being is present in the work of all the philosophers discussed in this thesis, perhaps with the exception of Duns Scotus and Aureole. Aristotle provides an early example of one of the key problems medieval and Renaissance philosophers faced in defining time *qua esse*,

when he remarks in the *Physics* that time does not seem capable of substantial existence:

> Some of [time] is past and no longer exists, and the rest is in the future and does not yet exist; and all time… is entirely made up of the no-longer and the not-yet; and how can we conceive of that which is composed of non-existents sharing in existence in any way? (217b 34 – 218a 3)

Aristotle falls back on a definition of time as an attribute rather than a substance, eventually describing it as ontologically parasitic upon motion. Even then, however, he faced logical difficulties in accounting for the temporality of resting objects, and the apparent unity of time in a world comprised of a multitude of motions—problems that remained a concern for later thinkers. For later scholastic philosophers considering Aristotle's theory of time, however, these two problems are not the main issue, for the popular interpretation of Aristotle followed that of Averroes, who, by positing the stellar motion as the seat of time, solved the problem of accounting for the multiplicity of motion and removed the difficulty of accounting for resting bodies.

Averroes, however, presented a different kind of problem to scholastic philosophers, and one which necessitated, for some, the first tentative proposals that time may be physically absolute: while Averroes' theory (or rather his interpretation of Aristotle's theory) was metaphysically unproblematic it jarred glaringly with biblical evidence, which was commonly treated as historically accurate. Averroes asserted that if the motion of heaven were to cease, time would also freeze:

> [W]hen motion is sensed, time is sensed primarily and essentially. It is by reason of motion [that] we sense ourselves to be in a changeable existence, and to be changeable ourselves, because we are in this existence. ... It is on that account that we sense time primarily, and it is manifest that we do not sense ourselves to be in a changeable existence except through the transmutation of heaven. If heaven stood still, it would be possible for us to exist in an unchanging existence—but that is impossible.[282]

[282]Averroes, *Aristotelis Opera*, 179B. ."..motus igitur, qui cum sentitur, sentitur primo, & essentialiter tempus, est motus, ex quo sentimus nos esse in esse transmutabili, & nos transmutari, quia sumus in hoc esse...est illud, ex quo sequitur nos sentire tempus primo. & manifestum est quod nos non sentimus nos esse in esse transmutabili, nisi ex transmutatione coeli. &. si esset possibile ipsum quiescere, esset possibile nos esse in esse non transmutabili: sed hoc est impossible..." My translation.

Averroes' theory of time as emanating from heaven necessitates the outcome he observes. Patently, such a theory of time conflicts with a literal reading of Joshua X 13:

> On the day on which the Lord delivered the Armorites to Israel Joshua said to the Lord in the presence of the children of Israel: "Oh sun, move not over Gibeon, Oh moon, over the valley of Aijalon." And the sun and moon stood still while the nation avenged itself on its enemies. So it is written in the Book of the Just. Thus the sun stood, in the middle of heaven, and did not set for the space of one day. Neither before nor since has there been so long a day, with the Lord obeying the voice of man, and fighting for Israel.[283]

If this passage were to be taken as historically accurate, then time cannot be an effect of heavenly motion, a matter of deduction observed by thinkers from St Augustine to Suárez. For early scholastic philosophers like Duns Scotus and Aureole, the 'Joshua problem' forced a retreat from attributive theories of time and the tentative proposal the time may, in fact, be without a physical cause. This retreat stemmed from the lack of a proper subject for time, were it to be considered an accident, or attribute, of a substantial being. Aristotle had considered the possible subjects for time to be either motions of the soul (thought), motion in general, or the first stellar motion. Having dismissed the first possibility as unsuitable, and Averroes having given sound arguments against the second, the evidence from Joshua left no apparent subject for time remaining.

Duns Scotus' and Aureole's assertions that time may be uncaused resolved the problem of a literal biblical exegesis, but left open the problem of accounting for time metaphysically. In the work of William of Ockham, this problem is pursued mercilessly. Having left no metaphysical stone unturned in the quest to find a suitable subject for time, or a way of assessing time to be a substance itself, Ockham concludes that time does not, in fact, exist—that it is not something "distinct from all

[283] Au*Biblia Latina* (Vulgate) *cum Glossa Ordinaria*, p. 447. "Tunc locutus est io sue si die qua tradidit ammorreum in conspectu filioru israel. dixitquam coram eis. Sol contra gabaan ne mouearis et luna contra vallem baylon steteruntquam sol et luna donec ulciferetur se gens de inimicis suis. Nonne scriptum est hoc in libro iustorum. Stetit ita quam sol in medio caeli et non factinavit occumbere spacio unius diei. Non fuit antea nec postea tam longa dies obediente domino voci homis et pugnante pro israel." My translation,

permanent things" (*distincta ab omni res permanentes*) "as the moderns say,"[284] (aiming this criticism at Duns Scotus) but rather that it "is only a definition that expresses the sense of the word, as the definition one can give to verbs, conjunctions, adverbs, etc."[285] Taking a nominalist approach, Ockham denies time a place in the categories of being altogether.

The pivotal stage in the development of absolute time occurs in the work of the late scholastic philosopher Francisco Suárez. Suárez had a dualistic account of time, arguing that there is one kind of time that is intrinsic to bodies, enabling their successive existence to be predicated of something intimate to their being, but also that there is another sort of time, 'extrinsic time,' or the 'immutable flux.' Suárez took this approach in order to preserve time in its place within the traditional categories of being as something attributed to substances: *quando*, or 'time when.' Striving against nominalist accounts of time, like Ockham's, Suárez was intent to predicate each body's temporality as something intrinsic to that body. While this element of Suárez's approach to time has its roots in scholastic classifications of being (Suárez's key work, the *Metaphysical disputation* is a systematic reconsideration of the Aristotelian categories), the second half of his theory of time, the 'immutable flux' or 'imaginary time' is difficult to distinguish from that of early-modern philosophers such as Newton—Suárez's account of the immutable flux has all the hallmarks of more developed absolutism. He calls it uncaused, necessary in its own existence, and defined solely by its immutable ordering:

> …flowing imaginary space is conceived as entirely necessary and immutable in its own flux [*omnino necessarium et immutabile in suo fluxu*], and therefore its part, once understood as past, cannot be understood as returning. For that space, …is conceived as entirely necessary and uncaused [*non causatum*], [and] ought even to be conceived as having an intrinsic necessity in flowing, by the order of its own parts…[286]

Yet we should not consider that because Suárez calls this time 'imaginary' that it is a figment of the imagination. Rather, as I argue in the chapter on Suárez, it is termed imaginary as it can only be apprehended through appeal to reason, and that because it

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[284]Ockham, *Quaestiones in Libros Physicorum Aristotelis*, pp. 543-45.

[285]Ockham, *Tractus de Successivus*, cap. II, fol. 139, col. b, p. 120. Passage translated into English in Pierre Duhem, *ibid*., p. 306.

[286] Suárez, *Metaphysical Disputations*, Disputation 50, Section IX "Whether the Time in a Thing is Distinguished From Motion"—Extract from 'Vera Responsio.' My translation.

is lacking in substantial form.[287] Again, we can see how the difficulty of either describing time as a properly existing substance, or of finding a substance of which it may be an attribute, shaped the development of theories of absolute time.

The key moment in the development of theories of absolute time comes in the later work of the neo-Epicurean atomist, Pierre Gassendi. Gassendi is arguably the only thinker to put forward a theory of time (and, indeed, space) which is truly and straight-forwardly absolute. Certainly thinkers such as Bruno and Telesio appear to believe time to be uncaused, but their doctrines comprise mere assertion, whereas Gassendi's treatment of the ontology of time is extensive, considered and reasoned. A life-long critic of the Aristotelian scholastics, Gassendi did away with the traditional categories altogether, proposing that time and space are neither substance nor attribute but between them constitute a separate kind of being, saying:

> ...place and time do not depend upon bodies and are not corporeal accidents... [since] even if there were no bodies there would still remain both an unchanging place and an evolving time. [All being] is either substance or accident, or place, in which all substances or accidents exist, or time, in which all substances and all accidents endure.[288]

For the ancient Epicureans, whom Gassendi sought to follow, nature was constituted of atoms and the void, all actions taking place in an absolute-like space. However, the Epicureans (like other ancient philosophers, including Aristotle and Plato) saw time as relational. For the Epicureans, time was an aspect of the motion of atoms. Gassendi's addition of absolute time to the Epicurean metaphysics of nature was a novel and radical proposal, providing the basis for the ontology of time of later thinkers such a Newton and More.

In the work of Newton and More we see something perhaps unexpected: a return to the notion that time is, in fact an accident of being. After a lifetime of consideration and reflection about the nature of God, Henry More decided that God, immanent in the actions of nature, must also be physically extended. This view was unlike that of Gassendi, who believed that God was 'whole in every part' of nature. More

[287]Suárez, *On Beings of Reason*, (Disp. 54, translated by John P. Doyle), IV, 7, p. 95.
[288] Gassendi, *Syntagma*, Sec. 1, Bk. 2, Chap. 1, translated by Craig B. Brush *ibid*., p. 384.

concluded that space and time are in fact attributes of the temporally and spatially extended God, describing them as:

> ...that *inmost extension* or *amplitude* which will necessarily remain after we have imagined all matter, or whatever else is removeable, removed or exterminated our of the world, is to be look'd upon as the *permanent expansion* or *amplitude* of the *radical essentiality* of *God*.[289]

While Newton's writings on the ontology of time are not as numerous as Mores, some of Newton's unpublished manuscripts point to a likely influence of More upon Newton in regard to the nature of God and time. Newton also considered space and time to be attributes of God, echoing More in his contention that God's spatial and temporal infinity constitute space and time:

> [God] is Eternal and Infinite, Omnipotent and Omniscient; that is, his duration reaches from Eternity to Eternity; his presence from Infinity to Infinity; he governs all things, and knows all things that are or can be done. He is not Eternity and Infinity, but Eternal and Infinite; he is not Duration and Space, but he endures and is present. He endures forever, and is every where present; and, by existing always and every where, he constitutes Duration and Space.[290]

Thus we see that Newton's absolute space and time is not his alone, but a theory held by a number of his contemporaries. Nor can Newton's absolutism be considered a hallmark of absolutism: Newton's absolutism is mitigated. He did not believe space and time to be uncaused, but merely uncaused by corporeal being. For Newton space and time are attributes—as they were for Aristotle.

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[289] More, *Divine Dialogues*, pp 448-9.

[290] Newton, General Scholium to the *Principia Mathematica*; Andrew Motte translation (1729), p.6.

Bibliography

Adams, Marilyn McCord, William Ockham, vol. II, Notre Dame, University of Notre Dame Press, 1987.

Anzulewicz, Henryk, "*Aeternitas – aevum – tempus*. The Concept of Time in the System of Albert the Great," in *The Medieval Concept of Time: The Scholastic Debate and its Reception in Early Modern Philosophy,* Pasquale Porro, *ed*., Leiden, Brill, 2001.

Aquinas, *Commentary on Aristotle's Physics*, Introduction by Vernon J. Bourke, trans. R. J. Blackwell, R. J. Spath and W. E. Thirlkel, London, Routledge & Kegan Paul, 1963.

Aquinas, *De Aeternitate Mundi*, in *S. Thomae Aquinatis Opera Omnia*, (vol. 3), Stuttgart, Frommann-Holzboog, 1980, work 034 OCM, pp. 291-2.

Aquinas, *On the Power of God (Quaestiones Disputatae de Potentia Dei)*, (three vols.), trans. the English Dominican Fathers, London, Burns Oates and Washbourne Ltd, 1933.

Aquinas, *Quaestiones Quodlibetales*, in *S. Thomae Aquinatis Opera Omnia*, (vol. 3), Stuttgart, Frommann-Holzboog, 1980, work 019 QDL, pp. 438-500.

Ariotti, Piero, "Celestial Reductionism of Time", *Studi Internazionali di Filosophia*, August 1972, pp. 91-120.

Ariotti, Piero, "Toward Absolute Time: Continental Antecedents of the Newtonian Conception of Absolute Time", *Studi Internazionali di Filosophia*, v. 5, 1973.

Ariotti, Piero, "Toward Absolute Time: the Undermining and Refutation of the Aristotelian Conception of Time in the Sixteenth and Seventeenth Centuries", *Annals of Science*, vol. 30, 1973, pp. 31-50.

Aristotle, "Categoriae", *The Works of Aristotle*, ed. W. D. Ross, English trans. E. M. Edghill, Oxford, Clarendon Press, 1928.

Aristotle, "Κατηγοριαι", *Organon*, edidit Theodorus Waitz, Lipsiae, Sumtibus Hahnii, 1844.

Aristotle, *On the Heavens*, English trans. Stuart Leggatt, Warminster, Aris & Phillips, 1995.

Aristotle, *Physics*, Loeb Edition in Greek (2 vols), and English trans. Philip H. Wicksteed & Francis M. Cornford, London, Heinemann, 1929.

Arthur, Richard T., "Newton's Fluxions and Equably Flowing Time," *Studies in the History and Philosophy of Science*, vol. 26, no. 2, 1995, pp. 323-451.

Averroes, *Aristotelis Opera cum Averrois Commentarius*, Vol. IV, (Latin Text), Venetiis apud Junctas, 1562, facsimile edition, Frankfurt, Minerva, 1962.

Averroes, *Averroes' Middle Commentaries on Aristotle's Categories and De Interpretation*, with an introduction by Charles E. Butterworth, Princeton, Princeton University Press, 1983.

Averroes, *Averroes' Questions in Physics, from the unpublished Sefer ha-derusim ha-tib iyim*, English translation Helen Tunik Goldstein, Dordecht, Kluwer Academic Publishers, 1991.

Averroes, *De Substantia Orbis*, Hebrew text with English translation and commentary by Arthur Hyman, Cambridge, Medieval Academy of America and Israel Academy of Sciences and Humanities, 1986.

Biblia Latina cum Glossa Ordinaria, (facsimile reprint, editio princeps Adolph Rusch, Strassburg, 1480/81), Turnhout, Brepols, 1992.

Boehner, O. F. M., "Introduction", Ockham, William, *Philosophical Writings*, translated with an Introduction by Philotheus Boehner, (revised by Stephen Brown), Indianapolis, Hackett, 1990.

Bourke, Vernon J., "Introduction," to Aquinas, *Commentary on Aristotle's Physics*, J. Blackwell, R. J. Spath and W. E. Thirlkel, London, Routledge & Kegan Paul, 1963.

Brundell, Barry, *Pierre Gassendi: From Aristotelianism to a New Natural Philosophy*, Dordrecht, D. Reidel Publishing Company, 1987.

Čapek, Milič and Emge, Walter, (eds) *The Concepts of Space and Time*, Boston, Reidel, 1976.

Čapek, Milič, "The Conflict Between the Absolutist and the Relational Theory of Time Before Newton", *Journal of the History of Ideas*, vol. 48, 1987, pp. 595-608.

Charleton, Walter, *Epicuro-Gassendo-Charletoniana, or, A fabrick of science natural, upon the hypothesis of atoms founded by Epicurus, repaired by Petrus Gassendus, augmented by Walter Charleton*, New York, Johnson Reprint Corp., 1966.

Clagett, Marshall, *The Science of Mechanics in the Middle Ages*, Madison, University of Wisconsin Press, 1959

Copleston, Frederick, *A History of Philosophy: Volume 1, Greece and Rome*, New York, Newman Press, 1971.

Cornish, Denis, "Aristotle's Attempted Derivation of Temporal Order from That of Movement and Space", *Phronesis*, vol. 21, 1976, pp. 241-51.

Daniel, Stephen H., "Seventeenth-Century Scholastic Treatments of Time", *Journal of the History of Ideas*, vol. 42, 4, 1981, pp. 587-606.

Davidson, Herbert A., *Alfarbi Avicenna, and Averroes, On Intellect: Their Cosmologies, Theories of the Active Intellect, and Theories of Human Intellect*, New York, Oxford University Press, 1992.

Deason, G.B., "Reformation Theology and the Mechanistic Conception of Nature," in D.C. Lindberg and R.L. Numbers eds, *God and Nature: Historical Essays on the Encounter Between Christianity and Science*, Berkeley, University of California Press, 1986, pp. 167-191.

Debus, Allen G., *Man and Nature in the Renaissance*, Cambridge, Cambridge University Press. 1978.

Descartes, *The Principles of Philosophy*, in *The Philosophical Works of Descartes*, translated by Elizabeth S Haldane and G.R.T. Ross, (in two volumes), Cambridge, Cambridge University Press, 1967.

Doyle, John P., "Introduction" to Suárez, *On Beings of Reason*, Milwaukee, Marquette University Press, 1995.

Duhem, Pierre, *Le Système du Monde: Histoire des Doctrines Cosmologiques de Platon a Copernic*, Tome VII, "Le Physique Parisienne au XIVe Siècle," Paris : Hermann, 1959.

Duhem, Pierre, *Medieval Cosmology: Theories of Infinity, Place, Time, Void, and the Plurality of Worlds*, edited and translated by Roger Ariew, Chicago, University of Chicago Press, 1985.

Duns Scotus, John, *Quaestiones Quodlibetales*, in *Opera Omnia—Editio Nova*, (apud Ludovicum Vives, MDCCCXCV), reprinted Westmead, Gregg International Publishers, 1969.

Duns Scotus, John, *Queastiones in Quartum Librum Sententiarum (Scriptum Oxonensis)*, in *Opera Omnia—Editio Nova*, (apud Ludovicum Vives, MDCCCXCV), reprinted Westmead, Gregg International Publishers, 1969.

Earman, John, "Who's Afraid of Absolute Space," *Australasian Journal of Philosophy*, 1970, pp. 287-319.

Easterling, H. J., "The Unmoved Mover in Early Aristotle", *Phronesis*, vol. 21, 1976, pp. 252-66.

Epicurus, "Letter to Herodotus," in Diogenes Laertius, *Lives and Opinions of the Eminent Philosophers*, translation and Introduction R. D. Hicks, Loeb, 1925.

Fortin, Ernest L., and O'Neill, Peter D., (translators), "Condemnation of 219 Propositions", in *Medieval Political Philosophy: a Sourcebook*, R. Lerner and M. Mahdi (eds), Toronto, Collier-Macmillan Canada, Ltd., 1963, pp. 335-54.

Frank, William A., and Wolter, A. B., *Duns Scotus: Metaphysician*, West Lafayette, Purdue University Press, 1995.

Freddoso, Alfred J., "Introduction," in, Suárez, Francisco, *On Efficient Causality: Metaphysical Disputations 17, 18, and 19*, Yale University Press, 1994.

G. A. J. Rogers, "Locke, Newton, and the Cambridge Platonists on Innate Ideas," *Journal of the History of Ideas*, Vol. 40, No. 2., Apr. - Jun., 1979, pp. 191-205.

Gassendi, Pierre, *Syntagma Philosophicum (pars secunda, quae est Physica), Sectio Prima, Liber II, De Loco & Tempore, seu spatio, & duratione Rerum*, *Opera omnia*, Faksimile-Neudruck der Ausgabe von Lyon 1658, Stuttgart-Bad Cannstatt, F. Frommann, 1964.

Gassendi, Pierre, *The collected works of Pierre Gassendi*, edited and translated by Craig B. Brush, New York, Johnson Reprint Corporation, 1972.

Goddu, André, *The Physics of William of Ockham*, Leiden, E. J. Brill, 1984.

Gracia, Jorge, "Francisco Suárez, the Man in History", *American Catholic Philosophical Quarterly*, vol. 65 (3), 1991, pp. 259-266.

Grant, Edward, *Much Ado About Nothing: Theories of Space and Vacuum from the Middle Ages to the Scientific Revolution*, Cambridge, Cambridge University Press, 1981.

Harris, C. R. S., *Duns Scotus*, (two vols.), Bristol, Thoemmes Press, 1994.

Henry, John, "A Cambridge Platonist's Materialism: Henry More and the Concept of Soul," *Journal of the Warburg and Courtauld Institutes*, Vol. 49, 1986, pp. 172-195.

Hicks, R.D., "Introduction," in Diogenes Laertius, *Lives and Opinions of the Eminent Philosophers*, Loeb, 1925.

Hutchison, Keith, "Supernaturalism and the Mechanical Philosophy," *History of Science*, xxi, 1983, pp 297-333.

Hutton, Sarah, 'Some Renaissance Critiques of Aristotle's Theory of Time', *Annals of Science*, 34, 1977, 345-63.

Kargon, Robert. "Walter Charleton, Robert Boyle, and the Acceptance of Epicurean Atomism in England," *Isis*, 55, 1964, pp 184–192.

Kilwardby, Robert, *On Time and Imagination*, introduction and translation by Alexander Broadie, Oxford, Oxford University Press, 1993.

Knowles, David, *The Evolution of Medieval Thought*, London, Longman, 1988.

Kogan, Barry S., *Averroes and the Metaphysics of Causation*, Albany, State University of New York Press, 1985.

Koyré, Alexandre, *From the closed world to the infinite universe*, Baltimore, Johns Hopkins University Press, 1968.

Laertius, Diogenes, *Lives and Opinions of the Eminent Philosophers*, translation with an introduction by R.D. Hicks, Loeb, 1925.

Lawton, William Cranston, *The Classical Review*, Vol. 13, No. 2, Mar., 1899, pp. 100-109.

Leff, Gordon, *William of Ockham*, Manchester, Manchester University Press, 1975.

Lennon, Thomas M., *The Battle of Gods and Giants: the Legacies of Descartes and Gassendi*, Princeton, Princeton University Press, 1993.

Lettinck, P., *Aristotle's Physics and its Reception in the Arabic World*, Leiden, E.J. Brill, 1994.

Locke, John, *An Essay Concerning Human Understanding*, London, William Tegg, Thirty-Eighth Edition.

Lucretius, *De Rerum Natura*, translated by R.E. Latham, London, Penguin, 1994.

MacClintock, Stuart, "Averroes", *Encyclopedia of Philosophy*, New York, Macmillan, 1967.

Mach, Ernst, *The Science of Mechanics*, Open Court, 1960.

Mason, Stephen, "Religious Reform and the Pulmonary Transit of the Blood," *History of Science*, vol. 41, 2003, p.459-471.

Maurer, Armand A., *Medieval Philosophy*, New York, Random House, 1964.

Mc Guire, J.E., "Newton on Place Time and God: an Unpublished Source," *British Journal for the History of Science*, vol. 11, 1978, pp. 114-129.

Mc Guire, J.E., "Predicates of Pure Existence: Newton on God's Space and Time," *Philosophical Perspectives on Newtonian Science*, ed. Phillip Bricker and R.I.G. Hughes, Cambridge, MIT Press.

Mc Guire, J.E., and Tamny, Martin, *Certain Philosophical Questions: Newton's Trinity Notebook*. Cambridge, Cambridge University Press, 1983.

Mc Inerny, Ralph, *Aquinas Against the Averroists*, West Lafayette, Purdue University Press, 1993.

More, Henry, "Clarisimo Viro, Nobilisimoque Philosopho, Renato Descartes, Henricus Morus Anglus," *Henry More: A Collection of Several Philosophical Writings, in Two Volumnes*, Cambridge, James Flesher, 1662. Facsimile copy, New York, Garland Publishing Company, 1978, Vol. I, pp 71-81.

More, Henry, *The immortality of the soul*, in *Henry More: A Collection of Several Philosophical Writings, in Two Volumnes*, (Cambridge, James Flesher, 1662. Facsimile copy, New York, Garland Publishing Company, 1978), vol. II, pp1-234.

More, Henry, *Enchiridium metaphysicam*. Translated by Alexander Jacob, *Henry More's Manual of Metaphysics: A Translation of the Enchiridium metaphysicam (1679) with an Introduction and Notes*, Zürich, Georg Olms Verlag Hildesheim, 1995.

More, Henry, *The Argument of Democritus Platonissans or the Infinitie of Worlds*, in *A Platonick Song of the Soul*, Cranbury, Associated University Presses Inc., 1998, pp 405-37.

More, Henry, *Divine Dialogues, Containing the Attributes and Providence of God*, Glasgow, Robert Foulis, 1743.

Newton, Isaac, *Opticks: or a Treatise of the Reflections, Inflections and Colours of Light*, (based on the fourth edition London 1730), New York, Dover Publications, 1952.

Newton, Isaac, *Sir Isaac Newton's Mathematical Principles of Natural Philosophy and his System of the World*, translation Andrew Motte (1729), revised Florian Cajori, Berkeley, University of California Press, 1966.

Newton, Isaac, "De gravitatione et aequipondio fluidorum," in *Unpublished Scientific Papers of Isaac Newton*, ed. A. Rupert Hall and Mary Boas Hall, Cambridge, Cambridge University Press, 1962, English translation (accompanying Latin text) pp. 121-156.

Newton, Isaac, *De gravitatione et æquipondio fluidorum*, Add. Ms. 4003, Cambridge University Library, UK. Available at The Newton Project - University of Sussex, East Sussex website: http://www.newtonproject.sussex.ac.uk/texts/viewtext.php?id=THEM00093&mode=normalized.

Niermeyer, J. F., *Mediae Latinitatis Lexicon Minus*, Leiden, E.J. Brill, 1993.

Normore, Calvin G., "Who was Condemned in 1277?", *Modern Schoolman*, v. 72, 1995, pp. 273-281.

Ockham, William, *Philosophia Naturalis Guillielmi Occam*, facsimile of the edition of 1637, Vaduz-Liechtenstein, Gregg Press, 1963.

Ockham, William, *Quaestiones in Libros Physicorum Aristotelis*, in Guillelmi de Ockham, *Opera Philosophica et Theologica*, vol. 6, edidit Stephanus Brown, St. Bonaventure, Franciscan Institute, 1984, pp. 395-813.

Ockham, William, *Quodlibetal Questions*, 2 vols, translated by Alfred J. Freddoso and Francis E. Kelly, New Haven, Yale University Press, 1991.

Ockham, William, *Summula Philosophiae Naturalis*, in Guillelmi de Ockham, *Opera Philosophica et Theologica*, vol. 6, edidit Stephanus Brown, St. Bonaventure, Franciscan Institute, 1984, pp. 135-394.

Oresme, Nicole, *Le livre du ciel et du monde*, edited by Albert D. Menut and Alexander J. Denomy, translated with an introduction by Albert D. Menut, Madison, University of Wisconsin Press, 1968.

Osler, Margaret J., "Providence and Divine Will in Gassendi's Views on Scientific Knowledge," *Journal for the History of Ideas*, vol. 44, 1983, pp. 549-560.

Plato, "Τιμαιοσ", Greek, with French trans. Albert Rivaud, Paris, Societe D'Edition, 1963.

Plato, *Platonis Timaeus Interprete Chalcidio cum Eiusdem Commentario*, ed. Ioh. Wrobel, (Lipsiae, B. G. Teubneri, 1876 ed.), Frankfurt, Minerva, 1963.

Plato, *Timaeus and Critias*, English trans. A. E. Taylor, London, Methuen, 1929.

Plato, *Timaeus and Critias*, English trans. Thomas Taylor, Washington, Pantheon, 1944.

Plotinus, *Enneads*, Vol III, translated by A.H. Armstrong, London, Heinemann, 1988.

Porro, Pasquale, (ed.) *The Medieval Concept of Time*, Leiden, Brill, 2001.

Power, J. E., "Henry More an Issac Newton on Absolute Space," *Journal of the History of Ideas*, 31, no. 2, 289-96.

Reid, Jasper, "The Evolution of Henry More's Theory of Divine Absolute Space," *Journal of the History of Philosophy,* vol. 45, no. 1, 2007, pp 79–102.

Robinson, John Mansley, *An Introduction to Early Greek Philosophy*: *the chief fragments and ancient testimony, with connecting commentary*. Boston, Houghton Mifflin, 1968.

Ross, Sir David, "Introduction" and Commentary (to Greek Text), *Aristotle's Physics*, Oxford, Clarendon Press, 1936.

Ross, Sir David, *Aristotle,* London, Methuen, 1960.

Rudavsky, T.M., *Time Matters: Time Creation and Cosmology in Medieval Jewish Philosophy*, Albany, Suny Press, 2000.

Rynasiewicz, Robert, "By their Properties, Causes and effects: Newton's Scholium on Time, Space, Place and Motion—I. The Text," *Studies in the History and Philosophy of Science*, Vol. 26, No. 1, 1995, pp. 133-153.

Rynasiewicz, Robert, "By their Properties, Causes and effects: Newton's Scholium on Time, Space, Place and Motion—II. The Context," *Studies in the History and Philosophy of Science*, Vol. 26, No. 2, 1995, pp. 295-321.

Sarasohn, Lisa T., "Motion and Morality: Pierre Gassendi, Thomas Hobbes and the Mechanical World-View," *Journal of the History of Ideas*, Vol. 46, No. 3., Jul. - Sept., 1985, pp. 363-379.

Shapiro, Herman, Motion, Time and Place According to William of Ockham, St. Bonaventure, Franciscan Institute, 1957.

Smart, J.J.C., (ed.), *Problems of Space and Time*, New York, Macmillan, 1964.

St. Augustine, *Confessions*, trans. Vernon J. Bourke, Washington D.C., Catholic University press, 1966.

St. Augustine, *Confessions*. Translation by Albert C. Outler, in vol. VII of the *Library of Christian Classics*, Philadelphia, Westminster Press.

Suárez, Francisco, *Disputationes Metaphysicae*, (Editio Nova, Paris 1866), Hildesheim, Georg Olms Verlagsbuchhandlung, 1965.

Suárez, Francisco, *On Beings of Reason (De Entibus Rationis): Disputation LIV*, "Introduction" and translation John P. Doyle, Milwaukee, Marquette University Press, 1995.

Suárez, Francisco, *On Efficient Causality: Metaphysical Disputations 17, 18, and 19*, "Introduction" and translation Alfred J., Freddoso, New Haven, Yale University Press, 1994.

Telesio, Bernardino, *De rerum natura iuxta propria principia*, Naples edition of 1586, facsimile at website of Biblioteca de la Universidad Complutense de Madrid: http://alfama.sim.ucm.es/dioscorides/temp/938467609_37.jpg

Toulmin, "Criticism in the History of Science: Newton on Absolute Space, Time and Motion (I & II)," *The Philosophical Review*, Vol. 68, January and April, 1959, 1-29 and 203-27.

Van Steenberghen, Ferdinand, *Thomas Aquinas and Radical Aristotelianism*, Washington, D.C., The Catholic University of America Press, 1980.

Von Leyden, W., "Time Number and Eternity in Plato and Aristotle", *Philosophical Quarterly*, vol. 14, 1964, pp. 35-52.

Westfall, Richard S., *Never at Rest: The life of Isaac Newton*, Cambridge, Cambridge University Press, 1993.

Whitrow, G.J, "Berkeley's Philosophy of Motion," *British Journal for the History of Science*, vol. IV, 1954, pp. 37-45.

Wilshire, Leland E., "Were the Oxford Condemnations of 1277 Directed Against Aquinas?", *New Scholasticism*, v. 48, 1974, pp. 125-132.

Wipple, John F., "Thomas Aquinas and the Condemnations of 1277", *Modern Schoolman*, v. 72, 1995, pp. 233-272.

Wolter, Alan, "Introduction", *Duns Scotus: Philosophical Writings*, Edinburgh, Nelson, 1962.

Appendix:

Extract from Francisco Suárez, Metaphysical Disputation 50, Section IX

Latin Text

"Whether the Time in a Thing is Distinguished From Motion"—Extract from 'Vera Responsio,' *Disputationes Metaphysicae*, (Editio Nova, Paris 1866), Hildesheim, Georg Olms Verlagsbuchhandlung, 1965.

15. Ut autem hoc melius comprehendatur, distinguendem est inter illud intervallum, seu spatium imaginarium successivum, quod mente concipimus tanquem necessario fluens ex aeternitate, et realem durationem motus, quae verum ac reale tempus appelatur. Haec rursus realis duratio dupliciter potest considerari: uno modo, absolute secundum solam suam realitatem; alio modo, ut coexistens, et quasi replens (ut ita dicum) quamdam partem illius imaginariae successionis, cui coexistere concipitur. Nam, sicut in corporibus concipimus quoddam spatium permanens, cujus aliquam partem replet quodlibet corpus in loco existens, ita successione temporum concipimus quoddam spatium fluens et successivum, cujus aliquam partem replet omnis motus realiter fluens; quod si fuisset motus ab aeterno; intelligeretur ut replens totum illud spatium, eique coexistens. Igitur, si realis duratio motus apprehendatur ut coexistens tali parti illius successionis imaginariae, quae praeteriit, et ut sic appelletur tempus praeteritum, impossibile est ut sub ea connotatione et rationis apprehensione iterum producatur, non quidem ex parte sua, sed ex parte alterius extremi. Et ratio est, quia illud spatium imaginarium fluens concipatur ut omnino necessarium et immutabile in suo fluxu; et ideo pars ejus, quae concipiatur ut semel praeterita, non potest concipi ut iterabilis; nam illud spatium, cum concipiatur ut omnino necessarium et non causatum, etiam concipi debet ut habens intrinsecam necessitatem in fluxu et ordine suarum partium, ac proinde, quae semel praeteriit, non potest concipi ut iterum

rediens. Ex quo fit ut pars realis temporis, quae semel coextitit parti praeteritae illius successionis imaginariae, non possit iterum ei coexistere. Et ideo tempus praeteritum sub hoc conceptu coexistentis, seu replentis talem partem spatii successive imaginarii, non potest redire.

16. At vero ipsa duratio realis praeteriti motus, quae etiam fuit praeteritum tempus, potest iterum fieri praeteritum tempus, potest iterum fieri ut coexistens alteri parti illius imaginarae successionis. Et quia duratio ut coexistens majori vel minori partii illius successiones imaginariae concipitur a nobis ut major vel minor, etiamsi in se realieter non sit major vel minor, ut clare ptet in indivisibilius durationibus, ideo etiam eadem duratio ejusdem motus si nis extendatur, seu extendi concipiatur per duas partes illius successionis imaginariae, etiam concipitur ut major duratio, seu ut aequivalens duobus, verbi gratia, aut tribus diebus, etiam in se non sit realiter major, aut distincta secundum partes, sed eadem iterum... Et sane, quandocunque loquimur de tempore praeterito ut irrecuperabili, seu quod iterum redire non potest, vel apprehendimus illam continuam imaginariam successionem omnino necessariam et immutabilem, vel, si simul concipimus aliquam realem durationem aut circulationem coeli, apprehendimus illam ut existentem in tali parte illius successivi intervalli, quae neque antea fuisse, nec postea esse iterum potest. Atque it vidur locutus Augustinus dicto capite 23, lib. 11 Confess. Nam cum dixisset, cessante motu coeli, pugnam Josue actam esse per suum spatium temporis quod ei sufficeret, concludit dicens: *Video igatur tempus quamdam esse distensionem...*