

Metaphor and Argumentation in Lucretius

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Declaration of Authorship

I, Matthew Simon Paul Johncock, hereby declare that this thesis and the work presented in it are entirely my own. Where I have consulted the work of others, this is always clearly stated.

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Abstract

This thesis argues that Lucretius employs five coherent groups of imagery in his *De Rerum Natura* to explain the fundamental laws and processes of his materialist philosophy. These groups, embedded in human experience, guide Lucretius' reader through the difficult, and at times unpalatable, doctrines of Epicureanism. Inspired by Lucretius' weaving metaphors for argumentation, and the way in which these groups of imagery intertwine to form the expository fabric of the *DRN*, I have labelled them 'conceptual threads'.

Part 1 applies this framework to the Book 1 prologue, and creates new readings for several key passages (not least the hymn to Venus), while enhancing the coherence of the prologue as a whole. Lucretius introduces the conceptual threads prominently here, to ensure his reader comprehends them before they are expanded throughout the *DRN*.

From this foundation, Part 2 individually maps the development and principal applications of each thread, and explores how Lucretius applies each consistently to depict a fundamental law or process, and the more specific laws and processes relying on these. The broad variety of contexts in which the threads occur emphasises that the fundamental tenets of Lucretius' philosophy are universal.

Part 3 considers how the threads intertwine to express more complex theories, and uncovers deeper meaning in Lucretius' most important doctrines – of creation, the soul, sensation, cosmology and ethics. To comprehend these, the reader must employ their understanding of the individual threads as they have been consistently developed in the epic, and often apply new knowledge retrospectively to gain deeper understanding of earlier theories.

The Epilogue considers how the conceptual threads depict Lucretius' methodology of composition, and how they enhance the consolatory aspects of the *DRN*, especially in the doctrine that 'death is nothing to us' in Book 3, and the harrowing plague scene at the end of Book 6.

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Matthew

Introduction

The status quaestionis

This thesis considers how persistent, coherent patterns of imagery explain the fundamental laws and processes of Lucretius' science and philosophy. It will show how these patterns, taken from human experience, serve to guide the reader through the difficult, and at times unpalatable, doctrines of Epicureanism. Frequently they take the form of metaphors explaining scientific realities, but often they are employed literally, which in turn strengthens their metaphorical application. Inspired by Lucretius' weaving metaphors for argumentation, and the complex web these images form, I have labelled them 'conceptual threads'. This term expresses how they develop and intertwine as the epic progresses.

The present work builds on existing scholarship which has established the importance of imagery to Lucretius' *De Rerum Natura (DRN)* and its interpretation, but the coherence of the patterns of imagery across the whole poem has not hitherto been appreciated. In 1949 Stella Pope wrote as follows:

'It is possible that some of the problems in Lucretius will be resolved by a consideration of his imagery in its richness and variety, the reality which it gives to theoretic processes, and the clarity with which abstractions are realized. In this may lie the explanation of the passionate invocation to Venus at the outset of the poem attacking orthodox religion, and the emotional fervour which pervades Lucretius' exposition of his scientific philosophy. Certainly when one has tried to understand his imagery the rigid cleavage which some have seen between scientific and poetic parts of the *De Rerum Natura* no longer seems to exist.'¹

Pope's approach to unpacking Lucretius' imagery is pertinent and convincing, yet, being restricted to a ten-page paper, it provides only a cursory analysis of a handful of recurrent metaphors.² A full treatment did not appear until 20 years later. In 1969 the first monograph on Lucretian imagery was published: David West's seminal *The Imagery and Poetry of*

¹ Pope (1949) 79. The concluding line of Pope's observation in fact recalls Hohler (1926) 282, who describes Lucretius' similes as 'a peculiar harmonizing of the poetical and scientific imagination, which causes the fortuitous elegance and the vividness of his illustrations of the familiar by the familiar, the unseen by the seen, to be felt by the reader as proofs rather than as mere decorative imagery.'

² Light/dark vs birth/death; movement; water/rivers; feeding; weaving; building; the *leges* and *concilium* of atomic union.

Lucretius.³ In this book, which is obviously the starting point for anyone else undertaking research in this area, West tackles the apparent contradiction of setting forth Epicurean doctrine in verse, arguing convincingly that, far from being a mere adornment, Lucretius' poetry is central to his argument. West investigates short passages in depth to explain how images, many previously overlooked, strengthen the concurrent arguments. He argues, with typical forthright fervour, that a failure to translate Lucretius' rich images is by turns 'destructive', 'monstrous', even 'murder'.⁴ Inflammatory language aside, it is difficult to disagree that we are doing Lucretius a great disservice by misunderstanding his imagery and, in turn, his scientific argument.

Since then there have been some briefer studies of Lucretius' use of particular imagery to explain certain scientific theories. Snyder (1983) briefly addresses the weaving metaphors used to describe Lucretius' atoms and his poetic composition. Cabisius (1984) considers the socio-political metaphors for atomic union.⁵ Mayer (1990) discusses military imagery principally as a kind of stamp of the heroic epic form on the *DRN*. Gale (1994), although mainly concerned with Lucretius' use of science to debunk myth, also considers various images at length, in particular those of Venus and *voluptas*. Gale (2000), ch. 7, building on Mayer's work, addresses Lucretius' military imagery and its reception in Virgil's *Georgics*. A brief chapter in Clay (1998) focuses not on the types of metaphors employed by Lucretius, but rather his techniques and inspirations for them.⁶ The commentaries provide further insight into Lucretian metaphor, in particular P. M. Brown (1984) and (1997), D. Fowler (2002) and Gale (2009).

The most comprehensive approach to recurrent imagery in Lucretius so far is Garani (2007), who makes significant progress in the understanding of this topic. She spots and unpacks several previously overlooked recurrent images, and offers an insightful interpretation of Lucretius' use of arguments by analogy. However, Garani's principal concern is with drawing comparisons with Empedocles, which narrows the field of images

³ Perhaps most surprisingly, it seems West had not read, or at least was unaware of, Pope's article. Rather, he refers to the earlier article by Davies (1931).

⁴ We might see something of Lucretius' self-assurance in West's assertions. These all occur in one page of the opening chapter; West (1969) 3.

⁵ See also Fowler (1989); Garani (2007) 47-69, which incorporates sexual and military metaphors applied to atoms into a 'web of human relationships'.

⁶ pp.161-73. Namely 'confusion' (applying to the vehicle terms appropriate to the tenor, and vice versa), 'contamination' (applying human attributes to atoms) and '*translatio*' (the appropriation of metaphors from Greek philosophy). The first two recall West's 'transfusion of terms' (1969, pp.43-8), which involves, in an analogy or comparison, the application to a target domain of a word or group of words usually only relevant to its source domain. For example, 1.271-97, in which *fluunt* (280), relevant to rivers (the source domain), is applied to winds (the target domain).

considered,⁷ and also limits analysis of Lucretius' overall strategy of argumentation through imagery, or how certain images are introduced and developed throughout the epic.⁸

Metaphor theory

Twentieth-century metaphor studies are relevant to my interpretation of Lucretius' imagery, in particular the theory of the experiential basis of metaphor, advanced by Lakoff and Johnson (1980), since Lucretius' conceptual gestalts are deeply rooted in human experience.⁹ This theory explains metaphor as deeply embedded in human experience, enabling us to express and understand complex concepts. Creating a metaphor involves 'mapping' one or more concepts onto another concept, frequently with multiple correspondences over many levels. The experiential basis of these metaphors greatly enhances our understanding of complex concepts. In some cases, we comprehend a complex concept more easily by considering the whole concept, known as a 'gestalt', rather than one or more of its parts.¹⁰ Again, in some cases we understand the individual parts of one complex concept by the individual parts of another, and also the complex concept by the other as a whole. Lakoff and Johnson, since they consider metaphor as experiential, label the mapped concept in a multi-dimensional correspondence an 'experiential gestalt', i.e. a conceptual whole born out of human experience.¹¹ Sometimes more than one 'experiential gestalt' can be applied either separately or simultaneously to the same broad concept, depending on which qualities of the concept we wish to emphasise.¹² These gestalt metaphors (only a small part of Lakoff and

⁷ 'The focus will be on four major metaphorical fields that seem to dominate Lucretius' poem and best underscore the intertextual relationship between himself and Empedocles'; Garani (2007) 155.

⁸ I have been unable to consult Barnaby Taylor's as yet unpublished doctoral thesis, *Word and Object in Lucretius: Epicurean Linguistics in Theory and Practice* (2013), Ch. 3 of which is on conceptual metaphor in Lucretius.

⁹ They have also expanded their theory fruitfully into other areas, including literary criticism (Lakoff & Turner (1989)), philosophy (Lakoff & Johnson (1999)) and politics (Lakoff (1996)).

¹⁰ Lakoff & Johnson (1980) 69-76. According to the Neural Theory of Language (NLT), the way the brain is wired explains why gestalts are easily formed and comprehended; for NLT, see Feldman (2006) and a summary in Lakoff (2008).

¹¹ They give the example of understanding a particular conversation as being an argument. We can do this through the metaphor 'argument is war'. By understanding individual elements of a conversation as being like individual elements of war (e.g. defence, attack, manoeuvring, retreating etc.), and by applying the 'experiential gestalt' of war to the conversation, we can comprehend that conversation as being an argument; Lakoff & Johnson (1980) 79-86.

¹² For example, we comprehend the concept of love sometimes as 'a journey', or 'war', or 'a physical object', or 'madness' etc. Each explains one of many aspects of the same concept; Lakoff & Johnson (1980) 108.

Johnson's wide-ranging theory), and their explanatory function, form the basis of my reading of Lucretius' use of metaphor in the *DRN*.¹³

Lakoff and Johnson's gestalt metaphor theory is relevant to Lucretius, because he maps multi-correspondence metaphors onto complex concepts, and constituent parts of metaphors onto corresponding parts of the same concepts. Furthermore, as in Lakoff and Johnson's theory, Lucretius frequently employs multiple, apparently conflicting metaphors concurrently to explain different elements of complex concepts. By considering Lakoff and Johnson's model in the scientific and philosophical context of the *DRN*, we find that Lucretius' employment of metaphor is a necessary element of his scientific exposition, enhancing understanding of otherwise arcane concepts.¹⁴ By considering the explanatory purpose of Lucretius' metaphors, we can extract special relevance from his choice and employment of them, and their efficacy.

Lucretius' metaphors fulfil the three 'functions of metaphor in actual literary usage' outlined by Silk (2003). This theory focuses not on the basis of metaphor in linguistics, but on its application in literature, which is relevant to this thesis. The three 'functions' are: to make clearer, like a diagram; to make immediate to the senses; and to exploit associations and disassociations between two things or concepts.¹⁵ The first of these is the primary methodology behind Lucretius' use of metaphor: to help his reader understand his science.¹⁶ It is evident both in stand-alone metaphors, similes or analogies (both brief and extended), and in his persistent gestalt metaphors. The second encapsulates Lucretius' intention to shine light on the dark discoveries of the Greeks, to make visible the atomic processes

¹³ Other aspects of Lakoff and Johnson's theory, such as 'orientational' and 'ontological' metaphors, which primarily relate to how the very basis of linguistic expression is formed from our interaction with the world (for example how prepositions are used – one can be 'in' a race, a relationship or a bad mood, because these are all conceived as containers) are less relevant to this thesis. Conceptual metaphor theory has only recently been applied to classical language and literature, and this thesis contributes to the expansion of research in this area. Pender (2000) and Garani (2007) – concerned with the explanatory role of metaphor in Plato, and Lucretius and Empedocles respectively – relate their studies to Lakoff and Johnson (Garani more extensively so). Latin linguistic studies of conceptual metaphor include Sjöblad (2009) (on Lakoffian metaphor in Cicero's *De Senectute*); Fedriani (2011) and (2014) (on the experiential basis for linguistic expressions). Such research contributes more broadly to the discussion of the extent to which conceptual metaphor theory applies cross-culturally; for which see especially Kövecses (2005).

¹⁴ Martin & Harré (1982) 89: 'We need to use metaphor to say what we mean – since in the course both of literary composition and scientific theorizing we can conceive of more than we can currently say.'

¹⁵ Silk (2003) 126-8.

¹⁶ Silk (2003) 127-8 notes that this function of metaphor is common in science and philosophy, offering Lucretius' analogy between human speech and animal communication (5.1056-90) as an example.

underlying all things (1.136-45).¹⁷ The third in particular links apparently disparate concepts together by the shared processes underlying them (which are themselves often expressed with metaphors). This explanatory approach will be considered shortly.

Lucretius employs each of these functions for different explanatory purposes throughout the *DRN*. He exploits the power of metaphors, particularly those rooted in commonly understood concepts from human understanding and experience, to explain complex scientific processes – predominantly at an atomic level. This thesis will investigate specifically how Lucretius employs five complex metaphors (Lakoff and Johnson’s ‘experiential gestalts’) consistently to explain the central tenets of the cornerstone of his philosophy – his materialist scientific doctrine¹⁸ – namely: atomic attraction and the swerve; the atomic birth-death cycle; atomic compound structure; void and atomic movement; and finiteness and infinity. For each of these concepts, Lucretius establishes an ‘experiential gestalt’ (incorporating multiple constituent metaphorical correspondences), that persists and expands throughout the epic. These gestalts are, respective to the above scientific tenets, PLEASURE, LIFE-CYCLE, WEAVING, LIQUIDS, and BOUNDARIES.¹⁹

By explaining such key doctrines, these metaphors occupy a special position in Lucretius’ exposition. They are not the only persistent metaphors in the *DRN*, but others either lack explanatory force (the first of Silk’s ‘functions’) or do not consistently explain just one central tenet of Lucretius’ philosophy. For example, social metaphors can depict atomic union as an ‘assembly’ of bodies, but do not adequately explain the reasons for their union, or the resulting birth and growth of composite bodies.²⁰ The metaphor has scarcely more functional value than any image expressing ‘coming together’ (and indeed when Lucretius depicts ‘coming together’ social intercourse does not always come to mind). Similarly,

¹⁷ For Lucretius explaining the unseen by the seen, see Schrijvers (1977); Snyder (1983); Hardie (1986) 219-23; Schiesaro (1990); Garani (2007) 182; Lehoux (2013).

¹⁸ Consistency denied of Lucretius’ metaphors by Anderson (1960) and Amory (1969).

¹⁹ These can be seen as root metaphors (Pepper (1942)), which are fundamental to Lucretius’ scientific and philosophical worldview, and without which the worldview itself would be incoherent or, at best, lack sufficient epistemological support. Schrijvers (1977) applies Pepper’s approach to Lucretius, particularly in relation to biological root-metaphors, the Earth-mother analogy and his various analogical representations of the soul. See also Schiesaro (1990) 72-87.

²⁰ For example, Cabisius (1984) 112 and Garani (2007) 66-7 read a social metaphor in a depiction of the spontaneous creation of earthworms in the soil: *quia corpora materiai / antiquis ex ordinibus permota nova re / conciliantur ita ut debent animalia gigni* (2.899-901). It is something of a stretch to take *ordo* in its sense of ‘social classes’ here, and similarly to consider *nova res* as signifying ‘revolution’ (Cabisius’ translation). Although these words can carry this meaning, the purpose of a social metaphor in explaining re-creation from atoms is unclear. It would not especially clarify Lucretius’ argument for the reader, and indeed giving atoms the power of (political) revolution would contradict Lucretius’ enthusiastic denial that atoms are sentient (1.919-20; 2.973-900). When advancing interpretations of metaphors in Lucretius’ scientific explanations, it is important to consider whether they support his science and aid the reader’s understanding of it.

military metaphors, although consistently depicting the ‘violent conflict’ of atomic collisions, provide a visual image, rather than an explanation of the underlying forces at work.²¹ Both metaphors prove problematic beyond a superficial level. For example, social structure entails superiority and inferiority of classes, but the same cannot be said of atomic varieties; and aspects of war, such as military ranks or conquering an enemy have no relevance to atoms. They are occasionally pertinent motifs, rather than persistent explanatory *gestalts*.

Hitherto no single scholarly examination of Lucretian metaphor has considered in depth its role in explaining the principal laws and processes of Lucretius’ science. My analysis will explore the five metaphors specifically on their scientific merits. By examining five key metaphors for five key scientific concepts, I shall highlight the strict method in Lucretius’ metaphor. Special consideration will be given to why each metaphor was chosen to depict each concept, and how Lucretius introduces them to his reader, purposefully and clearly mapping them out, especially in the prologue.²²

Lucretius’ gestalts

Lucretius’ *gestalts* consist of recurrent terminology imbued with metaphorical meaning. The definitions of these terms are frequently derived not from the words’ generally accepted or common usages (κατὰ τὴν πλείστην ὁμιλίαν – Epicurus *Ep. Hdt.* 67; κατὰ τὴν πλείστην φορὰν – *Ep. Hdt.* 70),²³ but from root meanings – which risks obscuring the clarity of his argument. Therefore, following Epicurus’ assertion that it is necessary to grasp the meanings of words (or the ideas attached to them, τὰ ὑποτεταγμένα τοῖς φθόγγοις – *Ep. Hdt.* 37),²⁴ and specifically the ‘first concept’ (τὸ πρῶτον ἐννόημα – *Ep. Hdt.* 38)²⁵ associated with them, to ensure full clarity of meaning,²⁶ Lucretius establishes his own ‘first meaning’ for his terms by

²¹ This may explain why the treatment of Lucretius’ military imagery by Mayer (1990) and Gale (2000) 232-69 focuses in particular on its roots in the epic genre. Gale also notes its application in Lucretius’ moral philosophy, highlighting the paradox that ‘it is necessary to become aware of and to accept the random and violent nature of the physical world in order to escape the randomness and violence of (unenlightened) human life.’ (*ibid.* 240).

²² In Epicurean empiricism, the mind receives images only if it focuses on them (= *prolepsis*). Schrijvers (1970) argues that Lucretius’ explanatory approach adheres to this concept, as he urges his reader to focus on and see his proofs, and supports this with subsequent visual *exempla*. The early establishment of the threads focuses the reader’s mind on them, and their later recurrence activates the reader’s understanding of them.

²³ The exact meaning of these phrases is obscured by the broad range of meanings of ὁμιλία (‘usage’, ‘practice’, also ‘society’) and φορὰ (‘something brought forth’, ‘a tendency’).

²⁴ Asmis (1984) 20: ‘what is subordinate to the utterances’.

²⁵ Asmis’ translation (1984, p.20); Bailey (1926) suggests ‘first mental image’.

²⁶ The argument that inaccurate language is an obstacle to understanding is echoed by John Locke (1632-1704) and John Wilkins (1641-72). Wilkins even created a new written language called ‘real character’, based on his conviction that ‘in a Philosophical language, every word ought in strictness to have but one proper sense and acception, to prevent equivocalness.’ Wilkins (1668) 318.

introducing them in contexts activating and confirming their intended meaning (usually involving collocations with other terms from the same conceptual field).²⁷ This will be evident in the introduction of, among other words, *natura* (1.21, 25), *primordia* (1.55) and *materies* (1.58) – considered in Part 1. By introducing his terms in this way, Lucretius concentrates the reader’s mind on the metaphor, preparing them to recall their metaphorical meanings throughout the poem,²⁸ to gain deeper understanding of his science. To support this, several techniques can be employed to ascertain intended metaphorical meanings in Lucretius’ terminology, principally extratextual comparisons, etymology or internal usages. These techniques have contributed to the translations of Lucretius within this thesis, which are all my own.²⁹

So far the focus has been on metaphor, but Lucretius’ five gestalts are also frequently employed literally in his scientific explanations – for example LIFE-CYCLE depicting the birth of animals, and LIQUIDS portraying flowing water. Therefore, they are more broadly ‘thematic’ or ‘conceptual’ gestalts, rather than solely metaphorical. This is an important aspect, since often literal applications of these ‘conceptual gestalts’ inform metaphorical applications and vice versa, in a reciprocal relationship. The reader’s understanding of key theories is enhanced by a two-fold, complementary metaphorical and literal approach. The five gestalts considered in this thesis vary in the extent to which they are employed metaphorically or literally, as Parts 2 and 3 in particular will make clear.

Since these complex metaphors run throughout the epic and intertwine to form an intricate web of scientific explanation, I have named them ‘threads’. This label embodies the concept of a gestalt, because each ‘thread’ corresponds to a whole scientific concept, while its individual parts, or ‘strands’, correspond to elements of that scientific concept. It is also extracted from Lucretius’ own portrayal of his poetic composition (1.50-55), which will be considered in detail in Part 1. In the lines immediately following this passage, Lucretius introduces his atomic vocabulary, expressed partly by a weaving metaphor (beginning with *primordia* – 1.55), thus setting strands of metaphorical explanation on his loom of discourse.³⁰ From this early expression of intent the reader is primed to notice explanatory

²⁷ Lucretius’ approach differs from Empedocles’, who apologises for his use of metaphor: †ἢ θέμις† καλέουσι, νόμῳ δ’ ἐπίφημι καὶ αὐτός (B9.5); see Garani (2007) 153-4.

²⁸ This fulfils the role of a *prolepsis* – a preparation for receiving a sensation, crucial to the Epicurean theory of sensory perception. Schrijvers (1970) 140-7 argues that Lucretius present his images in this way.

²⁹ Translations of other authors are also my own, unless otherwise stated.

³⁰ Weaving is a common metaphor in poetic composition, and rhetoric (e.g. the *filum orationis*, Cic. *De or.* 3.26.103; *Amic.* 7.25). Scholars aptly use weaving metaphors to describe Lucretius’ intricate composition: his persistent metaphor of a journey towards philosophical enlightenment ‘est le fil qui

threads running throughout the poem. Furthermore, Lucretius' depiction of atoms and his methodology in the same (weaving) terms is appropriate, since materialism is the heart of Lucretius' worldview, and thus poetic composition.³¹

The threads support Epicurean methods of scientific enquiry and explanation. To explain an occurrence accurately, reasoning (*ratio*) must be applied to the sensory evidence we receive. Sensory evidence itself is unimpeachable, but can be interpreted falsely by incorrect *ratio* (4.462-521).³² Among the tools for correct *ratio* are the conceptual threads, since they are used to express the fundamental theories of Lucretius' science. A closely related tool is analogy,³³ which elucidates unexplained phenomena by comparison with occurrences that have been explained.³⁴ The threads work in the same way, but obviate the need for an explicit analogy. Instead connections are made by terminology from the threads, which concisely highlights the processes shared between occurrences. By this method, the processes underlying things are 'universalised' – i.e. shown to have universal power.³⁵ A closely related method of enquiry is the use of multiple possible explanations for a given phenomenon,³⁶ provided each explanation works within the boundaries of established laws – or within the applications of the threads.

By these techniques processes at all levels from the micro- to the macroscopic are compared both within their own level and with others across levels. Within this universalising structure, Lucretius also employs specific analogies by which a microscopic process is represented by a macroscopic process, which the same microscopic process causes internally – creating a kind of 'internalised analogy'. Each of these techniques is appropriate to Lucretius' scientific worldview: as Hardie remarks, for Lucretius 'the structure of things is homogenous at all levels'.³⁷ This homogeneity is embodied in no small part by Lucretius'

les relie l'une à l'autre' – Schrijvers (1970) 19; 'punning, poetry, and philosophy form interwoven threads in the fabric of Lucretius' epic' – Snyder (1980) 144.

³¹ Schiesaro (1994) 87 argues that, since all is body and void to Lucretius, he can make no analogy that does not entail atomic causation at its heart.

³² Asmis (1984) 141-66.

³³ See Hardie (1986) 221-3.

³⁴ Philodemus argues that inference by similarity is as strong a scientific method as denying the opposite of a proposition (*de Signis* cols. 11.32-12.31 de Lacy (pp.48-50)). Lucretius employs the former method throughout the *DRN*, but, contrary to Philodemus' recommendation (col. 18.17-20 de Lacy (p.64)), also compares things that are not obviously closely connected. See also Asmis (1984) 197-211; Schiesaro (1990); Setaioli (2005).

³⁵ Described by Leen (1984) 108 as Lucretius' ability 'to see sameness in very different things'. This ability is well represented by his conceptual threads, both in the metaphors they draw, and in their contribution to universalisation through shared metaphor and analogy.

³⁶ Epicurus *Ep. Hdt.* 78-80, *Ep. Pyth.* 85-7; Asmis (1984) 321-30; Hankinson (2013).

³⁷ Hardie (1986) 220.

conceptual threads. My investigation will shed new light on Lucretius' careful development of explanations throughout the *DRN*.

The reader

The success of Lucretius' didactic approach relies firmly on the reader. Lucretius sets his reader on a journey, on which they should be able to develop from uninitiated novices to skilled Epicurean scientific enquirers.³⁸ They must pay attention and apply *ratio* to the evidence Lucretius provides, and, informed by what they have learnt, seek further proofs for themselves. Lucretius directs them along the correct route, not just by signposted digressions on methodologies of scientific enquiry, argumentation, and comprehension, but by the threads themselves. The reader's understanding of the threads and how they develop (because they represent the fundamental laws and processes of Lucretius' science) enables them to become adept at interpreting sensory evidence correctly – especially because the threads provide sensory evidence for the reader in the form of pictorial *exempla* and imagery, which serve as representations of imperceptible scientific processes.³⁹ Thus the reader becomes able not just to understand, but also to make the analogies that are central to Epicurean empiricism.

Lucretius is likely to have had several types of reader in mind, including those broadly interested in philosophy, those hostile to Epicureanism (Cicero falls into both groups),⁴⁰ staunch Epicureans and potentially complete novices. He balances friendly teaching, for his devotees of Epicurean study,⁴¹ with 'didactic coercion',⁴² for his novices who must be cajoled into applying themselves to their learning. This is exemplified in 1.398-417: on the one hand (398-409) the reader must use Lucretius' proofs to pursue further ones for themselves, like hounds pursuing prey by tracking 'certain traces' (406) left behind;⁴³ on the other (410-17), Lucretius will provide so many proofs that he fears death may strike before they run out. The novice reader may be represented by Memmius (to whom 1.410-17 are addressed), or find

³⁸ Lucretius frequently applies the 'understanding is a journey' metaphor in the *DRN* (e.g. 1.72-4, 659, 1114-7; 2.740).

³⁹ Lehoux (2013) notes that trained perception marks the balance between the Epicurean insistence on relying on sensory evidence, and acknowledgement of frequent misinterpretation of evidence (this being caused only by the untrained mind).

⁴⁰ We know from a famous letter to his brother that he read and admired *Lucreti poemata* (*Q Fr.* 2.10.3), despite criticising Epicurean doctrine elsewhere.

⁴¹ Certainly he does not assume ignorance from the start of the epic; Keen (1985).

⁴² Mitsis (1993).

⁴³ Giving the reader 'a certain degree of autonomy'; Schiesaro (2007) 66.

comfort in Memmius' apparent confusion at Epicurean doctrine.⁴⁴ In fact the novice, upon re-reading the epic, may become an initiate (or at least come close) – and consideration will be given to the effect the conceptual threads have on the returning reader.⁴⁵ This thesis will focus on the willing participant – the 'keen reader', happy to apply themselves to learning and to be guided by hand to enlightenment, since this reader would benefit most from the full range of applications of the conceptual threads (although the reader who only notices some aspects will still benefit to an extent). Less importance will be placed on Memmius,⁴⁶ because even if the *DRN* is principally intended to guide him towards Epicurean enlightenment, he represents only one type of reader.⁴⁷

Thesis outline

The order of exposition of this thesis draws attention to the introduction and subsequent expansion of the threads. It follows Lucretius by addressing each thread's basic applications – usually at an atomic level – before considering their depiction of more complex, or macroscopic, concepts. The resulting approach is broadly linear across the three parts as a whole, but thematic as the threads and their applications are considered in turn. Part 1 considers the Book 1 prologue, in which the threads are introduced. This passage, incorporating the notoriously problematic address to Venus,⁴⁸ also serves as a test case for the conceptual threads theory. The reading proposed here brings coherence to the prologue as a whole, advances solutions to the many difficulties in the Venus passage, and reveals that Lucretius constructs his atomic vocabulary (introduced in 1.50-61) from the LIFE-CYCLE and WEAVING threads. Part 2 pursues the five conceptual threads individually through the first arguments and beyond, outlining their principal facets and consistent application. Then Part 3 considers how the threads are interwoven to explain more complex concepts.⁴⁹ Here we shall see the importance of the threads in depicting the principal elements of Epicurean doctrine, including: the perpetual cycle of creation and destruction; sensation; the mortality

⁴⁴ The reader, faced with Memmius' apparent ignorance, may more readily accept Lucretius' coercive approach; Mitsis (1993) 125-6.

⁴⁵ See Solomon (2004) on this concept.

⁴⁶ For various views on which Memmius is addressed, see Mussehl (1912); Boyancé (1950); Townend (1978); Smith (1992) xlvi-xlix.

⁴⁷ Indeed Volk (2002) 74 considers Memmius not to be a reader at all, but 'an intra-textual character', as part of a 'teacher-student constellation typical of didactic poetry', separate from the extra-textual interaction between Lucretius and his readership (p.82).

⁴⁸ Problematic no less in its textual difficulties than in its content. Here, and throughout this thesis, Smith's 1992 revised version of Rouse's Loeb text (originally published 1924) is followed, with minor amendments noted *in situ*.

⁴⁹ Pender (2000) 118-48 considers Plato's employment of multiple metaphors for explaining key concepts.

of the body and soul; and the limits of pleasure. The Epilogue will consider the threads' role in fulfilling the principal moral aim of the epic – to free the reader from fear – in particular in relation to emotion, *religio* and the devastating plague scene at the end of Book 6.

Part 1

Setting the Threads on the Loom: Metaphor in Lucretius' Prologue

Addressing how Lucretius introduces key concepts and metaphors in the *DRN* causes difficulties, since the prologue (1.1-148) is the most disputed and complex passage in the epic.⁵⁰ It seems clear that – as a prologue should – it introduces the whole poem, since its themes recur (albeit to varying extents) across the six books.⁵¹ Lucretius introduces the following key themes: creation; peace; the gods' detachment from human affairs; atoms; *religio*; Epicurus; the fear of death; celestial bodies; the soul and mind; the task of composition; and the dispelling of fear by *Naturae species ratioque*. Broad content aside, several issues remain – especially with the Venus passage, including: the invocation of a goddess in an Epicurean poem; the sharp shift between this and the subsequent assertion that the Gods live detached from human affairs; the relevance and meaning of the Venus-Mars scene; the apparent metamorphosis of Venus into Nature from 1.56 onwards; and the relevance of the Venus passage to the rest of the prologue.

Various solutions to these issues have been suggested, including: the division of the prologue into static and kinetic pleasure, represented by Venus⁵²; correspondences drawn with Empedocles' Love and Strife;⁵³ Asmis' comparing Lucretius' Venus and the Stoic Zeus;⁵⁴ highlighting the importance of *natura* (translating Greek φύσις);⁵⁵ and Lucretius' apparent remodelling of Venus to Epicurean ideas of the goddess from 1.45 onwards.⁵⁶ Each approach has its merits, but difficulties remain. Several of these can be explained by a close reading of metaphor, and its bedfellow metonymy – a reading that also bears fruit in the analysis of the rest of the prologue. Furthermore, just as the prologue introduces the key themes of the

⁵⁰ I will primarily address apparent contradictions in content, rather than any textual difficulties, which have at any rate been extensively debated. For summaries of the main difficulties and potential solutions, see Regenbogen (1932); Friedländer (1939); Bignone (1945) 136-44; Bailey (1947) 585-88 and *ad* 44-9.

⁵¹ As asserted by Bailey (1947) 587; Leonard & Smith (1942); Brown (1984) 41. Lienhard (1969) 349 goes as far as to say: 'it is clearly a comprehensive introduction to the whole poem'. In contrast, Cox (1971) 1 asserts that 1.1-49 is a prologue to the whole epic, and 1.50-148 to Book 1 alone.

⁵² Bignone (1945) 437-44, adapted by Elder (1954). Bailey (1947) 1749-50 argues Bignone's interpretation solves the problem of lines 44-9.

⁵³ Furley (1970); Gale (1994) 50-75; Sedley (1998a) 1-34; Garani (2007) 34-43.

⁵⁴ Asmis (1982).

⁵⁵ Clay (1983) 82-95.

⁵⁶ Solomon (2004).

DRN, so it introduces the principal metaphors of the work.⁵⁷ By highlighting these metaphorical correspondences, the prologue, far from being a standalone passage clothed in enigma, will be inextricably tied to the first arguments and far beyond.

Lucretius' Venus and the conceptual thread of PLEASURE

The opening lines are a good place to start:

*Aeneadum genetrix, hominum divomque voluptas,
alma Venus, caeli subter labentia signa
quae mare navigerum, quae terras frugiferentis
concelebras, per te quoniam genus omne animantum
concipitur visitque exortum lumina solis [...]* 5
(1.1-5)

Mother of the offspring of Aeneas, pleasure of man and the gods, nurturing Venus, you who beneath the gliding heavenly constellations fill the ship-bearing sea and the fruitful earth, since by you every kind of living thing is conceived and, having sprung to life, looks on the light of the sun [...]

The rich imagery of birth makes the primary focus of this passage clear, but Venus in these lines is immediately complex, playing three roles: to the Romans (in conventional religion), a mother; to men and gods, pleasure;⁵⁸ to all living things, sex. The first suggests this will be a standard prayer to a goddess, while the second contrastingly hints at the Epicurean remodelling of Venus in the poem itself. The second two, meanwhile, depict different qualities possessed by Venus. She represents a life-giving and life-sustaining force (suggested by *alma*) that causes the conception of all living things (4-5), but she is also *voluptas* ('pleasure'), expressed by apposition. Thus we can read Venus as synonymous with, or metonymy for, *voluptas*⁵⁹, essentially creating an abstract compound 'Venus-*voluptas*'.⁶⁰ When Venus fills the land and sea (*concelebras*, in this context strikingly suggesting

⁵⁷ Gale (1997) 64 similarly considers the prominent introduction of 'systems of imagery', namely the Nature-Venus personification, atomic seeds, Epicurus the warrior, and light and darkness.

⁵⁸ The phrase *hominum divomque voluptas* recalls Homer (πατήρ ἀνδρῶν τε θεῶν τε – *Il.* 1.544) and Ennius (*patrem divum hominumque* – *Ann.* fr.448; *divumque hominumque pater* – *Ann.* fr.449, both *War.*); Brown (1984) *ad loc.* If the echo is intentional, Lucretius' purposely replaces *pater* with *voluptas* rather than *mater* – thus distancing Venus further from the role of birth, traditional in Roman religion.

⁵⁹ Bignone (1945); Boyancé (1962).

⁶⁰ Bignone (1945) 437-44 argues pleasure in this passage represents the Epicurean division of 'kinetic' (here = 'sexual') and 'static' pleasure (1.1-23, 1.24-49 respectively). Elder (1954), however, notes that there is static pleasure in the light image of 1.8-9 and kinetic pleasure in the Venus-Mars tableau (1.29-40); Asmis (1982) 467-8 is similarly sceptical. At any rate, it is disputed whether Epicureans did mark this division; see discussion in Glidden (1980) 189-90; Gosling & Taylor (1982) 365-96; Nikolsky (2001).

insemination),⁶¹ pleasure fills them too. As we shall see later, this compound concept allows Lucretius to associate with pleasure certain roles not normally associated with it, which Venus performs in the prologue.

Some roles, however, are directly associated with pleasure:

[...] *tibi **suavis** daedala tellus
summittit flores, tibi **rident** aequora ponti
placatumque nitet diffuso lumine caelum.*

(1.7-9)

[...] for you the skilful earth puts forth **sweet** flowers, for you the expanses of the sea **laugh**, and the sky, **soothed**, shines with outpoured light.⁶²

The delightful, abundant image captures the pleasure brought by Venus' arrival,⁶³ and now Venus represents not just *voluptas* (1.1), but also the cause of *voluptas*. The universalising triplet⁶⁴ earth-sea-sky emphasises the scope of Venus' pleasurable power, and this is picked up shortly after:

[...] *aeriae primum volucres te, diva, tuumque
significant initum **percussae corda** tua vi.
inde ferae, pecudes **persultant** pabula **laeta**
et rapidos tranant amnis: ita **capta lepore**
te sequitur **cupide** quo quamque inducere pergis.*

15

(1.12-6)

[...] first the birds of the air signal you, goddess, and your initiation, **struck to the heart** by your power. Then the wild beasts, and the livestock **dance over flourishing** pastures and swim across strong-flowing rivers: so **eagerly** each, **seized by** your **charm**, follows you to where you proceed to lead them.

Another pleasant image represents Venus' threefold power (birds, wild beasts, domesticated animals),⁶⁵ and extends it from inanimate to animate beings, from the macro to the micro

⁶¹ Suggested to me by David West.

⁶² For the liquids metaphor here, see p.93.

⁶³ I am unconvinced by the allegory, advanced by Hahn (1941) and upheld by Gale (1994) 217-9, of Venus with spring. Rather, spring is the archetypal time when Venus' power is most evident, being synonymous with pleasure, beauty and procreation. Thus Venus arrives alongside spring in 5.737-8 (*it Ver et Venus, et Veneris praenuntius ante / pennatus [= Cupid] graditur*).

⁶⁴ Three parts listed, standing together for a whole; compare the universalising doublet 'heaven and Earth' (i.e. 'the world').

⁶⁵ It seems most likely a distinction is meant between *ferae* and *pecudes*, whether in a slightly loose *asyndeton bimembre* (with a comma in between the two, as printed by Smith (1992)), or with Bentley's emendation *ferae et pecudes*, supported by Kollmann (1974). Either way, we can read a tripartite list echoing others in the prologue. Furthermore, farm animals are a typical Lucretian image (e.g. lambs – 1.257-61; sheep – 2.317-22; calves, goats and sheep – 2.349-70).

level. Lucretius also gives Venus the power of *lepos* ('charm'), denoting the pleasure she brings. This charm instils desire in the animals by striking (*perculsae*) – emphasising Venus' power (*vi*) and suggesting a propelling force causing the animals' movement. This power has both persuasive (hinted at by *inducere*)⁶⁶ and sexual (*cupide*) connotations, and by it Venus leads the animals to procreate, as *voluptas* leads men in 2.172.⁶⁷ The animals desire to pursue Venus and pleasure – strengthening the reading of Venus as metonymy for *voluptas*.

Lucretius then expands upon Venus' power of sexual persuasion:

*denique, per maria ac montis fluviosque rapacis
frondiferasque domos avium camposque virentis,
omnibus **incutiens blandum** per pectora **amorem**,
efficis ut **cupide** generatim saecla **propagent**.* 20
(1.17-20)

And lastly, over the seas and mountains and rapacious rivers, and the leaf-bearing homes of birds, and verdant fields, **striking seductive love** into all through the breast, you make them **eagerly beget** generations according to kind.

Venus causes sexual desire in all animate beings, across the domains of sea, land and sky (another universalising triplet). Again she is persuasive (*blandum*) and again she causes animals to follow her eagerly (*cupide*, repeated from 1.16) by striking them (*incutiens*). Venus has caused flowers to be born, and led animals and caused them to mate. Instigating birth is her most important power, since birth is the central theme of the epic.

This is confirmed in the next lines:

*quae quoniam **rerum naturam** sola gubernas,
nec sine te quicquam dias in luminis oras
exoritur neque fit laetum neque amabile quicquam,
te sociam studeo scribendis versibus esse
quos ego **De Rerum Natura** pangere conor [...]* 25
(1.21-25)

But since you alone steer the birth of things, and without you nothing is born into the daylight borders of light nor does anything happy or loveable come to be, I strive after you to be my partner in writing verses, which I endeavour to arrange **On the Birth of Things** [...]

⁶⁶ Venus by her persuasive power 'leads' animals to a certain action (*OLD, induco* 10).

⁶⁷ See pp.154-5 for an analysis of this passage.

This passage summarises the preceding 20 lines,⁶⁸ confirming that Venus both causes birth and brings pleasure (expressed by *laetum* and *amabile*). She can also help Lucretius to create a pleasurable poem, if she answers his appeal.⁶⁹ Noting the prominence of birth here is crucial to our understanding of the *DRN*. The preceding imagery, including *efficis ut cupide generatim saecla propagent* (1.20), confirms that *rerum natura* in 1.21 denotes the birth (and all it entails) of things, exhibiting the root sense of *natura* from *nascor*, ‘to be born’ (after Greek φύσις from φύω).⁷⁰ Therefore, when this phrase is repeated as the subject of Lucretius’ work (1.25), ‘On the Birth of Things’ is the sense that springs to mind.⁷¹ The logic is watertight: ‘since you govern the birth of things, help me to compose a poem about the birth of things’. The reader is armed to read ‘birth’ in *natura* whenever it recurs in the epic – although the translator will generally be forced by context to translate it as ‘Nature’ or ‘nature’.⁷² The principal theme of the epic will be generation, which Venus steers. She is therefore an appropriate guide for Lucretius’ poetic venture.

Importantly these lines confirm that Venus is not a synonym for the *Natura* of 1.57. As outlined in 1.4-5 (*per te [...] concipitur* – ‘conceived by you’) and 1.20 (*efficis ut [...] propagent* – ‘make them beget’) Venus represents sexual attraction and intercourse, not birth itself.⁷³ Rather she steers *natura rerum* (1.21) – the birth of things – by instilling them with sexual desire, a role she maintains in Lucretius’ discourse on love at the end of Book 4. With this reading Venus cannot be supplanted by, or remodelled as, Nature (= birth) later in the

⁶⁸ The connection is drawn especially by *nec sine te quicquam dias in luminis oras / exoritur*, which recalls *per te quoniam genus omne animantum / concipitur visitque exortum lumina solis* (1.4-5), and by the explanatory conjunction *quoniam*; see Schrijvers (1970) 188.

⁶⁹ Schrijvers (1970) 32-3 highlights the charming passage of poetry in which this petition for charm from Venus sits – an example of what Jules Marouzeau termed ‘la leçon par exemple.’

⁷⁰ Although the term may broadly refer to the universe here (Pellicer (1966) 228), Lucretius brings its birth meaning to the fore, as Clay (1983) 85 argues: ‘In the matrix of the first twenty lines of Lucretius’ invocation, *rerum natura* can have no other meaning’; see also Sedley (1998a) 25-6; Volk (2002) 85; Gale (2004) 53. The late Latin grammarians Lactantius and Servius note the connection between *nascor* and *natura*; see Maltby (1991) *s. v. natura*; for the connection between φύσις and *natura*, see Pellicer (1966).

⁷¹ Bailey (1947) *ad* 1.21 and p.583 notes the birth meaning of *natura* in 1.21, but not in 1.25, and therefore comments: ‘*Natura* in the title has a very wide sense and means something like “all about things”, including their material, structure, growth and behaviour.’

⁷² ‘The crucial term *natura* emerges in Lucretius’ poem, not as it was most commonly used in Latin (κατὰ τὴν πλείστην φοράν), but restored to its original meaning (τὸ πρῶτον ἐννόημα) of birth and genesis.’ (Clay (1983) 85). It is unlikely the Roman reader would miss this meaning, as many modern readers have, particularly since all other derivatives of *nascor* carry some birth connotations (*natus* – son; *nata* – daughter; *naturalis* – natural (opp. to adoptive); *nativus* – having birth/origin; *natio* – birth, race; *nativitas* – birth; *natalis* – natal) – see Keen (1979) n.7.

⁷³ Alternatively, Catto (1988) 98 and 99 labels Lucretius’ Venus as ‘metonymy for the creative process of *natura*’ (but also argues, confusingly, that Venus is later subordinated by Nature). Brown (1987) 91-9 draws a strong link to the Venus of Book 4, albeit focusing solely on her role in sexual pleasure and love, rather than the other types of pleasure evident in the prologue.

and charming words: *da dictis, diva, leporem* – 1.28).⁷⁸ Whenever something is created, whether life or a work of literature, Venus is never far away.

Venus instigates peace as she instigates birth. She rules over peace just as she does over birth: alone (*sola* – 1.31, cf. 1.21) and through *lepos*, and she affects Mars as she affects Nature – with *suavis* and *placidam* recalling *suavis* and *placatum* in 1.7 and 9. There is good reason for Lucretius to ask Venus to beg for peace. During wartime there are few *noctes serenas* (1.142), in which Lucretius composes his epic (see also 1.41-2). When Lucretius addresses Calliope in 6.92-5, he also focuses on *requies* ('rest') and *voluptas* (94), and asks her to be his leader (*te duce* – 95) – a role played by Venus (leading the animals) in 1.15-20. Additionally, *pacem* suggests Epicurean ἀταραξία, the ideal mental state of calmness, peace and freedom from fear,⁷⁹ the pinnacle of Epicurean *voluptas*. Venus, as a goddess, lives this sort of life (*summa cum pace* – 1.45; *privata dolore omni, privata periclis* – 1.47) – and therefore Lucretius is appealing to Venus' sympathy by her experience.⁸⁰

Why a goddess who lives *semota ab nostris rebus* (1.46) would petition for peace on man's behalf is unclear, and the text offers no simple answers. Perhaps Lucretius' prologue intentionally portrays two contrasting Venuses: Venus the metonym for *voluptas*, embodying the cause of desire, and pleasure in the strictest Epicurean sense;⁸¹ and Venus the Roman divinity, matching the reader's expectations of the 'mother of the Romans' (appropriate to the prayer format).⁸² Perhaps Lucretius intended to make a clearer comparison or contrast than the one in the text as we have it, for example adding a logical progression before 1.44-9 (following their likely transposition from 2.646-51),⁸³ to accommodate the lines more

⁷⁸ *lepos* is important to Lucretius' poetic vision, as evident in his 'mission statement' (1.921-50). The thematically linked phrases *musaeo contingens cuncta lepore* (934), *contingunt mellis dulci flavoque liquore* (938) and *musaeo dulci contingere melle* (947) all denote *lepos* in his poetry. Note also the correspondence between Venus' *suavis* [...] *loquellas* and Lucretius' creation of *suaviloquenti / carmine Pierio* (1.945-6). See pp.222-4 for more on Lucretius' pleasing poetry.

⁷⁹ The ultimate aim of securing knowledge of the unknown: Epicurus *Ep. Pyth.* 85, 96.

⁸⁰ Bailey (1947) 1750, after Bignone, emphasises this reading, so that the lines 'fall into their place as Lucr.'s explanation of his allegory and the justification of an appeal for peace to a goddess whose life [...] is one of undisturbed and perpetual peace.' For this connection, see also Schrijvers (1970) 189-90.

⁸¹ This is the appropriate, Epicurean way to understand the gods: it is permissible, for example to call the sea Neptune, corn Ceres and wine Bacchus – as long as one understands the reality: that this is mere metonymy (2.655-60). Boyancé (1947) 99 remarks: 'Vénus est le plaisir, comme Bacchus est le vin, et Cérès est le blé'.

⁸² Gale (1994) 217 comments that 'we cannot exclude the possibility that the proem deliberately presents the reader with two contradictory images of divinity'. I argue, however, that the Epicurean image of divinity is preferred in the end (1.44 onwards).

⁸³ Brown (1984) 43-4 deletes the lines from the prologue, arguing that they make more sense in the context of 2.646-51, and in the Venus prologue they make 'L. associate his Mars and Venus with the orthodox Epicurean gods, whilst simultaneously emphasising the fundamental inconsistencies'. Bailey (1947) *ad loc.*, however, remarks that repeated lines sometimes make more sense in one place than the other (e.g. 4.170-3 = 6.251-4), suggesting they were written in one context and not fully adjusted

smoothly into their new context.⁸⁴ This would have contributed a stricter logical progression than the partial logical order created by the persistent theme of peace in 1.29-49.⁸⁵ Alternatively, Lucretius may simply have struggled to juggle Epicurean pleasure with the complex metonymy of Venus as *voluptas*, while maintaining the pretence of a standard hymn format.⁸⁶ Although inconsistencies in Lucretius' portrayal of Venus remain, the interpretation advanced here has extracted a greater coherence than before.

The metonymy suggested in the opening line has extended throughout the address to Venus. Each of her deeds either represents pleasure, or entails instilling pleasure in things – ranging from the world to plants, animals, gods, humans and poetry. She is *voluptas* and *lepos*, but also the cause of *voluptas* and *lepos*. In addition, Venus displays powers not immediately associated with *voluptas*, in particular persuasion, and the actions of striking and leading – and so *voluptas* may be considered synecdoche for Venus.⁸⁷ Nevertheless, *voluptas* assumes these additional roles by association, a connection made partly by the apposition *voluptas / [...] Venus* in lines 1-2, and partly because persuasion, striking and leading are portrayed with terms associated with pleasure, and in sexual contexts. When terms associated with these deeds occur later in the *DRN*, the reader should recall Venus and *voluptas*; and when *voluptas* or other pleasure terms (*cupido*, *lepos*, etc.) occur, Venus should be recalled. Thus, the goddess' presence is felt throughout the epic, despite being mentioned by name only four further times (1.228; 2.173, 437; 3.776) outside the discourse on love (4.1037-287). This complex web of correspondences forms the conceptual thread of PLEASURE, which encapsulates pleasure, desire, attraction, and charm, as well as persuasion, striking and leading.

This reading allows the Venus prologue to be deciphered more comprehensively than before. Lucretius addresses an apparently un-Epicurean goddess through a standard prayer

when copied to another. The theme of peace in 1.29-43 justifies the copying of the lines to 1.44-9; lack of revision explains the condensed and, at first glance contradictory, logic.

⁸⁴ A stronger contradictory or explanatory conjunction than *enim* (1.44) might be expected. A more explicit logical connection may have been intended after 1.43, which *enim* would then comfortably follow. Schrijvers (1970) 177-80 suggests that in Lucretius *enim* and *nam* often pick up from an individual word or phrase (I say 'x', *enim* 'y'...) in a preceding line or passage, rather than from an entire proof.

⁸⁵ Friedländer (1939) 371: 'The whole hymn is so laid out that peace becomes more and more its ruling idea'.

⁸⁶ A common tension in allegory or extended metaphor is that the allegory can overpower the thing it is representing, and vice versa; Whitman (1987) 1-13.

⁸⁷ Referring to the whole by a part, e.g.: 'that's a nice set of wheels (= car)'. Cf. Whitman (1987) 14-20, who notes that Athena in Homer can only ever be a partial allegory for wisdom, as she possesses several qualities as a goddess that are incompatible with it.

format,⁸⁸ not simply to honour her in an appropriately Epicurean manner,⁸⁹ but to introduce pleasure as the universal instigator of creation. The content, structure, and linguistic and rhetorical techniques are typical of prayers. Lucretius enumerates Venus' powers (1.1-20), including her sphere of influence (1.2-15),⁹⁰ before appealing for help in composition (1.21-8)⁹¹ and peace in which to compose (1.29-49); he addresses Venus by name and lists her characteristics in apposition (*hominum divomque voluptas, / alma Venus* – 1.1-2), before outlining her powers in a relative clause (*quae mare [...]* – 1.3),⁹² and repeating *te* four times (1.4-6),⁹³ and to persuade Venus, he employs flattery ('you alone rule birth, so help me to compose on birth'),⁹⁴ and appeals to experience ('you live in peace, so grant us peace also').⁹⁵ However, with 1.44-9 and the remainder of the epic in mind, this seems misleading, for Lucretius' Venus is not the standard Roman goddess, but the embodiment of Epicurean *voluptas*, the bringer of pleasure, and the instigator of birth.⁹⁶ If we accept Lucretius' hymn as an intentional red herring, playing with his reader's expectations, the apparent contradiction between 1.1-43 and 44-9 is lessened. With this reading, Lucretius' 'prayer' becomes a subversive appeal to an Epicurean principle, designed to introduce the important conceptual thread of PLEASURE.

Lucretius builds upon literary tradition to subvert the standard prayer formats of ancient literature, creating a striking contrast between his scientific theory and popular theology. Asmis suggests that Lucretius is specifically contradicting Stoic depictions of Zeus,⁹⁷ although her reading is principally supported by extratextual evidence. More convincing are

⁸⁸ The prologue of a didactic work commonly includes a hymn to an appropriate deity, Gale (1994) 209 notes, citing Hesiod's *Works and Days*, Aratus' *Phaenomena* and Virgil's *Georgics*.

⁸⁹ See n.81 above. Kleve (1966) interprets the Venus prologue from this perspective, with reference to Philodemus, *De Musica* 4.4.

⁹⁰ See e.g. Homeric hymn to Apollo, 3.14-21.

⁹¹ See Hom. *Od.* 1.1, 10.

⁹² Homeric hymn 8 to Ares is an emphatic example: 'Ares, exceeding in strength, chariot-rider, golden-helmeted, doughty in heart, shield-bearer, Saviour of cities, harnessed in bronze, strong of arm, unwearied, mighty with the spear, O defence of Olympus, father of warlike Victory, ally of Themis, stern governor of the rebellious, leader of righteous men, sceptred King of manliness, who whirl your fiery sphere among the planets in their sevenfold courses through the aether wherein your blazing steeds ever bear you above the third firmament of heaven [...]' (Evelyn-White's (1914) Loeb translation). In Latin see e.g. Hor. *Carm.* 1.10.1-3: *Mercuri, facunde nepos Atlantis, / qui feros cultus hominum recentum / voce formasti catus [...]*.

⁹³ See e.g. Hor. *Carm.* 1.35, where *te* emphatically starts four of the ode's opening six stanzas.

⁹⁴ See e.g. Homeric hymn 22 to Poseidon: 'A two-fold office the gods allotted you, O Shaker of the Earth, to be a tamer of horses and a saviour of ships! Hail, Poseidon, Holder of the Earth, dark-haired lord! O blessed one, be kindly in heart and help those who voyage in ships!' (Evelyn-White).

⁹⁵ A technique from *suasoriae*, appropriate to this prayer format.

⁹⁶ *Aeneadum genetrix* (1.1) may support the deception, as Lucretius inverts the standard praise of a god's ancestry or progeny. The procreative impulse of pleasure (= Venus), because it causes birth, has no ancestry.

⁹⁷ In Cleanthes' *Hymn to Zeus*; Asmis (1982).

perceived similarities between Lucretius' Venus and Empedocles' Love (itself an embodiment of creation). However, the association drawn between the Mars tableau and Empedocles' battle between Love (creative) and Strife (destructive) may be too specific.⁹⁸ Mars, although a destructive god, is not emphatically portrayed as such (aside from *belli fera moenera Mavors / armipotens regit* – 1.32-3), compared with the abundant depiction of Venus. The related suggestion that *Natura*, which possesses creative and destructive qualities (1.55-7), is represented by Mars and Venus together is not conclusively supported by the text.⁹⁹ If Venus represents a quality of *Natura*, it is problematic for Venus also to be her *gubernator* (1.21).¹⁰⁰ Again, although Venus governs both Mars and *Natura*, the two cannot be associated simply with each other. The deeper reading of a love-strife allegory here is largely reliant not on the prologue itself, but on other passages in the *DRN*.¹⁰¹ If the apparent reference to Empedocles is intentional, it displays more differences than similarities.¹⁰² A nod to the previous greatest poet-philosopher within an opening hymn structure situates Lucretius firmly in the didactic tradition, but the prologue's content is overwhelmingly Epicurean. The passage can be read most convincingly as an exploration of Epicurean *voluptas*, cast through the prism of a hymn to Venus, rather than a complex allegory for the cycle of love and strife, or birth and death – the proper roles of *Natura*.

Although Lucretius' Venus displays qualities of the standard Roman goddess, we need not assume Lucretius remodels her in Epicurean terms later.¹⁰³ Rather his Venus seems quite consistent. In the prologue, she embodies pleasure, desire, sexual desire and a striking or persuasive force in sexual contexts, as she does later in the epic: *Veneris fructu* – regular, not sexual, pleasure (4.1073); *Veneris dulcedinis* – desire (4.1059); sexual attraction (4.1052, 1084, 1101 etc.); *res per Veneris blanditur saecla propagent* – persuasion to sexual attraction (2.173); *Veneris [...] ictus* – striking by blows (4.1052). These aspects are also appropriate to her representation of sexual intercourse in 2.437, 3.776, 4.1113 etc. She is pleasure and

⁹⁸ Sedley (1998a) 17: 'It has long been recognised that here we have a striking allusion to the joint-protagonists of Empedocles' physical poem, Love and Strife – whom Empedocles himself sometimes calls Aphrodite and Ares.' See also Gale (1994) 50-75; Garani (2007) 34-43.

⁹⁹ Gale (1994) 72 convincingly describes Venus and Mars as 'wound in each other's embrace', asserting that 'this may be a way of suggesting that Empedocles' creative and destructive forces are in fact eternally and indissolubly linked'. However, this relies on translator's *legerdemain*, since Lucretius' *circumfusa* ('poured around') suggests a less tangible and permanent joining of bodies than Gale's (a weaving metaphor).

¹⁰⁰ Gale (1994) and Garani (2007) overlook this contradiction, because they assume the displacement of Venus by *Natura*, which I have argued against earlier in this Part.

¹⁰¹ Especially in Gale (1994) 222-3.

¹⁰² Partly conceded by Furley (1970), e.g. in relation to the four elements, which, he argues, Lucretius considers 'only as cosmic masses' (p.59).

¹⁰³ Solomon (2004).

desire in Lucretius' introduction to his discourse on love: *namque voluptatem praesagit muta cupido. / haec Venus est nobis [...]* (4.1057-8). The Venus-*voluptas* metonymy of the prologue extends throughout the epic beyond conventional ideas of pleasure to poetic composition, delightful imagery, free will and even, as we shall see in Part 3 Section A, atomic attraction – the central concepts of the PLEASURE thread.

De Rerum Natura: birth in Lucretius' prologue

We earlier introduced *Natura* as representing, through its root sense from *nascor*, birth – a metaphorical correspondence felt in the very title of the epic – and as governed by Venus (1.21-5). This relationship was in fact suggested in the opening lines:

*Aeneadum **genetrix**, hominum divomque voluptas,
alma Venus, caeli subter labentia signa
quae mare navigerum, quae terras **frugiferentis**
concelebras, per te quoniam genus omne animantum
concipitur visitque **exortum** lumina solis* 5
(1.1-5)

Venus, as 'the one who gave birth to Aeneas' descendants' (*genetrix* the agent noun from *gigno*, cf. *genitabilis* – 1.11),¹⁰⁴ is a nurturing (*alma*) mother. She initiates the 'birth' (emphasised by the root-meaning of (*frugi*)*fero* – 'to bear') of plants by 'inseminating' (*concelebras*) the ground. She also causes conception (*concipitur*)¹⁰⁵ and birth (*exortum* here means 'having been born') in animals. This vivid description of the birth of living things becomes a metaphor later:

*quae quoniam **rerum naturam** sola gubernas,
nec sine te **quicquam** dias in luminis oras
exoritur neque fit laetum neque amabile **quicquam**,
te sociam studio scribendis versibus esse
quos ego **De Rerum Natura** pangere conor* 25
(1.21-25)

¹⁰⁴ A further etymological correspondence can be read in *genus*. Although it does not strictly mean 'birth' here, it derives from *gigno* – as noted by various ancient grammarians; Maltby (1991), s. v. *genus*.

¹⁰⁵ OLD, *concipio* 3, which lists this passage (also e.g. Ov. *Fast.* 4.771). The verb can also denote parentage (3b, 'to be the mother of') and the germination of plants (3c).

Birth, governed by Venus, is extended to [sc. 'all'] 'things' (*rerum; quicquam*) for the first time,¹⁰⁶ implying that Venus can affect things as she can animals (1.19-20) – striking them and causing them to 'procreate'. This is the first metaphorical correspondence of the LIFE-CYCLE thread in the epic.

In 1.21-5 *natura* denotes 'birth', instigated by Venus. In 1.56-7 it becomes a personified force, *Natura*,¹⁰⁷ metonymy for the birth of all things:

[...] *et rerum primordia pandam,* 55
unde omnis Natura creet res auctet alatque
quove eadem rursum Natura perempta resolvat,
 (1.55-7)
 [...] and I shall unfold the first-threads of things, from which Nature
gives birth to, makes grow and **nurtures** everything, and into which the
 same Nature **unties** things again when they are destroyed, [...]

Natura – the personified force of birth – not only gives birth to everything,¹⁰⁸ but makes it grow and nourishes it too.¹⁰⁹ In striking contrast, when the birth force of *Natura* dies, things are destroyed (or, by a weaving metaphor, 'untied').¹¹⁰ Thus *Natura* takes on the role of death, and encapsulates Lucretius' birth-death cycle – a dual role emphasised by *eadem*.¹¹¹ Everything that *Natura* causes to be born, she also causes to die. This distinguishes Lucretius

¹⁰⁶ Also notable is the metaphorical correspondence between birth and 'looking on the light of the sun', supported by *exorior*, the usual term for the sun rising. This metaphor is well-established in poetry, occurring in Ennius (*luminis oras*, *Ann.* 2, fr.136 War.).

¹⁰⁷ Clay (1983) 94 asserts that *Natura* displaces Venus 'precisely at the point where this cycle [of Nature] moves from genesis to dissolution' in 1.57 – a view reiterated in *id.* (1998) 128. My reading of Venus and Nature's different roles denies that Venus can be displaced by *Natura*.

¹⁰⁸ *creo* is a central term of Lucretius' LIFE-CYCLE thread. Although it can carry a neutral sense (broadly 'to make' – *OLD*, *creo* 2b, 4, 5), its foremost sense is 'to give birth' or 'procreate' (*OLD*, *creo* 1: Cic. *Tusc.* 3.59; Prop. 4.177; Livy 1.3.7, etc.). This sense is evident in this first usage (1.55) and also in the first arguments – inviting the reader to consider its birth meaning throughout the *DRN*. The inceptive form *cresco*, 'to grow' is conceptually, as well as etymologically, related see E-M, s. v. *creo*.

¹⁰⁹ This need not recall *alma Venus* in 1.2. The term *alma* in Latin applies to various mother goddesses, including Venus (Plaut. *Rud.* 694; Verg. *Aen.* 1.618, 10.332), but particularly Ceres (Lucil. *fr.* 5.214 War.; Verg. *G.* 1.7; Hor. *Carm.* 4.5.18), and Cybele (Verg. *Aen.* 10.220) and Maia (Hor. *Carm.* 1.2.42), who share the name *Magna Mater*. Lucretius distinguishes the nourishment each provides: Mother Earth physically gave birth to all plant and animal life (5.783-854), *Natura* represents birth itself, and Venus offers nourishment in terms of pleasure. In 6.750, Lucretius describes Athena as *alma* in the more general sense 'kind' or 'bountiful'.

¹¹⁰ See n.141.

¹¹¹ I follow the reading of Brown (1984) *ad loc.*, taking *eadem* with *Natura*, rather than referring to 'the same things' after *res* in line 56 (as assumed by Bailey (1947) and Leonard & Smith (1942), both *ad loc.*). Cf. 1.630 for *eadem* used of *Natura* in this way. Schrijvers (1977) reads a biological metaphor at the heart of this cycle. It may at first be surprising that one term, *Natura*, embodies birth and death, but this recalls a theory of Heraclitus ([Plut.] *Cons. ad Apoll.* = fr.202 KRS): 'And as the same thing there exists in us living and dead [...] for these things having changed round are those, and those having changed round are these' (translation KRS). By contrast, Empedocles' Love and Strife are separate entities.

from his epic predecessors Ennius and Homer in 1.112-26, a passage which otherwise serves to highlight similarities:¹¹² whereas they depict the immortal soul migrating to the underworld, Lucretius believes that *Natura's* powers of birth and death are universal. It is crucial that the reader understands that the soul is mortal (1.112-4), as a pillar of Lucretius' philosophy. For Lucretius the very nature of birth entails death, and this is borne out in his LIFE-CYCLE thread.

Seeds and threads: Lucretius' atomic vocabulary

At the heart of this birth-death cycle are Lucretius' atoms, introduced alongside *Natura* in 1.54-61. In this passage Lucretius carefully introduces a group of atomic terminology steeped in metaphor. It is therefore perhaps the most crucial passage for understanding Lucretius' method of explaining science through metaphor.

In his 'mission statement' (1.136-45) Lucretius states that his task is difficult because 'one must produce new words on account of the utter poverty of the language and the novelty of the subject matter' to 'shed light upon the dark discoveries of the Greeks' (1.136-9).¹¹³ Indeed Lucretius must invent several new terms throughout his discourse, but not atomic terminology. In extant Latin before Lucretius are found a transliterated version of ἄτομος (first in Lucilius fr. 820 War. – [...] *eidola atque atomos vincere Epicuri volam [...]*), and *corpusculum*, which Cicero ascribes to the Roman Epicurean Amafinius.¹¹⁴

However, Lucretius pointedly avoids using either term with any frequency.¹¹⁵ *corpusculum* occurs just five times in the *DRN*, with Lucretius preferring to emphasise a connection between 'body' (the quality that enables things to touch and be touched) and the atomic 'bodies' of which all things consist (see especially 1.483-598). Meanwhile, *atomus* does not occur once, even though ἄτομος occurs in the atomists, and 25 times in Epicurus' extant writings. Smallness and indivisibility are clearly qualities of Lucretius' atoms (the latter is handled at length in 1.483-643), but, in his quest for originality (1.926-34),¹¹⁶ he avoided

¹¹² Ennius is described as *clara* (1.119), just as Lucretius shines *clara lumina* on things (1.144); Homer is said to 'have begun to unfold the nature of things' (*coepisse et rerum naturam expandere* – 1.126), recalling both the title of Lucretius' work, and his method of 'unfolding' his philosophy (*pandam* – 55; *praepandere* – 1.144).

¹¹³ For the poverty of Latin, cf. 1.832; 3.260. For concepts new to Latin, Lucretius employs new words such as *clinamen* (2.292 etc.), and existing words given new meaning, such as *extremum cacumen* (1.599, 749 etc.) and *simulacrum* (4.34, 257 etc.).

¹¹⁴ Cic. *Acad.* 1.6: *quid est enim magnum, cum causas rerum efficientium sustulleris, de corpusculorum (ita enim appellat atomos) concursione fortuita loqui?*

¹¹⁵ See Sedley (1999) 230.

¹¹⁶ Although Lucretius tends to avoid transliteration (*homoeomeria* (1.830, 834) and *harmonia* (3.100, 118, 131; 4.1215) are exceptions, partly because they resist succinct rendering into Latin), he is not

these terms and created a new atomic vocabulary. He wanted his terminology to emphasise certain other qualities of atoms, and to achieve this he turned to metaphors, rooted in human experience.¹¹⁷

Lucretius' approach can be understood by considering how he transforms Epicurus' atomic vocabulary into Latin – avoiding some terms, translating others directly, and amending others in translation.¹¹⁸ An investigation of Lucretius' terminological summary from the prologue will highlight that he perceives atomic forms in metaphorical terms:

[...] *et rerum **primordia** pandam,* 55
unde omnis Natura creet res auctet alatque
quove eadem rursum Natura perempta resolvat,
*quae nos **materiem** et **genitalia corpora** rebus*
*reddunda in ratione vocare et **semina** rerum*
appellare suemus et haec eadem usurpare 60
***corpora prima**, quod ex illis sunt omnia **primis**.*

(1.55-61)

[...] and I shall unfold the **first-threads** of things, from which Nature gives birth, makes grow and nurtures everything, and into which the same Nature **unties** things again when they are destroyed – these, when we are explaining the reasons for things, we have become accustomed to call the '**mother-substance** and **procreative bodies** of things', and to name 'the **seeds** of things', and to call habitually these same things '**first bodies**', because all things consist of these **first things**.

It is surprising that two of Lucretius' most frequently used atomic terms are missing from this crucial passage – *elementa* (= Epicurus' στοιχεῖα) and unmodified *corpora* (= Epicurus' σώματα), which both carry a general sense of 'distinct, composite parts'. Instead, Lucretius chooses terms with a strong metaphorical sense, predominantly pertaining to birth – a metaphor present in Epicurus' σπέρματα ('seeds'),¹¹⁹ translated here by *semina*. Both σπέρμα and *semen* are established terms in relation to animal and plant conception and growth.¹²⁰

adverse to translation. This is evident in his atomic vocabulary, and terms such as *finis* (= περάς) and *natura* (= φύσις). For atoms, Lucretius seems to have preferred his own translations to others'.

¹¹⁷ Martin & Harré (1982) 96-7 remark that neologisms in general supply novel meaning, but only metaphors can do this while being instantly meaningful to language users without need of technical understanding and experience. For Lucretius' replacement of technical terms with sets of metaphors, see Sedley (1999)

¹¹⁸ Previous detailed examinations include Reiley (1909) 35-62, and Keen (1979); see also Bailey (1947) for notes at each first occurrence of atomic vocabulary.

¹¹⁹ In *Ep. Hdt.* 38, and also in Anaxagoras – although see KRS 193, pp.367-8, and note there, on the difficulty of interpreting his term. Kranz provides a useful index on σπέρμα in the Presocratics in DK, vol. 2.

¹²⁰ Before Lucretius, Cato uses *semen* in the botanical sense (e.g. *Agr.* 5.3, 48.3 etc.), while Plaut. *Amph.* 1139 and Catull. 67.26 use it of semen, and Varro *Rust.* 2.2.4 and Cic. *Prov. Cons.* fr. 2.43 of

Another possible translation is *materies* (literally, ‘matter’ or ‘timber’), from the Greek term ὕλη, which also occurs in Epicurus. This connection is unclear, however, since ὕλη may not mean ‘atoms’ in its two occurrences in Epicurus’ extant writings (*Ep. Pyth.* 93 and 112, where it could equally mean generic ‘fuel’).¹²¹ Furthermore, Lucretius extracts a meaning – captured in the above translation ‘mother-substance’ – not carried by Epicurus’ term. Lucretius’ first argument brings out this sense:

*quippe ubi non essent genitalia corpora cuique,
qui posset mater rebus consistere certa?
at nunc seminibus quia certis quaeque creantur,
inde enascitur atque oras in luminis exit* 170
materies ubi inest cuiusque et corpora prima;
(1.167-71)

Indeed since each thing would not have procreative bodies, how could a fixed mother for things exist? But now because each is born from fixed seeds, thence each is born and comes out into the borders of light, and in which the **mother-substance** and the first bodies of each are inside; [...]

Birth imagery pervades the passage, with *genitalia corpora* (cf. 1.58) and *creo* (cf. 1.56, 58) repeated from the terminological summary, and the birth image of 170 recalling *dias in luminis oras / exoritur* (1.22-3) from the Venus prologue. *mater* further strengthens the birth imagery, and proves the intended etymology between *mater* and *materies*.¹²² The polyptoton *certa [...] certis* (168-9) connects *mater* and *semina*, which in 1.58-9 was introduced as a synonym for *materies*. In turn, *mater* and *materies* are linked, marking their shared maternal meaning. The birth meaning of *materies* is confirmed in 1.191:

*[...] omnia quando
paulatim crescunt, ut par est, semine certo,
crescentesque genus servant; ut noscere possis* 190
quidque sua de materie grandescere aliq̄ue.
(1.188-91)

parentage. The term complements the long-established sexual metaphor of sowing, depicted in Greek by σπείρω, the verbal form of σπέρμα (Latin *semen*); e.g. Soph. *Aj.* 1293. Lucretius employs this metaphor in *muliebria conserat arva* (4.1107); see Adams (1982) 154.

¹²¹ See Reiley (1909) 48-9. The word is more common in Aristotle, who may have been first to use it in a philosophical context, as one of the four causes of his οὐσία.

¹²² E-M, s. v. *materies*: ‘proprement ‘substance dont est faite la *mater*, c’est-à-dire le tronc de l’arbre considéré en tant que producteur de rejetons. Dérive de *mater*, comme *pauperies* de *pauper*.’ See also Maltby (1991) s. v. *materies*. There is general consensus that *mater* intentionally introduces *materies*: Merrill (1907) *ad* 1.171 notes, ‘*materies* seems to look back to *mater*, 168, as if the two were etymologically related’; and Bailey (1947) *ad* 1.168, ‘*mater* is intended to suggest *materies* 171’. Nevertheless, neither translates *materies* with a birth meaning. See also Leonard & Smith (1942) *ad* 168; Brown (1984) *ad* 171.

[...] since everything grows a little at a time, as is fitting, from **fixed seed**, and in growing preserves its kind; so that you may recognise that each grows and is nourished by its own **mother-substance**.

Again *materies* is synonymous with *semina*, and it assumes the roles of *grandescere alique*, recalling *Natura* in 1.56 (*auctet alatque*). The careful attachment of a birth meaning to *materies* in the Book 1 prologue indicates that Lucretius intends the same meaning throughout the epic. Lucretius has transferred the metaphor of *materies* (and ὕλη) from trees, fuel or construction, towards birth. The usual translations – ‘matter’ (Rouse,¹²³ Leonard, Melville), ‘material’ (Bailey), ‘matèria’ (Giussani), ‘raw material’ (Latham) or similar – seem inadequate. The bolder translation ‘mother-substance’ conveys Lucretius’ metaphor, and situates *materies* firmly within his birth-themed atomic vocabulary.¹²⁴

The reading of a birth metaphor in *materies* is justified further by *genitalia corpora* (1.58), which carries a clear birth meaning – captured by Merrill’s ‘creative elements’.¹²⁵ The occurrence of this compound term here is surprising, since it occurs just three more times in the atomic sense (1.167; 2.62-3, 548).¹²⁶ It seems anomalous in this terminological summary, and hardly for Lucretius an ‘accustomed’ (*suëmus* – 1.60) term. It seems the reason that *genitalia corpora* is introduced here is its birth sense, which *corpora* on its own lacks. Similarly, *prima corpora* (1.61) – suggesting ‘beginning bodies’ or ‘initial bodies’ – is conceptually related to birth. In fact, the reader might appropriately think of the generative qualities of *corpora* whenever this term occurs in an atomic sense in the *DRN*.

Lucretius’ *prima corpora* and *prima* (1.61) translate Epicurus’ ἀρχή, which denotes both atoms – often qualifying ἄτομοι (e.g. *Ep. Hdt.* 41) – and beginnings in general (e.g. *Ep. Hdt.* 44). In the context of Lucretius’ terminological summary, *prima corpora* and *prima* support the overall sense of creation. These two terms have perhaps been included by Lucretius in this list of terminology because they are more appropriate than *elementa* and *corpora* for extending the birth metaphor.

¹²³ For bibliographical details, see under Smith (1992).

¹²⁴ Snyder (1980) 39, noting the wordplay of *mater-materies*, states, ‘matter and its atomic structure function as the mother of things’. Schrijvers (1977) 80, by outlining a specifically biological metaphorical group (or perhaps by overlooking the metaphor implicit in the term), does not correlate *materies* with *semina* or *genitalia corpora*.

¹²⁵ Merrill (1907) *ad* 1.58. Keen (1979) 65-6 suggests that *genitalia corpora* translates σωματων φύσεις (Epicurus *Ep. Hdt.* 41). However, Epicurus’ φύσις more directly corresponds with Lucretius’ *Natura*, in the sense ‘inborn nature’ or even ‘birth’ – a comparison that Keen makes; see also Pellicer (1966). Lucretius translates σωματων φύσις directly with *corporea natura* (‘bodily nature’), e.g. in 1.302-3 and 2.20-1.

¹²⁶ The term occurs in 4.1044 and 6.1207, denoting human ‘genital parts’. We also find *genitalia semina* (5.851), which means ‘procreative seed’ in a sexual context.

After the prologue the creative properties of Lucretius' atoms are emphasised throughout the first arguments and beyond. Lucretius builds upon the vocabulary introduced in the prologue to map concepts of sexual union and birth onto his atoms. This is a principal role of the LIFE-CYCLE thread, which expands to create a panoptic atomic theory applicable to inanimate and animate objects on a microscopic and macroscopic level. Birth lies at the heart of human experience, and by applying a birth metaphor to atomic creation in the prologue, Lucretius introduces his atomic theory in a more easily comprehensible way, setting up more complex correspondences between atomic union and dissolution (Books 1 and 2), and the nature of sensation, the soul, love and death (Books 3 to 6).

However, not all of Lucretius' atomic vocabulary fits within this one metaphor.¹²⁷ The atomic terms discussed so far are synonyms for one which has no equivalent in Epicurus: *primordia* (1.55). This is the first atomic term introduced in the epic, and is Lucretius' second-favourite term behind *corpora* (and its various compounds), occurring 72 times in all (53 in the atomic-themed opening two books), so its accurate translation is critical. The birth meaning of the other atomic terms introduced in this summary suggests *primordia* might be another birth term. Indeed its prefix *prim-* expresses origins (cf. *corpora prima* and *primis* in 1.61) and its suffix *-ordia* is linked to the verb *ordior*, usually translated 'to begin'. Previous usages of *primordia* suggest the same, denoting a 'beginning' (*dubito [...] quod primordium capissam ad stirpem exquirendum* – Pac. fr. 52.3 War.) or family 'origins' (*in primordio pueruli* – Var. Log. 9.1 in Non. p.308M; see also Cic. Leg. 2.7, written at a similar time to the DRN).¹²⁸ Finally, it is argued that Lucretius employs *principia*,¹²⁹ which, like *corpora prima* and *prima*, is conceptually related to beginnings and birth, to cover the unmetrical genitive, dative and ablative plural forms of *primordia*, in a 'complementary distribution'.¹³⁰ Although it is not necessarily the case that *primordia* and *principia*, since they are used interchangeably to denote Lucretius' atoms, must carry the same metaphorical meaning, nevertheless translating *primordia* as 'first beginnings' completes a tidy, thematically consistent group of atomic vocabulary introduced in this summary, and maintains the persistent birth imagery of the Venus prologue.

¹²⁷ *contra* Sedley (1999) 230.

¹²⁸ See also Cic. *Part. or.* 7.21, which denotes elements (i.e. building blocks) of an argument.

¹²⁹ A term Lucretius may have omitted from his glossary to avoid over-repetition of words with *prim-* as a root, or because it is a virtual synonym of (*corpora*) *prima*.

¹³⁰ Reiley (1909) 51-3; Merrill (1907) *ad* 1.55 s. v. *primordia*; Bailey (1947) *ad* 1.55 s. v. *rerum primordia*.

This reading does not, however, fully account for Lucretius' ingenuity in metaphor, and interest in the semantic range of words. As seen with *Natura* and *materies*, Lucretius employs root-meanings to add metaphorical colour to his philosophy. The term *primordia* fits within a semantic grouping in Lucretius alongside *exordium*, 'the warp set up on a loom'¹³¹ (like *primordium* etymologically connected with *ordior*, which, as well as meaning 'to begin', also specifically means 'to lay the warp of a web'),¹³² and *ordo*, which broadly denotes ordered rows or lines (and therefore can conceptually apply to threads in weaving).¹³³ While *ordo* is not etymologically related to *ordior* (or *primordium* and *exordium*),¹³⁴ it is difficult to agree with Ernout and Meillet that 'les Latins ne sentaient pas une parenté entre *ordo* et *ordior*',¹³⁵ owing to their aural proximity, to which Lucretius often draws attention (particularly between *ordo* and *primordia*), therefore assimilating their meaning and creating a (false) etymology.¹³⁶ Taking this semantic group, and especially the close relationship between *primordia* and *exordia*, *primordia* might be translated as the 'first threads laid on the loom'.¹³⁷ The meaning seems initially too abstract, and the translators render it 'first-beginnings' (Rouse, Bailey), 'atoms' (Latham), 'prime particles' or 'basic particles' (Stallings), or 'primal elements' or 'primal matter' (Melville). 1.50-7, however, confirm Lucretius' intention:

quod superest, vacuas auris animumque sagacem 50
semotum a curis adhibe veram ad rationem,
*ne mea dona tibi studio **disposta** fideli,*
intellecta prium quam sint, contempta relinuas.

¹³¹ OLD, *exordium* 1, used literally (e.g. Quint. *Inst.* 5.10.71, of a toga) or metaphorically (e.g. *Inc. trag.* 87 War., of a prologue, alongside *detexo*). Compare also *exordior*, used in a weaving metaphor in Plaut. *Pseud.* 399 (with *detexo* and *tela*), *Bacch.* 350 (with *tela*); Cic. *De or.* 2.145 (with *pertexo*), 2.158 (with *detexo* and *retexo*). On the derivatives of *texo*, see n.255.

¹³² OLD, *ordior* 1, e.g. Plin. *HN* 11.80 (of a spider). For the etymological connection, see de Vaan (2008) s. v. *ordior*. Lucretius employs *primordia* and *exordia* as synonyms in the *DRN*, for which see pp.69-70.

¹³³ E.g. OLD, *ordo* 1b, 'a row of seats in the theatre'; *ordo* 2, 'a line of soldiers standing abreast (usu. in battle), a rank; *ordo* 5, 'civil or social standing, rank, position'.

¹³⁴ E-M, s. v. *ordo*: 'Le dérivé de *ordo* qui signifie <<mettre en ordre>>, c'est *ordino*'; de Vaan (2008) s. v. *ordo*: 'The original denominative to *ordo* was *ornare* < *ord-n-are < *orde/on-a-' – although he does (s. v. *ordior*) posit a possible connection between *exordior* specifically and *ordo* from a shared *ord-root.

¹³⁵ E-M, s. v. *ordo*.

¹³⁶ See pp.71-2 for a detailed consideration. Also, Nagy (2002) 80-1 notes the weaving sense of *ordior* evident in Cic. *Leg.* 1.3.9, alongside *contexo* and *absolvo*.

¹³⁷ Snyder (1983) 40-1 calls them 'first warp-threads', and notes that the weaving sense is more clearly captured by the tmesis *ordia prima* at 4.28. Reiley (1909) 52 (also p.62) previously noted the importance of this separation, but, despite noting the weaving meaning of *exordia*, suggested a birth, rather than weaving, meaning for *primordia*. Similarly Garani (2007) 175-6, in analysing 4.114-5, recognises the weaving meaning of *exordia* 'atoms', but not of *primordia*, which she translates as 'first-beginnings'.

*nam tibi de summa caeli ratione deumque
 disserere incipiam, et rerum primordia pandam, 55
 unde omnis Natura creet res auctet alatque
 quove eadem rursum Natura perempta resolvat,*

(1.50-7)

What is more, apply your open ears and keen judgement, far removed from worries, to true reasoning, lest my gifts, **laid out** before you with loyal devotion, be disregarded before they have been understood. For I shall begin to **separate the threads** of the highest logical array of the heavens and the gods, and I shall **unfold** the **first-threads** of things, whence Nature gives birth, makes grow and nurtures everything, and into which the same Nature **unties** things again when they are destroyed, [...]

Lucretius' method of explanation involves 'laying out', 'separating out' and 'unfolding' threads of scientific evidence. *disposta* is a complex word suggesting both 'separating' (the *dis-* prefix) and 'laying out' (*pono*) – an image expanded by *disserere* ('to disentwine', 'to unfasten')¹³⁸ and *pandam* ('to spread or stretch out cloth').¹³⁹ The importance of this method is emphasised by *studio [...] fideli*: the task is painstaking but crucial to explaining his complex theories. A metaphor is created, depicting pieces of evidence for atomic theory as threads entwined in complex array, which Lucretius must separate for his reader to comprehend.¹⁴⁰ This marks the first instance of Lucretius' WEAVING thread.

Lucretius extends the weaving metaphor to the atoms themselves. They are described as 'first-threads' that are used to create all things and are prone to being 'untied' – the most common application of the weaving metaphor in the *DRN*.¹⁴¹ The weaving metaphor of *resolvat* in 1.57 is less surprising than it may seem, since it translates Epicurus' διαλύω

¹³⁸ Formed again of the *dis-* prefix and *OLD, sero*² 'to link together, entwine, interlace', from the Greek εἶρω 'to fasten together in rows, string' (e.g. of a necklace) – LSJ. Although *dissero* more generally means 'to explain', its weaving sense is brought out by the other weaving terms in this passage.

¹³⁹ *OLD, pando* 2a. Cf. *expandere* in 1.126, describing Homer 'unfolding' the nature of things; and *praepandere lumina* 'to unfold the lights (of explanation)' in 1.144. Snyder (1983) 37-43, while noticing the intrinsic meaning of *primordia*, overlooks the surrounding weaving imagery in this passage. The link between Lucretius' weaving of discourse and atomic threads does, however, support her argument that his 'woven' poem mirrors the 'woven universe'.

¹⁴⁰ The comparison between separating threads and separating words for the purpose of teaching occurs in Pl. *Cra.* 388b11-c1: 'So a name is a kind of teaching instrument, and one that separates things that are, just as the shuttle separates the web.'

¹⁴¹ Expressed most frequently by the essentially interchangeable cognates *solvo, resolvio, dissolvo* and *exsolvo*. In Latin these express various connotations of untying, unweaving and unpicking both threads and threadlike things, for examples: *OLD, solvo* 1-6 and 11 (e.g. *Ov. Met.* 4.6 of hair ties; *Curt.* 3.1.18 of knots; *Cic. Att.* 11.9.2 and 15.4.4 of a tied-up bundle of letters); *OLD, resolvio* 1-2 (*Verg. Aen.* 3.370 of a headband; *Ov. Ars am.* 3.328 of hair); *OLD, dissolvo* 1, 'undo' (*Tib.* 1.7.1-2 of the warp-threads (*stamina*) knitted (*neo*) by the fates) and 3 'unbind, set free' (*Tib.* 1.10.62 with *coma*); *OLD, exsolvo* 1, 'undo' (*Plaut. Rud.* 367 with *restis*) and 2, 'release (from bonds)' (*Plaut. Bacch.* 957).

(literally ‘loosen’, ‘untie’), with which it is etymologically linked¹⁴² – a term that may stem from Empedocles or Leucippus (Aristotle uses διαλύω and its derivative διάλυσις in a summary of their theories – *Gen. corr.* A8, 325a2 = KRS 545). As Parts 2 and 3 will explore, Lucretius expands Epicurus’ weaving image far beyond διαλύω and the occasional περιπλοκή (‘interlacing’) and πλεκτικός (‘entwined’) (e.g. *Ep. Hdt.* 43),¹⁴³ to create an expansive, coherent portrayal of atomic compound structure and dissolution. Lucretius’ *primordia* cannot simply be grouped with *corpora prima* as ‘Lucretius’ more neutral equivalents for the ἀρχαί of Greek physics’.¹⁴⁴ Rather, the term expresses a crucial metaphor absent from Lucretius’ other common atomic terms, including its supposed partner *principia*. This crucial passage alerts the reader to the WEAVING thread, which they should recall when *primordia* and *resolvo* recur, and also their cognates (*exordia*; *solvo*, *dissolvo*, *exsolvo*), and more generally other weaving terms in an atomic context. The keen reader will follow Lucretius and picture interwoven ‘first-threads’ forming the nature of things, and also the woven nature of Lucretius’ exposition (introduced by *pandam*, *disserere* and *disposta* above), as he unties and unfolds the *facts* of atomic union by untying *things themselves* into their first-threads. His poem will mirror the make-up of the world, and in itself reinforce his atomic theory.¹⁴⁵

Having outlined the birth and weaving metaphors in Lucretius’ atomic vocabulary, two questions arise: why did Lucretius choose these metaphors in particular for his atoms, and why did he choose two metaphors instead of one? First, both metaphors are ideal for depicting the principal aspects of Lucretius’ atoms. Birth (why and how things come to be) is the fundamental explanandum in natural philosophy. It is also fundamental to life and central to our experience, and thus readily comprehensible. Most importantly, several aspects of birth can be mapped directly onto atoms: birth begins with seeds (= Lucretius’ *semina*), which create things and make them grow; things are born according to species and, once born,

¹⁴² E-M, s. v. *solvo*, which also points out the connection between *absolvo* and ἀπολύω; also de Vaan (2008) s. v. *solvo*.

¹⁴³ Considered by Snyder (1983) 41. Aristotle employs a cognate in describing Democritus’ theory of atomic collisions, which are said ‘to be entangled’ (περιπλέκεσθαι – on *Democritus ap. Simpl. in Cael.* 295.9 = KRS 578); cf. also *in Cael.* 295.11 = KRS 583; and *in Cael.* 242.21 = KRS 584.

¹⁴⁴ Clay (1998) 129. Similarly, Keen (1979) 63-4, following Reiley (1909) 51, asserts that *primordia* has been taken from ὥστε τὰς ἀρχὰς ἀτόμους ἀναγκαῖον εἶναι σωμάτων φύσει (Epicurus *Ep. Hdt.* 41), owing to similarities between this section of Epicurus’ letter and *DRN* 1.483-6. Despite a strong connection between ἀρχή and the *prim-* stem of *primordia*, this overlooks the important first occurrence of *primordia* in 1.55 and its weaving context. Moreover, *prima* (used both substantively and adjectivally, as in *prima corpora*) suffices as a direct translation of ἀρχή. It is unnecessary to assume *primordia* was inspired specifically by this passage of Epicurus.

¹⁴⁵ See pp.224-6.

maintain their essential characteristics throughout their lives;¹⁴⁶ and everything born is destined to die. These concepts are expressed in Lucretius' atomic theory, which is central to his birth-death cycle, explored in Part 2 Section A. The weaving metaphor is also well chosen, since weaving as a craft was universally known by Lucretius' readership.¹⁴⁷ Furthermore, aspects of weaving and woven cloth are extensively applicable to conjoined atoms: threads are the smallest parts of woven items, and if they are split any further, weaving becomes impossible; woven threads cohere until an external force (i.e. tearing or unravelling) is applied; a cloth is destroyed when its threads are untied; untied threads can be rewoven in different configurations to make new items; the characteristics of a cloth depend on the type(s) of threads used in its production, and the order and density in which these are interwoven. These aspects, which form the WEAVING thread, perfectly capture atomic compound structure and dissolution in the *DRN*, as Part 2 Section B will consider.

The question of why Lucretius chose two metaphors for his atoms can now be addressed. The birth metaphor is ideal for depicting atomic creation; the weaving metaphor for depicting compound structure. However, neither metaphor depicts both aspects. Each covers the conceptual shortcomings of the other, and both together explain Lucretius' atoms. Lucretius may hint at this division in a reference to his indivisible bodies, 'which we teach to be the **seeds** and **first-threads** of things' (*semina quae rerum primordiaque esse docemus* – 1.501). However, this phrase draws attention to a possible contradiction. The birth metaphor pictorialises atoms as essentially round seeds¹⁴⁸, while by the weaving metaphor atoms are threads which are woven into compounds. But how can an atom be both a ball and a thread?

This apparent contradiction might be compared with the modern wave-particle duality model of light. Two contrasting and apparently incompatible theories depicting light as waves or particles were combined in the early twentieth century, and both models are now used to explain the properties and functions of light. Each model explains different functions, and both cannot be used together: when detected by interaction light acts like

¹⁴⁶ Lucretius frequently addresses the fixed nature of procreation (e.g. 1.159-73, 584-98) via the intertwined BOUNDARIES and LIFE-CYCLE threads – a correspondence considered in Part 3 Section A.

¹⁴⁷ 'The assumption of readers' familiarity with the operations of weaving led to frequent allusions [by Greek and Roman authors], to which we should be alert' – Snyder (1983) 39.

¹⁴⁸ In 3.186-207, soul atoms are compared to round, smooth water atoms, and then by analogy to poppy seeds. Other types of atoms are more like wheat-ears – essentially rounded, but elongated and spiked. Similarly, oil atoms strain slowly through a sieve despite (we assume) being round, because they have hooked protrusions (2.392-7). By mapping Lucretius' 'atoms are seeds' metaphor onto this explanation, the oil atoms are reminiscent of burdock seed, for example, which cling together and onto animals' fur.

particles; when in motion it acts like waves.¹⁴⁹ Each model is a metaphor, whereby light is conceptualised in terms of two macroscopic concepts (waves and balls).¹⁵⁰ The wave metaphor highlights the wave-like properties of light and suppresses its particle-like properties; the particle metaphor vice versa.¹⁵¹ Similarly, Lucretius' seeds metaphor highlights his atoms' seed-like properties and suppresses their thread-like properties, while his threads metaphor does the opposite.¹⁵² The metaphors are probably not intended to be conceptualised simultaneously (although sometimes they are juxtaposed), but neither fully explains atoms without the other.¹⁵³ Parts 2 and 3 will consider in more detail how the two metaphors complement one another, and occasionally combine to explain more complex concepts.

In fact, Lucretius' atomic term *primordia* bridges the gap between the two metaphors. The translation 'first-threads' captures its weaving meaning, but the prefix *prim-* also suggests a creative aspect (as, for example, *corpora prima*). Expanding the metaphor, the first threads (i.e. warp threads) mark the beginning of weaving, the creation of a cloth or garment.¹⁵⁴ This plays a broader role in Lucretius' atomic theory, since not only are the warp threads the starting-point (technically the 'starting border') of weaving, but they also dictate what sort of weave will result (in other words the cloth's growth and resulting form), depending on their configuration.¹⁵⁵ In an atomic sense, the configuration of *primordia* dictates the form and qualities of the things they create,¹⁵⁶ which further explains the 'fixed birth and growth' of things, depicted by the intertwined LIFE-CYCLE and BOUNDARIES threads.¹⁵⁷ The nature of a thing, animate or inanimate, is fixed as soon as its creation (or weaving) is

¹⁴⁹ The two theories are now applied to all types of radiation, and also to matter itself. Eisburg & Resnick (1985) 62-3 in their explanation paraphrase Niels Bohr as follows: 'The wave and particle models are complementary; if a measurement proves the wave character of radiation or matter, then it is impossible to prove the particle character in the same measurement, and conversely. [...] Furthermore, our understanding of radiation, or of matter, is incomplete unless we take into account measurements which reveal the wave aspects and also those that reveal the particle aspects.'. In fact the two models (interacting particles and moving waves) have recently been observed simultaneously through microscopic imaging; Piazza *et al.* (2015).

¹⁵⁰ See Bump (1985) 445 and 446.

¹⁵¹ Lakoff & Johnson (1980) 164-6.

¹⁵² Pender (2000) notes the same approach to metaphor in Plato.

¹⁵³ The mind is in fact capable, via the process of 'blending' (a central theory of cognitive linguistics), of accommodating opposites in a single thought. For the concept of blending, see especially Fauconnier & Turner (2003). They remark (p.29) that 'often the point of the blend is not to obscure incompatibilities but, in a fashion, to have at once something and its opposite'.

¹⁵⁴ Weaving as a process is inextricably associated with beginnings; Nagy (2002) 79.

¹⁵⁵ Indeed we can tell which weaves were used in ancient weaving from surviving examples of starting borders; Hoffmann (1964) 151-83; see also Wild (1970) 55-6.

¹⁵⁶ Explored in Part 2 Section B.

¹⁵⁷ See Part 3 Section A.

initiated. The single term *primordia* marks the convergence of the LIFE-CYCLE, BOUNDARIES and WEAVING threads to depict the fixed nature of things.

Lucretius uses his first ‘mission statement’ (1.50-61) to introduce the conceptual LIFE-CYCLE and WEAVING threads in his theory of atomic union. These threads persist throughout the epic, and are combined (or rather, interwoven) with others to explain the central theories of Lucretius’ science. The importance of understanding these metaphors is underlined in this passage. He gains the reader’s attention:

quod superest, vacuas auris animumque sagacem 50
semotum a curis adhibe veram ad rationem,
ne mea dona tibi studio disposta fideli,
intellecta prius quam sint, contempta relinquas.

(1.50-53)¹⁵⁸

Then he lays out, in his atomic vocabulary, his principal threads – LIFE-CYCLE and WEAVING. *ratio* here might even represent Lucretius’ ‘rationale’ or ‘methodology’ – specifically of metaphor, which the subsequent lines (1.54-7) exemplify. The reader, by applying ‘open ears and keen judgement’ to the birth and weaving metaphors, will gain increased understanding of Lucretius’ atomic theory. The same applies to the metaphors of his other threads.¹⁵⁹ This opening ‘mission statement’ is much more than ‘a very compendious syllabus of the poem’.¹⁶⁰ Rather, it alerts the reader to Lucretius’ methodology, directing them towards getting the most out of the *DRN*. Metaphor is as essential to Lucretius’ philosophy as the science it explains. Noticing its importance underlines the consistent, introductory nature of the prologue. The correspondence highlighted by Lucretius between ‘woven’ atoms and his ‘woven’ exposition invites us to consider the prologue – the starting point for the growth of his poem – as a ‘starting border’.¹⁶¹ Just as warp threads on a loom (or atomic first-threads in a compound) dictate, by their type and configuration, the form of the item they produce, so the prologue’s content and structure – including the conceptual threads laid down in it – dictate the content of the epic.

Epicurus: breaker of boundaries

¹⁵⁸ Translated pp.34-5.

¹⁵⁹ Elsewhere, concentration on proofs themselves is required for the reader to sense and understand the process they depict: Schrijvers (1970) 145-6.

¹⁶⁰ Bailey (1947) 604.

¹⁶¹ For the relevance of the starting border to poetic composition, see Fanfani & Harlizius-Klück (forthcoming 2016).

homines, aliqua ratione valerent / religionibus atque minis obsistere vatum (1.107-9). In our passage *finita potestas* and *alte terminus haerens* embody the metaphor, together suggesting the boundaries of an empire, thus extending the military metaphor above.¹⁶⁸ The phrase *alte terminus haerens* recurs at important points, describing the constancy of species as proof for unchangeable atoms (1.595-6), and representing an antidote to fear of the gods (5.89-90; 6.65-6).

The preceding lines of our passage explain how Epicurus secured this knowledge:

[...] *sed eo magis acrem*
inirrat animi virtutem, effringere ut arta 70
Naturae primus portarum claustra cupiret.
ergo vivida vis animi pervicit, et extra
processit longe flammantia moenia mundi
atque omne immensum peragravit mente animoque,
 (1.69-74)

[...] but [*religio*] provoked the shrewd vigour of his mind so much more that he desired to be the first to **break open** the **tightly-fastened bolts of Nature's gates**. Therefore, the vigorous force of his mind won a convincing victory, and he advanced **far beyond the flaming walls of the world** and traversed the immeasurable universe with his mind and judgement [...]

By breaking Nature's confining gates, Epicurus broke both the existing boundaries of human knowledge and the assumed boundary of the world, the *flammantia moenia mundi* (cf. 2.1144; 5.454).¹⁶⁹ The image is of city walls breached by General Epicurus, casting open the limitless universe (discussed in detail in 1.958-1051). 1.62-79 introduce the BOUNDARIES thread, which, responding to and expanding upon Epicurus' πέρασ ('boundary') and ἄπειρος ('limitless'),¹⁷⁰ depicts the various limits integral to his philosophy including the limitless universe and the limits restricting the birth of things. The latter concept represents the

¹⁶⁸ A *terminus* can refer to a boundary marker of a property (*OLD* 1) or the limit of a country or empire (2; e.g. Hor. *Carm.* 3.3.53), a sense activated here. The *finita potestas* would have been a prominent image in the contemporary public consciousness, owing to Pompey's expansion of the Roman Empire, and subsequent triumph, after victory in the Mithridatic wars (61B.C.). Wiseman (1992) argues that from the same conflict elephants would also have been an appropriate contemporary image – thus explaining the inclusion of the ivory palisade image of 2.532-40.

¹⁶⁹ The same concept appears in Epicurus' letter to Pythocles, which describes our (or any) world as ἀποτομήν ἔχουσα ἀπὸ τοῦ ἀπείρου καὶ καταλήγουσα ἐν πέρατι ἢ ἀραιῷ ἢ πυκνῷ (*Ep. Pyth.* 88). The *OLD* classifies the *flammantia moenia mundi* as the bounds of the world in (specifically) Epicurean philosophy. However, it is also attributed to Anaximander ([Plut.] *Strom.* 2; fr.121 KRS). Elsewhere in Latin (aside from Ov. *Met.* 2.401), Manilius employs the image in 1.486, 3.48, and especially 1.149-51, which depicts in Stoic terms how the four elements formed the world, suggesting that the image was not specifically Epicurean even in Lucretius' time.

¹⁷⁰ e.g. *Ep. Hdt.* 41-2, 45; *Ep. Pyth.* 89; Segal (1990) 113-4.

pleasurable friendship by creating a pleasurable poem with Venus' help. Again Venus is seen to be an appropriate addressee of the *DRN*.

Lucretius also explains his methodology further in this passage. Earlier he drew attention to the process of untying the facts of things by untying things into their atomic first-threads. Here he explains another approach for depicting atoms: shining light on them to make them visible. He describes illuminating the 'dark' discoveries of his Greek predecessors,¹⁷³ and laying forth lights by which his reader can see hidden things (i.e. atoms and their processes). This is crucial to Lucretius' philosophy, since although sensory evidence is the unimpeachable standard of proof for Epicureans, atoms cannot be sensed.¹⁷⁴ The lights in these images represent Lucretius' explanations, and more specifically his visual *exempla*, analogies and metaphors, which form the spine of his clear poetry (*lucida / carmina* in 1.933-4, which recalls *clara lumina* here). By mapping these onto atoms and their processes, Lucretius enables his reader to 'see deeply, far into things'.¹⁷⁵ Similar light metaphors recur throughout the *DRN* to depict this explanatory method.

This imagery extends to Lucretius' preferred time of composition: *noctes serenas*, which suggest Lucretius' ability to see into dark (or obscure) things.¹⁷⁶ Lucretius' calm nights of work contrast the wakeful nights of terror experienced by those ignorant of Epicureanism (1.132-5).¹⁷⁷ Epicurean philosophy is a light exposing the dark fear of man, as summarised in the famous lines that follow:

*hunc igitur terrorem animi tenebrasque necessest
non radii solis neque lucida tela diei
discutiant, sed Naturae species ratioque.*

(1.146-8)

Therefore, it is necessary not for the **rays of the sun** or the **shining beams of daylight** to shake off this terror and **darkness** of the mind, but rather Nature's outward form and reasoning.

¹⁷³ Lucretius presumably has in mind both Epicurus and the Atomists. This is not false modesty, but genuine indebtedness to his predecessors. *obscura* is also closely related to *caeca*, used of atoms in 1.277, 295, 328 etc. Brown (1984) *ad loc.* remarks: 'The darkness is appropriate both to the difficulty of the subject and to the imperceptibility of nature's processes at the atomic level'.

¹⁷⁴ Townend (1965) 100-1; Schrijvers (1977); Lehoux (2013).

¹⁷⁵ The *con-* prefix (*OLD, con-* 5) suggests intensity of action, thus *convisere* means 'to see thoroughly', or here 'to see deeply'. As West (1969) 81 has it: 'the Epicurean vision is not of the superficies but of the inner atomic constitution of everything in the Universe.'

¹⁷⁶ Nightingale (2007) terms this 'night-vision'.

¹⁷⁷ This passage is recalled in 2.55-61, where Lucretius describes men fearing in the light what children fear in the darkness, especially by the verbatim repetition of 1.146-8 in 2.59-61. In turn, 2.55-61 is repeated in 3.87-93 and 6.35-41, emphasising the importance to Lucretius' philosophy of conquering darkness and fear.

Most editions of Lucretius print these lines as an introduction to the first argument. However, they most appropriately form the end of the prologue.¹⁷⁸ Lucretius' argument flows well: 'I shall illuminate hidden things so you might see them clearly. This visual evidence and the knowledge of it – and not actual light – will dispel the darkness of fear'. Lucretius distinguishes carefully between actual light (*radii solis* and *lucida tela diei*) and the metaphorical light (*clara lumina*) he shines on hidden things. Daylight partially dispels fear by enabling us to see, but only the light of philosophy, informed by our *ratio* in interpreting Nature, can dispel fear completely. This is facilitated by Lucretius' visual *exempla* and metaphors.¹⁷⁹

Instead of sunlight, Lucretius' remedy for fear is *Naturae species ratioque*. The translators take *ratio* and *species* with *Naturae*: 'the outward appearance and inner workings of nature' (Bailey, Latham), 'the aspect and law of nature' (Rouse), or 'the face of nature and her laws' (Melville). Yet this would be an unsatisfactory remedy, since the laws and evidence of Nature cannot overcome mental darkness and terror alone. Only a keen mind (cf. 1.50-1) can interpret them correctly. Therefore, as P. M. Brown observes, *Naturae species ratioque* carries a dual meaning: both *Naturae species et Naturae ratio* ('The outward appearance and "rationale" of Nature') and *Naturae species, ratioque* ('The evidence transmitted by Nature, and our reasoning in interpreting it').¹⁸⁰ This interpretation clarifies the preceding lines. The light Lucretius sheds on the dark truths of the world is his portrayal of *Naturae species ratioque*, but, as in 1.51-3, the onus is partially on his reader, who must employ *ratio* to interpret Lucretius' illumination correctly.

¹⁷⁸ Lucretius' explanation of his methodology persists in these lines, while *principium cuius hinc nobis exordia sumet* (1.149) aptly introduces Lucretius' first arguments. Also, *igitur* most frequently marks a conclusion, either in the middle or at the end of a paragraph (19 times combined, of 23 occurrences in Book 1).

¹⁷⁹ West (1969) 80-2 and Snyder (1983) 43 read a weaving metaphor in *radii* (which also means 'shuttles') and *tela* ('loom'), supported by their appearance in a description of the loom (5.1351-3), the proximity of *exordia* in 1.149, and the weaving metaphor applied to sunlight in 5.267 and 389. The Latin resists this interpretation, since *discutiant* would jar with singular *tela* (as opposed to *tela* the plural of *telum*), even if forming a joint subject with plural *radii*. The purpose of a weaving metaphor is also questionable, and West does not provide an explanation. The phrase *lucida tela* occurs in the sense 'flashing spears' in 4.845 – an entirely appropriate image for sunlight in 1.146-8, and also supporting the sense of 'striking out' fear.

¹⁸⁰ Lucretius' phrase is thus distinguished from φυσιολογία, which Sedley (1999) 229 argues Lucretius is translating, since this only means 'logos about physis' and not the *logos* possessed by *physis*. My translation, 'Nature's outward form and reasoning', captures the ambiguity. *Natura* and *ratio* are key, but separate, elements of Lucretius' empirical approach, as emphasised in 1.497-8 (*sed quia vera tamen ratio Naturaque rerum / cogit [...]*); see Brown (1984) *ad loc.* and Garani (2007) 18. This echoes Friedrich Max Müller's assertion (1882, Lecture VII), following Epicurus, that reason helped language to develop: 'General notions are not formed at random, but according to law, that law being our reason within corresponding to the reason without – to the reason, if I may so call it, of nature'.

The prologue to the *DRN* is intricately composed and carefully calculated to introduce the epic's key themes, scientific theories and metaphors.¹⁸¹ Most importantly, four key conceptual threads have been introduced – PLEASURE, LIFE-CYCLE, WEAVING, and BOUNDARIES – and another, LIQUIDS, has been briefly hinted at. This Part, like Lucretius' prologue, has introduced the conceptual threads of the *DRN*, enabling more detailed analysis and understanding of the remainder of the epic in the rest of the thesis. Parts 2 and 3 will show the threads to be universal, depicting the scientific laws and processes governing everything from the most microscopic to the most macroscopic level. They embody the homogeneity of Lucretius' materialist science,¹⁸² and show the two most common translations of the title – 'On the Nature of Things' and 'On the Nature of the Universe' – to amount to the same thing.

¹⁸¹ Including the military metaphor, frequently employed in visual *exempla* in the *DRN*, and the light metaphor, which depicts Lucretius' processes of enquiry and methodology of argumentation.

¹⁸² Analogy has the same effect, as Hardie (1986) 220 argues.

Part 2

Tracking the Individual Threads

Lucretius' five conceptual threads – LIFE-CYCLE, WEAVING, LIQUIDS, BOUNDARIES and PLEASURE – have been introduced to varying degrees in the Book 1 prologue. This Part will individually map their development throughout the rest of the epic and show that each thread is consistently applied within rigidly-defined parameters. In this way, each thread creates a framework within which new and more complex correspondences can be created. This didactic approach is appropriate to Epicureanism, which holds that first principles must be established before being applied to more complex concepts (Epicurus *Ep. Hdt.* 35-7). The development of the threads presupposes the reader's understanding of them, since they become more allusive as the epic progresses, often tying together disparate theories with just one or two choice terms. Furthermore, as the threads progress they expand and modify theories established earlier in the epic. Evidently the more attentive reader will benefit most from this methodology of exposition – although even those who spot and understand only certain instances will grasp some aspects of Lucretian universalisation. The reader who has noticed and understood the threads as they are introduced will gain further meaning when they are applied in new contexts, and even apply later occurrences retrospectively to extract new meaning from earlier theories.

To optimise this process of comprehension, Lucretius introduces further aspects of the threads in the first arguments and beyond, broadening them to uncover several fundamental theories of his science. Thus the gestalt nature (a whole consisting of thematically consistent parts) of each thread becomes apparent, and the reader becomes conversant with each thread's vocabulary. Thematically-related terms – both metaphorical and literal – within each thread are often introduced in dense collocations (as we saw with Lucretius' atomic vocabulary), signposting clearly how they will be applied later in the *DRN*. Alongside terms with a meaning clearly related to a given thread, Lucretius introduces terms that carry only a broadly similar metaphorical or conceptual meaning, but whose primary or even secondary meaning supports the thread in that context. A term introduced in this way may reasonably be considered as part of the thread it is introduced alongside, and to support that thread whenever the term occurs later in the *DRN* (as we saw in the prologue with verbs of leading and striking being incorporated into the PLEASURE thread). This interpretation may risk West's 'pansemantic fallacy', that every word can carry all or any of its meanings in a

given context.¹⁸³ However, when a word is introduced in a crucial context with an unexpected or secondary meaning activated by juxtaposition with established terms of a given thread, it is probable that Lucretius intends his reader to recall this meaning when it occurs later in a similar context. The employment of the threads in the early stages of the *DRN* sets the tone for their development.

This Part will consider each thread in turn, starting with the more prominent (in the order LIFE-CYCLE, WEAVING, LIQUIDS, BOUNDARIES, PLEASURE), and establish the breadth of their correspondences. The presentation of each thread in this Part is dictated by the nature and employment of each thread in the *DRN*. In general, the threads' gestalt nature is suited to thematic analysis, taking each main part in turn. However, since the development of the threads is important, a broadly linear approach will be applied to each principal part – although at times this is affected slightly by Lucretius' occasionally non-linear approach (partially caused by his preference for 'anticipation of thought').¹⁸⁴ The exception will be the LIFE-CYCLE thread, which will be mapped in essentially linear order, because its most interesting aspect is its broad development from microscopic to macroscopic applications as the *DRN* progresses. The primary focus will be on the threads' role of explaining scientific and philosophical theories, with only brief comment on how the threads depict Lucretius' methodology of exposition and argumentation, which the Epilogue will consider more fully.

Since Part 3 addresses instances where the threads intertwine, Part 2 will only outline the essence of each thread, the fundamental theories they represent, and how Lucretius guides his reader to understand them. This follows Lucretius' approach of establishing the threads first before considering complex concepts later. In this Part, several apparently confusing or contradictory passages will be clarified, and Lucretius' methodological technique of universalisation, and his logical exposition, will be highlighted. The threads will be shown to a large extent to form and dictate the structure of the *DRN*, to support and direct the development of arguments, and, by explaining the central theories of Lucretius' philosophy, to guide the reader on the path to *vera ratio*.

¹⁸³ West (1995) 161, in which he denies that the sexual sense of *sinus* in Hor. *Carm.* 1.33.16 is activated in the context. Lucretius, who understood the importance of employing words to avoid misunderstanding (see Epicurus *Ep. Hdt.* 37-8; Asmis (1984) 19-34), would not condone pansemanticism.

¹⁸⁴ This, labelled by Büchner (1936) as 'die verfrühte Andeutung', is taken to be an application of Epicurus' *προλήψις* (the concentration of the mind on sense impressions); see Schrijvers (1970). Bailey (1947) 165-8 attributes Lucretius' non-linear approach to his poetic mind. Classen (1968) esp. 80-7, rather more harshly accuses Lucretius of begging the question by these anticipations. Asmis (1983) 36-66 offers a kinder assessment, for example (p.37): 'Lucretius is in control of the logical sequence, but [...] has chosen to present his doctrines in an order which is not strictly logically correct'.

Section A

The LIFE-CYCLE Thread

The abundant imagery in the Venus prologue announced the importance of the LIFE-CYCLE thread in his epic. We have seen how *Venus-voluptas* governs *Natura* in the birth of things, and that *Natura* is the force which causes everything to be created and destroyed through atomic combination and dissolution. Knowledge of how birth and death occur can dispel fear, and this was Epicurus' gift to man. Lucretius passes on this knowledge to his reader by expanding the LIFE-CYCLE thread in Book 1 and beyond. This Section will outline the principal applications of this thread when used on its own, mapping its linear development to track the cycle of 'life' from an atomic to a macroscopic level – as per Lucretius' scientific worldview.

Nothing is born from nothing (1.159-214)

The *DRN* began with an extended image of birth, and birth is prominent in the first arguments. In the lines directly following the prologue, Lucretius translates Epicurus' principal law:

πρῶτον μὲν ὅτι οὐδὲν γίνεται ἐκ τοῦ μὴ ὄντος.

(*Ep. Hdt.* 38)

principium cuius hinc nobis exordia sumet,
nullam rem e nilo **gigni** divinitus umquam.

150
(1.149-50)

Hence, the first subject which begins our web of discourse is that nothing is ever **born** by divine agency from nothing.

Lucretius begins his argument by capturing the birth sense of Epicurus' γίνεται in *gigni*, and thus picks up the LIFE-CYCLE thread from 1.56 (*omnis Natura creet res auctet alatque*). He also embellishes Epicurus' law with the addition of *divinitus*, which constitutes a logical progression from the passages on Iphianassa (1.80-101), and the fear of death and the gods (1.102-35, 146-8) in the prologue.¹⁸⁵ The next lines (1.151-8) ease the transition, and reiterate

¹⁸⁵ Solomon (2004) 268-70 considers the flow from these arguments. Bailey (1947) 625 attributes *divinitus* to Lucretius' 'vehement anti-theological bias', although he does also concede that Epicurus in *RS* 11 describes the refutation of *religio* as the reason for studying nature – and thus Clay (1983) 113 considers Lucretius' addition to represent 'a perfect awareness of the antitheological implications' of

the reasons behind this scientific discourse, i.e. to rid the reader of fear caused by *religio*. Lucretius expands upon 1.150 by stating that he will undertake to prove that ‘nothing can **be born**’ from nothing (*nil posse creari / de nilo* – 155-6), and to discover ‘from where each thing can **be born** (*unde queat res quaeque creari* – 157) and how everything occurs ‘without the workings of the gods’ (*opera sine divom* – 158). The gods then disappear from the first argument. However, perhaps Lucretius intends his reader, when they encounter a birth term here, to recall these lines and know that the gods are unconnected with creation. This process of comprehension is enabled by the LIFE-CYCLE thread.

At this point the concept of ‘birth’ is used primarily metaphorically, referring to all things (i.e. animate and inanimate). In the subsequent lines the emphasis seems to shift to the literal birth of animals:

*nam si de nilo fierent, ex omnibu' rebus
omne genus nasci posset, nil semine egeret. 160
e mari primum homines, e terra posset oriri
squamigerum genus et volucres erumpere caelo;
armenta atque aliae pecudes, genus omne ferarum,
incerto partu culta ac deserta tenerent;
nec fructus idem arboribus constare solerent, 165
sed mutarentur: ferre omnes omnia possent.
quippe ubi non essent genitalia corpora cuique,
qui posset mater rebus consistere certa?
at nunc seminibus quia certis quaeque creantur,
inde enascitur atque oras in luminis exit 170
materies ubi inest cuiusque et corpora prima;
atque hac re nequeunt ex omnibus omnia gigni,
quod certis in rebus inest secreta facultas.*

(1.159-73)

For if they **came to be** from nothing, every kind of thing could be **born** from all things, nothing would require a **seed**.¹⁸⁶ First men could **arise** from the sea, the scaly tribes from the earth, and birds could **hatch** from the sky; cattle and other herds, every kind of wild animal, would, with unfixed **birth**, occupy cultivated land and desert; nor would the same fruits be accustomed to remain on the same trees, but they would switch around: everything could **bear** everything. Indeed, since each thing would not have **generative** bodies, how could a fixed **mother** for things exist? But now because each is **born** from fixed **seeds**, the place in which the **mother-substance** and first bodies of each are inside, from these each is **born** and comes out into the borders of light; and by this evidence everything cannot be **born** from everything, because there is a hidden supply in fixed things.

this principal theory. It seems to me that maintaining a logical flow is a more important contributing factor in this addition.

¹⁸⁶ This is Lucretius' translation of Epicurus *Ep. Hdt.* 38, πᾶν γὰρ ἐκ παντὸς ἐγίνετ' ἂν σπερμάτων γε οὐθὲν προσδεόμενον.

The range and variety of birth words in this passage is striking. Alongside *creo* and *gigno* we see *fio*, *nascor*, *orior*, *fero* and *enascor*;¹⁸⁷ a variety of birth nouns – *genus* (from *gigno*), *partus* and *mater*; and the recurrence of three atomic terms of birth meaning – *semina*, *genitalia corpora* and *materies*. The transitions in this analogy, which proves creation from atoms by displaying the creation of living things from fixed mothers and seeds, are extraordinarily deft. The argument moves seamlessly from ‘things’ (*rebus* – 159, answering *rem* in 150 and *res* in 157) to animate beings (starting with *homines* in 161). The shift is eased by *ex omnibu’ rebus / omne genus nasci posset* (159-60), in which *genus* denotes any ‘kind’ of *res*, before later referring specifically to living things (162, 163).¹⁸⁸

However, *semine* in 160 recalls its atomic meaning from 1.59, and, while *seminibus* in 169 refers specifically to biological seed, we cannot, since it occurs alongside *genitalia corpora* (167) and *materies* (171), avoid thinking of the programmatic list of atomic vocabulary in 1.55-61.¹⁸⁹ The same connection is drawn by *mater* (referring to the literal mother of each animal)¹⁹⁰ and *materies* (the atomic ‘mother-substance’ from which all things are created).¹⁹¹ The transitions and overlapping meanings allow Lucretius, as Sedley observes, to allude to atoms before he has proved their existence.¹⁹² They also blur the lines between animal birth and the ‘birth’ of inanimate things, appealing to the reader’s understanding of animal birth to prove that everything is ‘born’ from ‘fixed seed, according to ‘species’. The passage is an especially compact example of a conceptual thread being applied both metaphorically and literally to strengthen an argument.

The final transition between 169-71 and 172-3 – that just as animals are born from fixed *materies*, so too are all things – reveals that the birth terms pervading the preceding lines are intended to refer simultaneously to literal animal birth (explicitly) and to

¹⁸⁷ We might also include *erumpo* here. Although this technically means ‘burst forth’, when applied here to the way in which birds are born, hatching should immediately spring to mind; see Brown (1984) *ad loc.*

¹⁸⁸ Bailey (1947) *ad* 1.159 misses this transition, labelling *omnibu’ [...] omne genus* ‘an overstatement’ of Epicurus’ πᾶν ἐκ παντός.

¹⁸⁹ Sedley (1998) 194.

¹⁹⁰ Solomon (2004) 270 interprets this as an early introduction to the *Mater Terra* passage (1.250-64) – perhaps following Bailey (1947) *ad* 1.168 (*‘mater* in Lucretius is normally “the earth”, which is “the mother of all things”’). This takes our passage out of context. In the previous lines Lucretius states that if everything came from everything, men and animals could be born from anything, fruits from any tree – i.e. none from their ‘fixed’ mother. Here *mater* here means ‘mother’ in its strictest sense.

¹⁹¹ See discussion pp.31-2.

¹⁹² Sedley (1998) 193.

metaphorical inanimate ‘birth’ (implicitly).¹⁹³ Therefore, when these terms later explain creation from atoms, a birth metaphor is surely intended. Far from poetic *variatio* to avoid repetition of *gigno, creo* etc., the broad range of birth terms in our passage creates a closely-related terminological group, whose birth meaning also applies in an atomic context. Lucretius has extracted the metaphorical potential from Epicurus’ γίγνομαι (used to describe creation from atoms) and greatly expanded it. In the opening sections of the letter to Herodotus (concerned with atoms and εἶδωλα), the repetition of γίγνομαι and its derivatives (γίνεται, ἐγένετο – 38; γίνονται – 42; γένοιτο – 45; γίνεσθαι – 46a (twice) and 48; γένεσις – 48; γεννητικοὶ – 48) tempers any intended metaphor by a lack of variety – in stark contrast with Lucretius. Just as in his atomic vocabulary, Lucretius has extracted a birth metaphor latent in Epicurus and expanded it with a broad array of terms. Through the LIFE-CYCLE thread, Lucretius has associated atoms with the seeds that create living things, heightening his reader’s understanding of this cornerstone doctrine by a tight visual analogy.

The LIFE-CYCLE thread persists throughout this first argument, extending the analogy between living things being born from seeds and all things being born from atoms. The next 41 lines, in addition to several of the twelve birth words of the previous passage,¹⁹⁴ introduce an additional fourteen terms of birth and growth.¹⁹⁵ Of these, many have an obvious birth meaning: *exorior* (180, 187);¹⁹⁶ *fetus* (‘produce’ – 193, 209);¹⁹⁷ *natura* (= here ‘inborn nature’ – 194); *Natura* (199); *propago* (195).¹⁹⁸ Many others have an obvious meaning of growth or nourishment, both closely associated with birth: *augeo* (184); *cresco* (185, 189, 190); *grandesco* (191); *alo* (191; cf. 1.56). Others have an implicit birth meaning activated by the context: *concilium* (= here ‘union’ – 183) and *coeo* (lit. ‘coming together’, here in a sexual sense – 185) – both depicting the coming together of atoms; *paro* (= here ‘bring into being’ –

¹⁹³ This is a more satisfactory reading than that of Bailey (1947) 628, who states that Lucretius’ atomic terms are used in this passage ‘with the wider meaning of “seeds” or “germs” or “primary particles”’ in the manner of Anaxagoras, Empedocles or Thales. Lucretius’ argument is more extensive and less generic than Bailey’s rather superficial reading allows.

¹⁹⁴ i.e. *fio* (180, 186, 205, 214), *semen* (176, 185, 189), *orior* (204, 212), *genitalis* (182), *creo* (177, 206), *materies* (191, 203), *gigno* (204).

¹⁹⁵ I agree with Bailey’s assertion (1947, p.627) that ‘growth in Lucretius’ view was not different from birth; it is the addition to the thing of further appropriate seeds, like in kind to those which produced its birth.’

¹⁹⁶ Cf. 1.5, 23.

¹⁹⁷ *OLD*, *fetus*² can either denote the bearing of young (1a-c) or fruits (2), or the offspring (3a-b) or fruit (4a-b) itself.

¹⁹⁸ As Brown (1984) *ad loc.* notes, this can denote plant propagation (*OLD*, *propago*¹ 1) – recalling the horticultural metaphor of *semen* – or, metaphorically as here, animal procreation (2a-b).

199);¹⁹⁹ *effero* and *profero* (both here = ‘bring forth’ in a birth sense – 179, 207);²⁰⁰ and *fecundus* (= ‘fertile’ – 211).²⁰¹ In particular, *coeo* and *concilium* in the phrases *seminis ad coitum* and *genitali concilio* can carry no meaning other than atoms conjoining in ‘sexual union’.²⁰² Furthermore, their occurrence alongside so many birth terms in this prominent passage encourages us to read a birth meaning when they occur later – especially in a similar birth context. In the prologue Lucretius depicted the birth of animals, and later ‘birth’ from atoms;²⁰³ here an analogy draws the connection more tightly. By tracking the LIFE-CYCLE thread between these passages, a clearer thematic progression between the prologue and first arguments has been discerned.

Nothing is destroyed into nothing (1.215-64)

Lucretius’ second argument translates the second half of Epicurus’ first law and completes Nature’s dual roles of creation and destruction expressed in 1.56-7:

καὶ εἰ ἐφθείρετο δὲ τὸ ἀφανιζόμενον εἰς τὸ μὴ ὄν, πάντα ἂν ἀπωλώλει
τὰ πράγματα, οὐκ ὄντων εἰς ἃ διελύετο.

(*Ep. Hdt.* 38)

huc accedit uti quidque in sua corpora rursus 215
dissoluat Natura neque ad nilum interemat res.
nam si quid mortale e cunctis partibus esset,
ex oculis res quaeque repente erepta periret;

(1.215-8)

Add to this that Nature unties each thing into its own bodies again and does not **destroy** things to nothing. For if something were **mortal** in all its parts, each thing would **perish** and be snatched away from our sight in an instant; [...]

¹⁹⁹ OLD, *paro* 2, under which this instance is listed (cf. also *materies ut suppeditet rebus reparandis* – 1.547). The verb is cognate with *pario*, whose first meaning in the OLD is ‘to give birth to, bear’, cf. Plaut. *Amph.* 480, *Truc.* 18; Ter. *An.* 464.

²⁰⁰ OLD, *effero* 6, ‘yield (crops)’; *profero* 3 (first in Naev. *fr. com.* 18-19 War.).

²⁰¹ OLD, *fecundus* 1a-d. *salio* (187) and *submitto* (193) also conceptually support the birth image.

²⁰² As argued by Sedley (1998) 196. Adams (1982) 178-9 attributes the first sexual application of *coeo* to Lucr. 4.1055 (of sexual intercourse). However, the instance in 1.185 carries metaphorical sexual connotations (brought out by *semen*). Its derived noun *coitus* can mean ‘sexual intercourse or union’ (OLD, *coitus* 3; TLL, *coitus* 2 – *commixtio sexualis, concubitus*; e.g. Ov. *Met.* 7.709 and Sen. *Phaedr.* 160), a sense which is transferred onto *coetus* (OLD, *coetus*: ‘n.b. see COETUS, which is not distinguishable in some cases; TLL, *coetus* II – *actio venere, amore coeundi, coitus*; e.g. Sil. 1.638 and Stat. *Theb.* 4.214). *concilium* meanwhile is said carry a sexual meaning only in later Latin, as in TLL s. v. *concilium*, I.3 *de concubitu*: Arn. 2.16, *per corporalibus conciliis procreant*). However, TLL, *loc. cit.* also suggests a euphemistic usage in Plaut. *Mil.* 1013, *socium tuorum conciliorum*, referring to the activity of *lenocinium*. With this, the sexual context and the similar metaphor applied to *coeo* in mind, we might conclude that *concilium* also carries a metaphorical sexual meaning here.

²⁰³ Sedley (1998) 195 observes, ‘the language of biological procreation is being exploited to the utmost’.

things being created from and destroyed into atoms is supported by Lucretius' theory of flux, expressed by the intertwined LIFE-CYCLE and LIQUIDS threads (for which, see Part 3 Section A) – vividly depicted in an extended image of creation initiated by rain from *Pater Aether* (1.250-64).²¹⁰ For now, it will suffice to note the concluding lines:

*haud igitur penitus **pereunt** quaecumque videntur,
quando alid ex alio reficit **Natura**, nec ullam
rem **gigni** patitur nisi **morte** adiuta aliena.*

(1.262-4)

Therefore anything that seems to does not completely **die**, since **Nature** restores one thing from another, nor does she allow anything to be **born** unless benefitted by another's **death**.

The cycle of birth and death is embodied in the alternating triplet *pereunt-gigni-morte*, and the repetition of *pereunt* from the analogy's opening line (250). The dual roles of *Natura* are reemphasised, particularly in the balanced final line. As a whole, the complementary first arguments (1.150-264) introduce, through the LIFE-CYCLE thread, the essence of Lucretius' theory of creation and dissolution.

Atomic 'mothers' and mortal compounds (1.483-624)

The lengthy explanation of the nature of atoms marks the first solely metaphorical application of the LIFE-CYCLE thread, and the full detachment of *semina* from sustained images of the birth of living things (*semina quae rerum primordiaque esse docemus, / unde omnis rerum nunc constet summa creata* – 501-2). Here the thread distinguishes between eternal, indestructible atoms, and the things they create, which are born and die:

*praeterea quoniam **genitis** in rebus inanest,
materiem circum solidam constare necessest,*

(1.511-2)

Besides, since there is void in things that are **born**, solid **mother-substance** must exist around it, [...]

*praeterea nisi **materies aeterna** fuisset,
antehac ad nilum penitus res quaeque redissent,*

540

²¹⁰ The image recurs in 2.991-1022, in which Mother Earth 'gives birth' (*parit* – 994) to crops and subsequently (*parit* – 995) all animals that feed on them, which in turn grow and 'propagate' (*propagant* – 997) – a cycle that proves the Earth is rightly called Mother (998). The cycle also shows that death is impermanent, since the constituent *materies* returns to the Earth or the Ether to be reassembled again in sexual union (*coetum* – 1003; *coniungit* – 1004). For the sexual sense of *coniungo*, see Adams (1982) 179-80, which offers Lucr. 5.853 (*feminaque ut maribus coniungi possit*) and Hor. *Carm.* 1.33.8 (*ingentur caprae lupis*) as examples; for *coetus* see n.202.

*de niloque **renata** forent quaecumque videmus.
at quoniam supra docui nil posse **creari**
de nilo neque **quod genitum est** ad nil revocari,
esse **immortali** primordia corpore debent, 545
dissolui quo quaeque supremo tempore possint,
materies ut suppeditet rebus **reparandis**.*

(1.540-7)

Besides, unless the **mother-substance** had been **eternal**, all things would beforehand have returned utterly to nothing, and whatever we see would have been **reborn** from nothing. But since I have taught above that nothing can be **born** from nothing, nor **what has been born** be recalled to nothing, the first-threads must be of **immortal** body into which each thing might be untied at the last moment, so **mother-substance** is available for the **restoration** of things.

Lucretius distinguishes his atoms, which are eternal and immortal, from the things they create, which are born and, having been destroyed, reborn. The contrast is pointedly made with *materies* – the ‘mother-substance’ that ‘gives birth’ to other things (cf. also 1.516-9). These passages are representative of 1.512-633, in which *materies* occurs nine times²¹¹ (of 61 occurrences in Books 1 and 2) at a rate of one every 13.6 lines. The only two passages with a greater concentration (1.171-249, 986-1051)²¹² both centre specifically on creation and destruction, suggesting that *materies* is specifically intended to evoke birth and re-birth (cf. 1.171) as a central part of the LIFE-CYCLE thread.

The debunking of other philosophers (1.635-920)

Lucretius employs aspects of his LIFE-CYCLE thread effectively to portray and disprove the theories of the Presocratics Heraclitus (1.635-704), Empedocles (1.705-829) and Anaxagoras (1.830-920).²¹³ First, Lucretius summarises Heraclitus’ central theory in the language of his own atomic theory, as all things being ‘born’ (*creatae* – 645) from fire. Extending the metaphor, he offers a counter-argument, that if the (sexual?)²¹⁴ ‘union’ (*coetu* – 666; cf. 1.185) of fire made everything, fire ‘**would die** to nothing’ (*occidet ad nilum* – 668) in the process. This would be impossible, because everything ‘**would be born** from nothing’ (*e nilo [...] creantur* – 669; cf. *de niloque **renata vigescat*** – 674) – an impossibility in Lucretius’

²¹¹ 512, 516, 518, 540, 547, 552, 565, 591, 633.

²¹² Seven in each, at one every 11.3 lines, and one every 9.4 lines respectively.

²¹³ Explaining others’ theories in a way that facilitates easy dismissal is a feature of ancient criticism of other philosophers; see Tatum (1984).

²¹⁴ See n.202.

worldview (1.215-64). For Lucretius, the carefully defined constraints of his LIFE-CYCLE thread are incompatible with Heraclitus' theory, and therefore disprove it.²¹⁵

Lucretius dismisses Empedocles' four elements in the same way, referring to them as 'born' (*nativa* – 754) and 'made of mortal body' (*mortali cum corpore funditus* – 755). He then recycles almost verbatim the proof against Heraclitus from 674 to refute Empedocles' theory of unlimited division:

*debeat ad nilum iam rerum summa reverti
de niloque **renata vigescere** copia rerum*

(1.756-7)

the sum of things should by now have returned to nothing, and the abundance of things is **reborn** and **grows strong** from nothing.

Again the LIFE-CYCLE thread, drawing on 1.215-64, disproves an opposing theory in Lucretius' own terms. Later Lucretius argues that Empedocles' four elements cannot be the building blocks of things, if the elements themselves 'are **born** from one another' (*alternis **gignuntur*** – 767). *gigno* pointedly undermines Empedocles' theory, since birth entails mortality and so the four elements, having died, would be unable to create new things (cf. 1.511-19 and 540-50)²¹⁶. If, on the other hand, they do not change when they join in (sexual) union (*coire* – 770; *concilio* – 772, cf. 1.183), nothing different could 'be born' (*creata* – 773) from them. This *reductio ad absurdum* (with a suppressed counter-argument, 'but things are born...') simultaneously undermines Empedocles' theory and strengthens Lucretius' LIFE-CYCLE thread.

Lucretius employs a slightly different technique to discredit Anaxagoras' *homoeomeria*, expressing a *reductio ad absurdum* with condescending diminutives (*pauillis atque minutis* – 835 and 836; *terris parvis* – 840), odd-sounding plurals (*ignibus, umoribus* – 841), unusual imagery (*auri micis*, 'grains of gold' – 839)²¹⁷ and a particularly sceptical *putat* (839). When juxtaposed with *creari* (837), *coeuntibu'* (838) and *concreescere* (840), words from the LIFE-CYCLE thread that express solid truths in Lucretius' science, Anaxagoras' theory becomes more ridiculous. Later Lucretius employs his atomic term *semina* to argue that fire breaking out in a forest is not caused by fire within the wood (as Anaxagoras supposed), but

²¹⁵ Cf. 1.1153-6, where Lucretius refutes other portrayals of the Earth's creation with *mortalia* (1153), *crearunt* (1155) *genuit* (1156) and *alit* (1156).

²¹⁶ For this technique, see also *gigni* and *creari* in relation to water and earth (784) and fire (799). Fire is described neutrally as being born in e.g. 2.386-7 (*ignis / noster hic e lignis ortus taedaque creatus*), 591.

²¹⁷ More often used of grains of salt, as in Catull. 86.3 (metaphorically) and Hor. *Carm.* 3.23.12.

by *semina [...] ardoris* (902), which congregate when the branches rub together.²¹⁸ The reader, spotting this central term of the LIFE-CYCLE thread, recalls Lucretius' atoms and the truth of how one substance can be created from another.

Atomic motion and the swerve (2.62-332)

The LIFE-CYCLE thread has argued that things are created when atoms combine in (sexual) union. This passage expands upon the process – the movement and swerve of atoms²¹⁹ – behind the birth of things. The LIFE-CYCLE thread here builds upon the foundations of Book 1 immediately after the Book 2 prologue, by introducing the issue at hand as, 'by what motion the **generative** bodies of **mother-substance give birth to** various things and untie them again **once born**' (*quo motu genitalia materiai / corpora res varias gignant genitasque resolvant* – 62-3). Lucretius guides the reader from arguments towards the end of Book 1 that the atoms made the universe 'by trying out every kind of motion and (sexual) union' (*omne genus motus et coetus experiundo* – 1.1026). Although the focus of Book 2 will be atomic motion and the forces behind it (2.64-5), Lucretius ensures the resultant birth of things is not forgotten in the subsequent arguments, denying that resting atoms can 'give birth to motions' (*progignere motus* – 2.81), and that atomic weight alone 'gives birth to blows that can bestow generative motion' (*plagas / gignere quae possint genitalis reddere motus* – 2.227-8). A swerve is needed too, or else:

*nec foret offensus natus nec plaga creata
principiis: ita nil umquam Natura creasset.*

(2.223-4)

there would have been no collision **born** nor blow **created** by the first-beginnings: thus **Nature** would never have **created** anything.

The etymological figure *natus-Natura* (which translation can scarcely capture) and the polyptoton *creata-creasset* situate birth prominently in this passage.

As atomic motion initiates birth, so perpetual motion enables a perpetual cycle of creation, preserving the constancy of the universe. This theory (2.294-302) recalls Epicurus' *Letter to Herodotus* 39,²²⁰ which is devoid of birth vocabulary. Lucretius, however, describes a constant sum of 'mother-substance' (*materiai* – 294), which 'nothing **increases** or **dies** from'

²¹⁸ A similar explanation is given in 4.324-31 for why bright light causes pain in our eyes: a multitude of *semina [...] ignis* (4.330) present in light enter our eyes and 'give birth to' (*gignunt* – 331) pain.

²¹⁹ Expressed by the LIQUIDS and PLEASURE threads – see pp.99, 159-66.

²²⁰ Bailey (1947) 291.

(*neque **ad**augescit quicquam neque **deperit** inde* – 296). As a result, current atomic motions are the same as they have always been, and will remain the same forever (2.297-9):²²¹

*et quae consuerint **gigni gignentur** eadem 300
condicione et erunt et **crescent** vique valebunt,
quantum cuique datum est per foedera **Naturai**.
(2.300-302)*

[...] and things which are accustomed to be **born** will be **born** by the same agreement and they will exist and **grow** and be robust in strength, as much as is granted to them by the laws of **Nature**.

This argument is strengthened by the metaphorical correspondences between *materies* in 294 and the other terms from the LIFE-CYCLE thread. Again, the very name *materies* supports and even justifies the subsequent assertions about birth and death: of course nothing can add to *materies*, as it is the (only) mother of all things. Furthermore, its eternal nature – established in Book 1 – backs up the image of unchanging, eternal birth in our passage – an intentional *petitio principii* or Lucretian ‘anticipation’ strengthening his argument.²²²

More on the birth-death cycle (2.569-80)

Among his consideration of atomic variety, Lucretius extends his crucial argument (1.215-64, especially 250-64) that birth and death alternate in an eternal cycle to depict the balanced, infinite sum of matter:

*nec superare queunt motus itaque **exitiales**
perpetuo neque in aeternum sepelire salutem, 570
nec porro rerum **genitales auctificique**
motus perpetuo possunt servare **creata**. [...] 572
nunc hic nunc illic superant **vitalia** rerum 575
et superantur item. miscetur **funere** vagor
quem pueri tollunt **visentes luminis oras**;
nec nox ulla diem neque noctem aurora secutast
quae non audierit mixtos vagatibus aegris
ploratus **mortis** comites et **funeris** atri. 580
(2.569-80)*

And so **death-bringing** motions cannot conquer continuously nor bury safety for eternity, nor besides can **generative** and **growth-causing** motions continuously preserve things **born**. [...] now here now there the **life-giving** parts of things conquer and are conquered in turn. With **funeral** rites are mingled the cries which children raise upon **seeing the borders of light**; and no night has followed day nor dawn night which

²²¹ Motion is crucial for atomic creation. See the repeated asyndetic lists depicting how atoms cause variety in things (1.633-4, 685; 2.726-7, 896, 1021; 5.438-9).

²²² See n.184.

will not have mixed with their sick cries the wailing that accompanies **death** and the black **funeral**.

A dual metaphor is evident here, as Lucretius subtly equates the fixed nature of the day-night cycle and the birth-death cycle of humans with the cycle of atomic combination and dissolution.²²³ The two analogous examples combine in *visentes luminis oras*, both an established metaphor for birth (cf. 1.22, 170, 179) and a literal depiction of witnessing dawn. Lucretius employs our human experience of birth and death to tighten the established connection between birth in living things and atomic union. Again the LIFE-CYCLE thread is applied literally and metaphorically to universalise and prove a theory. Lucretius portrays the cycle consistently to bring into sharp focus that things born will inevitably die. By moving from animal birth in 1.250-64 to human birth and death here, Lucretius makes the analogy more personal and vivid to his reader, and introduces his theory that death is inevitable long before addressing it in Book 3.

The cycle of birth and death also applies to the Earth (2.1105-74)

The birth-death cycle of terrestrial life, introduced in 1.250-64 and 2.991-1022,²²⁴ is extended to the Earth itself in an extended analogy. Lucretius describes, by means of the LIFE-CYCLE thread, the world's birth (*mundi tempus genitale* – 1105; *diemque / primigenum maris et terrae solisque coortum* – 1106),²²⁵ and growth (*mare et terrae possent augescere* – 1109). The birth and growth of animals according to kind (befitting our understanding of birth) is now applied to the world (*terreno corpore terra / crescit* – 1114). This growth is not unlimited, however, as *Natura* 'reins in' the growth of all things (*Natura suis refrenat viribus auctum* – 1121) – suggesting that growth is pre-limited at birth (i.e. *Natura*).²²⁶ This is supported by an analogy with human growth and decline (1118-49) and a depiction of the Earth's infertility in comparison to when she bore all animals (1150-74).²²⁷ Lucretius concludes at the end of the book that in time 'everything gradually decays and goes to the reef of destruction (*ad scopulum*)' (1170). The LIFE-CYCLE thread builds on images of birth and

²²³ Later, Lucretius offers his tentative theory that new suns and moons are born daily by a timely confluence of atoms (5.656-79; 731-50). For now, Lucretius has illegitimately compared human birth and death with the coming and going (not strictly 'birth' and 'death') of day and night – a minor Lucretian 'anticipation'.

²²⁴ See n.210.

²²⁵ There is a play-on-words here, as *orior* is the usual verb for depicting sunrises.

²²⁶ See Part 3 Section A for the limits of birth.

²²⁷ See pp.199-200 on these passages.

death from human experience to construct a universal birth-death cycle, based on atomic cohesion and dissolution, active at the most microscopic and macroscopic levels.

The Book 3 prologue (3.1-93)

Here Lucretius returns to Epicurus' role in bringing knowledge to mankind. Rather than being the victorious general of 1.62-79, he is now a father (*tu pater es* – 3.9) bearing knowledge for his followers (9-10).²²⁸ As in the Book 1 prologue, he brings knowledge of birth (*coepit vociferari / naturam rerum* – 3.14-5) itself 'born' from his mind (*mente coortam* – 3.15).²²⁹ Lucretius places birth prominently in this transition between the first two books, on atoms, and the next two, on the soul and perception. He expresses an intended logical progression, that having proved things 'are born' (*creari* – 3.34) from atoms, now he must depict the nature of the soul (3.35-6) – i.e. that it is also born. The importance of the LIFE-CYCLE thread in relation to the soul is confirmed.

The subtle introduction of the soul's mortality (3.186-230)²³⁰

Lucretius explains that the soul is exceedingly quick and moveable (owing to its round, minute atoms), to lay a foundation for later proofs of the soul's mortality (3.417-829). The analogy Lucretius casts to prove the soul's speed hints again at its birth (and therefore mortality). Soul is bodily, since it can touch and be touched (3.161-76; cf. 1.430-48), and we infer from this that the soul consists of atoms (for all is atoms or void, and only atoms are bodily). This is proved in 3.187, which states that anything as mobile as the soul must consist of exceedingly round and minute 'seeds' – the atomic term *semina*, which also implies that the soul must be born. Lucretius strengthens this implication by comparing the soul to water, which is 'born' (*creata* – 190) from round particles, and honey, which consists of a tightly-clinging congregation of 'mother-substance' (*materiai* – 193). Lucretius then compares the soul to

²²⁸ For the Roman and divine implications of *pater* see Bailey (1947) *ad* 3.9.

²²⁹ I see no problem with *coortam* (agreeing with *naturam rerum*) in the manuscripts, since it depicts the facts of the nature of things springing from Epicurus' mind. Emendation to *coorta* (agreeing with *ratio*) is unwarranted; see Bailey (1947) *ad loc.*

²³⁰ Bailey (1947) *ad* 208-27 rightly states that this passage refers more specifically to the *anima* (soul) than the *animus* (mind). However, lightness and mobility refer happily to both, and the two are conjoined in one nature (3.136-7, 416). Lucretius indeed tells his reader to think of both when he refers to either (*tu fac utrumque uno sub iungas nomine eorum [...] quatenus est unum inter se coniunctaque res est.* – 3.421-4), and he alternates freely between *animus* and *anima* in 3.558-79. Their joint nature is emphasised by the repeated elided phrases *anima atque animus*, *animus atque animam* etc. (1.131; 3.161, 329, 416, 499, 565, 705, 796; 4.121; 5.140). With these observations in mind, it is difficult to read with Annas (1992) 175-6 and Konstan (2008) a distinction between 'the rational soul' (*animus*) and 'the irrational soul' (*anima*) in Lucretius. Therefore, I refer generically to 'the soul' in relation to either *anima*, *animus* or *anima atque animus*.

poppy seeds (196-7), picking up from *seminibus* in 187 to bring the analogy full-circle. Although the primary comparison here is of shape, the established semantic range of *semina* implies that the soul is born from atoms, and therefore mortal.

That the soul's atoms are minute, and therefore light, is supported by an observation that there is no change in bodyweight when the soul departs at death (216-7). An analogy follows with wine and ointment, which do not change in weight when they lose odour, because this also consists of *minuta semina*. Again this term, this time by analogy, implies that the soul is born from atoms. This is confirmed in the following lines, which reassert that the soul, because its departure does not reduce the body's weight, must 'be **born** from exceedingly tiny **seeds**' (*perquam paucillis esse creatam / seminibus* – 229-30). The crucial term *creatam* marks the first explicit statement that the soul is born, and therefore mortal, because for Lucretius birth implies mortality. This almost surreptitious introduction of the soul's birth (and implied mortality) is strengthened across the next few passages (*sic calor atque aer et venti caeca potestas / mixta creant unam naturam [sc. animae]* – 269-70; *corporibus quia de partis paucisque creatast* – 278; *ab origine prima* - 331). By noticing these birth terms and recalling their established connotations, the keen reader will be preconditioned to accept the soul's mortality when it is discussed later.²³¹

Proofs of the soul's mortality (3.417-829)

Interestingly, the soul's birth and mortality is for now only depicted metaphorically as 'birth' from seeds. Later this depiction of the soul is expressed literally by the same terminology. So far Lucretius has advanced a preliminary fundamental proof, based on essential doctrine that bodily, immortal atoms create bodily, mortal things. He continues in 3.323-36 to depict the combined nature (and therefore shared mortality) of soul and body at the atomic level. These foundations strengthen the thirty proofs that the soul is born and dies with the body (3.417-829), which in themselves consist principally of inferences from examples of ageing (445-58), disease (459-75, 487-525., 819-29), the effects of alcohol (476-86), shocks (592-606), heredity (741-53), etc. The LIFE-CYCLE thread persists from the introductory proofs into the subsequent

²³¹ Lucretius builds on these assertions that the soul is born with the body in 4.823-76, in which he dismisses a teleological account of human sensation (as in Aristotle, especially *Gen. an.*), that our sensory organs were born in order to sense things. In turn, we infer that Lucretius also denies the soul was born for the purpose of sensation. Instead, soul and sensory organs alike had an intrinsic potential for sensation, which was only fully 'born' when there were things to sense ('nothing is born (*natumst*) in the body so we can use it, but the thing born (*natumst*) is what begets (*procreat*) the use' – 834-5), and so our sensory organs existed long before words, sights and sounds (836-42).

arguments, in which the keen reader should recall that the soul is an atomic compound and, therefore, mortal.

The mortality of the soul is Lucretius' longest maintained proof, and is used to set up (in the very next line, 830) the crucial doctrine *nil igitur mors est ad nos*. The LIFE-CYCLE thread in this section is literal rather than metaphorical, but the terminology describing the soul's birth and death is the same as that of atomic creation and destruction: the soul dies (*pereo* – 437, 710, 798; *intereo* 701, 756, 759; *funus* - 712), grows (*cresco* – 683), and is born (*origo* – 686; *creo* – 708; *natalis* – 711; *orior* – 788; *innasco* – 792; *gigno* - 797). The reader has been conditioned to understand atomic union and dissolution metaphorically in these terms, and so these proofs should recall the atomic reality underlying them. This connection is strengthened in 806-18, which argues that anything immortal must either be solid (like atoms), be unable to be touched (like void), or have no space around it (like the universe). The penultimate proof of this section reminds the reader that all composite bodies are mortal, and consist of atoms. The reader should recall this reality in the closing section of the book, which argues that death is nothing to us and so should not be feared – to be considered in the Epilogue.

Effluences 'born' from things (Book 4)

The characteristics of the effluences that cause sensation, the focus of Book 4, are primarily expressed by the WEAVING and LIQUIDS threads,²³² but their emission is occasionally depicted with birth terms. Effluences are 'born' from the objects that emit them (*geno*²³³ – 143, 159; *origo* – 160; *gigno* – 604; *exorior* – 605), sometimes from within (*intrinsicus ortae* – 92; *exire coortae* – 94). Some images, like those of mythical creatures, are 'born' (*gignuntur* – 131; *creantur* – 744) or 'grow together' (*concrescere* – 134) when films conjoin in mid-air. Their various qualities are 'born' from the qualities of their constituent atoms, such as roughness and smoothness (of the voice: *coorta* (530), *creatur* (543); of flavour: *coorta* (625)), or size – affecting the ability of smell to pass through walls (*creatum* – 698). Sensory effluences, like all composite bodies, are born by atomic combination, and therefore are bodily and mortal.

Seeds and conception (4.1030-1287)

The most important instance of the LIFE-CYCLE thread in Book 4 occurs at the very end, in Lucretius' account of human reproduction. Conception and the transmission of hereditary characteristics are both caused by *semen* ('seed'), the technical term in ancient science (=

²³² As will be discussed in Part 3 Section C.

²³³ An unreduplicated form of *gigno*.

Greek σπέρμα)²³⁴ for male and female gametes.²³⁵ Lucretius introduces *semen* in his description, preceding his discussion of sexual desire, of a wet dream (1030-6). Ejaculation occurs when a source of desire causing a build-up of *semen* is followed by the desire to expel it towards the source (1045-8). During sexual intercourse, this male *semen* mixes with female *semen*²³⁶. In the light of the atomic term *semina* this has implications for the reading of the various aspects of conception covered in this section.

Seed dictates several aspects of conception and inheritance. First, gender (4.1227-32) is caused by seed ratios (always a proportion of both male and female seed): a majority of male seed creates a boy; of female seed, a girl. Second, family resemblance (1209-16) is dictated by whether the mother's or father's force is dominant during intercourse, with children like their mothers born from their mother's seed,²³⁷ and those like their fathers from their father's seed.²³⁸ Third, barrenness (1233-47) is caused by seed that is either too thin (because it cannot cohere) or too thick (because it is clogged and the male seed cannot get through to mix with it).²³⁹ Fourth, failure to conceive (1248-59) is caused by the incompatibility of male and female seed: it is best for the thin to mix with the thick, and vice versa.

There is little new in Lucretius' explanations, but by implication they are enhanced by his atomic theory. Essentially, successful conception and the transmission of characteristics depend on the type and ratio of *semina* combining. That Lucretius has atoms analogously in mind here is confirmed by a passage on inheritance through the generations (4.1218-22). In instances where children look like their grandparents or great-grandparents, this is because 'parents often hide in their bodies many first-threads (*primordia*) mixed in many ways, which fathers pass on to fathers grown from their stock' (4.220-22). Thus the function possessed by

²³⁴ Pl. *Ti.* 86C; Arist. *Gen. an.* passim.

²³⁵ In 4.1030-57 the term *semen* refers solely to male seminal fluid, but later (1209ff.) also applies to female reproductive 'seed', e.g. *commiscendo semine* (1209).

²³⁶ For this theory, from Democritus and Empedocles (according to Arist. *Gen. an.* 1.18, 722b7-723a8) and supported by Hippocrates, *Generation*, see Democritus 138a and 138b Taylor (1999); Blayney (1986) 230-3; Taylor (1999) 198-9. Against this theory, Aristotle argued that the female supplies material in the form of καταμήνια (menstrual blood) rather than *semen* (Arist. *Gen. an.* 1.19-20, 726a28-728b32). For a detailed account of Lucretius' portrayal and its forerunners, see Brown (1987) 320-23.

²³⁷ The word *similis* here does not clearly reveal whether Lucretius has in mind shared physical characteristics or personality traits.

²³⁸ Again this stems from Democritus, according to Aristotle (*Gen. an.* 4.3, 769a17-22). A dual process seems to take place here: the mother's force prevailing allows for a child to be born like the mother, with characteristics passed on by the mother's seed. This is to account for sons that are like their mothers and daughters like their fathers, but it is not made clear how, for example, if the mother's force is dominant, this does not necessarily create a daughter. Brown (1987) 322-3 notes Lucretius' failure here.

²³⁹ See especially Hippocrates, *Barrenness*.

sexual *semina* of creating offspring with similar characteristics to their parents is in fact reliant on the atomic *semina* of which they consist. Across these correspondences, Lucretius has performed an innovative and effective sleight of hand. He has established an extensive metaphor of birth from atoms, which is rooted in our everyday understanding of birth, but here the correspondence is reversed, helping the reader to map their comprehension of atomic 'birth' onto humans, in order to understand the reasons behind gender and inherited characteristics. Both are caused by different types of *semina* and their various different ratios. The literal is explained by the metaphorical and, like in the description of the soul's birth and mortality, the LIFE-CYCLE thread has come full circle again.

On the creation of the world (Book 5)

The principal application of the LIFE-CYCLE thread in Book 5 is to emphasise the world was born and is therefore mortal. This is stated in the prologue: 'I must explain the reason that the world consists of **mortal** body and **had birth**' (*mihi mortali consistere corpore mundum / nativomque simul ratio reddunda sit esse* – 65-6). This will be explored in depth in Part 3 Section E, in particular in comparison with the mortality of the human body and soul. For now, it will suffice to introduce briefly Lucretius' expansion of the LIFE-CYCLE thread to depict how the world was born. Again, following the literal birth entailed in conception in Book 4, metaphorical birth returns.

One of Lucretius' principal aims in discussing the world's origin is to prove that gods were not involved in its creation (recalling the first argument, *nullam rem e nilo gigni divinitus umquam* – 1.150).²⁴⁰ Lucretius asks from where 'an *exemplum* of things **being born**' (*exemplum [...] gignundis rebus* – 181) would have entered the gods' minds, to give them an insight into the power of the atoms and what they could achieve 'by swapping their order around' (*permutato ordine* – 185), 'unless **Nature** herself provided a model for **birth**' (*si non ipsa dedit specimen Natura creandi* – 186). The argument is somewhat circular, avoiding the possibility that the gods created the concept of birth, and therefore *Natura*. For Lucretius, however, such inventions only occur by analogy, which must be drawn from *Natura* (as in the inventions of man in 5.1011-457). As argued in Part 1, for Lucretius *Natura* is birth and all it entails, and so only *Natura* can provide the paradigm of birth from which things can be created. By her *specimen* atoms combine (as Lucretius elucidates following *ita* in 187) in a manner (appropriate for *Natura*) associated with birth (*coire* – 190; *creare* – 191) and

²⁴⁰ As in Epicurus *Ep. Hdt.* 76-82.

'regeneration' across the sum of things (*qualibus haec rerum geritur nunc summa novando* – 194).

Having discounted divine provenance, Lucretius later depicts the chance creation of the world by the union of atoms, driven by blows to all varieties of motions:

omnimodisque coire atque omnia pertemptare, 425
quaecumque inter se possent congressa creare,
 (5.425-26)
 [...] and to **unite** in all ways and exhaust all combinations, whatever they could **give birth** to by coming together among themselves [...]

The image of sexual union suggested by *coire* is resumed when Lucretius states that atoms created the world 'by trying out all kinds of **unions** and motions' (*omne genus coetus et motus experiundo* – 428, repeated almost verbatim from 1.1026).²⁴¹ As a result atoms became the *exordia* (430 – here = congregations of *primordia*) that created the realms of the world and everything in it. From these first congregations the world's constituent parts were formed by various other processes, such as the compacting of heavy earth (449-52), and the squeezing out of water (452), the Ether (457-9) and the particles that would make heavenly bodies (453-4, 471-9), clouds (465-6) etc.²⁴² Birth was the first process that initiated the evolution of the world to its current state. The Earth and sky cohabit today as when they were born from first conception (*prima concepta ab origine* – 548), and the beginning of their lifespan (*ex ineunte aevo* – 555). The LIFE-CYCLE thread has been expanded to the most macroscopic level.

Clouds (6.451-82), disease (6.655-72)

In Book 6 the LIFE-CYCLE thread occurs intermittently to depict various processes. Lucretius uses birth terms to describe cloud-producing bodies uniting (*coeo* – 452); small clouds conjoining to form bigger clouds (*concreasco* – 451; *coniungo* – 457; *cresco* – 457); and storm clouds (*coerior* – 458). Birth occurs first at the atomic level, then at the compound level until the largest, densest clouds are produced. The cause of volcanic eruptions is similarly expressed in birth terms, in an analogy with 'fever born with burning heat' (*calido febrim fervore coortam* – 656) in the body, which occurs:

nimirum quia sunt multarum semina rerum,

²⁴¹ Lucretius uses *coetus* here as a synonym for *coitus* (see n.202), and, following *coire* in 425 and *creare* in 426, may have a sexual meaning.

²⁴² See Part 3 Section B on this process.

*et satis haec tellus morbi caelumque mali fert,
unde queat vis immensi **procre**scere morbi.*

(6.662-4)

[...] no doubt because there are **seeds** of many things, and this Earth and the sky carry enough nasty disease, from which can **grow together** the force of immeasurable disease.

Lucretius uses this example in turn to prove there are many seeds that can cause storms, earthquakes, hurricanes and volcanic eruptions (665-72). The analogy is drawn tightly by corresponding birth terms between the analogy and the conclusion:

*[...] et ardescunt caelestia templa, 670
et tempestates pluviae graviore **coortu**
sunt, ubi forte ita se tetulerunt **semina** aquarum.*

(6.670-2)

[...] both the celestial regions burn and there are storms of rain with heavier **origin**, when by chance the **seeds** of water have raised themselves together in this way.

Here *coortu* picks up from *coortam* in 656, and *semina* is repeated from 662, emphasising the similarity of the two processes. Storms and disease are both born from the confluence of many seeds.

Despite these examples, in Book 6, as in Book 4, close congregations of birth terms are less frequent. Taking the key birth terms *creo*, *gigno*, *nascor*, *orior*, *cresco* and *coeo* and their derivatives,²⁴³ these occur only 66 times in Book 6 (1 every 19.5 lines) compared with 121 in Book 5 (1/12.8 lines) and 218 across the first two books (1/10.5 lines). However, where the LIFE-CYCLE thread appears in Book 6, it is frequently in an innovative way. Specifically, among these 66 occurrences, there is a marked increase in instances of the compounds *coerior* and *concre*scere, which both suggest birth by combination. Of 19 instances of *orior* and its derivatives, 14 are of *coerior*;²⁴⁴ of 17 instances of *cresco* and derivatives, 8 are of *concre*scere²⁴⁵ – representing respectively 41% and 42% of occurrences of these two verbs in the *DRN*. There is a clear change in focus in Book 6 towards the birth of things from atomic congregations: clouds (159, 250, 451, 465); rain, storms and other precipitation (196, 458,

²⁴³ *recreo*, *procreo*, *creat*rix; *progigno*, *egigno*, *genitor*, *genetrix*, *genitabilis*, *genitalis*, *progenus*, *primigenus*, *terrigenus*, *generas*co; *nativus*, *Natura* (capitalised only), *innas*co, *naturalis*, *enas*co; *exorior*, *aborior*, *suborior*, *oborior*, *adorior*, *coerior*; *procre*scere, *recre*scere, *decre*scere, *concre*scere (and participle *concretus*); *coitus* (and the often indistinguishable *coetus*).

²⁴⁴ Or 74% – compare Book 1 (6.7%), Book 2 (23%) and Book 4 (31%).

²⁴⁵ Or 47% – compare Book 1 (13.3%), Book 3 (11.1%) and Book 5 (25%). n.b. Book 4 has a 50% ratio, although for only 6 total instances of *cresco* and compounds (compared to 17 in Book 6, 15 in Book 1 etc.).

495, 528, 671, 956); wind (579); volcanic fire (641); disease (656, 1091, 1096, 1100); hot springs in winter (846); and iron atoms in a magnet (1013). These phenomena are tied together in the shared process of birth. This is most emphatic in the close proximity of *febrim fervore coortam* (656) and *pluviae graviore coortu* (671) in the analogy explored above. Furthermore, the LIFE-CYCLE thread again shows that birth occurs at both a microscopic level, between individual atoms, and a macroscopic level, to form great composite bodies.

Section B

The WEAVING Thread

In the prologue Lucretius introduced the WEAVING thread in relation to his poetic discourse ('untying' and 'laying out' the facts of *Natura*) and the cohesion and dissolution of his *primordia* ('first-threads') (1.50-61). The prominence of weaving in this passage suggests its importance in depicting Lucretius' atomic theory. The thread expands throughout the *DRN*, as weaving terms are employed to depict the role of atomic cohesion and dissolution in a wide range of apparently disparate processes, which are tied together by shared 'woven textures' or their 'unravelling'.²⁴⁶ The frequency of weaving terms in such contexts throughout the epic, and the average Roman reader's broad experience of weaving,²⁴⁷ urges deeper reading of instances of the WEAVING thread, from which several detailed and technical multi-correspondence metaphors, drawing on technicalities of weaving and the various qualities of woven cloth, become apparent. As a result a conceptual thread emerges of unrivalled richness in the *DRN*.

Lucretius has already highlighted his atoms' threadlike nature in describing atomic dissolution: *Natura perempta resolvat* ('Nature unties things again when they are destroyed' – 1.57).²⁴⁸ However, in lieu of an opposite and complementary weaving metaphor describing creation, the LIFE-CYCLE thread is used (*Natura creet auget alatque* – 56). Lucretius has not simply chosen to introduce only this most common weaving metaphor here, but rather Lucretius sees initial atomic combination not in weaving, but in birth terms – presumably because birth in the natural world is the perfect paradigm for creation. The metaphors of weaving and birth together explain atomic combination and compound structure, while the metaphors of weaving and death (as Part 3 Section A will consider) interweave to depict atomic dissolution. Although we have seen that the atomic term *primordia* straddles both the birth and weaving metaphors to depict the 'first-threads' (or the 'starting border') of things, neither this term nor any in Lucretius' weaving vocabulary depicts specific aspects of atomic creation.

²⁴⁶ Snyder (1983) provides a brief overview.

²⁴⁷ Crowfoot (1936) 36 states that ancient writers expected their readers to recognise 'any witty or fanciful allusion' to weaving and its tools, however slight; see also Snyder (1983) 39 on this observation.

²⁴⁸ See pp.35-6 and notes there.

The investigation of the WEAVING thread in this Section will focus on atomic compound structure and the various qualities created by interwoven first-threads (which will be expanded upon further in Part 3). This Section will consider the weaving terms for atomic ‘thread’ and its arrangement, before introducing examples of how the WEAVING thread explains the qualities of woven compounds, and various processes. Lucretius builds a foundation of persistent weaving terms, upon which he develops complex metaphors to explain more complex concepts.

Atomic ‘first-threads’ and their woven compounds

The principal atomic term with weaving connotations, occurring 72 times in all, is *primordia*. In Part 1 ‘first-threads’ was advanced as a suitable translation for this term, owing to its juxtaposition with other weaving terms in 1.50-61. This approach will prove fruitful in this Section for translating other weaving terms depicting atomic congregations and their dissolution. Lucretius employs as a synonym for *primordia* its cognate *exordia*, which in weaving denotes the warp set up on the loom.²⁴⁹ The connection between these terms is highlighted by the replacement of *primordia* with *exordia* five times in the sense ‘atoms’:²⁵⁰ in a discussion of atomic shapes (*exordia rerum / qualia sint* – 2.333-4); to recap proofs of atomic shape and movement (*quoniam docui cunctarum exordia rerum / qualia sint* – 3.31-2, repeated in 4.45-6);²⁵¹ to depict the spacing of soul atoms in the body (*tanta / intervalla tenere exordia prima animai* – 3.379-80); and to explain how small atoms are (*exordia rerum / cunctarum quam sint subtilia percipe paucis* – 4.114-5).²⁵² The collocations *exordia rerum* (recalling the frequent *primordia rerum*) and *exordia prima* (a clear resonance with *primordia*, and especially *ordia prima* in 4.28), occurring eight times in all (2.333, 1062; 3.31; 4.45, 114; 5.430 with *rerum*; and 3.380, 5.677 with *prima*), strengthen the correspondence

²⁴⁹ See p.34 and note there.

²⁵⁰ Out of eleven usages of *exordium*. Of the other six, four occur in an atomic context but may refer more specifically to ‘(atomic) beginnings’ (5.331, 471), or both this and ‘congregations of atoms’ (2.1062, repeated almost verbatim in 5.430); while another refers to ‘beginnings of causes’ (5.677), although with a subsidiary meaning of ‘atomic beginnings’ brought out by *ab origine prima* (‘from the first origin (of the world)’) in the same location in the next line. The other example is used of argumentation (1.149), itself frequently expressed by a weaving metaphor in Latin (for which see p.224 and notes there). In fact, in seven of the ten instances pertaining to ‘beginnings’ or ‘atoms’ *elementa* is elided with the preceding word, suggesting Lucretius considered it a permissible variant for *primordia* when required by metre.

²⁵¹ The passage 4.45-53 is bracketed in most editions, since these lines pick up directly from Book 2, and were presumably written at a time when Book 4 was intended to follow 2 directly. For a brief summary of the editing of this passage, see Bailey (1947) 1181-2, 1184.

²⁵² The weaving sense of *exordia* is brought out further by *subtilis*, for which see n.276.

further.²⁵³ These instances highlight the connection between *exordia* and *primordia* and strengthen our reading of a weaving metaphor in *primordia*, and the broader image of atoms as threads that form woven compounds.

The metaphor of the woven structure of things is the primary application of the WEAVING thread in the *DRN*. It is introduced emphatically in the argument that nothing can be reduced to nothing, as a proof for the existence of indestructible matter (1.215-49). The physical structure of things is described as *nexus* ('bindings' – 1.220, 240, 244),²⁵⁴ *textura* ('(woven) texture' – 1.247) and *contextum* ('interweaving' – 1.243),²⁵⁵ which is held together 'less or more entangled' (*minus aut magis indupedita* – 240).²⁵⁶ The metaphor in this passage is supported further by descriptions of the destruction of these composite bodies in terms of 'untying'. This prominent passage alerts the reader to keep 'woven compounds', and the vocabulary depicting them, firmly in mind throughout the *DRN*.

This metaphor is supported by a striking analogy employed to prove that atoms can be colourless and still make coloured things (2.826-33). The smaller the parts into which

²⁵³ It is notable also that among these instances, six show elision between *exordia* and the preceding word, in which cases *primordia* would not fit metrically. Again *exordia prima* and *exordia rerum* appear to be synonyms for *primordia rerum* where this would not fit. This would recall Homer's employment of formulae; see Finkelberg (2011) s. v. Formula and refs. there.

²⁵⁴ This is part of a group of cognate weaving terms used by Lucretius (with *necto*, *conecto*, *adnecto* and *conexus*): *OLD*, *necto* 1-4, of both threads (Sen. *Her. O.* 1098, with *stamina*; Stat. *Silv.* 1.4.123, with *fila*) and threadlike things (Varro *Rust.* 1.23.6, with *linum*; Hor. *Carm.* 1.38.2 of a flower garland); *conecto*, 'to join, fasten, or link together', cf. Verg. *Aen.* 8.437 (of snakes); Prop. 2.5.23 (of hair); *adnecto* 1 (Plin. *HN* 11.81 of a spider's web); *nexus*³ 1 denoting the action of weaving (Sen. *Q Nat.* 2.2.3), 2 of something that fastens (Stat. *Silv.* 4.4.93 of hair) and 4, 'an intertwined or entangled formation' (Lucretius' preferred usage – e.g. 1.220, 240; cf. Tib. 2.3.16 of a basket, with *detexo* and *rarus* – for which see n.275). The weaving sense is made clear within the WEAVING thread applied to the structure of composite bodies, weakening any sense of a legal 'bond', advanced by Davies (1931) 36-7.

²⁵⁵ The two of these belong within a large group of connected words used by Lucretius, alongside the verbs of weaving *texo*, *contexo*, *pertexo* (used only figuratively, of weaving discourse – 1.418; 6.42) and *subtexo*; *retexo* ('to unweave'); and *textus* ('woven fabric'). See *OLD*, *texo* 1 and 2 (Ter. *Haut.* 285 with *tela*; Tib. 2.3.54 with *vestis*; Cic. *Nat. D.* and Catull. 68.49 of spiders; Ov. *Met.* 10.123 of plaited flowers); *OLD*, *contexo* 1 (Cic. *Nat. D.* 2.158 of wool); *OLD*, *contextus*³ 1, 'the action of weaving' (Cic. *Fin.* 5.83); *OLD*, *retexo* 1 (Cic. *Luc.* 95 and Ov. *Am.* 3.9.30, denoting Penelope's night-time activity); *subtexo* usually occurs in a metaphorical sense, often of cloud (or darkness) 'woven' to hide the sun (Ov. *Met.* 14.368; Verg. *Aen.* 3.582), although see Juv. 7.192 and Stat. *Silv.* 1.2.99; *OLD*, *textura*, 'the art or process of weaving' (Prop. 4.5.23; Plaut. *Stich.* 348 of spiders) – but Lucretius employs the term in the sense 'woven texture', normally denoted by *textum* in Latin (Ov. *Ep.* 9.163, *Met.* 8.640; Stat. *Theb.* 5.354); *OLD*, *textus*³ 'a woven fabric' (Apul. *Flor.* 9, *Apol.* 61, used figuratively). The terms are all etymologically linked with *tela*, *subtemen*, *subtilis* (see n.276), *textilis* and *textile* – all of which carry weaving connotations – see E-M s. v. *texo*, who equate Lucretius' *textura* with Greek περιπλοκή, used by Epicurus.

²⁵⁶ *OLD*, *impedio* 1 'to restrict the movement of (by hobbling, binding, entangling, etc.), e.g. Plaut. *Mil.* 1388 (with *plagae*); Cic. *Tusc.* 5.82 (with *vincula* – see n.311); Ov. *Pont.* 14.30 and Apul. *Met.* 5.22 (of hair). Lucretius also uses its antonym, *expedio*, 'to free from fastenings [...] untie' or 'to disentangle, untwine' (*OLD*, 1a-b; e.g. Ov. *Met.* 6.57, in the weaving process; Apul. *Met.* 1.16.10-11, with *restis*; Cic. *Att.* 5.21.3, of figurative knots).

something is ‘pulled apart’ (*distrahitur* – 827), the more its colour fades away (and so the *primordia* are colourless); just as ‘when [purple wool] is pulled apart thread by thread’ (*filatim cum distractum est* – 831) its colour is lost. The wool corresponds to any coloured item, its individual threads to the coloured item’s atomic ‘first-threads’. One of Lucretius’ explanatory methods is to use terms from his principal metaphors in an analogy (in the literal sense), to support their metaphorical sense elsewhere.²⁵⁷ This is the case with *distraho*, which we shall find later describing the process of pulling something apart into its first-threads. More generally, as we shall see later in this Section, analogies with woven items are frequently employed to represent the ‘woven’ textures of things and the qualities associated with them.

A third term that supports the weaving metaphor in Lucretius’ atomic vocabulary is *ordo*, which is joined to *primordia* and *exordia* by its aural similarity²⁵⁸ – a connection drawn especially by fifteen instances of juxtaposition between *ordo* and *primordia*. In itself *ordo* carries a general sense of ordered rows or lines,²⁵⁹ which lends itself to depicting woven items, and this is brought out by such juxtapositions and in particular several passages discussing the importance of the *ordo* (‘order’, ‘formation’, ‘array’) of *primordia* for creating variety in things, and the creation of new things by rearranging this *ordo*. Two examples will suffice as preliminary proof. First, Lucretius concludes an explanation of how atoms, which cannot feel, can create things capable of sensation (supported by an example of food being ingested by animals and changed into their sensible, bodily substance), with an appeal to the reader: ‘Do you see, then, how much it matters in what sort of **order** the **first-threads** are placed [...]?’ (*iamne vides igitur magni primordia rerum / referre in quali sint ordine quaeque locata* – 2.883-4).²⁶⁰ The aural jingle *primordia-ordo* closely associates the two terms, while emphasising in weaving terms the importance of atomic order.

A second example strengthens this reading. Lucretius denies that the Gods invented atoms and the world:

<i>quove modost umquam vis cognita principiorum,</i>	
<i>quidque inter sese permutato ordine possent,</i>	185
<i>si non ipsa dedit specimen Natura creandi?</i>	
<i>namque ita multa modis multis primordia rerum [...]</i>	
<i>[...] consuerunt concita ferri</i>	189
<i>omnimodisque coire atque omnia pertemptare,[...]</i>	190

²⁵⁷ Garani (2007) 210-19 reads this approach with what she terms Lucretius’ ‘squeezing out the sponge’ metaphor.

²⁵⁸ See p.34.

²⁵⁹ See n.133.

²⁶⁰ Compare 1.1021-2 (*neque consilio primordia rerum / ordine se quo quaeque sagaci mente locarunt*).

ut non sit mirum si in talis disposituras 192
deciderunt quoque et in talis venere meatus,
qualibus haec rerum geritur nunc summa novando.

(5.184-94)

Or in what way was the power of the first-things ever learned, and what they could do in themselves by swapping their **order** around, if Nature herself did not provide a model for birth? For thus many **first-threads** of things in many ways [...] have been accustomed to be carried and to unite in all kinds of ways [...] so that it would be no wonder if they fell into such **laid-out arrangements**, and also to come into such movements, by which this sum of things now carries out regeneration.

This passage addresses the potentially teleological implications of ordered atomic array, first denying divine design, and then stressing the chance (*deciderunt*) behind their combination.²⁶¹ The figure *ordo-primordia* suggests the arrangement of woven threads, and their rearrangement to cause variety in things. Lucretius offers a synonym for *ordo* – *dispositura*, whose cognate *dispono* carried weaving connotations in 1.52.²⁶² *dispositura* suggests things separated and laid down, perhaps in careful arrangement – suggesting the setting of warp threads on the loom, and thus applying a weaving metaphor to Epicurus' more neutral θέσις ('arrangement', 'placement' – *Ep. Hdt.* 46^a). With this reading, atomic compound structure is expressed by a consistent weaving metaphor, spearheaded not just by *primordia* and *exordia*, but also by *ordo* and *dispositura*.

The order of atoms in different things

With these observations in mind, a new reading arises for a crucial phrase, which appears five times in various modified forms in the *DRN*, highlighting the atomic causes of creation and variety in things. The first occurrence concludes the theory of smallest parts, arguing that without limited division matter would not exist for further creation, and would lack:

[...] *varios conexus pondera plagas*
concursum motus, per quae res quaeque geruntur.

(1.633-4)

[...] the various **interweavings**, weights, blows, collisions, motions by which everything is carried out.

Such processes (and also *intervalla vias*, 'spaces, paths' – 2.726; 5.438) cause every action (*quaeque geruntur*) and reaction at an atomic level, in turn dictating macroscopic

²⁶¹ Cf. 1.1021-8, which denies atomic intelligence in their own design: *deveniunt in talis disposituras* (1027); and also 5.416-31.

²⁶² See discussion on p.35.

occurrences, and maintaining the fixed separation of certain entities. They include weaving, expressed here by *conexus*.²⁶³

This phrase occurs twice more, with an important alteration. In 1.665-89 Lucretius states that all cannot be fire, as Heraclitus believes, because either everything would have the characteristics of fire, or fire would have to change (and therefore perish) to create new things. Instead:

[...] *sunt quaedam corpora quorum
conkursus motus **ordo positura** figurae
efficiunt ignis, mutatoque **ordine** mutant
naturam [...]*

685

(1.684-7)

[...] there are certain bodies whose collisions, motions, **array, placements**, shapes make up fire, and by changed **array** they change its nature [...]

Here Lucretius refers to the motions and placements of atoms, and in doing so replaces *conexus* with *ordo*, to shift the focus from atomic interweaving in general to the order of the first-threads,²⁶⁴ the importance of which has just been emphasised by the repetition *mutato ordine* (677, 686) and *mutari ordine* (681). The weaving sense is supported by *positura* (a near synonym for *dispositura*, mentioned above), which later appears in a clearer weaving context, describing the effect of a blow striking the body:

*dissoluuntur enim positurae principiorum
et penitus motus vitales **inpediuntur***

(2.947-8)

For the **placements** of first-things are **untied** and the vital motions are deeply **entangled**, [...]

Two processes are depicted here: the ‘untied pattern’ of the atoms, and the resulting ‘entanglement’ of the *motus vitales*. The weaving terms *dissolvo* and *impedio* activate in *positura* a sense of carefully laid-out threads. Like *conexus* and *ordo*, the ‘laying out’ of first-threads is a principal cause of creation (1.1027; 5.192) and of the fixed nature of things (2.896; 3.787, 795; 5.131, 139, 695).

²⁶³ See n.254. Snyder’s suggestion (1983, p.41) that *pondera* might refer to loom-weights in 2.88 and 218 is made unlikely by this passage, since, whereas different weights of atoms cause different qualities in things, different loom-weights do not effect a cloth’s weave. Benferhat (2014) 600 notes this is the first attestation of the 4th declension noun *conexus*, and may be Lucretius’ coinage, translating Greek συμπλοκή; see E-M, s. v. *necto*: ‘conecto: attacher ensemble, συμπλέκω’.

²⁶⁴ Furthermore, by replacing *conexus* with *ordo* here, the weaving sense of the latter is brought out.

We find 1.685 repeated in 2.1021, as a conclusion to Lucretius' famous analogy comparing variety in words caused by rearranged letters, with variety in things caused by rearranged atoms.²⁶⁵ In words, Lucretius says, the letters' **'placements** distinguish between things' (*positura discrepitant res* – 1018), and so in things:

*concursus motus ordo positura figurae
cum permutantur, mutari res quoque debent.*

(2.1021-2)

[...] when the collisions, motions, **array, placements**, shapes are now changed, things must also be changed.

These lines tie the analogy tightly, picking up from *positura* in 1009 (of letters) and *ordine* in 1014 (of atoms). The placements of atoms and letters in Lucretius' analogy recall the placement of threads in a woven cloth, and the different results created by rearranging these threads. The possible combinations enabled by atomic 'interweaving' are a principal cause of variety in things. Weaving is seen to play two roles here: 'first-threads' interweave to create things, and rearrange to create new things and cause variety.

As in his proofs against Heraclitus' theory of fire, Lucretius emphasises the importance of atomic arrangement to refute Empedocles' doctrine of the four elements. Lucretius takes the example of fire changing to air, arguing that this is not caused by a power struggle of elements, but by the addition, subtraction and rearrangement of atoms: *demptis paucis paucisque tributis, / ordine mutato et motu, facere aeris auras* (1.800-1). Changes of substance, like poetry differing in sound by transposed words and verses, can be caused solely by *permutato ordine* (1.827). This recalls Lucretius' argument, discussed above, that food being changed into animals' bodies (2.883-5) is caused by changed *ordo* of *primordia*. Juxtaposed with this example is one of wood 'turning into' (*versat* – 882) fire, which is pertinent, as it repeats his previous explanation (dismissing Anaxagoras' *homoeomeria* theory) of a forest fire caused by a confluence of *semina ignis* in tree branches:

*iamne vides igitur, paulo quod diximus ante,
permagni referre eadem primordia saepe
cum quibus et quali positura contineantur
et quos inter se dent motus accipiantque,*

910
(1.907-10)

²⁶⁵ An analogy so important that it spawned a new mode of reading the *DRN*: Friedländer's 'atomology' (1941), by which shared letters and syllables in Lucretius' words highlight the similarities between things. See also Snyder (1980), Dionigi (1988) and Schiesaro (1994), who argues not only that the letters should be considered to consist of atoms too, but also (p.85) the epic's rhetorical devices 'are actually devised to reflect a set of underlying atomic phenomena'.

Therefore do you now see, as I have said just before, how important it is with which and in what **positions** the same first-threads are held and which motions they give and receive among themselves [...] ?

The similarity between the passages is clear, both in content and the repetition of *permagni referre* from *magni [...] referre* in 2.883-4 (the phrase occurs five times in the first two books, all in relation to atomic position and motion).²⁶⁶ Here *positura* replaces *ordo* in 2.884, again highlighting their synonymous nature, and situating them together in Lucretius' weaving metaphor. Lucretius pointedly emphasises the importance of atomic *ordo* and *positura* in creating different things. As in weaving, the arrangement of individual atomic 'threads' is required to create new and different 'woven' things, and two different items consisting of the same or similar atomic 'threads' differ only by varied arrangements of these threads. In weaving the pattern is set by the starting border; in creation by the position of atomic 'first-threads'.

The qualities of different things are caused not just by the *ordo* and *positura* of their first-threads, but also by the way they interweave. Returning to 1.215-49, the woven structures (*nexus* – 240) of different things are held together 'less or more entangled' (*minus aut magis indupedita* – 240) and so require different forces to 'untie' (*dissolvere* – 243) their 'different **bindings**' (*nexus dissimiles* – 244-5). This depiction of the relationship between a thing's woven texture and the most appropriate means of destroying it forms an important foundation for the explanation of many processes in the *DRN*. The reader who notes this weaving metaphor, and the terms that express it, will increase their understanding of Lucretius' science later in the *DRN*.

Different woven structures account for the various sensations we receive from different things, in particular in our interaction²⁶⁷ with sensory effluences. We usually²⁶⁷ perceive things as they actually are because they emit vision films 'in the same **array**' (*ordine eodem* – 4.68) as their surface atoms. If the woven pattern of a film's atoms differed from the source object, we would perceive it incorrectly. Similarly, rearranging atoms, although colourless themselves, changes the colour of things, again because 'it matters greatly' (*magni refert* – 2.760) which seeds make up things, and 'which **placements**' (*quali positura* – 761) they are arranged in. Thus something black becomes white when the '**array** of its first-things

²⁶⁶ 1.817, 908; 2.760, 883, 894.

²⁶⁷ Sometimes vision films become distorted in some way, causing optical illusions (cf. especially 4.353-63; also 4.379-468).

is changed' (*ordo / principiis mutatus* – 769-70).²⁶⁸ We perceive colour correctly when the atoms in a given film reach our eyes in the correct *ordo*.

The reception of pain is also explained in weaving terms. Bitter things, for example, hurt our senses because their constituent atoms are furnished with tiny hooks, by which they are 'held **woven** together among themselves' (*inter se nexa teneri* – 2.405).²⁶⁹ As well as creating a closely cohering structure, these hooks also 'tear open' (*rescindere* – 406)²⁷⁰ our senses, causing an unpleasant sensation. On the contrary, the atoms of things such as smoke and fire, which 'prick' (*pungere* – 2.460) our senses, cannot be hooked, as these substances are diffuse and not *perplexis indupedita* ('entangled by entwined elements' – 459).²⁷¹ Instead, they consist of 'not **entwined** but sharp elements' (*non e perplexis sed acutis esse elementis* – 463). How we perceive things is dictated by their woven structures. Furthermore, our sensory interactions with things depend on the atomic *textura* of our sensory organs (4.657), and so certain things are more *aptus* ('suitable', or perhaps 'bindable'²⁷² – 4.677) to certain species than others – embodying the potential for interweaving between sensory effluences and the organ receiving them.

Woven structure – and specifically how closely atoms are interwoven (cf. *minus aut magis indupedita* in 1.240 above) – accounts for the varied firmness and density in things, since atoms cannot vary in solidity (1.483-634, esp. 565-76). In Book 2, Lucretius explains that substances such as stone and iron are dense because their atoms, being 'more tightly packed in union' (100) and '**entangled** by their own **intertwined** shapes' (*indupedita suis perplexis*

²⁶⁸ This reading clarifies the meaning of 1.589-90, which depicts the constancy of species as strict 'to such an extent that all the different birds display markings of their kinds **in patterns** on their bodies' (*usque adeo variae volucres ut in ordine cunctae / ostendant maculas generalis corpore inesse*). Rouse's 'in succession' will not do for *ordine* here. Lucretius is interested in the 'pattern' of a bird's plumage caused by atomic *ordo*, just as changed *ordo* of threads creates a new type of cloth, to prove that animals of a given kind share *inmutabili materiae corpus* (591) – i.e. consist of the same atoms in the same *ordo*.

²⁶⁹ In the immediately preceding passage (2.391-7) the same description is applied to explain why olive oil moves slowly through a sieve; see pp.171-2.

²⁷⁰ This verb often applies to woven items (e.g. Tib. 1.10.16 with *vestis*), as do its cognates *scindo* (Pl. *Trin.* 837, with *vela*; Livy 3.58.8 and Verg. *A.* 12.609, with *vestis*), *discindo* (Ter. *Ad.* 120, with *vestis*) and *perscindo* (Tib. 1.10.63, with *vestis*). The weaving sense is activated when depicting the texture of things (consistently depicted as 'woven') being torn, and is a more convincing reading from an explanatory perspective than of (personified) 'divorce', as Brown (1984) *ad* 220. Here our 'woven' sense organs appropriately receive 'woven' effluences; see also on metal images (pp.86-7).

²⁷¹ The adjective *perplexus* is related to the verb *plecto*, 'to plait, twine' (often of flowers in a garland – Lucr. 5.1399; Catull. 64.283) and its derivatives, e.g. *implecto*, used by Virgil of the Eumenides' snake-hair (*G.* 4.482). The verbs are common in Lucretius and form a connected group of weaving terms alongside the etymologically related *plico* and its derivatives (see n.533). The words are all related to Greek πλέκω, 'to plait, weave' employed by Epicurus as περιπλοκή and πλεκτικός; E-M s. v. *plecto*.

²⁷² *OLD*, *aptus* 1, 'tied, fastened, bound'; cf. Enn. *Ann.* 341 (with *vincla*); Bas. *poet.* 2.4 (of hair); and esp. the weaving metaphor in Cic. *Orat.* 235.13 (*facilius est apta dissolvere quam dissipata conectere*).

ipsa figuris – 102),²⁷³ only collide and separate at short intervals. This is supported by *magis condenso conciliatu* (100), ‘in more greatly condensed union’, which in the context must denote tightly packed threads.²⁷⁴ In contrast, smoke is diffuse because it is ‘not entangled by interwoven elements’ (*non [...] perplexis indupedita [sc. elementis]* – 2.459), while air consists of spread-out atoms and is therefore ‘loose-knit’ (*rarum* – 107).²⁷⁵ These explanations reflect our experience of cloth: a tightly-woven fabric is more resilient than one loosely-woven from the same thread.

These depictions of woven atomic array play an important role in Lucretius’ theory of the soul. The soul, being bodily (3.161-2), consists of atoms, and these, to account for the soul’s fast movement (3.182-5, 203-7), must be particularly minute (3.179-80), round (3.186-7), and ‘exceedingly fine’ (*persubtilem* (3.179), a weaving term).²⁷⁶ The soul’s ‘woven’ substance is confirmed as Lucretius continues his description:

*haec quoque res etiam naturam dedicat eius,
quam tenui constet textura quamque loco se
contineat parvo, si possit conglomerari, [...]*

210
(3.208-10)

²⁷³ A description recalled in Lucretius’ explanation of magnetism in Book 6: ‘Nor does anything cling together more **entangled** (*magis [...] indupedita*) among its own elements, nor is anything **woven together** more **tightly** (*arte conexa*)’ than iron (1009-11). Similarly, in Book 5 Lucretius describes earth atoms as *perplexa* (450, 452) in order to explain why the earth is heavier and denser than the sea and sky.

²⁷⁴ *condenso* is, along with *denso* and the related *denseo*, the technical term for ‘beating up the weft’. Varro, *Ling.* 5.23.113 defines *densus* cloth as that which ‘is beaten up by *dentibus pectinis* (‘the teeth of the comb’); for the verb *denseo* in this sense, see e.g. *Ov. Fast.* 3.819-20: *illa etiam stantis radio percurrere telas / erudit et rarum pectine denset opus*. Elsewhere *densus* refers to hair (*Lucil.* 9.682; *Ov. Ars am.* 3.165), reminiscent of thread; and is used figuratively with *texo* in *Sil.* 6.540. The sense of *condenso*, ‘to pack closely together’ (*OLD, condenso* 1) is nevertheless appropriate to the weaving context. *concilio* can denote the thickening of cloth, as Varro, *Ling.* 6.43 notes: *a cogitatione concilium, quod ut vestimentum apud fullonem* (= ‘cloth-fuller’) *cum cogitur, conciliari dictum*, but its sense ‘bring together’ (*OLD, concilio* 1) is equally appropriate to weaving in the context.

²⁷⁵ The adjective *rarus* can depict anything porous, but also ‘loosely woven’ items such as cloth (*Plin. HN* 34.172) and nets (*Verg. Aen.* 4.131). This sense is activated in relation to compound structure, which is depicted consistently in weaving terms. When *rarus* is first used (1.347) – of the porous nature of rock – the reader, recalling the woven texture of things introduced at length in 1.215-49, will think of its weaving sense. Lucretius also occasionally uses the derivatives *rarefio* and *rarefacio*, ‘to make thin’ (only attested in Lucretius) and *raresco*, ‘to become less dense’ (*OLD, raresco* 1, e.g. *Ov. Met.* 15.246: *resoluta [...] tellus in liquidas rarescit aquas*).

²⁷⁶ An intensive form of *subtilis* (which Lucretius uses, along with the adverb *subtiliter*), from *tela*, which the *OLD* defines as either ‘cloth in the process of being woven on a loom’ (1, e.g. *Plaut. Pseud.* 400; *Cic. Luc.* 95; *Virg. Aen.* 4.264), ‘the upright threads in a loom’ (3, e.g. *Verg. G.* 1.285; *Tib.* 1.6.79; *Ov. Fast.* 3.8.19); or, as in *Lucr.* 5.1351, ‘a loom’ (4, e.g. *Ter. An.* 75; *Cato, Agr.* 10.5). *subtilis* occurs in a weaving sense in *Catull.* 64.63 (with *mitra*); *Fro. Aur.* 2.p.224 (233N) (*subtile et tenue subtemen*); *E-M. s. v. subtilis*: ‘sans doute terme de tisserand [...] cf. subtemen, qui désigne les fils les plus fins de la trame’; de Vaan, *s. v. texo* draws an etymological link between *texo* and *subtilis* from a shared root *tek-s-.

This proof besides also makes its nature clear, how **fine** a **texture** it consists of and in how small a space it might hold itself together, if it could be **wound into a ball**, [...]

The image of the woven soul is clear, with the weaving sense of *tenuis* ('fine')²⁷⁷ brought out by *textura*,²⁷⁸ and *conglomerari* suggesting thread being wound into a ball.²⁷⁹ The soul's finely-woven texture is confirmed shortly after as Lucretius describes its composite nature (3.231-45), which must consist of breath, heat and air, since we sense that these leave the moribund. This breath is 'fine' (*tenvis* – 232), while the heat, 'since its nature is **loose-knit**' (*rara quod eius enim constat natura* – 235), must have many '**first-threads** of air' (*aeris [...]* *primordia* – 236) within. To this is added a fourth substance 'entirely without name' (242), than which nothing is 'finer' (*tenvius* – 243). The soul's loosely-woven texture is created by its *rarus* and *tenuis* constituent parts. The reader, from experience, can understand the soul's woven texture as highly mobile, fragile, and able to be penetrated by or interwoven with another substance. The wide-reaching implications of Lucretius' description of the soul in weaving terms will be considered in Part 3 Section D.

How composite bodies combine

Just as composite bodies are formed from *primordia* woven together in various ways, so can composite bodies be interwoven with one another. This does not occur without restriction, as Lucretius confirms (2.700-29): 'it must not be thought, however, that all things can be **woven together** (*conecti*) in all ways' (2.700-1)²⁸⁰, because if this were the case, *portenta* such as Chimeras would exist, or we would see 'many limbs of land animals **woven together** (*conecti*) with sea creatures' (2.704). We know from the first arguments of Book 1 that this cannot happen, since animals are born from fixed mothers and seeds, and Lucretius repeats these proofs here (2.707-9). The reason why not all composites can combine is explained by an analogy at the atomic level, contrasting individual food atoms interwoven with our bodies (expressed by *conexa* – 712), with other atoms that are excreted because they cannot 'be

²⁷⁷ *tenuis* (often *tenvis* in Lucretius for metrical reasons) denotes anything fine or drawn-out, but often specifically 'fine' thread (Plaut. *Men.* 516 with *subtemen*; Verg. *Aen.* 4.264 denoting fine gold thread inlaid in a cloak) or 'finely-woven' fabric (Verg. *Aen.* 8.33; Tib. 2.3.52; Ov. *Ars am.* 3.445); cf. also Catull. 68.49 of a spider's web (*tenuem texens aranea telam*). The weaving sense is activated by context. If an item that is known to be woven is described as *tenuis*, the senses outlined here are activated.

²⁷⁸ See n.255.

²⁷⁹ A reading taken as read by Snyder (1983) 42. The verb is used of hair in Pac. fr. 13-14 War. cf. *glomero* (Ov. *Met.* 6.19, of wool) and *glomus*, which Lucretius uses of wool (1.360; cf. Hor. *Epist.* 1.13.14). Although *glomus*, *glomero* and *conglomerato* can refer to any mass in a ball (and E-M, s. v. *glomus* assert that *glomus* and *globus*, 'ball' do not differ in meaning), an appropriate image of wound-up threads is created when applied to physical substances in Lucretius.

²⁸⁰ See n.254.

unpicked without harming either piece. Body and soul do not exist as woven wholes before being combined, but rather are interwoven as first-threads – a description supported further by *subtiliter [...] conexas* ('finely woven together') in 3.739-40.

The body threads form the majority of the structure, with the soul threads interwoven at intervals. This is confirmed in 3.370-95, where Lucretius denies Democritus' theory that the first-threads (*primordia* – 372, pointedly employed here) of body and soul are 'laid out' (*adposita* – 373) one-by-one in alternating pattern to 'weave together' (*nectere* – 373) the limbs. Instead, the soul's *elementa* are both smaller (374) and fewer (376) than those of the body, and are 'set out **loose-knit** throughout the limbs' (*rara per artus / dissita sunt* – 376-7). The concept of weaving *ab initio* is embodied by *adposita* and *dissita*, which recall *dispono* (see p.35) in meaning and, respectively, their shared stem and prefix. The single woven structure of soul and body is not like a cloth spun from equal quantities of two types of thread, but more like a cloth woven principally from one type of thick thread, forming the majority of the warp and weft, with a different, thinner thread inlaid at intervals.

This reading, which shows the range and explanatory power of the WEAVING thread, may explain the problematic subsequent proof, which explains that we cannot feel certain things like gnats' feet and cobwebs when they fall on the intervals between the soul's *primordia* (3.377-95) – although even such small things must be considerably larger than even a few intervening body atoms.²⁸³ We might, however, following our interpretation of 3.370-7, imagine a fine thread (representing the soul) interwoven with a cloth (representing the body) at intervals, so that on one side only parts of the fine thread are seen between the thicker threads, but underneath it runs unseen over a greater space. If body and soul atoms intertwine in this way, wider gaps occur on the skin's surface, on which the gnat treads. The soul's first-threads cannot feel such objects because they run under the skin's surface, covered by first-threads of skin. Our intricate interpretation may seem to stretch the image here, but the WEAVING thread employed in Lucretius' description of the body and soul supports it.

Untying things into atoms

²⁸³ 4.116-22 argues *a fortiori* that, because we cannot see a third part of the smallest creatures, their internal organs must be exceedingly small, and their constituent atoms more so in turn. By this reasoning, a gnat's foot could not fall between two soul atoms. In 3.377-95 Giussani (1923) *ad loc.* suggests Lucretius believed there were no soul atoms on the skin's surface. Bailey (1947) *ad loc.* doubts Lucretius considered this problematic or noticed any difference between his examples.

Lucretius intends his reader to envisage compound dissolution as ‘unweaving’ throughout the *DRN*.

Since it is established in the first arguments that everything is unwoven into constituent bodies, the reader can infer that the bodies themselves cannot be untied. Lucretius seeks to confirm this in 1.483-643, the crucial passage explaining atomic indivisibility and the complex doctrine of smallest parts. The contrast is made early in the passage:

*materies igitur, solido quae corpore constat,
esse aeterna potest, cum cetera **dissoluantur**.*

(1.518-9)

Therefore the mother-substance, which consists of solid body, can be eternal, while all else **is untied**.

A weaving metaphor distinguishes atoms, which cannot be untied, from compounds (= *cetera*), which can. This is made explicit shortly after:

*haec neque **dissolui** plagis extrinsecus icta
possunt nec porro penitus penetrata **retexi** [...]*

(1.528-9)

These [bodies] can neither be **untied**, struck from without by blows, nor moreover be penetrated and **unravelling** from within [...]

The *primordia* mark the final point of unravelling: they must be indivisible, and all things must ultimately be untied into them (545-6).

Lucretius extends the metaphorical correspondence to argue that if atoms could be untied, nothing would remain now to create things, ‘for we see that any given thing can be **untied** (*dissolvi*) more quickly than it can be remade again’ (556-7). Moreover, there would be no time for the creation of things if infinite time, ‘disturbing and **untying**’ (*disturbans dissoluensque* – 559), had already destroyed them to nothing, because the first-threads would be untied more quickly than they could tie together. This brings to mind, from experience of weaving, someone unravelling a cloth at one end faster than it can be woven at the other. The weaving metaphor is perfect for enhancing the reader’s understanding of the first-threads’ indestructibility.

Towards the end of this passage, Lucretius employs the WEAVING thread to elucidate the difficult smallest parts theory.²⁸⁵ From our experience of weaving, the smallest thread,

²⁸⁵ For a summary of Epicurus’ and Lucretius’ differing portrayals of this concept, and their relation to Democritus and Leucippus, see Bailey (1947) 700-4.

although consisting of smaller parts, cannot be untied further without reweaving becoming impossible. Similarly, an atom consists of ‘other similar parts in **order**, in tightly packed formation’ (*similes ex ordine partes / agmine condense* – 605-6, with *ordo* embodying an ordered pattern of threads, or, here, their strands)²⁸⁶, which cling together and cannot be ‘torn apart’ (*revelli* – 608).²⁸⁷ If *Natura* could force atoms ‘to be untied’ (*resolvi* – 628) into their smallest parts, nothing could be made afresh, because things not ‘enlarged by parts’ (631) cannot possess the *varios conexus pondera plagas / concursus motus* (633-4) of *genitalis materies*, which enable things to come to pass. Lucretius uses the WEAVING thread to reiterate that the *primordia* are the ‘first-threads’ of all things, marking both the limit to which things can be torn, and the point from which things can be rewoven.

Having employed the WEAVING thread to explain the nature of atoms, Lucretius can extend his arguments to a macroscopic level. Just as both atoms and compounds form woven composites (discussed above), so unweaving occurs at the smallest and largest level. At the end of Book 1, Lucretius turns from small composite bodies to the world and the universe, to argue that matter and void are infinite. If matter were finite, he says, ‘the abundance of mother-substance’ (1017-8) would be ‘untied’ (*soluta* – 1018) and carried across the void, rendering creation impossible. Lucretius then casts an analogy, that just as animals deprived of food waste away, so things are ‘untied’ (*dissolvi* – 1040) when further *materies* ceases to be supplied. Just as sufficient thread is required for weaving or repairing cloth to take place, so sufficient first-threads are required for ongoing life and creation.

The second principal point of Lucretius’ argument here is that the universe has no middle (1.1052-1113; esp. 1.1070-1).²⁸⁸ Some believe (1052-1067) the earth stands at the middle of the universe, and matter compressing it from all directions prevents its topmost and lowest parts from being ‘untied’ (*resolvi* – 1055). But there can be no middle, since the

²⁸⁶ A complementary metaphor is evident here, with *ordo* and *agmen* suggesting their meaning of military battle lines (*OLD*, *ordo* 2. ‘a line of soldiers standing abreast (usu. in battle), a rank’; *agmen* 7. ‘a line of troops’); Brown (1984) *ad loc.*

²⁸⁷ See 1.612-3: ‘Nature forbids anything to be **torn away**’ (*neque avelli quicquam [...] concedit Natura*) from the first-threads. Derivatives of *vello* (of which Lucretius uses *avello*, *convello*, *divello*, *evello* and *revello*) frequently depict the tearing or pulling apart of threads or threadlike things: *vello* – of hair (*Scip. min. orat.* 10; *Hor. Epist.* 2.1.46) and wool (*Varro Ling.* 5.54); *avello* – of hair (*Sen. Oed.* 592); *divello* – of knots (*Verg. Aen.* 2.220); *evelli* – of hair (*Plaut. Truc.* 288; *Sen. Ep.* 47.7). Also, *vello* is etymologically connected to *vellus*, ‘wool’ (E-M s. v. *vello*) and has a derivative, *vellico*, ‘to pluck (hairs)’. Although *vello* and its derivatives also often apply to plucking, pulling or tearing things that are not threadlike, for Lucretius they provide an appropriate image for depicting effects on ‘interwoven’ atomic structures.

²⁸⁸ Although 1070 is incomplete (*nam medium nil esse potest... / infinita*) owing to mutilation in manuscript O, the general sense is clear, whether we take Munro’s (*quando omnia constant*) or Lachmann’s (*ubi summa profundist*) supplements (Bailey prints Munro’s in a critical note, but does not dispute Lachmann’s, or others’, conjectures). Bailey (1947) *ad* 1.1068-75.

universe is infinite and all moves perpetually. Others argue that only the world remains static in the middle, while air and heat travel away (and fuel the stars and the sun). However, by this argument, the *flammanitia moenia mundi* would suddenly be ‘untied’ (*soluta* – 1103) into the void, and the ruins of things and the sky, ‘untying’ (*solventes* – 1108) bodies into the void, would leave nothing but ‘empty space and invisible **first-threads**’ (*desertum [...] spatium et primordia caeca* – 1110). In short, suggesting that either matter is finite, or substances can tend away into the void, allows for the untying of the world and, in turn, the universe.

Finally, Lucretius adds another cause of unravelling to the ‘blows’ and ‘force’ of 1.215ff.: atomic motion. The importance of motion to birth is evident in the phrase *varios conexus pondera plagas / concursus motus* (1.633-4), and the first arguments of Book 2 (62-332), in which motion also causes death, expressed by the weaving term *resolvant* (63). The dual effects of motion and unweaving are reemphasised in the analogy for atomic movement of dust motes dancing in the sunbeams (2.112-24). A warfare metaphor is prominent in this image (*et velut aeterno certamine proelia pugnas / edere turmatim certantia nec dare pausam* – 118-9), but the result of this battle is described in weaving terms: the motes are ‘driven by repeated unions and **tearings apart**’ (*conciliis et discidiis exercita crebris* – 120). Just as the right blow or force can untie or tear cloth, so can movement, by pushing together and pulling apart. These two metaphors represent two causes of atomic dissolution.

The description of the dissolution of things into their constituent bodies as ‘unweaving’ into their ‘first-threads’ is the most important aspect of Lucretius’ WEAVING thread, because it forms the basis of several explanations of physical processes. Among these processes is the death of things, explained by the intertwined WEAVING and LIFE-CYCLE threads. This has important implications for Lucretius’ central ethical doctrine that death is nothing to us, which is supported by consistent and extensive applications of the ‘death is unweaving’ metaphor at an atomic level and in relation to inanimate things. The end of this Section will introduce the WEAVING thread’s role in depicting several physical processes, while Part 3 will address those, including death, that are portrayed by the WEAVING thread intertwining with one or more other threads.

Sensory effluences

Another principal role of the WEAVING thread is to depict sensation.²⁸⁹ We hear, smell and see things, Lucretius argues, because thin effluences are emitted from things and strike our senses. Of these, vision is caused by ‘films’ emitted from the surface of things, and Lucretius

²⁸⁹ Briefly noted by Snyder (1983) 42.

describes there with several terms emphasising either the similarity between the films and their source objects – as with *simulacra* ('likenesses'), *effigiae* ('images', 'icons'), *imago* ('image') and *figurae* ('shapes'), all representing a replica such as a sculpture or cast²⁹⁰ – or their nature as thin coverings – *membranae* ('skins'). These terms do not suggest the films are woven; however, Lucretius frequently uses weaving terminology to describe their structure as consisting of first-threads woven into an exceedingly fine texture. In doing so, again Lucretius broadly expands a metaphor from Epicurus, who describes the films as 'far surpassing visible things in their **fineness**' (**λεπτότησιν** ἀπέχοντες μακρὰν τῶν φαινομένων – *Ep. Hdt.* 46^a).²⁹¹

The weaving metaphor is only latent in Lucretius' introduction to the films (4.26-44), in the adjective *tenuis* (42).²⁹² However, in the immediately subsequent passages (if we are to delete 4.45-53),²⁹³ Lucretius draws two analogies with weaving particularly in mind. The first (4.54-64) describes visible substances cast from things in two ways: either 'poured out **loosened**' (*diffusa solute* – 55)²⁹⁴ or 'more **interwoven** and **crowded together**' (*contexta magis condensaque* – 57).²⁹⁵ Of the former kind are wood smoke and heat from flame,²⁹⁶ which are visible but loosely formed (*solute* here must specifically mean 'loosened', since 'untied' emissions would be invisible); of the latter kind are animal skins, which are tightly formed enough to be visible and tangible. Lucretius describes these skins in greater depth, with further weaving metaphors:

*et partim contexta magis condensaque, ut olim
cum teretis ponunt tunicas aestate cicadae,
et vituli cum membranas de corpore summo
nascentes mittunt, et item cum lubrica serpens* 60
exiit in spinis vestem [...]

(4.57-61)

[...] and others more **interwoven** and crowded together, as on occasion when cicadas **take off their snug tunics** in the summer, and when calves send out skins from the surface of their bodies as they are being born, and again when the slippery snake **takes off its clothing** among the thorns [...]

²⁹⁰ Recalling Epicurus' τύποι and εἶδωλα (*Ep. Hdt.* 46^a); see Sedley (1999) 231-4.

²⁹¹ λεπτός commonly refers to 'fine' garments in Homer, cf. LSJ, λεπτός 3.

²⁹² See n.277.

²⁹³ See n.251.

²⁹⁴ See Part 3 Section C for the combination of liquids and weaving metaphor in depicting sensation.

²⁹⁵ Snyder (1983) 41-2 notes the weaving metaphor of *condensa* (see n.274) brought out by *contexta* (see n.255).

²⁹⁶ i.e. intense heat, visible as haze; less intense heat could not be included among *rebus apertis*.

The images of cicadas and snakes are audacious, especially the use of *pono* and *exuo* to describe removing clothes,²⁹⁷ and of *teres*, often used of fabrics tightly ‘rounded into a bulge’.²⁹⁸ Translations should preserve such vivid images, rather than dilute them with ‘drop’ (Rouse, Melville), ‘throw off’ (Rouse), ‘shed’ (Latham), ‘shrugs her castings off’ (Stallings), ‘slough off their skins’ (Melville). Lucretius explains *contexta magis* (57) with explicit clothing imagery, depicting woven, snug-fitting coverings, which largely maintain the shape of the wearer when removed.

Just one of Lucretius’ technical terms for films occurs here (*membranae*, depicting the calf’s caul), and in the one *exemplum* devoid of weaving imagery. The caul, being thin, wet and fragile, cannot maintain the calf’s shape once shed, and is not receptive to weaving imagery. However, it joins the snakeskin and cicada shells in a trio of skins of varying solidity, to express two important aspects: variety of thickness, and (at least for two of them) woven structure. If deliberate, this is a rather forced attempt at implying the woven nature of *membranae* by association. Regardless, the passage clearly introduces the woven nature of films, through a carefully drawn analogy and individual terms (alongside *solute* and *contexta* we also find *tenuis* – 63). This is supported in the next lines, where Lucretius concludes that the emission of such visible skins from things should remove doubt that ‘fine’ (*tenvia* – 66) vision films, which are cast from the very edge of things and are ‘less entangled’ (*minus indupediri* – 70) with their source body, can preserve their ‘array’ (*ordo* – 66) more easily. In this passage Lucretius emphatically depicts the woven nature of his films by metaphor and analogy. This is maintained in the subsequent analogy, depicting colour cast from a theatre awning – a passage addressed in Part 3 Section C, in relation to intertwined weaving and liquids metaphors.

The WEAVING thread also depicts mental images, which are similar to vision films, but finer and more fragile. Their fineness explains why we can imagine composite monsters that have never been seen, such as centaurs. The film of a man and a horse cohere instantly in the air, ‘on account of their **fine-woven** nature and **thin textures**’ (*propter subtilem naturam et*

²⁹⁷ OLD, *pono* 6b, ‘to take off (clothes)’, cf. Cic. Tusc. 1.113 (w. *vestis*), 5.60 (w. *tunica*); Ov. *Ars am.* 2.616 and *Met.* 4.345 (w. *velamen*). OLD, *exuo* 1, ‘to take or put off (a garment)’, cf. Plaut. *Men.* 199 (*si non saltas, exue igitur [sc. pallam]*); Ov. *Fast.* 2.171 (w. *tunica*); Suet. *Ner.* 32.3 (w. *vestis*).

²⁹⁸ OLD, *teres* 1c. Examples under this entry may be better translated as ‘tightly rounded’. In Hor. *Carm.* 1.1.28 (*rupit teretes Marsus aper plagas*), *teres* describes a net tight enough to catch a boar; in Catull. 64.65 (*tereti strophio lactentis vincta papillas*) *teres* describes a band wound tightly around the breasts; and in Ov. *Fast.* 319-20, when Omphale swaps clothes with Hercules (*dat tenuis tunicas [...] dat teretem zonam*), *teres* introduces a clear contrast (extended when Hercules puts them on – 321-4) with Hercules’ usual clothing: the dress is ‘tightly rounded’ and therefore too small for Hercules’ belly (321). Thus in the present passage, *teres* specifically depicts a cast-off cicada skin maintaining the cicada’s body shape, contrasting the limp snakeskin and the wet, disintegrating calf’s caul.

tenvia texta – 742-3; cf. *tenvia* – 726), just like spiders’ webs (themselves woven – cf. 3.383) or gold leaf. The metaphor suggests mental films have sufficient gaps between their threads to allow interweaving, which supports Lucretius’ explanation of why and how the mind perceives mental images. These images must be of ‘much **finer texture**’ (*magis tenvia textu* – 728; cf. *mage tenvia* – 756) than vision images, so they can enter through ‘the **loose-knit** parts of the body’ (*corporis rara* - 730) and rouse the ‘**fine** nature of the mind’ (*tenvem animi naturam* – 731; cf. *tenvis enim mens est* - 748). We can picture things in our minds because mental images and the mind are both *tenuis*.²⁹⁹ Indeed, of 43 appearances of this adjective in the *DRN*, fifteen refer to films³⁰⁰ (four to mental films specifically),³⁰¹ while a further six refer to the mind or spirit.³⁰² The weaving metaphor universalises Lucretius’ theory of effluences both sensory and mental. As Book 4 progresses, Lucretius explains further qualities of these effluences by building upon their established woven nature. In doing so, the WEAVING and LIQUIDS threads intertwine, as Part 3 Section C will consider.

Other processes

In addition to the theory of vision, Lucretius utilises the WEAVING thread to explain further complex processes – in particular in Book 6 to explain various natural phenomena that confuse and often terrify men.³⁰³ These phenomena are often difficult to explain by physical or empirical evidence, and so Lucretius uses analogy and the threads – in particular the WEAVING thread – to infer their underlying causes, as a result simplifying and to an extent demystifying them.

In 5.247-323 Lucretius provides the visibly fluctuating growth and diminution of the Earth as evidence for the world’s mortality. The cycle at the moment maintains equilibrium, but eventually, when diminution sufficiently outweighs growth, the world will die. In this cycle, the WEAVING thread explains how ocean levels remain relatively constant, despite the

²⁹⁹ Lucretius uses the same argument (5.146-55) to prove that the gods do not touch our world. Their nature, he says, is *tenvis* [...] *longeque remota / sensibus ab nostris* (148-9) and so our minds can scarcely see them. The *tenuis* nature of the gods might seem ideal for our *tenuis* minds to see them. However, a distinction seems to be drawn by *longeque remota sensibus* – suggesting that a combination of distance and fineness hinders our perception of the gods. Perhaps their images have been broken up or distorted before they reach our minds.

³⁰⁰ 4.42, 63, 66, 85, 95, 104, 110, 158 twice, 726, 728, 756, 802, 807, 1096 (specifically love images).

³⁰¹ 4.726, 728, 756, 802 (and possibly 1096 – referring ambiguously to erotic images).

³⁰² Aside from the two here, 3.209, 232, 243, 425.

³⁰³ Explanations of such phenomena were a philosophical commonplace, seen in. Arist. *Mete.* 1.9 (rain), 11 (snow), 12 (hail); 2.4-6 (winds), 7-8 (earthquakes), 9 (thunder and lightning); 3.1 (hurricanes, typhoons, thunderbolts), 4-5 (rainbows). For the influence of Theophrastus (via Aetius) on Lucretius, see Sedley (1998a) 157-60, which includes a useful table comparing the order of phenomena addressed in the three authors. The threads’ consolatory aspects will be addressed in the Epilogue.

evident abundance of new water in seas, rivers and springs, partly by evaporation and partly by water permeating into the earth (5.261-72). Evaporation occurs ‘because strong winds by sweeping, and the heavenly sun by **unweaving** with its rays, diminish the waters’ (*quod validi verrentes aequora venti / deminuunt radiisque **retexens** aetherius sol* – 266-7) – with the subsidiary meaning of *radii* (‘shuttles’ in weaving) activated by the context.³⁰⁴ As West argues, the easiest way to unweave a cloth and keep the thread is to pass the shuttle back through the open warp threads.³⁰⁵ Here, we assume, like Penelope’s cloth, total unweaving is prevented by a constant cycle of weaving and unravelling.³⁰⁶ Lucretius returns to this image to describe the ongoing war of the four elements (5.380-415). Whenever one element becomes dominant, another grows to subdue it, and so when water has grown powerful, the wind sweeps it and the sun unweaves it with its rays (388-9, repeated from 266-7, bar the opening two words). A principal way in which one of the four elements is kept in check is atomic unweaving, which balances against rain to maintain consistent water levels in the world.

The WEAVING thread also explains how lightning evaporates wine in a pot (6.225-38). The lightning’s minute constituent bodies allow it to pass through solid walls, stone and metals (which it also melts – 6.352-6), and to affect earthenware pots in an unexpected way:

*curat item vasis integris vina repente
diffugiant, quia nimirum facile omnia circum
conlaxat rareque **facit** lateramina vasi
adveniens calor eius, et insinuatus in ipsum
mobiliter **soluens** differt **primordia** vini.* 235
(6.231-5)

[Lightning] also sees to it that wine suddenly escapes from intact vessels, no doubt because its approaching heat easily **loosens** all the earthenware around the vase and **makes it loose-knit**, and, having penetrated the vessel itself with ease of movement, **unties the first-threads** of wine and carries them abroad.

The process is expressed by two weaving images: the lightning expands the gaps between the pot’s first-threads,³⁰⁷ enabling itself to pass through; and it unties the wine’s first-threads, causing them to depart between the pot’s first-threads.

³⁰⁴ This sense of *radii* occurs in the description of the loom at 5.1353. West (1969) 80-2 argues these two instances support his reading of a weaving metaphor in *radii solis* and *lucida tela diei* in 1.147. The weaving meaning is more obviously activated here (see n.179).

³⁰⁵ West (1969) 82.

³⁰⁶ See Gale (2009) *ad loc.*

³⁰⁷ *conlaxo* is rare, but its cognates *laxo* (OLD 3 and 4) and *relaxo* (OLD 3b) frequently carry an ‘untying’ sense; cf. Lucil. 4.632 (of knots); Sen. *Tro.* 1179 (of sails); Verg. *Aen.* 3.267 (of rope). Cicero uses *relaxo* figuratively alongside other weaving terms (*Div.* 2.100 with *solvo*; *De or.* 3.176 with *vincio*), creating a similar effect to Lucretius here.

The keen reader, upon encountering evaporation by unweaving in 5.267 and 389, should recall the metaphor of compounds being ‘unwoven’, persistent in the opening four books. The particularly alert reader may even recall a pertinent example at the beginning of the argument (1.483-632) that *primordia rerum* are solid and indestructible. Lucretius admits it is difficult to imagine anything solid, because even hard substances have weaknesses. For example, heat melts metals such as gold: ‘the rigidity of gold is weakened and **untied** by heat’ (*labefactus rigor auri solvitur aestu* – 492).³⁰⁸ The sense of *solvo* here is unattested in Latin before Lucretius,³⁰⁹ but its Greek cognate λύω can mean both ‘loosen’ and ‘melt’ (Aristotle employs it in the latter sense).³¹⁰ Lucretius exploits the dual meaning latent in *solvo* and gives it special relevance within his ‘woven’ atomic theory, situating melting among the dissolution or ‘unweaving’ of composite bodies (introduced in 1.215-49). This intrinsic process is universalised beyond destruction to changes of state.

Three passages in Book 6 comprehensively dispel any doubt that *solvo* depicts melting metaphorically as ‘unweaving’ here. First, in describing (6.348-56) lightning’s various effects on different things, Lucretius states that it ‘**unties** and instantaneously boils bronze and gold’ (*dissoluit [...] aes aurumque repente / confervefacit* – 352-3), before extending the metaphor, stating that metals, owing to their weak *elementa*, ‘**untie** all their **knots** and **loosen** their **bonds**’ (*dissolunt nodos omnis et vincla relaxant* – 356)³¹¹ when struck by lightning. Metals are included among substances in which lightning can pierce through ‘the points where the **woven textures** are held together’ (*qua texta tenentur* – 351) – i.e. where the first-threads intertwine. These points mark the point of ‘untying’ or dissolution in things. Whereas earlier the melting of metals by lightning was described literally as *liquidum facit* (6.230), here Lucretius clarifies that this entails the unweaving of the constituent atomic ‘knots and bonds’ in metal.

³⁰⁸ Note the possible pun of *rigor*, which can also mean ‘frozen’ (*OLD, rigor* 2.), contrasting *aestu* at the end of the line.

³⁰⁹ *OLD, soluo* 13a, ‘to turn to liquid, dissolve’; 13b, ‘to melt by heat’; *Ov. Ars. am* 2.47 (of melting wax); *Hor. Carm.* 1.4.1 (winter thawing).

³¹⁰ In *Mete.* 4.6-7 Aristotle alternates between λύεσθαι and τήξις to refer to the dissolution or melting of solids; see Webster (1923) *ad* 382b35.

³¹¹ The primary sense of *nodus* is ‘knot’ (*OLD, nodus* 1), sometimes used in a transferred sense (e.g. *Cic. Att.* 5.21.3 of difficulties – see *OLD, nodus* 5a). *vinc(u)lum* denotes any kind of bond, including ropes or chains (*OLD, vinculum* 1-4) – e.g. *Enn. Ann.* 518 War. (of tethers); *Man.* 5.660, *Hor. Epod.* 17.72 and *Ov. Met.* 11.75 (of snares or nooses). Its cognate verb *vincio* usually means to ‘tie’, ‘fasten’ or bind (*OLD, vincio* 1, 2 and 4) – e.g. *Ter. Eun.* 314 and *Verg. Aen.* 1.337 (with items of attire). The sense of *vinculum* and *vincio* denoting ties or tying is appropriate to Lucretius’ WEAVING thread, and the sense is often brought out by context. Notably *vincio* and *nodus* occur together in *Ov. Met.* 8.248 (binding together with a knot), and *nodus* and *vinculum* in *Cic. Tim.* 13.8 (of joining parts of the world).

The melting of metal and ice are tied together by a shared ‘unweaving’ metaphor, confirmed among Lucretius’ consideration of the magnet (6.906-1089). Lucretius explains that different bodies are not suited to all things and do not effect them in the same way. For example, the sun bakes the earth dry, but it ‘unties’ (*dissolvit* – 963) ice, melts (*tabescere cogit* – 964) snow with its *radii*, liquefies (*liquefit* – 965; *liquidum facit* – 966) wax and bronze, and ‘unties’ (*resolvit* – 966) gold. The passages considered here contain a broad variety of weaving terms depicting melting, with seven different verbs of untying or unweaving (*retexo*, *solvo*, *exsolvo*, *dissolvo*, *raresco*, *relaxo*, *conlaxo*), the weaving implement *radii* (‘shuttles’), and two nouns suggesting interwoven texture (*nodj*, *vincla*). A further metaphor from weaving might be read in a depiction of heat contracting skin and flesh – *trahit et conducit* (967), which recalls the contraction of the soul’s woven substance in Book 3 (expressed by, e.g. *conducere* – 3.534; *distracta* – 3.492; and *distractam* – 3.590, 799).³¹² The unweaving metaphor is so extensively applied to melting that the reader would struggle to envisage melting without thinking of unweaving – even when depicted with more literal terms such as *liquefacio* or *liquefit*.

The WEAVING thread also depicts the dispersal of clouds, which is given as a cause of several other meteorological processes. The sky in general and clouds specifically are often portrayed with a weaving metaphor in ancient literature, presumably owing to the resemblance between clouds and clumps of wool.³¹³ Although cloud dispersal is somewhat different from melting or evaporation, the underlying atomic process is the same. This is especially evident in Lucretius’ description (6.160-422) of the mysterious phenomenon of thunder and lightning, for which numerous explanations are advanced, in order to prove it is neither mysterious nor caused by the gods (6.379-422; cf. 6.50-79).

Empirical evidence suggests lightning only originates from cloudy skies,³¹⁴ and therefore clouds, and their woven nature, are central to Lucretius’ explanations. Lucretius offers an aural comparison (6.108-15) between a thunderclap and a theatre awning flapping

³¹² Considered in Part 3 Section D. The weaving metaphor of *distraho* has been established in the analogy with thread being pulled apart in 2.826-33 (see pp.70-1). E-M, s. v. *traho* note ‘*traho lanam: d’où <<filer>>*’.

³¹³ Cf. 6.504 (*vellera lanae*). The comparison is made in Theophr., *Sign.* 13.87, while Virgil’s *nigro glomeri pulvere nubem* (A. 12.254, specifically a cloud of dust) recalls wool wound into a ball. For the sky in general, cf. Sen. *Q Nat* 2.1.1 (*scrutatur [...] solidumne sit caelum [...] an ex subtili tenuique nexum*).

³¹⁴ For the opposite occurrence, cf. Hor. *Carm.* 1.34, in which the poet sees a bolt from the blue and, seriously or not (Mayer (2012) 207-9 cites exponents of each point of view), recants his Epicurean beliefs.

or clothes drying on a washing line. The awning is ‘torn apart’ (*perscissa* – 111)³¹⁵ in the wind, mimicking the sound of tearing paper (112) or of thunder. By these analogies with woven items, Lucretius hints at the clouds’ ‘woven’ nature. This is supported by a description (6.476-82) of how clouds are formed, in which Lucretius strikingly concludes:

*urget enim quoque signiferi super aetheris aestus
et quasi **densendo subtexit** caerulea nimbis.*

(6.481-2)

For the heat of the star-bearing ether above also presses them and, **by condensing** them, as it were, **weaves** under the blue with clouds.

Clouds are formed by weaving techniques, expressed by the vivid *subtexo*³¹⁶ and the term *denso*, here suggests ‘beating up the weft’³¹⁷ to create a cloth of uniform density. Later Lucretius describes thunder caused when wind ‘tears through’ (*perscindat* – 138) cloud, recalling *perscindo* in the earlier analogy with awning and clothes. The awning analogy directs the reader to recall the awning in 4.75-89, in which the weaving metaphor is also particularly prevalent (see Part 3 Section C). The connection is aided by the comparison with mist and smoke in 6.102-7, which were described in weaving terms in 4.56 and 4.90-7. Again, the woven nature of things is shown to be universal. Finally, as the awning analogy and its surrounding passages in Book 4 alert the reader to the depiction of effluences as ‘loosely-woven’ throughout the book, so here Lucretius highlights a weaving metaphor, which will persist throughout his explanations of weather phenomena.

Lucretius proceeds to explain lightning in various ways, which unsurprisingly match his explanations of thunder. Three different causes are expressed by a metaphor of ‘tearing’. Lightning occurs, Lucretius says (6.173-84), when wind trapped in a cloud rushes around and grows hot enough to ‘tear apart’ (*perscidit* – 180) the cloud and emit *semina ignis* as a lightning flash. It also occurs (6.269-94) when whirling wind forges a thunderbolt in a cloud and suddenly forces the bolt to ‘tear apart’ (*perscindit* – 283) the cloud, which also (*discidio* – 293) causes rain to fall. Finally, wind from without tears apart (*perscidit* – 297) cloud and causes lightning to fall. The repeated *perscindo* and its cognate *discidium* tie together the processes of thunder and lightning, again recalling the cloth analogies of 108-15. By noticing this correspondence and recalling these everyday images, the reader’s understanding of splitting clouds is enhanced.

³¹⁵ Similar meteorological usages occur in Livy 21.58.7 (of wind) and Sen. *Q Nat.* 2.20.2 (of lightning). See n.270 for *perscindo* and its cognates.

³¹⁶ See n.255.

³¹⁷ See n.274.

Two further devastating meteorological phenomena are explained in the same way. One of the causes of water-spouts Lucretius advances (6.423-42) is wind trying to burst through a cloud, first forcing it down before finally 'tearing it apart' (*discidit* – 436) and causing the water to boil. Lucretius suggests that whirlwinds (6.443-50) might occur when a wind vortex gathers seeds of cloud around itself, descends to the ground and 'unties' (*dissoluitque* – 446), vomiting out violent winds. The rending of clouds is not caused by the gods, but by the unweaving of constituent atomic congregations – a process firmly established in the preceding books.

By the end of Book 6, Lucretius' reader should be thoroughly conversant with the metaphor of atomic unweaving, which has been applied persistently across Lucretius' principal doctrines to universalise the process of dissolution across a wide range of disparate examples. The conceptual thread, supported by carefully-drawn analogies with woven things (such as clothes and theatre awnings) brings intangible or invisible phenomena closer to the reader, in particular by the persistent use of specific weaving terms (such as *solvo*, *textus*, *necto*), and by correlations between certain physical processes and known weaving techniques and qualities of woven cloth. As a result, the reader's understanding of the universe is enhanced from the microscopic to the macroscopic level.

Section C

The LIQUIDS Thread

Of the five conceptual threads, the LIQUIDS thread is introduced least extensively in the prologue, despite underpinning several crucial theories.³¹⁸ Just two liquids metaphors occur here, both pertaining to Venus' deeds. The first forms part of the pleasing description of Venus' effect on the world:

[...] *tibi rident aequora ponti
placatumque nitet **diffuso** lumine caelum.*

(1.8-9)

[...] for you the expanses of the sea laugh, and the sky, soothed, shines
with **outpoured** light.³¹⁹

The image of pouring light is common in literature, and Lucretius' reader might picture it 'pouring' from a small point of origin (the sun) and filling the sky like liquid in a vessel.³²⁰ The 'pouring light' metaphor in Latin is first attested in Ennius (*Ann.* 560 War.) and later occurs in Virgil (*Aen.* 2.683; 3.152) – an example of the many characteristics they share with Lucretius.³²¹

The second instance occurs in Lucretius' request that Venus petition Mars for peace on Rome's behalf:

³¹⁸ The importance of liquids imagery in Lucretius is noted by Pope (1949) 74-5; von Raumer (1893) 26-8; Serres (2000); Garani (2007) 195-219.

³¹⁹ The primary sense of *diffundo* is 'to spread (a liquid) widely over a surface (Varro, *Rust.* 3.5.2, with *aqua*; Vitruvius 8.2.2 of rain; Cicero *Nat. D.* 2.26 of thawing snow). Lucretius employs multiple other cognates of *fundo*¹, 'to pour' (*OLD* 1, 3, 4), all with various liquids applications: *circumfundo*, 'to pour round' (*OLD* 1, 2, 5); *confundo*, 'to pour into' (*OLD* 1), 'to pour together' (2; e.g. Cicero *Clu.* 173 of poison); *effundo*, 'to pour out off, or away' (*OLD* 1), also 'to cause to pour' (2), and applied to bodily substances (3) and rivers (4); *infundo*, 'to pour in' (*OLD* 1; used by Lucretius of water poured into a cup – 1.496), 'to fill or moisten' (2), 'to cause to pour' (3), and applied to rivers (4); *perfundo*, usually 'to wet, drench, flood, etc.' (*OLD* 2; used by Lucretius of incense – 2.416), and used of rivers (3); *profundo*, 'to empty liquids out of a container, pour out' (*OLD* 1), also used of bodily fluids (2); *suffundo*, 'to pour on or in' (*OLD* 1), 'to cause to well up' (2, usually of bodily fluids), 'to fill with a liquid that wells up from below' (3).

³²⁰ Empedocles and Ennius, perhaps the two strongest influences on Lucretius' style, both employ the image: Empedocles fr.21 (Simpl. in *Phys.* 159, 13 = KRS 355) – ἄμβροτα δ' ὅσσ' εἶδει τε καὶ ἀργέτι δαυέται αὐγῆ (the immortal things, as many as are drenched in heat and bright sunlight'); Ennius *Ann.* 560 War. – 'and they pour (*fundunt*) light from uplifted nostrils'. Cf. also Vergil *Aen.* 1.683, 3.152; Mart. 8.65.4; Seneca *Oed.* 155; *OLD*, *fundo* 5b (light, shadow), 5c (sounds).

³²¹ For this chain of influence across the genre of epic, both didactic and heroic, stretching back in fact to Hesiod and Homer, see especially Gale (1994) 99-129. For heroic epic in Lucretius, see Murley (1947), Hardie (1986) and Mayer (1990); for didactic epic in Lucretius, see Gale (2000), Volk (2002), Gale (2013); Lucretius hints at his own debt to Ennius in 1.117-9.

*hunc tu, diva, tuo recubantem corpore sancto
 circumfusa super, suavis ex ore loquellas
 funde petens placidam Romanis, incluta, pacem;* 40
 (1.38-40)

You, goddess, **poured** around him, in his recumbent state, from above with your sacred body, **pour** sweet sayings from your mouth, pursuing pleasing peace for the Romans, renowned one;

This similarly delightful image (supported by *suavis* and *placidam*) embodies the effect of Venus on Mars, or peace on war. The striking image of Venus being ‘poured around’ Mars from above again suggests the filling of space – this time around Mars.

Pouring is associated with pleasure in each example (the latter focusing on persuasion through pleasure), a connection resumed in Book 4 in the context of sexual pleasure. Lucretius describes various dreams (1024-36), culminating in those involving liquids: a thirsty man drinking from a river; children dreaming of urinating, and consequently wetting the bed; and a youth’s wet dream. The liquids imagery spills over into the next section (1037-57), where Lucretius explains the cause of men’s sexual arousal and ejaculation (compared with blood ejected from a wound – another liquid example). Sexual desire occurs when ‘a **drop** of Venus’ sweetness **drips** into the heart’ (*Veneris dulcedinis in cor / stillavit gutta* – 1059-60),³²² following which Lucretius advises that the ‘collected liquid’ (1065) – now referring to semen – should be cast out anywhere. This desire is later compared (4.1088-1104) with thirst, although it cannot be quenched as easily, since desire only enters the body as images – just as real thirst cannot be quenched by water sought in sleep (recalling 4.1024-5). The metaphors and literal *exempla* of liquids here introduce Lucretius’ discussion (4.1233-62) of the importance of corresponding thicknesses of sexual fluids for successful conception. Venus, as the embodiment of desire, can fill animate beings like a liquid, which flows into us at the initial impulse of desire and out again during sexual intercourse.

Despite these connections the LIQUIDS thread is not introduced extensively or especially consistently in the prologue. This is perhaps because its primary applications in the *DRN* are to prove the existence of void and to depict movement within it.³²³ Lucretius has chosen in his prologue to introduce only certain principal facets of his philosophy, and others, like void (and therefore the LIQUIDS thread), are omitted. Nevertheless, the thread’s

³²² *OLD*, *stillo* 1, ‘to fall in drops’; 2, ‘to drop’; 3, ‘to cause to drip’. From *stilla*, ‘drop of liquid’; see De Vaan (2008) s. v. *stilla*.

³²³ The assertion of Serres (2000) 82 that ‘Lucretian physics is modelled on a mechanics of flows’ is rather over-generalised, inflating the prominence of the liquids metaphor in the *DRN*, and overlooking the processes described by other metaphors.

For where after all might the scaly fish advance to, unless the **water has yielded space**? Furthermore, to where might the **waters withdraw**, seeing as the fish will be unable to go forward?

Lucretius then concludes (381-3): either nothing moves or void must exist to allow movement. Here all movement is represented by a single example of a fish moving through water, and Lucretius argues that all things contain void because water evidently does. The tendency of liquids to fill void space provides the archetype for movement, and thus pouring is a metaphor for movement through the void. This metaphor consistently depicts movement in the *DRN*. The reader, helped by Lucretius' careful choice of liquids imagery and *exempla* to depict void and movement, should recognise and understand this correspondence fully from these early proofs. Having primed the reader to envisage movement through the void in liquid terms, Lucretius can now extend the correspondence to other facets of void and beyond.

Void in things

When introducing the cornerstone doctrine that atoms are solid and indestructible (1.483-634), Lucretius concedes this seems unlikely, since even stone, iron and metal are evidently penetrable (489-93). The final example states:

*permanat calor argentum penetratque frigus,
quando utrumque manu retinentes pocula rite* 495
sensimus, infuso lympharum rore superne.

(1.494-6)

[...] heat and penetrating cold **seep through** silver, since we have felt both duly when we cling to a wine cup while the dew of water is poured in from above.

The goblet walls must contain void, through which the warmth or cold of water passes gradually (expressed by *permanat* as in 1.348 above).³³⁰ The explanation is resumed in an argument (1.520-39) that the universe consists solely of body and void, marked off alternately from one another (524-7). Bodies are distinct from void, and so cannot be destroyed by disintegration or external blows or piercing (528-30). Again, without void nothing could be broken or split in two,

³³⁰ Heat and cold are bodily substances. Heat is explained as consisting of 'seeds of fire' (*semina ignis*) or 'seeds of heat' (*semina vaporis* or *ardoris*). Lucretius never states explicitly that cold exists in atomic form, but does describe cold substances as containing 'toothed' (*dentata* – 432) bodies that cause cold sensations. However, we can also infer that something is cold when it lacks heat seeds; indeed changes in temperature in the springs of Ammon and Dodona (6.848-89) are ascribed to different proportions of fire atoms. See further Montserrat & Navarro (2000).

*nec capere umorem neque item manabile frigus
nec penetralem ignem, quibus omnia conficiuntur.* 535
(1.534-5)

[...] nor take in **moisture**, nor again **seeping** cold, nor penetrating fire,
by which everything is destroyed.

Void gaps between bodies allow liquids and ‘seeping’ (literally ‘seepable’) cold to enter. Lucretius has reversed the descriptions of hot and cold – the heat now penetrating, the cold pouring – emphasising their shared qualities. In these passages juxtaposed metaphorical and literal examples of pouring support the existence of void in things.

Lucretius employs various visual *exempla* to support this theory in his exploration of the possible structures different atoms can form (2.333-729). Examples of liquids passing through certain things are chosen to depict and explain the ways in which things interact. Firstly, Lucretius addresses the fact that lightning ‘flows’ (*fluat* – 383) with more penetration than torch fire. He then considers horn, through which light passes but rain ‘is spat back’ (*respuitur* – 388), because light consists of smaller bodies than water. Finally wine and oil passing through a sieve are considered. ‘We see wine **flow through** as quickly as you like’ (*quamvis subito [...] vina videmus / perfluere* – 391-2), while oil ‘lingers’ (392), because its *elementa* cannot ‘ooze through’ (*permanare* - 397) each hole singly.³³¹ The persistent image (first metaphorical and then literal) in these examples is flowing liquids – a connection emphasised by the echo of *fluat* (383) in *perfluere* (391). When addressing movement through the void spaces in things, liquids *exempla* and metaphors are Lucretius’ default explanatory devices.

Movement through the void

Pouring, the paradigm for movement through the void in things, also explains how things traverse spaces between things, or through the air, which contains extensive void space. This is introduced in the intricate analogy between wind and rivers (1.271-97), employed to prove the existence of invisible constituent bodies. The analogy is tightly made, with a striking fluidity of imagery applied to the two forces. The wind’s effects, vividly described (271-6), are attributed to *venti [...] corpora caeca* (277, repeated in the conclusion at 295), which must be tangible since wind is destructive. The comparable effects of water are then introduced by the following bridge:

³³¹ The analogy has shifted slightly, progressing deftly from invisible to visible void spaces. See pp.171-2 for more on this image.

nec ratione fluunt alia stragemque propagant 280
et cum mollis aquae fertur natura repente
flumine abundanti, quam largis imbribus auget
montibus ex altis magnus decursus aquai,

(1.280-3)

Nor do they [i.e. the bodies of wind] **flow** and deal destruction any differently from when the soft nature of water is carried suddenly by an abundant river, when a great deluge of water from the high mountains swells with abundant downpour, [...]

The image is richly painted by multiple words expressing abundance, and a pleonastic build-up of liquids vocabulary³³² – exhibiting the importance of liquids imagery for portraying movement. The unexpected application of *fluunt* to the bodies of wind in 280 is only explained by *mollis aquae* in the following line, as Lucretius introduces the comparison with rivers.³³³ This comparison is supported by multiple words shared between the descriptions of wind (270-9, 290-5) and rivers (280-9) and their effects: *ruit* (272 and 289) and *ruunt* (292); *montis* (274) and *montibus* (283); *silvifragis* (275) and *fragmina [...] silvarum* (284); *venti vis* (271), *aquai / vim* (285-6) and *viribus amnis* (287). The audacious wordplay of *venti [...] flamina* (290) compared with a *validum [...] flumen* (291) strengthens the comparison further. Importantly, the movement of the bodies of wind is described extensively in liquids terms, including the verb *fluo* which persistently depicts the movement of bodies throughout the *DRN*. The analogy between wind and rivers not only proves that invisible bodies exist, but also introduces Lucretius' doctrine of 'liquid' movement in advance.³³⁴

Atomic movement is described in these terms in Book 2. Lucretius states (184-224) that, because things tend downwards, a swerve must occur to enable atomic combination – otherwise, matter would 'fall through the deep void like drops of rain' (*imbris uti guttae, caderent per inane profundum* – 222) without combining.³³⁵ The preceding lines make it clear that the reader should understand movement in terms of pouring liquids. Lucretius addresses a conjecture that the upward motion of fire disproves the downward tendency of things (187-93), by arguing that it is propelled upwards by force (203-5). Two liquids analogies, of blood spurting from the body (194-5) and timber being forced up when pressed into water (196-200), support this. Although primarily explaining *upward* motion, each reasserts the metaphor 'movement is pouring through the void' – the blood filling the void in the

³³² West (1970) 273-4 enumerates these and further correspondences.

³³³ An example of West's 'transfusion of terms' (1969) 43-8; see n.6 of this thesis.

³³⁴ By our reading, this passage may be another Lucretian 'anticipation', for which see n.184.

³³⁵ The tendency of matter to 'pour' downwards is also expressed in a denial that the universe is finite (1.984-98); see pp.169-70 for discussion.

surrounding air, the water striving to fill the void vacated by the wood. The tendency of water to fill void space is so strong that the further the wood is submerged, the more violently the water forces it up when released (197-200). Fire is similarly forced upwards, being 'squeezed out' (*expressae* – 204) through the air, reminiscent of water squeezed from a bladder.³³⁶ In contrast, the sun 'scatters' (*dissipat* – 210) its heat downwards over a large area and 'sows the fields with light' (*lumine conserit arva* – 211). The primary image is of scattering seed (*sero* is etymologically linked with *semen*),³³⁷ but, since this is conceptually similar to the sprinkling of water, it supports the liquids imagery of the preceding examples.³³⁸

Speed

To portray movement through the void Lucretius has drawn on several aspects of liquid movement: seeping through porous things; filling void space as efficiently and quickly as possible; and tending downwards, unless forced otherwise. Another crucial concept explained by the LIQUIDS thread is speed, which was implicitly portrayed in the analogies of spurting blood and the log leaping from water, discussed above. This correspondence supports the explanation of several processes central to Lucretius' science.

Early in Book 2, Lucretius depicts the unsurpassed speed of atoms (142-64). This cannot be proved directly by the senses, so Lucretius provides an analogy with light, and specifically sunlight cast at dawn:

*primum aurora novo cum **spargit** lumine terras,
et variae volucres nemora avia pervolitantés* 145
*aera per tenerum **liquidis** loca vocibus **opplent**,
quam subito soleat sol ortus tempore tali
convestire sua **perfundens** omnia luce,
omnibus in promptu manifestumque esse videmus.*

(2.144-9)

First, when dawn **sprinkles** the lands with new light, and the various birds flying about the pathless woods through the soft air **fill** the place with **liquid** voices, how suddenly the risen sun at such a time is accustomed to clothe everything, **pouring forth** with its light, we see to be manifest in front of all.

The strength of the example is formed from a complex network of metaphorical correspondences. Light is described as a liquid, spreading out through the air and onto the

³³⁶ The squeezing metaphor will be considered in Part 3 Section B, expanding upon the 'squeezing out the sponge' metaphor outlined by Garani (2007) 210-19.

³³⁷ Lucretius may have known this link, since Varro *Ling.* 5.37 connects *seges* and *semen*. Later, the grammarian Festus connects *seges* with *sero*; see Maltby (1991) s. v. *seges*.

³³⁸ See n.326 for discussion of *dissipo*.

land, with *spargit*³³⁹ and *perfundens* depicting the wide area covered (aided by the different but complementary metaphor *convestire*, suggesting total covering with a cloth). Coupled with this image, a chorus of birds fill the surrounding air with their liquid voices.³⁴⁰ This is a particularly surreptitious analogy, neither explicitly separate nor ostensibly linked with the comparison between the speed of atoms and light. Nevertheless, the reader awake to Lucretius' methodology of metaphor would note the comparison of light with sound, and of both with liquids. Each entirely fills the available space almost instantly, like a poured liquid.

The speed of the soul is also depicted by the LIQUIDS thread (3.177-207). This enables Lucretius to explain the soul's movement as passive, contrasting Plato's metaphors of self-propulsion (*Phdr.* 245c-246a).³⁴¹ The metaphor is subtly introduced, with the soul described as consisting of *rutundis / [...] seminibus* (186-7), recalling liquid atoms (*levibus atque rutundis* – 2.451-2). An analogy clarifies the link:

*namque movetur aqua et tantillo momine flutat,
quippe volubilibus parvisque creata figuris.* 190
(3.189-90)

For water is moved and **flows about** by such a small impetus, clearly because it is born from rollable and small shapes.

Again a liquid provides the visible archetype of swift, unimpeded movement. The analogy with the soul is tightened by *volubilibus parvisque [...] figuris*, which responds to *rutundis / perquam seminibus [...] perquamque minutis* in 186-7. Since the soul's bodies are rounder and smaller than those of water, it must 'flow' with even less driving power (*tantillo momine*, responding to *momine [...] parvo* in 188). Lucretius then contrasts water with honey, a thicker, 'more lingering' (*cunctatior* – 192, recalling *cunctatur olivom* – 2.392) liquid, and compares it with poppy seeds, which provide a visual example of round, minute bodies. A pile of poppy seeds 'flows down' (*diffluat* – 197) when blown only lightly, and the reader can complete the argument *a fortiori* to infer how swiftly the considerably more minute bodies of *animus* move

³³⁹ OLD, *spargo* 1, 'to scatter in drops' (e.g. *Vitr.* 8.4.1, of water). The verb often refers to non-liquid things being scattered, but frequently, as here, in Lucretius the liquids sense is activated by context. The same is true of its derivatives, of which Lucretius uses: *conspargo*, 'to sprinkle a liquid' (OLD 1) (of spattering blood in 3.661); *dispergo*, more generally 'to scatter', but used figuratively with *defluo* in *Apul. Met.* 11.3; *exspargo* (only *Lucr.* 5.371); and *praespargo* (only *Lucr.* 5.739). See also de Vaan (2008), s. v. *spargo* on *respergere*, 'to sprinkle with liquid'.

³⁴⁰ See West (1969) 91-2 on the liquid imagery in this passage. *oppleo* denotes filling up in general, with any given substance. At times, as here, a liquids sense is activated, e.g. *Ter. Haut.* 306 (of tears). The same is true of *expleo*, 'to fill up' (often with solid things, but also, e.g., of satisfying thirst in *Cic. Sen.* 8.26 and *Lucr.* 4.876) and *plenus*, 'full' (e.g. *Stat. Silv.* 5.5.15, of udders; *Hor. Ars P.* figuratively with *mano*), which Lucretius also uses.

³⁴¹ Pender (2000) 151.

in comparison. The analogy is especially tight because poppy seeds have been compared to bodies of water in 2.451-5, and recall the atomic ‘seeds’ of soul in 187. Lucretius completes the analogy by concluding that the smaller and lighter constituent bodies are, the more mobile they, and the composite bodies they form, are (199-200). Anything consisting of bodies similar to those in free-flowing liquids must ‘flow’ in the same way,³⁴² and the soul, being ‘outstandingly mobile’ (204), must be formed from bodies ‘exceedingly small and light and round’ (*perquam [...] parvis et levibus atque rutundis* – 204-5) – and therefore flow faster than liquids.

Light

Pouring light is a common metaphor in the *DRN*, introduced in 1.9 with *diffuso lumine*, and extended in 2.144-9, discussed above. Elsewhere, in the famous dust motes analogy the sun’s rays ‘pour light’ (*lumina [...] fundunt* – 2.114-5) through a window, and, in a passage imitating Homer *Od.* 6.42-6, the home of the gods ‘laughs with light **poured** all around’³⁴³ (*large diffuso lumine ridet* – 3.22). Unsurprisingly, darkness, being ‘air deprived of light’ (4.368-9), moves in the same way. When the sky suddenly becomes dark with cloud, Lucretius says, ‘you might reckon that all the darkness had left Acheron and **filled the** great **caverns** of the sky’ (*tenebras omnis Acherunta rearis / liquisse et magnas caeli **complese cavernas*** – 4.170-1).³⁴⁴

The liquid qualities of light and darkness explain the complex phenomenon of shadows. Lucretius advances as a possible cause of eclipses (5.751-70) the intervention of a dark body in the path of light, explained as a barrier preventing the flow of liquid: the object ‘might interrupt the rays and **poured-forth** light’ (*radios interrumpat lumenque **profusum*** – 767). This is comparable with the way in which our bodies cast shadows by interrupting the rays of light so they ‘die’ (*dispereunt* – 376; cf. *perire* in the eclipse explanation, 5.760). Our shadows, being only air deprived of light, cannot follow us intentionally, but rather our bodies deprive ‘fixed places’ (*locis [...] certis* – 370, ‘fixed’ by the location of the intervening object) of sunlight in order (370-1). In turn, ‘the part we have left is **filled up** again’ (*repletur item quod liquimus eius* – 372) because ‘new rays of light always **pour out**’ (*semper [...] nova se radiorum lumina **fundunt*** – 375). Our bodies prevent the pouring light from filling the ground

³⁴² Leen (1984) 114-5 notes that the proof of the soul’s speed here ‘depends on the weight of a previous proof, in the form of a simile, to illustrate and bolster a subsequent argument of some difficulty’. However, she overlooks the ramifications of this depiction on the easy flowing of the soul at death, discussed below in Part 3 Section D.

³⁴³ Images of this kind will be discussed in the Epilogue.

³⁴⁴ Compare also the description of the cow’s character: it never experiences anger ‘**pouring over** the shadow of blind darkness’ (*suffundens caecae caliginis umbram* – 3.304).

instantaneously, as it does when its path is cleared. Lucretius extends the metaphor further in conclusion:

*propterea facile et spoliatur lumine terra
et repletur item nigrasque sibi abluit umbras.*

(4.377-8)

For this reason the sun is easily both deprived of light and **filled up** again, and it **washes away** the black shadows from itself.

Not only is the space 'filled up' by liquid light, but the light itself 'washes away' the shadows³⁴⁵ – a slightly misleading metaphor, since shadow, being air without light, cannot be 'washed away' (but appropriate to the description of light as a liquid).

The LIQUIDS thread depicts sunlight more vividly by the metaphor 'the sun is a fountain of light'. Lucretius offers proofs (5.281-305) that the sun emits light constantly, because whenever the cast-out rays perish, more arise in ceaseless support:

*largus item liquidi fons luminis, aetherius sol,
inrigat adsidue caelum candore recenti
speditatque novo confestim lumine lumen.*

(5.281-3)

Again the bountiful **fountain** of **liquid** light, the heavenly sun, constantly **floods** the earth with new brightness, and immediately brings new light as relief for light.

The mapping of a fountain onto the sun depicts three particular facets: the expansive area covered by the poured-out sunlight (expressed by *inrigat*);³⁴⁶ the relatively small size of the source; and the continual stream of light (emphasised emphatically by *adsidue* and *confestim*, and the juxtaposed polyptoton *lumine lumen*). The third aspect, although lacking liquid terminology, appropriately supports the fountain metaphor.

In the *DRN* fire and light are often synonymous and interchangeable, with terms such as *ignis* and *flamma* used of sunlight and *lumen* of fire. Therefore, the LIQUIDS thread depicts fire in similar terms to light. In 6.879-99 Lucretius explains how a spring at Dodona can light tow held above it. Invisible seeds of fire 'burst out' (*erumpere* – 895)³⁴⁷ of the water and 'gush

³⁴⁵ *OLD*, *abluo* 1, 'to wash off, out, or away'; also 2, 'to wash clean, cleanse'. Lucretius uses its cognate *eluo* literally of washing out purple dye in 6.1077.

³⁴⁶ A clear liquids metaphor; see *OLD*, *irrigo* 1, 'to flood, drench'; 1b, 'to irrigate'; 2, 'to cause (liquids) to flow'; see Gale (2009) *ad* 276.

³⁴⁷ The verb does not in itself carry liquids connotations, meaning 'to burst or spring out' (*OLD*, *erumpo* 1), but can take on a subsidiary sense in context, e.g., as here, of liquids (2b, of fluids; 2c of rivers), or, as in 1.162, of birth (see n.187 above).

forth' (*scatere* – 896)³⁴⁸, just as freshwater gushes out (*scatit* – 891)³⁴⁹ of the sea at the spring of Aradus – terms used in the extensive light-liquids correspondence of 5.594-603 (discussed in Part 3, Section B). This phenomenon is compared (6.900-5) with a candle being rekindled at a distance 'before the nearby fire **floods** it' (*prius [...] quam comminus imbuat ignis* – 903-4).³⁵⁰ The liquids image employed here is more appropriate to the phenomenon of the spring, and so the comparison works both ways, with the spring mapped onto the candle and vice versa to create a shared explanation supported by the 'liquid light' strand of the LIQUIDS thread.³⁵¹

The LIQUIDS thread is also commonly applied to lightning, which Lucretius, aligned with conventional ancient scientific thought,³⁵² believed to be a form of fire.³⁵³ Lightning is described as 'the golden colour of **liquid** fire' (*liquidis color aureus ignis* – 6.205), formed of seeds which clouds 'pour forth' (*profundant* – 6.210). These seeds, however, are 'without any water' (6.207), creating an apparent oxymoron, designed by Lucretius to emphasise the source image of 'pouring' (and its association with movement) rather than suggesting fire is actually a liquid. Later, Lucretius explains (6.348-56) that lightning passes through things because it is a liquid (*liquidis* – 349) able to penetrate the void in things – combining the metaphors 'fire is a liquid' and 'motion through void space is pouring'.³⁵⁴ The various movements and subsequent effects of fire are described consistently by the LIQUIDS thread.

Sensation

Lucretius' theory of sensation involves effluences being emitted from things, and moving towards and entering our sensory organs. This process is depicted by the LIQUIDS thread as a 'flow' from the source object, a description that probably stems from Empedocles, whose theory that things give off 'certain effluences' (ἀπορροάς τινας, from ἀπορρέω, 'to flow

³⁴⁸ OLD, *scateo* 1, '(of liquids) to be emitted with violence, gush forth'; also 1b 'to gush (with a liquid)'. Lucretius also uses the verb literally in 5.952 of springs; West (1969) 44; Godwin (1991) *ad* 895-6.

³⁴⁹ n.b. the verb can either be 2nd or mixed conjugation.

³⁵⁰ A word with clear liquids meaning: OLD, *imbuo* 1, 'to drench, steep, wet' (see also 1c, 3); West (1969) 45; Godwin (1991) *ad loc.*

³⁵¹ See West (1969) 44-5 for the 'transfusion of terms' in this passage, first from the argument to the analogy, and then to the second analogy.

³⁵² Cf. Epicurus *Ep. Pyth.* 101-3; and Arist. *Mete.* 369a10-369b11; 369b11-370a21, which ascribes to Anaxagoras and Empedocles a theory that fire (able to create lightning) is permanently present in the clouds.

³⁵³ West (1969) 7-9 argues that *fulgur* always means 'lightning' in Lucretius, despite dictionaries listing four of his usages (and only these four in classical Latin) as 'brightness'. These four usages all describe a form of fire: torches (5.295-6), sunlight (2.164) and lightning (1.725; 6.182). Lucretius' strategies of imagery aside (of which West uses these passages as examples), the Roman reader would comprehend phrases such as 'lightnings of fire', because lightning and fire were considered to be the same substance.

³⁵⁴ See p.89 for the weaving metaphor in this passage.

from') is summarised by Plato (*Meno* 76c).³⁵⁵ Epicurus utilises ἀπορροή (*Ep. Hdt.* 46^a) and its cognate ῥεῦσις (*Ep. Hdt.* 48) for the same purpose. Lucretius nods to these terms in a single reference to a *fluctus odorum* ('stream of smells' – 4.675) emanating from things, but elsewhere uses liquids terminology solely to describe the process behind the emission and movement of effluences, rather than their physical nature, which, as we saw in the Section B of this Part, is woven. As with his appropriation and expansion of latent metaphor in Epicurus' atomic terminology, Lucretius greatly expands the LIQUIDS thread in his theory of sensory effluences (including perhaps the creation of three neologisms).³⁵⁶ This is first evident in Book 4 in the analogy (4.74-85) depicting colours flowing from an undulating awning (expressed primarily by *fluto*, *fluito* and *perfuno*), and the accompanying examples of smell, smoke and heat 'poured out' (*diffusa* – 55; *diffusae* – 91) from things (both considered further in Part 3 Section C).

In 4.143-67, Lucretius describes the swift formation of vision films, which 'are born easily and swiftly and **flow** perpetually from things' (*facili et celeri ratione genantur / perpetuoque fluant ab rebus* – 143-4).³⁵⁷ Visual evidence that image films 'flow perpetually' (*perpetuo fluere* – 157) from things is provided by a mirror reflecting images instantly when held up. Following this repetition of *perpetuo fluo*, when *perpetuo* appears alone in 162 to depict places 'full' (*plena* – 162) of uninterrupted sunlight, the keen reader would envisage flowing movement, and consider sunlight as a perpetually flowing liquid filling all available space (recalling especially the pouring light in 2.144-9, discussed above). It is typically Lucretian to alternate between stating metaphors openly and implying them, urging the reader to apply their own *ratio* to enhance their understanding. A similar technique is employed in a proof (4.199-208) for the images' speed. Lucretius depicts swift effluences emitted from deep within an object, like sunlight and heat, which, in a familiar metaphor, we see 'pour forth' (*diffundere* – 202) and 'flood' (*rigare* – 203) the sky. Arguing *a fortiori*, Lucretius concludes that surely effluences emitted from the edge move even further in less time. This conclusion is devoid of liquids terminology, but the keen reader would map the

³⁵⁵ If Plato is using Empedocles' own term. In fact, it seems to have become standardised, as ἀπορροή occurs in Theophr. *Sens.* (KRS 589) and ἀπορρέω in Alex. *de sensu* 56.12 (= KRS 590), both depicting Democritus' and Leucippus' theories of sensation. The source of Lucretius' inspiration here is therefore uncertain.

³⁵⁶ *fluenter* (4.225; 6.931), *fluto* (4.77, also in 3.188) and *fluvidus* (2.464, 466) are unattested in Latin before Lucretius; Benferhat (2014) 601.

³⁵⁷ See also the explanation (4.332-6) of why people with jaundice see things with a yellow tinge. The flow of vision films is met by a flow (*fluunt* – 334) of yellow seeds from the eyes, dyeing (we infer) the films yellow.

liquids metaphor of *diffundere* and *rigare* onto these effluences, imagining them as ‘pouring forth’ more swiftly and freely.³⁵⁸

By the familiar Lucretian technique of universalisation through metaphor, other ‘long distance’³⁵⁹ sensation is caused by effluences ‘poured’ from things (4.218-29). These include odours, which ‘flow perpetually’ (*perpetuoque fluunt* – 218) from things, just like cold from rivers, heat from the sun and spray from waves (and vision films, as considered above); voices, which flit (*volitare* – 221) through the air; and salt and bitter tastes emitted by the sea and wormwood tincture respectively. The majority of these examples involve liquids, while the sun’s heat is given as an example of something that ‘flows’ (already a well-established description in the epic). The ascending tricolon in which the sensations are listed ends with examples of actual liquids – sea-spray and particles of wormwood tincture. The spray is emphatically described as a ‘devourer of sea walls’ (*exesor moerorum* – 220), to draw attention to its constant flow – supported also by *cum mare versamur propter*, ‘whenever we are by the sea’ or even ‘for the whole time’ (*cum* + indicative denotes either a habitual or simultaneous action). Only the voices in 221 are not described in liquid terms, but the surrounding context suggests the reader should imagine them ‘flowing’ too.³⁶⁰

The metaphor persists in the conclusion:

usque adeo omnibus ab rebus res quaeque fluenter 225
fertur et in cunctas dimittitur undique partis,
nec mora nec requies interdatur ulla fluendi,
perpetuo quoniam sentimus, et omnia semper
cernere odorari licet et sentire sonare.

(4.225-9)

So much so is it that each thing is carried **fluidly** from all things and sent to all parts in all directions, and no delay or rest from **flowing** gets in the way, since we constantly sense it, and we can always see them all, smell them and hear their sound.

Lucretius pleonastically states the universal and perpetual flow of emissions from things (*omnibus; in cunctas [...] undique partis; nec mora nec requies; perpetuo; omnia*). The passage as a whole is bookended by images of ‘perpetual flowing’ (*perpetuo* – 218, 228; *fluunt* – 218; *fluenter* – 225; *fluendi* – 227). Although only the first *perpetuo* modifies *fluo*, the keen reader

³⁵⁸ Similarly, in 2.256-68 Lucretius explains why, although we perceive things by their films, we cannot perceive the films singularly, just as we feel wind and cold without sensing each ‘little part’ (*particulam* – 261). Lucretius states that cold ‘flows’ (*fluit* – 260) towards us – applying a term used of films to make the comparison clearer to the reader.

³⁵⁹ Omitting touch and taste, which are caused by direct interaction with the items perceived.

³⁶⁰ In fact *volito* has appeared alongside liquid terms in the awning analogy (4.88) and among proofs for void in things (alongside *permano* – 1.355). Note also *travolat* employed near *tranant* in 4.601-2.

would envisage flowing in the second instance too (228), as in 4.157 and 162 (explored above). The reader will be certain that sensory effluences flow continually from things to arouse each of our ‘long-distance’ senses (listed in 229).

The LIQUIDS thread depicts sounds and smells later in Book 4. Recalling the ‘liquid voices’ of birds in 2.146, woodland music is described in the same way (*tibia [...] fundit digitis pulsata canentum* – 585; *fistula [...] ne cessat fundere musam* – 589), introducing a number of examples of liquid sounds. Lucretius states that voices ‘swim through’ (*tranant* – 601)³⁶¹ walls, amending the image from a flowing liquid to movement through a liquid (recalling the swimming fish in 1.370-83). He then considers the various ways they are dispersed or distorted (4.603-14). When a voice is cast forth, it spreads in all directions:

[...] *quasi ignis* 605
saepe solet scintilla suos se spargere in ignis.
ergo replentur loca vocibus abdita retro,
omnia quae circum fervunt sonituque cientur.
 (4.605-8)

[...] just as a spark of fire is often accustomed to **sprinkle** itself into its own fires. Therefore, concealed places are **filled** with voices again, all of which **boil** around and are stirred with sound.

As in 2.144-9, referring to light, we find *spargo* and a derivative of *pleo* depicting the totality of space covered and filled by a substance. The primary image is of fire, but nonetheless compliments the liquid metaphor in the preceding *exemplum*, especially since fire is often ‘liquid’ in the *DRN*. The use of *fervunt* here depicts the heat of the fire, but also perhaps suggests the bubbling murmur of (liquid) sounds arising, mingling and abating.³⁶² The dual image would certainly be appropriate, since heat makes things boil.

Lucretius’ brief consideration of smell is introduced pointedly with a dense collocation of liquids terms:

[...] *primum res multas esse necessesit*
unde fluens volvat varius se fluctus odorum, 675
et fluere et mitti volgo spargique putandumst;
 (4.674-6)

³⁶¹ Also used of images in 4.177 (*tranantibus auras*).

³⁶² *OLD*, *ferveo* (combined entry with *fervo*) 1b, ‘to boil’ (e.g. Sen. *Q Nat.* 3.24.1 of water) and 3 ‘(of seas, rivers, etc.) to be turbulent, seethe’ (e.g. Verg. *G.* 1.327) – a sense perhaps activated in these lines by *spargo* and *repleo*. The sound of either boiling water or hissing sparks (noted by Leonard & Smith (1942) *ad loc.*) is onomatopoeically enhanced by a remarkable six consecutive words beginning with ‘s’, among ten in total in just ten words (the ‘most prolonged’ alliteration in the *DRN*, according to Bailey (1947) *ad loc.*).

First, there must be many things from which, **flowing**, a varied **wave** of smells **undulates**, and it must be thought to **flow** and be sent out and **sprinkled** *en masse*; [...]

This introduction, with *fluo* repeated alongside its derived noun *fluctus*, and the technical usage of *volvo* depicting rolling waves,³⁶³ emphatically portrays smells as flowing, universalising the LIQUIDS thread's role in depicting sensory effluences. Following this, the remainder of the passage requires no further liquids imagery: the reader should envisage smells flowing and undulating, and apply this image to the remaining proofs. Nevertheless, *fluo* does return in 4.695 to explain that smells dissipate quickly because they are emitted from the depths (*penitus fluere [...] videntur* – 695-6), recalling 4.90-4 in which smells, smoke and heat 'pour forth' (*abundant* – 91).

The LIQUIDS thread depicts all long-distance sensation as caused by effluences flowing from things, proving how they fill all available space (be it a room, a forest or our sensory organs). By this depiction the LIQUIDS thread ties sensory effluences closely together with light, which is emitted and perceived in the same way. The liquid movement of these effluences forms the basis for more complex explanations, such as of optical illusions, aided by the WEAVING thread. Such correspondences will be considered in Part 3 Section C.

³⁶³ *OLD*, *volvo* 6.

Section D

The BOUNDARIES Thread

The importance of boundaries in Epicurean philosophy has been noted especially by de Lacy (1969), who considers the general concept of ‘limit’, which (p.104) ‘clearly represents to [Lucretius] the unifying principle of Epicurean teaching’. He examines limits in the central Epicurean theories of: atomic size and variety; the swerve; death; change; what can and cannot be born; and moral concepts of pleasure and fear. Within these limits there is scope for variety, but not infinite variety – a distinction Lucretius must balance carefully. The nature of limits is governed by *foedera Naturae* – the laws or ‘pacts’ restricting things, including (as suggested by *Natura*) their birth.³⁶⁴ Droz-Vincent (1996) also considers the central role of *foedera* in Lucretius’ science, additionally emphasising the important analogy between *foedera Naturae* and the *foedera* established by early man.³⁶⁵ A broad range of scholarship has considered ‘laws’ in the *DRN*.³⁶⁶ Within the framework of conceptual threads, Lucretius’ *foedera* and *pacta* can be viewed as an important strand of the BOUNDARIES thread, embodying the metaphor ‘laws are boundaries restricting things’ – governing *quid possit oriri, / quid nequeat* (1.75-6). To these analyses can be added Garani’s ‘filling or emptying the atomic container’ metaphor, in which body can be ‘filled’.³⁶⁷ This process is enabled by void, through which, as discussed in Section C, bodies move freely like pouring liquids. One substance can fill another, thanks to the void space bounded off by atoms – a convergence of the LIQUIDS and BOUNDARIES threads, to be examined in Part 3 Section B.

The strength of the BOUNDARIES thread, which encapsulates the visible and tangible limits (and by extension the microscopic limits) in things, and the laws limiting the power of things, originates from the ‘Epicurus the general’ passage of the Book 1 prologue. Here

³⁶⁴ A convergence of the LIFE-CYCLE and BOUNDARIES threads, considered in Part 3 Section A. Bailey (1947) *ad* 1.586 offers a pertinent summary: ‘Lucr. is not thinking of an observed uniformity in nature, but rather the limits which nature imposes on the growth, life, powers, etc. of things’. Cabisius (1984) compares these limits with the uniform structure of society, to support her reading of a recurring social metaphor applied by Lucretius to his atoms. On natural laws and the laws of nature, see also Lehoux (2006); Asmis (2008); Johnson (2013).

³⁶⁵ Again terms are employed both literally (the pacts between men) and metaphorically (the ‘pacts’ of Nature) to universalise a theory. The term *pactum* is used similarly in the *DRN*; Garani (2007) 59.

³⁶⁶ Cabisius (1984) 112-3; Asmis (2008) on how *foedera Naturae* define the ethical nature of Lucretius’ physics; Schiesaro (1990) 141 on the Roman colour in Lucretius’ depiction of these *foedera*, and (2007) on ‘law’ in general in Lucretius’ science; Garani (2007) 50-61.

³⁶⁷ Garani (2007) 187-95. Specifically she considers words suggesting fullness (in particular verbs formed from *plenus*, such as *repleo* and *compleo*) in Lucretius’ material science and his theory of pleasure.

Epicurus destroys the physical boundary of the *moenia mundi* so the ‘limit of power’ and ‘deep-set boundary mark’ of all things can be understood. Lucretius develops the BOUNDARIES thread from here, and it casts a wide reach over the *DRN*. By tracking the thread, the arguments of de Lacy, Droz-Vincent and Garani will be united, and expanded in order to explain previously overlooked aspects. The thread’s most extensive application is its combination with other threads to explain complex concepts, in particular the restrictions on the birth and lifespans of things and the Epicurean ‘axiom of change’ (that change constitutes the ‘death’ of what was before), which will be considered in Part 3. For now, the essence of the BOUNDARIES thread, and instances where it is employed alone, will be outlined.

The boundaries metaphor

The conceptual metaphor of boundaries has a broad range of potential applications, several of which Lucretius exploits. As with Lucretius’ other threads, the BOUNDARIES thread can be employed literally or metaphorically, and tie together apparently disparate theories, by explaining the literal with the metaphorical and vice versa. However, this thread differs from the others in a crucial aspect, since it embodies a fundamental aspect of human cognition and interaction with our surroundings.³⁶⁸ In short, we understand literal descriptions of boundaries by mapping our own cognitive experience of boundaries onto them. Lakoff and Johnson consider boundaries within their cognitive metaphor theory, in a group labelled ‘ontological metaphors’.³⁶⁹ These metaphors differ from their category ‘orientational metaphors’ (e.g. ‘good is up’, ‘bad is down’) because, rather than helping to explain things in terms of direction or position, they enable us to ‘pick out parts of our experience and treat them as discrete entities or substances of a uniform kind’,³⁷⁰ for example viewing events or activities as containers (e.g. one can be *in* or *out of* a race). We can not only label these, but also ‘categorize them, group them, and quantify them – and, by these means, reason about them’.³⁷¹ This process of reasoning and analysis depends fundamentally on ‘ontological metaphors’ – formed partly from our understanding of boundaries³⁷² – and echoes Lucretius’ own considerations of the interrelationship between knowledge, boundaries and the knowledge of boundaries.

³⁶⁸ Partially owing to the boundaries of the human body. Segal (1990) 95 argues that the breaking of boundaries in Lucretius ‘reflects some of our most basic fears about the violation of bodily boundaries’; see further *ibid.* pp.94-170.

³⁶⁹ Lakoff & Johnson (1980) 25-34.

³⁷⁰ *ibid.* 25.

³⁷¹ *ibid.* 25.

³⁷² *ibid.* 29-30.

Lakoff and Johnson's theory of how 'ontological metaphors' aid reasoning is echoed by individual applications of Lucretius' BOUNDARIES thread, including: the maximum and minimum boundaries of matter and the universe (quantifying); boundaries of variety (categorising, grouping, quantifying); boundaries between entities ('discrete entities', categorising); boundaries within entities ('discrete entities'); boundaries of knowledge (reasoning); boundaries of possibility (reasoning). Therefore, although the BOUNDARIES thread consists of constituent strands (two entities separated, the boundary separating them, the varying permanence of separation, the act of separating, etc.) applied to certain theories, and therefore constitutes a gestalt like Lucretius' other threads,³⁷³ it is employed more frequently in its gestalt form than others. The concept of boundaries is applied as a gestalt to a wide range of theories, especially via the words *finis* and *certus*. Thus multiple theories are unified under a central concept, running throughout Lucretius' scientific and philosophical theories. Truly, by understanding the nature of boundaries, we will be a long way towards achieving full Epicurean enlightenment.

Boundaries in the prologues

Lucretius introduces the BOUNDARIES thread in the Book 1 prologue, in his depiction of 'Epicurus the general' triumphantly breaking the boundaries of the universe and knowledge. Here, Lucretius outlines his perspective on the philosopher's ultimate aim: revealing the truth about the nature of things by displaying and breaking the boundaries of knowledge through the knowledge of boundaries. He portrays this in three ways: metaphorically breaking the boundaries of the universe (the *flammanitia moenia mundi*) by gaining knowledge (1.70-4); confirming by this knowledge that boundaries exist, and what they govern – the *finita potestas* and *alte terminus haerens* of things (1.75-7); and, as outlined following the Iphianassa scene, the ultimate goal of discovering the limit to desire and fear (summarised as *finem esse [...] aerumnarum*, 'there is a limit of troubles' – 1.107-8).³⁷⁴

These steps to *vera ratio* recur in the prologues to Books 3, 5 and 6, which also include eulogies to Epicurus. The Book 3 prologue praises Epicurus' skill in discovering truths, and describes the effects of his *ratio*:

*diffugiunt animi terrores, moenia mundi
discedunt, totum video per inane geri res.*

(3.16-7)

³⁷³ See pp.8-9.

³⁷⁴ See de Lacy (1969) 106-7 on limits in Epicurean ethics and physics.

[...] the terrors of the mind flee, the **walls** of the world fall away, I see things done throughout the whole void.

Here terror flees as the *moenia mundi* crumble.³⁷⁵ In the Book 5 prologue the causative link between knowledge of boundaries and the flight of terror is made more explicit. Lucretius warns that even those who accept that the gods did not create the world may nevertheless revert to superstition, if a celestial phenomenon occurs that they cannot explain. This is because knowledge of the gods alone cannot banish superstitious fear, if we are also

[...] *ignari quid queat esse,*
quid nequeat, finita potestas denique cuique
quanam sit ratione atque alte terminus haerens. 90
 (5.88-90)³⁷⁶

[...] ignorant of what can be, what cannot, in short by which reasoning each thing might have a **fixed limit** of power and a **deep-set boundary mark**.

As the Book 1 prologue explained (1.145-9), only *Naturae species ratioque* can dispel fear – and part of this *ratio* is the knowledge of boundaries. 1.146-9 are repeated in 6.39-41 to conclude the eulogy to Epicurus, which describes how Epicurus realised that man’s mind (*vas*, ‘the pot’ – 17) was causing grief. As a remedy, he ‘established a **limit** of desire and fear’ (*finem statuit cupidinis atque timoris* – 25), constituting the ‘**highest good**’ (*bonum summum* – 26) man should strive for – i.e. the absence of pain (Epicurus *Ep. Men.* 131-3). This limit can only be reached ‘by a narrow path’ (*tramite parvo* – 27) – i.e. Epicurean philosophy. In this prologue, fear, rather than fleeing, is shown, along with desire, to be limited. Even the path towards the *bonum summum* is limited both in width and direction. Comprehending, understanding and, in the case of pleasure, adhering to fixed boundaries established by Nature will enable Lucretius’ reader to attain *vera ratio* and freedom of fear, brought by Epicurean philosophy.³⁷⁷

On the correct understanding of boundaries

In the first arguments of Book 1, among the extensive intertwining of the BOUNDARIES and LIFE-CYCLE threads (to be examined in Part 3 Section A), Lucretius reiterates the central motivation

³⁷⁵ Elsewhere Lucretius refers to people superstitious about the heavens, who believe anyone shaking the *moenia mundi* with *ratio* should be punished like the giants in the war with the Olympian gods (5.114-21).

³⁷⁶ Repeating almost verbatim 1.75-7.

³⁷⁷ See de Lacy (1969) 104-6; Conte (1994) 24-5; Nightingale (2007) 75-9. Epicurus (*Ep. Men.* 133) states that the best man understands the limit to good things (τῶν ἀγαθῶν πέρασ), and that this is easy to attain.

of his philosophy – to rid man of fear. He states his first argument that nothing is ever born from nothing by divine agency (150) – a dual limit on birth. This misconception of divine causation ‘**confines** all mortals’ (*mortalis **continet** omnis* – 151) because they cannot reason (= *nulla ratione* – 153) about apparently miraculous celestial phenomena, and subsequently reckon (*rentur* – 154) them to be caused by the gods. In short, an inability to use reason (emphasised by the etymological figure of *ratio* with *reor*)³⁷⁸ to set a boundary on creation directly causes fear. Fear itself is expressed as a boundary confining mortals (*contineo* – elsewhere used of one substance ‘holding’ another)³⁷⁹ that must be broken. By doing this, as suggested by the image in Book 2 of observing life from ‘high serene temples’ built by correct philosophy (7-13), we will be bounded off from the majority of mankind, who live life in fear and torment.³⁸⁰ The image of confinement by fear is supported by the WEAVING thread, which depicts the constricting powers of fear, *religio* and pleasure (considered in Part 3 Section G and the Epilogue). The prominent continuation of the BOUNDARIES in the first arguments extends one of the prologue’s principal themes – the banishment of fear through *ratio*.

This mental process is portrayed again in Book 5, in relation to previous generations of men. Just as the reader’s understanding of Nature is enhanced by reasoned understanding of boundaries (guided by the BOUNDARIES thread), people unversed in science and philosophy can observe and reason about boundaries. In the lengthy exposition of mankind’s development (5.925-1457), Lucretius explains that early man correctly observed heavenly bodies and seasons operating ‘in fixed order’ (*ordine certo* – 1183), but misinterpreted the cause of these boundaries, attributing them to the gods, whom they located in the sky, the home of incomprehensible phenomena (1186-93). The keen reader would recall the Book 1 prologue, which revealed that this ignorance persisted into Epicurus’ time and beyond. Failure to reason correctly about the boundaries of things leads to *religio*, and doubt about the future *finis* (1213) of the world, owing to the belief that the gods might preserve it eternally.

In contrast (5.1436-9), early man, guided by the *certa ratione* and *ordine certo* (1439) of the seasons,³⁸¹ did learn when to farm animals and grow crops.³⁸² Thus, correct knowledge of boundaries can be beneficial. This reading eases an apparently jarring transition from the

³⁷⁸ Felt most strongly in the perfect participle *ratus*; Maltby (1991) s. v. *ratus*.

³⁷⁹ E.g. 1.1086 (the earth holding waters); 5.319 (the air holding the earth); 6.877 (water holding cold). Cf. also 3.210 (the soul compacted and ‘held’ in a small space).

³⁸⁰ Nussbaum (1989) 325-7.

³⁸¹ The chiasmus in this line is an ‘iconic’ echo of the cyclical nature of the seasons.

³⁸² This process of analogical reasoning is not explicitly stated, but can be inferred from 5.1361-78, in which cultivation is learnt from natural plant growth.

preceding passage, in which Lucretius describes how envy of others' possessions caused havoc, including murder (1420-2) and war (1424). Whereas 5.1436-9 suggests correct and beneficial understanding of boundaries, envy is caused by man's ignorance of 'the limit of possession' (*finis / habendi* – 1432-3) and 'to what point true pleasure can ever grow' (*omnino quoad crescat vera voluptas* – 1433). The keen reader should again heed the warning to understand the fixed boundaries of things, and to apply this understanding to reasoning, invention and the emotions in order to banish fear.

Atomic limits

Section A explored Lucretius' first arguments that everything is created from, consists of, and dies into constituent 'fixed seeds' (*semina certa*) and 'fixed mother-substance' (*materies certa*). The first arguments prove the 'fixed' nature of these by the observable existence of fixed mothers (*matres*) and seeds (*semina*) for living things.³⁸³ Lucretius only explains fully how this relates to *primordia*, and what exactly is 'fixed' about them, in 1.483-634, in which he establishes the limits of division (briefly introduced in 1.215-49), variety and quantity of matter, and the limits of void. As with the other conceptual threads, Lucretius establishes boundaries at the atomic level before extending them to other key processes and theories underlying his philosophy. Therefore, it is necessary to consider Lucretius' atomic boundaries before considering more complex applications of the BOUNDARIES thread. In turn, limited division, the separation of body and void, limited atomic variety and the limited swerve will be addressed, providing a comprehensive overview of Lucretius' atomic boundaries.

Starting with limited division, although indivisibility is not central to Lucretius' atomic vocabulary (as noted in Part 1), he states intermittently that *primordia* cannot be destroyed, for example *nec frangi nec findi in bina secando* (533-5), and *solida ac sine inani corpora prima / sunt* (538-9). These assertions are supported by *modus tollens* deductions, with premises broadly expressing 'if division were not limited...' (*si nullam finem Natura parasset / frangendis rebus* – 551-2; *si nullast frangendis reddita finis / corporibus* – 577-8). These introduce Lucretius' theory of smallest parts (599-634), which explains how bodies with volume can be indivisible. First Lucretius depicts the boundary of perception at the edge of visible things – the *extremum [...] cacumen* ('extreme point' – 599), which he then maps (in somewhat condensed fashion) onto the first-bodies (601-14). These consist entirely of 'extreme points', which are *sine partibus* (601), cohere in 'solid singleness' (*solida [...] simplicitate* – 1.609), and are unbreakable (613-4). Lucretius then employs the logic of Zeno

³⁸³ Part 3 Section A will consider this correspondence in greater depth.

Lucretius applies our cognitive understanding of boundaries marking off entities to the division between body and void,³⁸⁵ emphasised by the polyptoton *distinctum [...] distinguere*. The metaphor progresses from body and void bounding each other alternately, to bodies representing the boundary between empty space and full (an easier image to envisage). This is the basis for the metaphor ‘body is a container for void’.

Later in Book 1, among proofs that the universe is infinite (951-1117), Lucretius counters the conjecture that substances such as breezes and fire tend upwards, arguing that if they did, the world would be swiftly dispersed.³⁸⁶ This would (expressed by the WEAVING thread) partly be caused by things being ‘untied into the great void’ (*magnum per inane soluta* – 1103), but also because, we assume (following 1.418-44, and its conclusion ‘but nothing can do and be acted upon except body, nor provide space except void and space’), void alone cannot hold them in. Body forms a tangible boundary holding other body or confining void; and the edge of body bounds body off from void. In other words, body is the only physical boundary, and the very boundary point – the *extremum cacumen* – is also part of body, while void is simply what exists beyond the *extremum cacumen*. This is not particularly problematic for the reader’s understanding, since everyday theoretical boundaries (such as one that enables a mountain to be designated, although where it starts cannot be distinguished) are comprehensible to humans.³⁸⁷

The next boundary Lucretius places on atoms is limited variety (2.333-729).³⁸⁸ He seeks to display what kinds (*qualia* – 334) of atoms exist, ‘how far they **stand apart** in shape’ (*quam longe distantia formis* – 334), and ‘how varied they are in their many **kinds** of shapes’ (*multigenis quam sint variata figuris* – 335). They must differ to an extent, Lucretius says, because atoms have ‘no **limit** and no **total number**’ (*neque finis [...] neque summa* – 339). Indeed, Lucretius continues (342-76), even individuals within the same species, which look superficially alike, in fact differ in minor ways. For this reason, atoms cannot have been created ‘by hand’ (*manu* – 378) based on the ‘**fixed form**’ (*certam formam* – 379) of one atomic prototype, but must consist of *dissimili [...] figura* (380). This dissimilarity also

³⁸⁵ De Lacy (1969) does not discuss this central theory of Epicurean physics, perhaps because the word ‘limit’ (his primary focus) is semantically difficult in this context.

³⁸⁶ A lacuna after 1.1093 obscures the exact content of this passage. However, the analogy of the world dispersing *volucris ritu flammaram* (1102) at least suggests the continuation of the argument against fire tending upwards in 1083-93. Bailey’s supplement *afferret surgens ignis calor intus adaugens* (1947, *ad loc.*) is a reasonable approximation for the words preceding 1102.

³⁸⁷ Lakoff & Johnson (1980) 25 and 29-30.

³⁸⁸ Noted briefly by de Lacy (1969) 106.

accounts for the different interactions between substances (381-97), the different sensations aroused by different things (398-443), and the different qualities things possess (444-77).

Lucretius then modifies the proof, asserting that *primordia* 'differ in a **finite** array of shapes' (*finita variare figurarum ratione* – 480), otherwise 'some seeds will have to consist of **unlimited** size of body' (*semina quaedam / esse infinito debebunt corporis auctu* – 481-2). Experience shows that even the largest seeds are still small, and the bizarre image of infinitely large seeds dismisses the premise without requiring an expressed conclusion (which follows only at 499). The smallest parts theory supports this, since their transposition would allow only a limited number of possible combinations (485-90), and adding extra parts would, impossibly, create larger and larger atoms (491-99).

Two further proofs support this argument. The first asserts that unlimited atomic variety would allow the best and worst things to be surpassed; however:

*quae quoniam non sunt, sed rebus reddita certa
finitis utrimque tenet summam, fateare necessest
materiem quoque finitis differre figuris.*

(2.512-4)

Since these things are not so, but rather a **fixed limit**, allotted to things, **holds the whole** on both sides, it is necessary to confess that mother-substance also differs in a **finite** number of forms.

A conceptual bounded area creates a restricted range of things from good to bad, external to which nothing exists – expressed by *summa* (the range), *teneo* and *reddita certa finis*.³⁸⁹ The polyptoton *finitis [...] finitis* maps this restricted range onto the atoms, proving their limited variety of shapes.

The second proof addresses the conjecture that this range might consist of infinite parts:

denique ab ignibus ad gelidas iter usque pruinas 515
finitumst retroque pari ratione remensumst;
omnis enim calor ac frigus medique tepores
interutrasque iacent explentes ordine summam.
ergo finita distant ratione creata,
ancipiti quoniam mucroni utrimque notantur, 520

(2.515-20)

Lastly, the journey from fires to icy frosts is **limited** and is measured back again equally; for all heat and cold and intermediate temperatures **lie between the extremes filling up the sum** in ordered array.

³⁸⁹ This restricted range is echoed later in the limits set on pleasure (e.g. 5.1432-3; 6.26; cf. also 4.1084-120 on the insatiability of sexual impulse), which cannot be surpassed.

Therefore, things born **differ to a limited degree**, since they are distinguished at both ends by two opposite points, [...]

The limited range of possible temperatures is depicted as a line drawn between two extreme points,³⁹⁰ supported by a metaphor from building or surveying, with *iter*, *finitum* and *remensum* suggesting the construction of a road (a fixed path from 'a' to 'b'). The bounded length and width of this 'road' limits (*finita*) the degree of difference between each end.³⁹¹ Importantly here the same term (*finis*) applies both to the necessary limits of size and range, and to the resulting limit of variety. This is appropriate, since limited atomic variety is a direct result of limited atomic size and shape. Boundaries of size and range are deep-rooted cognitive concepts, which we experience in the boundary of our bodies and environmental boundaries, and enact in boundary legislation. By associating limited atomic variety with cognitive concepts of limited size and range, Lucretius embodies more clearly in the reader's mind the nature of the fixed laws underpinning this variety.

The same proof applies to sensory effluences, because their qualities are dictated by the limited variety of their atomic constituents – explaining further the limited range of agreeable and disagreeable sensations in 2.500-14. In Book 4, Lucretius asserts that emissions from things are fixed in the shapes they hold (*formarum vestigia certa* – 87), which is partly dictated by the things that emit them – suggested in Lucretius' description of smells as being emitted 'from **fixed** things' (*certis ab rebus* – 4.218; 6.924). The boundaries restricting sensory effluences are crucial to Lucretius' theory of sensation, since if they were not fixed, sensation would (contrary to Epicurean empiricism) be unreliable.

The atomic boundaries considered so far are imposed by physical laws, among the *foedera Naturae* governing all things.³⁹² These also play a complex and specifically-defined role in the movement of atoms,³⁹³ and specifically the swerve – one of the causes of atomic creation. Within Lucretius' law of movement through the void, a potential contradiction arises: if all tends down like a pouring liquid (as discussed in Section C above), how do atoms combine? The solution is the idiosyncratic theory of the swerve:

corpora cum deorsum rectum per inane feruntur

³⁹⁰ Garani (2007) 190 categorises this passage within her 'filling or emptying the atomic container' metaphor. The reading is supported by *explentes* (used in 1.606 of smallest parts 'filling up' the atom), but it is difficult to imagine a straight line being 'filled up' like a container, which brings liquids to mind.

³⁹¹ It is debatable whether Lucretius successfully dismisses the potential Zeno's paradox of infinite division along a line, since a limited range does not necessarily entail limited divisible parts along the range.

³⁹² See Droz-Vincent (1996) 197-9.

³⁹³ De Lacy (1969) 106-7; Berns (1976) 480-2.

*ponderibus propriis, incerto tempore ferme
incertisque locis spatio depellere paulum,
tantum quod momen mutatum dicere possis.* 220
(2.217-20)

[...] while bodies are carried by their own weight straight down through the void, at more or less **unfixed** times and in **unfixed** locations, they drive off course a little, to such an extent that you might call it changed movement.

The swerve enables collisions as the atoms deviate from pouring vertically ‘like raindrops’ (*imbris uti guttae* – 222). The deviations, in contrast to atomic size and shape, are not fully restricted, either in time or space – as expressed by *ferme*, which cannot, as D. Fowler suggests, mean ‘completely’ here,³⁹⁴ because if greater movements were possible, birth would be too transitory and random, and growth would not be restricted to fixed seasons. The meaning ‘almost’ or ‘more or less’³⁹⁵ captures the reality of birth within certain parameters, limiting the swerve (alongside *nec plus quam minimum* in 244) in time and extent.³⁹⁶ This is important because the swerve allows free will to occur:

*id facit exiguum clinamen principiorum
nec regione loci certa nec tempore certo.*
(2.292-3)

[...] the tiny swerve of the first-things, at neither a **fixed** location nor **fixed** time, brings this [free will] about.

Lucretius does not argue that the swerve is possible at any time or place, but that the time and place are not limited.³⁹⁷ The careful portrayal of a partially limited atomic swerve in these passages allows birth to be neither pre-ordained nor fully predictable, and, as Part 3 Section A will consider, for actions to occur by free will. The boundaries imposed on atoms have been shown to be crucial to Lucretius’ theory of creation.

Matter and the unlimited universe

The BOUNDARIES thread, like the others, is established at an atomic level, before being expanded to explain macroscopic realities. As a result, it answers at length *quid possit oriri, quid nequeat* from the Book 1 prologue. A further guiding factor in these limits of creation is

³⁹⁴ Fowler (2002) *ad loc.*

³⁹⁵ *OLD, fere, ferme* 1, 2.

³⁹⁶ As noted by de Lacy (1969) 108-7. For a consideration of what kind of movement *minimum* constitutes, see Fowler (2002) 303-5.

³⁹⁷ As Johnson (2013) 101 remarks: ‘what the atomists [including Lucretius] are committed to is not lack of order or violation of law, but rather lack of external constraint or control or domination.’

the infinity of matter and the universe, explored at the end of Book 1, and introduced as follows:

*omne quod est igitur nulla regione viarum
finitumst; namque extremum debebat habere.
extremum porro nullius posse videtur 960
esse, nisi ultra sit quod finiat; ut videatur
quo non longius haec sensus natura sequatur.
nunc extra summam quoniam nil esse fatendum,
non habet extremum, caret ergo fine modoque.
nec refert quibus adsistas regionibus eius: 965
usque adeo, quem quisque locum possedit, in omnis
tantundem partis infinitum omne relinquit.*

(1.958-67)

That which is the universe, therefore, is not **bounded** in any region of its paths; for then it ought to have an **extreme point**. Besides, no **extreme point** is seen to be able to exist unless there is something beyond that **bounds** it, so something might be seen, past which this nature of our senses might follow no further. Now since we must confess there is **nothing beyond the sum**, it has no **extreme point**, and therefore it lacks a **limit** and an **extent**. And it does not matter in which of its regions you stand, so much so that whatever place you occupy, you leave the universe just as **infinite** in all directions.

Lucretius returns to an argument supporting his smallest parts theory, that visible objects have extreme points, beyond which we cannot see (1.599-601). The two passages are linked together by the emphatic repetition of *extremum* in 959, 960 and 964, which recalls *extremum [...] cacumen* in 599. Here Lucretius shifts focus from a postulated boundary of atomic division to a theoretical boundary of the universe. Just as an *extremum* allows us to distinguish between bodies or between body and space, so an *extremum* applied to the universe requires either body or space. In each proof the *extremum* limits infinity, whether infinite division or infinite extent, but unlike matter the universe ‘has no extreme point, and therefore lacks a limit and an extent’. This connection embodies Lucretius’ assertion in 1.619-22 that unlimited division would result in no distinction between *rerum [...] summam minimamque* (619). The concept of boundaries is universal, whether limiting microscopic or macroscopic measurements.

Lucretius strengthens this with a visual explanation (968-83), that a spear cast at the ‘furthest extreme margins’ (*oras / ultimus extremas* – 969-70) of the universe would either keep moving (and therefore the universe is unbounded) or strike something (constituting matter beyond the universe). Therefore, wherever the putative *oras [...] extremas* (980-1) are placed, something must exist beyond, and so ‘the **boundary** can exist nowhere’ (*nusquam*

possit consistere finis – 982). This military image – whether or not it specifically implies the Roman fetial declaring war by casting a spear over an enemy border³⁹⁸ – recalls Epicurus' mental foray in the prologue. Just as Epicurus breached the *flammantia moenia mundi* to reveal the surrounding universe, so here a hypothetical boundary placed on the universe is destroyed by reasoning. By this proof, Lucretius, taking his reader with him, roams the universe with his mind, just like Epicurus (1.74-7). And like Epicurus, Lucretius returns with knowledge of boundaries: specifically that the universe has no boundary. His method of discovery is summarised by a play on words, in which Lucretius will pursue whoever still sets *oras extremas* for the universe, 'so that a **boundary** could exist nowhere, and the ready availability of flight [for the spear] will always prolong [your] flight' (*uti nusquam possit consistere finis / effugiumque fugae prolatet copia semper* – 982-3). Lucretius defeats his hypothetical adversary by situating him within the example.

Finally, whereas the universe is boundless, there are readily observable boundaries marked off within it:

*postremo ante oculos res rem finire videtur:
aer dissaepit collis atque aera montes;
terra mare et contra mare terras terminat omnis;
omne quidem vero nil est quod finiat extra.* 1001
(1.998-1001)

Lastly, before our eyes thing is seen to **limit** thing: air **separates** hills, and mountains air; land **bounds** the sea and conversely the sea all lands; and yet there is nothing that **limits** the universe from without.

Since boundaries are essential to perception and categorisation,³⁹⁹ it is intrinsically difficult for us to envisage a boundless universe. These examples draw attention to this difficulty, enhanced by three different 'limiting' verbs. Shortly after, Lucretius explains more fully:

*ipsa modum porro sibi rerum summa parare
ne possit, Natura tenet, quae corpus inani
et quod inane autem est finire corpore cogit,
ut sic alternis infinita omnia reddat,* 1010
(1.1008-11)

Moreover, Nature herself **keeps it** that **the sum** of things cannot provide a **limit** to itself, and she forces body to be **limited** by void, and again void by body, so that in this way she makes the universe **limitless** by these alternations, [...]

³⁹⁸ Mayer (1990) 37 attributes this interpretation to Richard Bentley. It is also advanced by Bignone (see Bailey (1947) *ad loc.*) and Smith (1992) *ad loc.* For this action, see *OCD*, s. v. *fetiales*.

³⁹⁹ See p.111.

Lucretius now returns to the atomic level. Just as distinct objects can be seen to be bounded off from others, so the distinct entities of body and void border each other. Indeed neither can remain unless bordered by the other, and so each must be infinite. Limitless boundaries between body and void combine to make a limitless universe.

The boundaries depicted at the end of Book 1 are complex, but the reader must reason correctly about them, in order to understand in Book 2 how atoms of limited variety can create things in an infinite universe. Lucretius argues:

[...] *primordia rerum,*
inter se simili quae sunt perfecta figura,
***infinita** cluere. etenim **distantia** cum sit* 525
*formarum **finita**, necesse est quae similes sint*
*esse **infinitas** aut **summam** materiai*
***finitam** constare, id quod non esse probavi,*
versibus ostendens corpuscula materiai
ex infinito summam** rerum usque **tenere 530
*undique protelo plagarum **continuato**.*

(2.523-31)

[...] the first-threads of things that are among themselves made of the same shape are reckoned to be **without limit**. Indeed, since there is a **limited difference** of shapes, those which are similar must be **unlimited**, or **the sum** of mother-substance would stand **limited**, something I have proved not to be so, displaying in verses that the little bodies of mother-substance completely **maintain the sum** of things **infinitely**, with an **uninterrupted** succession of blows from everywhere.

The BOUNDARIES thread is carefully applied in this passage to argue that, because atomic variety is limited, each type of atom must be unlimited to enable perpetual creation in an infinite universe. Lucretius reiterates this shortly after, arguing that each thing requires *infinita* [...] *vis materiai* (544) for its creation, since *finita* [...] *corpora* (547-8) could not combine in a boundless universe. If some *primordia* were *finita* (560) they would neither combine, nor remain combined nor grow, which Lucretius has shown to happen. He concludes that ‘there are therefore **unlimited** first-threads of things in whichever **type** you choose’ (*esse igitur genere in quovis primordia rerum / infinita* – 567-8), juxtaposing the boundary of kind (*genus*) with the boundless number of atoms in each. Bounded infinity, expressed by various correspondences of the BOUNDARIES thread, governs Lucretius’ physics.

This is supported at the end of Book 2 by a proof for the Earth’s decline, which is attributable to more atoms being given out than taken in (1128-49). Evidence for this is provided by the Earth’s declining ability to bear living things (1150-9), including crops, which we now have to farm because they no longer grow by themselves (1160-3). Lucretius then

depicts a ploughman and a vine-grower bemoaning their lot in comparison with older times, when less toil was required in farming, and crops could be grown on smaller plots of land (*angustis finibus*, 'with narrow borders' – 1171). This is attributable to a decline in the number of creative bodies in the soil. For Lucretius, cultivation involves turning the soil so its constituent bodies combine to create plants (1.210-2; 5.210-2), and so creation becomes more difficult, the fewer bodies there are. Therefore, it is less important how much space there is to grow crops than how great a concentration of creative bodies there is in the soil. Thus Lucretius' atomic theory explains the reasons behind the common *topos* that farming was easier in bygone days.⁴⁰⁰ The argument is subtly drawn; however, the keen reader with a clear knowledge of boundaries in Lucretius' atomic theory (and its depiction of seeds creating things) will understand the reasons behind this decline.

A combination between the carefully defined nature of variety in atoms, and the limitless universe formed from limitless body bounded off from limitless void explains the existence of discrete entities in the world. Lucretius argues in 2.688-99 that several things share several types of *primordia*, but in different combinations, so as to create different types of thing. The ways in which *primordia* can combine are limited, or else monsters could be formed by parts of living things combining (2.700-17). However, it is not only animals that are 'held by these laws' (*teneri / legibus hisce* – 718-9), but 'the same reasoning **marks off** everything **with a boundary**' (*eadem ratio **disternat** omnia* – 719). This is because all things '**dissimilar** in their whole nature' (*tota natura **dissimiles*** – 720) must also consist of 'a **different** form of first-things' (*dissimili [...] figura principiorum* – 722) – not necessarily entirely different, but with limited common constituent bodies (723-4). Furthermore, 'given that the seeds **are different**' (*semina cum [...] **distent*** – 725), so must all their movements, interweavings, blows etc. 'be different' (*differe* – 725). These various atomic qualities

*non animalia solum
corpora **seiungunt**, sed terras ac mare totum
secernunt caelumque a terris omne **retentant**.*

(2.727-29)

[...] **keep apart** not only animal bodies, but **set a barrier** between the earth and the whole sea, and **hold back** the totality of the heavens from the earth.

That the same laws (*leges* – a synonym for *foedera Naturae*) hold all things, and not just animals (718-9), is emphasised here by the application of *seiungunt* and *secernunt* to animals

⁴⁰⁰ The necessary labour of farming depicted by Hesiod throughout *Works and Days* contrasts the abundant produce readily available in the past (116-9).

and the parts of the world – expressing (by the *se-* prefix) similar separation or bounding off. The shared boundaries have also been expressed by the polyptoton *dissimiles [...] dissimili* (720-2), and the repeated *dis-* prefix in these terms and *distent* and *differre* (725). Thus boundaries are established for animate and inanimate things, including macroscopic entities such as the sea, earth and heavens. Therefore, just as infinite body bounded off alternately from void creates the universe, so the world is formed by the earth, sea and heavens bounded off from one another. Lucretius expands our comprehension of separate entities, rooted in our experience of the boundaries of our bodies, and those separating distinguishable things, to the macroscopic level, enhancing his reader's understanding of the boundaries restricting all things.

Section E

The PLEASURE Thread

As considered in Part 1, Lucretius introduces the PLEASURE thread in the prologue through the complex metonymic correspondence of Venus-*voluptas*, which symbolises the instigating force governing the process of birth (*Natura*), both literal and, in relation to creation from *primordia*, metaphorical. Venus represents not only *voluptas*, but more specifically both the *causes* of pleasing things, and the *sensation of pleasure* itself. These characteristics are evident respectively in the pleasing images of abundant creation caused by her arrival (*suavis [...] flores* – 7-8; *rident aequora ponti* – 8; *nitet diffuso lumine caelum* – 9); and the pleasure felt by animals as they follow her lead (*perculsae corda tua vi* – 13; *cupide* – 16, 20; *incutiens blandum per pectora amorem* – 19). In the prologue, the PLEASURE thread encapsulates the following concepts: pleasure in general; sexual pleasure specifically; pleasure as a cause of creation; pleasure as a means of persuasion towards certain movements and deeds (including poetic composition); and the causes of pleasure (including poetic imagery).

Typical of Lucretius' threads, these concepts are established in the prologue, before being expanded throughout the epic, intertwining as individual strands of the PLEASURE thread to embody more complex scientific or moral concepts. However, as considered in Part 1, among these strands are the concepts, not specifically related to pleasure, of striking and leading, which are introduced in the prologue by *incutio* and *induco* as roles of Venus. When these and other related terms recur in the *DRN*, the reader should recall their introduction in the context of Venus and *voluptas*. By doing so, they will be able to draw further meaning from several of Lucretius' scientific theories, in particular that of atomic creation.

Pleasure is of course central to Epicurean ethical theory, which urges the pursuit of natural and necessary pleasures (such as simple food or the beauty of nature) above others, and the avoidance of unnatural and unnecessary pleasures (such as wealth).⁴⁰¹ The *DRN* depicts a range of pleasures along these lines, establishing, as Part 3 Section G will consider, a fixed limit to pleasure.⁴⁰² This Section, however, will focus on how pleasure, as a conceptual thread, depicts certain processes and concepts central to Lucretius' science. In such contexts

⁴⁰¹ Epicurus *Ep. Men.* 127-32. For Epicurean pleasure, see e.g. Glidden (1980); Gosling & Taylor (1982) 345-412; Annas (1987); Sedley (1998b) 142-6, who argues that Epicurus' 'dyadic' scheme of pleasure versus pain mirrors his body/space duality nicely – marking a crossover between Epicurean physics and ethics, which Lucretius' threads also often fulfil; and Konstan (2008).

⁴⁰² See de Lacy (1969); Droz-Vincent (1996).

the PLEASURE thread suppresses the clear distinctions in Epicurus' theory of pleasure – appropriately, since Lucretius defines pleasure less clearly, rigidly and extensively than Epicurus.⁴⁰³ As is typical of the gestalt nature of Lucretius' conceptual threads, the PLEASURE thread, in referring to 'pleasure', depicts both the totality (comprising causes of pleasure, the emotions that lead us to pleasure, and the sensation of pleasure), and parts of this totality.

Persuasive pleasure

In the Book 1 prologue Venus, as metonymy for *voluptas*, makes things move, both in general and towards procreation.⁴⁰⁴ Upon her arrival the winds and clouds flee (1.6-7), and animals dance over the meadows (1.14-5); and later animals are driven to procreate (1.17-20). The latter two are caused by striking (*perculsae* – 13; *incutiens* – 19) and leading, as animals are persuaded to follow Venus, who leads them in their delight (*te sequitur cupide quo quamque inducere pergis* – 1.16). The pleasure entailed in this persuasion is captured by *capta lepore* (1.15 – causing movement), and *blandum [...] amorem* (1.19 – causing procreation). Leading and persuasion by Venus-*voluptas* persist later in the prologue, the former when Venus is designated the steersman (*gubernans* – 1.21) of birth, and *voluptas* leads (*inducit* – 1.142) Lucretius to compose his poetry; the latter when Venus is asked to use *suavis [...] loquellas* (1.39) to make Mars give up war, and *voluptas* persuades (*suadet* – 1.142; also *suavis* – 1.141) Lucretius to write. The persistence of leading and persuading, expressed by key related terms repeated in close proximity, highlights them as key themes. The keen reader should notice these concepts when they recur in similar contexts later in the *DRN*, and understand them in terms of pleasure, as per Venus-*voluptas* in the prologue.⁴⁰⁵

Movement (both sexual and non-sexual) in a given direction is often instigated by persuasion, and frequently by pleasure or the seeking of pleasurable things. Thus, sheep moving in an unmoving flock (2.317-322) are persuaded to move by the grass:

*lanigeræ reptant pecudes quo quamque vocantes
invitant herbae gemmantés rore recentí,*

(2.318-9)

⁴⁰³ Indeed occasionally Lucretius uses terms for sexual or general pleasure interchangeably, e.g.: *blanda voluptas*, used of both sexual (4.1263) and general (5.178) pleasure. Epicurus may have distinguished more clearly between pleasure (ἡδονή, *passim* in *Ep. Men.* and *RS*) and sexual pleasure (τὰ ἀφροδίσια, *Sent. Vat.* 51).

⁴⁰⁴ Boyancé (1947) 99: 'la voluptas, le principe de l'activité chez tous les êtres animés, le moteur de toute la vie.'

⁴⁰⁵ Indeed, Lucretius reminds the reader of the faculty of *voluptas* as the leader towards procreation in 2.171-3: *mortalis quae suadet adire / ipsaque deducit dux vitae dia voluptas / et res per Veneris blanditur saecula propagent.*

The woolly flocks creep wherever the **calling** grass, shining with recent dew, **invites** them, [...]

The pleasure of the look, and the prospective pleasure of the taste, of new grass guides the sheep's movements.⁴⁰⁶ The lambs, meanwhile, are led by the pleasure of play: 'they play and shake their heads in fun' (*ludunt blandeque coruscant* – 320)⁴⁰⁷ – *blande* suggesting both personal enjoyment and the encouragement of others' enjoyment. Later, Lucretius depicts (4.677-86) different animals led by the smell of their favourite foods. Here the foods represent an expected pleasure for the animals, and so assume the 'leading' role of Venus-*voluptas* in the prologue (*ducuntur* – 679; *ducit* – 682, 685). The argument here, that certain bodies are appropriate to certain things, is resumed in 6.970-8, including examples of goats attracted to wild olive (970-1), and pigs to mud (976-8). In each case the animals' pleasure is emphasised (*iuvat* – 970; *iucunda* – 977) as the cause of the attraction. These examples are employed analogously to explain why iron is attracted to the magnet, which is said 'to lead' (*ducere* – 907) the iron towards it. The keen reader, recalling the leading by Venus-*voluptas* in the prologue, and the *voluptas* of the animals in being led to their favourite things, might in turn envisage the iron as led by 'pleasure' towards the magnet (like the modern term 'magnetic attraction'). If this still seems doubtful, Part 3 Section A will consider how 'pleasure' is involved in the movement of inanimate atoms.

Pleasure the instigator of creation

As discussed in Part 1, in the prologue Venus instigates *Natura*, or rather pleasure instigates creation. In the opening invocation Venus, as the one by which 'every kind of living thing is **conceived**' (*genus omne animantum / concipitur* – 1.4-5), specifically represents sexual intercourse. Here *concipio* is used literally, but later it metaphorically depicts the 'conception' of things in general. Shortly after in the prologue the instigation takes the form of persuasion, with Venus as *dux* striking animals and leading them to procreate – a chain that will later also be applied metaphorically to atomic combination, as Part 3 Section A will address.

For now, a brief survey of Lucretius' use of Venus and *voluptas* to describe sexual intercourse and the pleasure derived from it will suffice. Sexual intercourse is described

⁴⁰⁶ Contrast the cow distressed at the slaughter of her calf in 2.349-66. For her, food (also dewy grass – *herbae rore vigentes* – 361) cannot 'delight her mind' (*oblectare animum* – 363) or 'lead her mind away' (*derivare [...] animum* – 365).

⁴⁰⁷ *OLD*, *corusco* lists differing senses: 'brandish' (1) and 'flash' like lightning or fire (3) (e.g. Verg. *G.* 4.98, with *fulgor*). It seems Lucretius is introducing a comparison with the soldiers in the next analogy (323-32), which depicts the *fulgor* (325) of their weapons. The soldiers are engaged in mock-battle manoeuvres, the lambs in mock-fighting.

metonymically as simply *Veneris res* (2.437; 4.1215;⁴⁰⁸ 5.848) and *Venus* (4.1267; 5.1017),⁴⁰⁹ and also with a variety of compound phrases: *conubia Veneris* (3.776), *Veneris compages* (4.1113, 1205), *Veneris sudor* (4.1128), and *Veneris stimulis* (4.1215). We also find *blanda voluptas* (4.1268) as a synonym for sexual intercourse, perhaps by synecdoche (since pleasure is only a part of this). In addition, *Venus* and *voluptas* also occur in phrases relating to sexual intercourse, such as sexual attraction (*Veneris vis* – 4.1172), sexual desire (*Venus* – 5.897, 962), and sterility (*Venus sterilis* – 4.1235); and sexual pleasure (*voluptas* – 4.1201; *communi' voluptas* – 4.1208) and orgasm (*voluptatis [...] vi* – 4.1114). This variety embodies the breadth of the concept of pleasure in Lucretius' thread, since it pertains to desire (i.e. the expectation or yearning for pleasure), the process by which pleasure is obtained, and the subsequent pleasure itself. The fluid meanings of *Venus* and *voluptas*, which occasionally take on each other's primary sense (sexual intercourse and sexual desire/pleasure respectively) in this context, support this. *Venus* embodies both concepts when she is described in 4.1057-8 as dumb desire heralding pleasure (*namque voluptatem praesagit muta cupido. / haec Venus est nobis*). Here *Venus* explicitly represents both pleasure and the desire that precedes it – as we untangled in the prologue. With this in mind, the PLEASURE thread is shown to be extensive in depicting creation through sexual intercourse, embodying desire, sexual intercourse itself, and sexual pleasure.

Blows and pleasure

In the Book 1 prologue *Venus* strikes animals with desire to seek pleasure through sexual intercourse (*percussae corda tua vi* – 13; *incutiens blandum per pectora amorem* – 19). Thus, a direct link is drawn between striking and sensation, and resulting actions and movements, with *Venus*, representing desire and subsequent pleasure, the initiating cause. This process is also described in Lucretius' second 'mission statement' (1.921-50) as he explains the inspiration for his poetry:

[...] *sed acri*
percussit thyrsos laudis spes magna meum cor,
et simul incussit suavem mi in pectus amorem
Musarum, [...]

925
(1.922-5)

⁴⁰⁸ In the phrase *harmonia Veneris*, describing sexual compatibility.

⁴⁰⁹ Campbell (2003) *ad loc.* suggests *Venus* here represents 'physical love' as well as other facets of Lucretian *Venus*. It seems to me, however, that 'Venus sapped their strength' (5.1017) can only refer to sexual intercourse.

[...] but great hope of fame has **struck** my heart with a thyrsus, and at the same time it has **struck** the **sweet love** of the Muses into my heart, [...]

In the prologue Lucretius described the motivation behind his composition as ‘the hoped for pleasure of sweet friendship’ (*sperata voluptas / suavis amicitiae* – 140-1), and here his inspiration is again hope (perhaps = ‘expected pleasure’ of, or ‘desire for’, fame) and pleasure (expressed by *suavis amor*). Both of these descriptions recall Venus and her effect on the animals in the prologue. It is also notable that, just as Venus causes animal procreation by striking (*incutiens* – 19), so desire for pleasure initiates poetic creation specifically by striking (*incussit* – 924). The actions of Venus in the prologue can therefore be seen as the archetype for how creative acts occur in the *DRN*.

In fact, general feelings and movements can also be caused by striking. This includes the expression of emotions by the mind, which occurs when a thought or idea ‘strikes the mind itself’ (*animus [...] percutit ipsum* – 2.886) and ‘moves it and causes it to express various feelings’ (*movet et varios sensus exprimere cogit* – 2.887).⁴¹⁰ Similarly, striking can initiate a response to the emotion of fear: the spirit ‘is struck’ (*percussast* – 160) by the mind, and in turn ‘strikes the body and drives it forward’ (*corpus propellit et icit* – 160). More generally, in 4.877-906 voluntary movement occurs when ‘images of movement’ (*simulacra meandi* – 881) strike (*pulsare* – 882) our mind, which in turn strikes (*ferit* – 887) the spirit, which then strikes (*ferit* – 890) the body, causing motion. This causes us to pursue pleasure, as we move ‘when we want’ (*cum volumus* – 878), by our will (*voluntas* – 883). Again, this recalls Venus in the prologue, striking the animals to move by their will towards expected pleasure. Here the desire for movement is general, however, and not specifically sexual.

A more detailed scheme of the causes of movement towards sexual pleasure occurs in 4.1037-57 at the beginning of Lucretius’ exploration of love. First he states that ‘only human force rouses (*ciet*) human seed from a human’ (1040). Having been roused, the genitals are ‘roused’ (*ciet* – 1043) in turn, recalling the chain of movement caused by sensation in the mind.⁴¹¹ Lucretius then asserts this connection more strongly. The body follows the movement of the mind, desiring to emit the seed towards wherever the mind was ‘wounded’ (*saucia* – 1048) with love. This metaphor is extended as Lucretius compares blood spurting from a wounded body towards the source of the blow (*ictu* – 1050). This analogy persists with an example of a man ‘who has received a blow from the shafts of Venus’

⁴¹⁰ Cf. 5.1222-3, in which proud kings are struck by fear, and consequentially fear the gods (*regesque superbi / corripunt divum percussi membra timore*).

⁴¹¹ Brown (1987) 63 terms the process ‘a physiological chain reaction – impersonal and mechanical’.

(*Veneris qui telis accipit ictus* – 1052), whether a boy or woman ‘launches’ (*iaculatur* – 1053; *iactans* – 1054) them at him. Again the man is struck and moves in the direction of expected pleasure:

unde feritur, eo tendit gestitque coire 1055
et iacere umorem in corpus de corpore ductum;
namque voluptatem praesagit muta cupido.
haec Venus est nobis; [...]

(4.1055-7)

[...] from where the blow has come he reaches out in that direction, and longs to have sex⁴¹² and to cast the fluid drawn from his body into the other body; for dumb **desire** heralds **pleasure**. This is our Venus; [...]

The blow of *cupido* strikes *cupido* into the man, causing him to seek pleasure from where the blow originated – a process described as *Venus nobis*. Again the Book 1 prologue, in which Venus strikes animals and leads them in her direction towards sexual intercourse, is recalled.⁴¹³ The man in our passage is affected exactly as the animals are, and yearns for sexual intercourse as they do. This underlines the consistent portrayal of Venus throughout the *DRN*, as a representation of both general and specifically sexual pleasure and their cause, and sexual intercourse and the pleasure it promises. Therefore, again it is not necessary to assume a ‘redefinition’ of Venus following the prologue.⁴¹⁴ This reading is aided by the PLEASURE thread and its various applications.

Despite this onslaught of blows, man can nevertheless overcome desire for love and sexual pleasure,⁴¹⁵ and their accompanying pains (*curam certumque dolorem* – 4.1067). One way to do this – other than to avoid attractive *simulacra*, to think of other things, to emit the seed somewhere else (4.1063-6) – is to mix up the original wounds ‘with new blows’ (*novis [...] plagis* – 4.1070), especially by visiting prostitutes (4.1071).⁴¹⁶ Blows, in the form of pleasure from another source, soothe the pain of overwhelming sexual desire brought about by obsessing over a single lover. A further good reason to seek these ‘blows’ from a different

⁴¹² This is the correct meaning of *coeo* in this context: not simply ‘to come together’, but, as Adams (1982) 179 has it, ‘the verbal euphemism *par excellence* for copulation’ (citing this passage as its first usage in this sense). Perhaps this is a synonym for Greek *σύνειμι* (‘to copulate’, Arist. *Hist. an.* 5.2.29, 540a10).

⁴¹³ The image recurs in 5.1075, describing a stallion struck by ‘the blow of winged love’ (*pinnigeri [...] ictus Amoris*).

⁴¹⁴ As Solomon (2004); or the replacement of Venus by Nature, as Catto (1988).

⁴¹⁵ As Brown (1987) 65 points out, one should not avoid sexual pleasure altogether, but that which is sought out of love.

⁴¹⁶ This interpretation, advanced by Brown (1987) 74, of the euphemistic phrase *volgivaque vagus Venere* (4.1071) is surely correct.

source is revealed at the end of Book 4, as Lucretius explains why men love unattractive girls. This is caused by the woman's efforts towards seemly conduct (*factis / morigerisque modis* – 1280-1) and cosmetic appearance (*cultu* – 1281). The man falls in love by becoming accustomed (*consuetudo* – 1283) to these:

*nam leviter quamvis quod crebro **tunditur ictu**,*
vincitur in longo spatio tamen atque labascit. 1285
 (4.1284-5)

[...] for however lightly he is **struck** with a repeated **blow**, he is nevertheless conquered in the long run and yields.

The combined effect of 'light' blows from something mildly pleasurable, like a seemly appearance, is sufficient to engender love and sexual desire.⁴¹⁷ Blows are persistently portrayed in the *DRN* as causing pleasure or the pursuit of pleasure, and most specifically to lead to sexual intercourse. This has implications for Lucretius' theory of creation, as Part 3 Section A will consider.

⁴¹⁷ The small blows equate to a beating, expressed by *tundo*, used most frequently of heavy (and usually repeated) blows; *OLD*, *tundo* – especially the transferred senses of buffeting by wind or waves (1c), haranguing someone with repeated noise or words (1d), and beating something to a pulp (2). For the possible sexual connotations of *tundo*, see Adams (1982) 149.

Part 3

Intertwining the Threads

Part 2 has tracked Lucretius' conceptual threads individually, mapping their principal applications, and showing how far they expand throughout the *DRN* from their introduction in the prologue. Part 3 will consider how the threads interact, or rather 'intertwine', to depict and explain more complex concepts. Established correspondences of individual threads are modified by, and modify, established correspondences of other threads, building upon the reader's understanding to extract new meaning. Such intertwining occurs throughout the *DRN* as new concepts are introduced, and as such certain brief glimpses of intertwined threads have been seen in Part 2. These will be built upon, alongside many others in this Part, and the extent to which Lucretius' central doctrines rely on the intertwining of his conceptual threads will become apparent. The full potential of the conceptual threads as explanatory devices will be further uncovered, revealing unexpected and even radical readings of certain doctrines.

The doctrines chosen for analysis in this Part represent those in which threads intertwine consistently to portray a crucial aspect of Lucretius' science or moral philosophy, in particular: the birth-death cycle; certain essential processes; sensation; the body and soul; the world; the meteorological and terrestrial phenomena of Book 6; and Lucretius' moral philosophy. The full reach of the threads, and their role in universalising Lucretius' key theories, will be exhibited, further highlighting Lucretius' consistent and coherent methodological approach.

Section A

Creation and Destruction

The central theory of Lucretius' philosophy is the cycle of creation and destruction by the combination and dissolution of atomic congregations. Interactions between conceptual threads depict different aspects of this cycle, and all five threads form a complex web explaining the whole cycle. Several established aspects of each conceptual thread are employed in this scheme, again underlining their consistent nature. This Section will address the interaction between the LIFE-CYCLE thread and each of the other threads in turn, broadly in order of appearance. Since several of Lucretius' theories depend on his theory of creation, several aspects considered here will be relevant for interpreting key theories later in this Part.

LIFE-CYCLE and BOUNDARIES

The BOUNDARIES thread occurs most frequently in the *DRN* when intertwined with the LIFE-CYCLE thread to explain, broadly, 'what can be born, and what cannot' (*quid possit oriri, / quid nequeat* – 1.75-6). The full meaning of this phrase will be clarified throughout the epic, and especially in the first two books, which outline the boundaries restricting the life cycle of things, from atomic creation to growth and the ultimate boundary of death, which marks each thing's restricted lifespan, and represents a departure from physical boundaries. The LIFE-CYCLE and BOUNDARIES threads intertwine most extensively in the first arguments of Book 1, that nothing comes from nothing, and nothing dies to nothing. Together these explain the following limits: nothing is born from nothing; species are restricted in the way they are born, their growth and their habitat; fixed things contain fixed *materies*; and birth occurs at fixed times and at fixed speeds. These key theories are expanded later to explain how boundaries govern other atomic and macroscopic processes.

The boundaries of birth

As discussed in Part 2 Section D, the purpose of explaining *quid possit oriri, quid nequeat* (i.e. the boundaries restricting creation) is to rid man of fear – especially that caused by *religio*. Lucretius explains two of these boundaries in his first argument (1.150), that nothing is born

from nothing, and nothing is born from divine agency (*divinitus*).⁴¹⁸ Lucretius supports his argument by portraying several limits restricting the birth of things, drawn from human experience. These, as Part 2 Section A explored, are punctuated by terms from Lucretius' birth-themed atomic vocabulary, and other birth words, some applied metaphorically to atoms and others literally to the birth of things. Lucretius' arguments are predominantly packaged in *modus tollens* ('denying the consequent') deductions, with the intertwined LIFE-CYCLE and BOUNDARIES threads expressing the impossible consequences unlimited birth would cause. Two pairs of terms express this in particular: *creo* and *certus*, and *genus* and *generatim*.

Lucretius depicts the boundaries restricting birth by frequently repeating *creo* and its cognate *cresco* (five and three occurrences respectively), and *certus* (seven). Three different but complementary proofs in particular juxtapose these terms to draw striking correlations between birth and boundaries. First, the act of creation depends on fixed mothers and fixed constituent bodies. Lucretius emphasises this by stating that without *genitalia corpora* things could not have a 'fixed mother' (*mater [...] certa* – 168),⁴¹⁹ and so they 'are born from fixed seeds' (*seminibus [...] certis [...] creantur* – 169). Second, things could not be born seasonally, unless 'fixed seeds' (*certa [...] semina* – 176) combine at the proper time, from which each thing 'is born' (*creatur* – 177). Third, instantaneous growth of trees, or youths from infants, is impossible because things '**grow gradually, as is appropriate, from fixed seed, and in growing preserve their kind**' (*paulatim crescunt, ut par est, semine certo, / crescentesque genus servant* – 189-90). In these proofs, 'fixed seed' simultaneously depicts animal and plant seed, and the atomic *semina* that create all things, while atomic *materies* is the metaphorical 'fixed mother' of things.⁴²⁰ Both denote a boundary restricting birth, which Lucretius highlights by juxtaposing *creo* and *certus* in linguistic jingles, deployed, as Snyder notes, 'as if the meaning of one term automatically included the meaning of the other'.⁴²¹ Thus we might read birth in *certus* and fixity in *creo*, each term representing a convergence of the LIFE-CYCLE and

⁴¹⁸ This must be what Lucretius means: that an instigating force (*represented* by the goddess Venus in the prologue), which is not divine, creates everything out of something. However the ambiguous wording (*nullam rem e nilo gigni divinitus umquam*) unfortunately allows that divine agency can create things from something.

⁴¹⁹ This phrase recalls the concept of illegitimate birth. Within this framework, suggesting the mother might be unknown makes the original proposition seem absurd.

⁴²⁰ Snyder (1980) 137-41 argues that several instances of Lucretius' frequent wordplay of *creo* and *certus* 'help to stress the idea that the *materies* does act as *mater certa* out of which are born all things.'

⁴²¹ Snyder (1980) 141. On pp.137-41 she enumerates 22 juxtapositions of these terms (alongside other *cer-* and *cre-* words, including *cerno* and *certo*) in an atomic context. Certainly a link was felt between *cerno* and *creo* (as Varro *Ling.* 6.81 notes) and also, therefore, *cresco*; Maltby (1991) s. v. *cerno*.

BOUNDARIES threads, again emphasising that for Lucretius birth intrinsically entails certain boundaries.

The term *genus* intrinsically relates to birth as a derivative of *gigno*. However, it also denotes a boundary of category, classifying animals into ‘kinds’ maintained by birth. Lucretius frequently draws attention to these concepts to highlight the boundaries governing birth, as in the first *modus tollens* deduction of the first arguments:

*nam si de nilo fierent, ex omnibu' rebus
omne **genus nasci** posset, nil **semine** egeret.* 160
(1.159-60)

For if they came to be from nothing, every **kind** of thing could be **born** from all things, nothing would require a **seed**.

Removing limits from birth eliminates *genera*, and so seed as we understand it would be unnecessary for birth. Lucretius disproves the premise throughout the opening arguments by demonstrating that birth requires seed, and occurs according to *genus*.

In 189-90, quoted in the consideration of *creo* and *certus* above, Lucretius states that animals preserve their *genus* throughout their gradual growth from fixed seed. The designation *genus* inherently denotes birth and growth within fixed parameters – as our experience of animal and plant life confirms – strengthening the theory of fixed seed. Again, in 192-8, when Lucretius considers ‘fixed rains’ (*certis imbribus* – 192), which enable plant birth, he draws attention not to the nourishment they provide for animals, but the fact that animals without food cannot ‘propagate their kind’ (*propagare genus* – 195).⁴²² Lucretius emphasises the boundaries of *genus* dictating birth, and the boundaries of seasons (expressed by ‘fixed rains’) that facilitate birth within these boundaries. The boundaries of birth and growth also disprove that anything can die to nothing, since, if time could reduce *materies* to nothing:

*unde animale **genus generatim** in lumina vitae
redducit Venus, aut reductum daedala tellus
unde alit atque auget **generatim** pabula praebens?* (1.227-29)

[...] from where does Venus lead back⁴²³ a **kind** of animal into the light of life **according to kind**, or, having been led back, from where does the skilful earth nourish them and make them grow, providing food, **according to kind**?

⁴²² *propago* suggests the generation of plants from *semina* (see n. 198), enhancing the connection between plants and animals.

⁴²³ Venus’ role here will be considered later in this Section.

Etymological figure (*genus generatim*) and the repetition of *generatim* place special emphasis on *genus*. The same boundaries entailed in birth also restrict growth and nourishment. The prominence of *genus* in the opening arguments firmly establishes the central role of boundaries in Lucretius' theory of birth.

A notable example occurs in a proof for the broad variety of atomic shapes and arrangements. Although animals in a field eat the same grass and drink from the same river:

*dissimili vivont specie retinentque **parentum** 665*
***naturam** et mores **generatim** quaeque imitantur.*
*tanta est in quovis **genere** herbae **materiai***
dissimilis ratio, tanta est in flumine quoque.

(2.665-8)

[...] they live in a different outward form and retain the **nature** of their **parents** and in each case copy customs **according to kind**. So dissimilar is the orderly array⁴²⁴ of **mother-substance** in whatever **variety** of herbage you choose, so dissimilar in each river.

Two different consequences of fixed inheritance are outlined here. Firstly, animals inherit their parents' nature and customs 'according to kind', and the reader is aware that this is owing to the passing on of fixed *materies* to offspring. Secondly, animals of the same kind consume the same kind of food, and the *materies* within this food is processed in such a way that the animals remain of the same kind. For this reason, different kinds of animal can eat the same food and still remain different. The contrast between these two points is strengthened by the position of *parentum* and *materiai* in their respective lines, the polyptoton *dissimili [...] dissimilis*, and the etymological figure *generatim [...] genere*. The latter highlights the incorrect postulation that different kinds of animal might become similar by consuming the same kind of plant. Instead the pattern of the *materies* of the plant is altered when the animal consumes it, ensuring that an animal does not become different in its kind by eating. Extrapolating from this, the *materies* of the food eaten by a parent surely forms part of the *materies* passed on to their offspring, which, by eating the same food, consume the same *materies*. Animals are able to maintain their *genus* because they consume food containing varied *materies* in different arrangements, which contributes to each animal's growth according to kind.

⁴²⁴ Bailey (1947) *ad loc.* suggests *dissimilis ratio* is a paraphrase for the unmetrical *differentia*, and so overlooks a reference to atomic order in addition to type. It seems *ratio* is intended to refer both to 'ratios' of different atomic types and to their varied arrangements. My translation attempts to capture the concept of order suggested by *ratio*.

Animals also inherit sensory responses to certain things, passed on by fixed first-bodies according to kind (4.642-86). Therefore, different animals like different foods not just because things contain ‘many seeds mixed in many ways’ (644), but because animals do too:

*ut sunt dissimiles extrinsecus et generatim
extima membrorum circumcaesura coercet,
proinde et seminibus constant variante figura.*

(4.646-8)

[...] as they are **dissimilar** externally and as the outermost contour of the limbs **holds in** [each animal] **according to kind**, so also they consist of seeds of varying shape.

The differences separating animals by kind are expressed by *dissimilis*, picked up by *distent* (649) and *differre* (649, 655) with their shared prefix. Because their constituent seeds differ, so do their *foramina*, and therefore (via the WEAVING thread) a given food’s *textura* (657) ‘forces’ (*coercet* – 657) a certain sensory reaction when it interacts with a given animal’s first-bodies. The repetition of *coerceo* symbolises the physical boundaries restricting an animal’s shape, and the boundary of an ‘enforced law’ dictating the animal’s sensation. These boundaries operate *generatim*, distinguishing animals by type. The same applies to smells (4.673-86), which have *dissimilis* (678) forms better suited to certain animals. Specifically, an animal’s sense of smell, being dictated according to *genus*, distinguishes edible and poisonous food, ‘and in this way **generations** of beasts are **preserved**’ (*eoque modo servantur saecula ferarum* – 686). Boundaries governing sensation are set from birth by heredity, which is itself maintained by these sensation boundaries.

This interpretation extracts further meaning from Lucretius’ first denial of the proposition *si de nilo fierent* – that animals would be born and live in unnatural locations (161-4). The term *genus* occurs twice (162, 163), highlighting that this would constitute a violation of boundaries of both birth and kind. This sense persists in the next denial, that fruits would be frequently interchanged (*mutarentur* – 166)⁴²⁵ between plants – that is, be born and grow without restrictions of *genus*. Lucretius summarises these impossibilities in the phrase ‘all would be able to bear all’ (*ferre omne omnia possent* – 166),⁴²⁶ which would be the result of *incerto partu* (164)⁴²⁷ – ‘unfixed birth’, or birth without its usual boundaries. The first arguments outline both the pre-established boundary governing birth and the boundaries

⁴²⁵ i.e. grow naturally without human intervention, by grafting (for which, cf. Varro *Rust.* 1.40.5-41.3). For Lucretius, change entails the death of what was before.

⁴²⁶ The elision perhaps embodies the muddling of species types.

⁴²⁷ This extends the reference to illegitimate birth (see n.419), with a further absurdity suggested by Lucretius’ focus on parents giving birth to uncertain offspring rather than on offspring of uncertain parentage.

maintained throughout a living thing's lifetime. By understanding the boundaries entailed in birth the reader can understand Lucretius' theory of birth more fully.

Heredity marks a key convergence of Lucretius' BOUNDARIES and LIFE-CYCLE threads. Picking up from the first arguments, later in Book 1 the 'limit of growth and possession of life allotted according to kind' (*generatim reddita finis / crescendi [...] vitamque tenendi* (584-5) and the *foedera Naturai* (586) restricting things according to *genus* prove the existence of *inmutabili' materiae* (591 – recalling *mater certa* and *semina certa* in the first arguments). Animals are so rigidly restricted in terms of *genus*, in fact, 'that various birds all show **in succession** that there are marks **of their kind** on their bodies' (*variae volucres ut in ordine cunctae / ostendant maculas generalis corpore inesse* – 589-90). This expresses the visible boundaries of *genus* inherited at birth, and specifically the fixed linear progression of inheritance. Here *in ordine* may carry an implicit weaving sense,⁴²⁸ of a starting border initiating a cloth's fixed 'creation' and 'growth'.

If the *primordia* could be changed (*commutari* – 593):

incertum quoque iam constet quid possit oriri,
quid nequeat, finita potestas denique cuique 595
quanam sit ratione atque alte terminus haerens,
nec totiens possent generatim saecla referre
naturam mores victum motusque parentum.

(1.594-8)

[...] it would also **not be fixed** what could **be born**, what could not, in short by which reasoning each thing might have a **fixed limit** of power and a **deep-set boundary mark**, and generations could not, **according to kind**, so often repeat the nature, customs, way of life and movements of their parents.

594-6 (from *quid possit*) repeat 1.75-7 verbatim, but extend the general boundaries introduced there to the fixed limits of heredity. These entail not just inherited appearance, such as fixed plumage, but also accustomed lifestyles and actions,⁴²⁹ which later provides proof that the soul is born with the body (3.741-53). Intra-species heredity proves the existence of fixed first-bodies, and these explain facets of heredity. Both are governed by the strict boundaries of *foedera Naturae* and the *alte terminus haerens*.

Boundaries of time and season

⁴²⁸ See discussion on pp.34, 71-6.

⁴²⁹ Perhaps a precursor to 3.288-322, which attributes the dispositions and moods of different kinds of animal to atomic positions (3.317-8).

The third boundary restricting birth, alongside fixed seed and heredity, is time. A further denial of the proposition *si de nilo fierent* appeals to the reader's experience of seasonal fruits and flowers (174-83). Their regular production occurs 'because **fixed** seeds of things flow together **at their own time**' (*certa suo quia tempore semina rerum / [...] confluerunt* (176-7)⁴³⁰ – i.e. time restrictions operate according to kind. Lucretius then restates his original premise, arguing that *si de nilo fierent* (180), things would be born

*incerto spatio atque alienis partibus anni
quippe ubi nulla forent primordia quae **genitali**
concilio possent **arceri** tempore iniquo.*

(1.181-3)

[...] at **unfixed** intervals and unnatural times of the year, for the very reason that there would be no first-threads which could **be kept from generative union** at an adverse time.

The evident fixed regularity of seasonal birth and growth need not be restated. It is so fixed that even the *primordia* are restricted (*arceri*) to uniting at fixed times – and this will later explain various fixed terrestrial and meteorological occurrences.

Lucretius then deduces that *si de nilo fierent*, things would require no time for growth, allowing infants to become youths and trees to grow instantaneously. This does not happen,

[...] *omnia quando
paulatim crescunt, ut par est, semine certo,
crescentesque genus servant; ut noscere possis* 190
quidque sua de materie grandescere alique.

(1.188-90)

[...] since everything **grows a little at a time**, as is fitting, from a **fixed seed, and in growing preserves** its kind; so that you may recognise that each **grows and is nourished by its own mother-substance**.

Lucretius succinctly summarises the boundaries of growth, governed specifically by time and *certa semina*. The echo of *suo tempore* (176) by *sua de materie* emphasises that time and *materies* are the two main restrictions on birth, and also expresses the boundaries set according to kind (suggested by *suus*), which also restrict growth (*crescentes genus servant*).

This argument is supported by a *reductio ad absurdum*, which extends the conjecture that everything could be born from everything, to ask why giant men could not be born. This would occur without the '**fixed mother-substance** [...] on which what can **arise** is dependent'

⁴³⁰ The liquids metaphor *confluerunt* will be considered later in this Section.

(*materies [...] certa [...] e qua constat quid possit oriri* (203-4)).⁴³¹ One effect of *certa materies* is that men cannot ‘by living conquer many generations of life’ (202) and grow to giant size. Lifespans are fixed, and dictate the *finita potestas* of each thing. This argument returns later in Book 1 to prove that indivisible bodies exist. Lucretius states that without ‘a **limit** to the breaking of things’ (*finem [...] frangendis rebus* – 552), time past would have destroyed *corpora materiai* (552) to the extent ‘that nothing **conceived** from these could within a **fixed** time make it to the final **boundary** of its lifetime’ (*ut nil ex illis a certo tempore posset / conceptum summum aetatis pervadere finem* – 554-5). If ‘mother-substance’ were susceptible to being destroyed, birth might be possible, but not full growth. This is supported by a weaving metaphor (see p.82), that recreation would not occur as fast as things ‘untying’ (*dissoluens* – 559). Therefore, there must be ‘a **fixed boundary** allotted to breaking up’ (*frangendi reddita finis / certa* – 561-2), since evidence shows both that things are ‘remade’ (*refici* – 562), and that there are ‘**fixed durations**’ (*finita [...] tempora* – 563) allotted to things ‘according to kind’ (*generatim* – 563), in which they grow to maturity.⁴³² These fixed durations are echoed by *generatim reddita finis / crescendi rebus* (‘the **limit of growth** allotted to things **according to kind**’ – 584) and the *foedera Naturai* (586), the ‘laws of Nature’ or perhaps ‘of birth’ that govern them. The boundaries restricting lifespans and growth to maturity are possible owing to the atomic boundary of division.

The fixed times and seasons for things introduced in the first arguments inform proofs in Book 5, where Lucretius explains the boundaries governing the regularity of celestial phenomena – expressed especially by the phrases *tempore certo* (‘at a fixed time’) and *ordine certo* (‘in a fixed line (i.e. ‘order’)’). This regularity, the basis for central theories in Platonism (the world soul) and Stoicism (the guiding intelligence of the universe), must be explained in Epicurean terms.⁴³³ An especially emphatic example of Lucretius’ approach is his suggestion (5.660-79) that daily sunrises and sunsets might occur when a new sun is born and dies.⁴³⁴ By this theory, dawn’s arrival *tempore [...] certo* (656) would require fires or ‘many **seeds** of heat to flow together **at a fixed time**’ (*semina multa / confluere ardoris [...] tempore certo* (660-1). The keen reader will recall seeds ‘flowing together’ (*confluxerunt*) to create flowers and fruits in 1.176-7, and map seasonal horticultural birth and growth onto the sun. Indeed, among examples analogous to the confluence *certo tempore* (5.667) of seeds of heat, other things

⁴³¹ Lucretius replicates the deed of Epicurus, who triumphantly brought knowledge of *quid possit oriri* (1.75) to man, and therefore sets his reader on a similar path to freedom from fear.

⁴³² Expressed by the metaphor *contingere florem*, which suggests living things reaching sexual maturity – a pre-requisite for reproduction.

⁴³³ For the Platonic view, cf. Pl. *Ti.*, esp. 27c-69a; for the Stoic view, cf. e.g. Cic. *Nat. D.* 1.15.39 and Sen. *Ep.* 65.2.

⁴³⁴ The multiple possible solutions offered correspond to Epicurus, *Ep. Pyth.* 92.

that occur *certo [...] tempore* (5.669) include trees blossoming and dropping their blossom (*tempore certo* – 670; *certo [...] tempore* – 671). He also appeals to our experience of regular events in human lifespans: teeth falling out (*certo [...] tempore* – 672-3), and beards growing in adolescence. Finally, he considers lightning, snow, rain, cloud and winds, which ‘occur in not entirely **unfixed** parts of the year’ (*non nimis incertis fiunt in partibus anni* – 676).

The weight of examples strengthens Lucretius’ unlikely theory. However, they are in fact less rigidly fixed than daily sunrises, and become progressively less fixed as they are introduced. Indeed, the examples do not even occur with the same kind of regularity: trees blossom yearly at more or less fixed times; the advances of age are broadly fixed, but gradual; and certain weather is associated with certain seasons *in general*. Masking such incongruities, the strength of Lucretius’ argument lies in the boundary expressed by the repetition of *tempore certo* and the alternative *non incertis in partibus anni*.⁴³⁵ This is enhanced in the conclusion by a weaving metaphor:

*namque ubi sic fuerunt causarum **exordia prima**
atque ita res mundi cecidere ab **origine prima**
consequiae*⁴³⁶ *quoque iam redeunt ex **ordine certo**.*

(5.677-79)

For since the **first warp** of causes has been so and things have occurred in this way from the **first birth** of the world, the consequences also recur from the **fixed thread**.

Lucretius explains that regular fixed occurrences, such as those addressed just previously, have existed from the world’s birth. The weaving metaphor of fixed threads (*ordo*) proceeding from the first warp (*exordia prima*), or ‘starting border’, of the universe, supports this argument. Anything woven is inseparably connected to the position of the threads, in particular in the starting border.⁴³⁷ The interwoven WEAVING, BOUNDARIES and LIFE-CYCLE threads make the daily creation of a new sun seem less improbable.

Further regular celestial occurrences are explained by these proofs. Two explanations for the progressive lengthening and shortening of days (5.680-704) entail boundaries of time and also place. In one Lucretius posits thicker air ‘in **fixed** regions’ (*certis in partibus* – 696) delaying the sun on its circuitous journey. In the other he modifies the explanation that a new sun is born daily when ‘fires flow together’ (*confluere ignes* – 702) at a fixed time, by suggesting this happens at different speeds (*tardius et citius* – 702), making the sun rise

⁴³⁵ Gale (2009) *ad* 670-4 suggests the regularity is emphasised by the chiasmus of 670-1.

⁴³⁶ This reading, from *OQ*, suggests (perhaps rightly) the notion of fixed cause and effect. Smith (1992) prints Lachmann’s conjecture *consequē*.

⁴³⁷ See pp.38-9, 75.

seasonally ‘in a fixed region’ (*certa de [...] parte* – 703). If the reader has accepted that daily sunrises might occur by fixed confluences of fires, this new proof is not problematic. Next, among explanations for lunar phases, Lucretius suggests moons are born daily in fixed succession (731-50). Although, since firm proof is impossible (727-31), this radical suggestion is one of many equally possible theories,⁴³⁸ in fact previously stated examples of regular occurrences support it. Lucretius asks why ‘a new moon couldn’t always **be born**, with **fixed** shapes in a **fixed row** of forms’ (*nequeat semper nova luna creari / ordine formarum certo certisque figuris* – 731-2), in a daily cycle of one moon dying (*aborisci* – 733) and another being born (*creata* – 733). The language used here recalls the preceding proofs, and Lucretius challenges his reader to disprove the present theory, ‘given that you see many things **born** in so **fixed a row**’ (*ordine cum videas tam certo multa creari* – 736). By mapping the weaving image of 5.677-9, which outlined the *ordine certo* of fixed occurrences from the universe’s first birth, onto the cycle of moons, Lucretius suggests their constant rebirth is an eternal, established phenomenon.

The reader, with a clear knowledge of boundaries informed by previous proofs, can easily understand and accept a fixed sequence of new moons. The BOUNDARIES thread ties together several celestial phenomena in shared processes, strengthening suggestions that solar and lunar eclipses occur when their light is doused *tempore [...] certo* (759) or *certa [...] parte* (769). Again Lucretius concludes that ‘it is less wondrous’ (748) if new moons are born and die *certo tempore* (748, 749), because so many things occur *certo tempore* (750). The BOUNDARIES and LIFE-CYCLE (and WEAVING) threads intertwine in this section to demystify and rationalise celestial phenomena.

Boundaries of motion

The various atomic causes of birth and variety in things, outlined in asyndetic lists (1.633-4, 685; 2.726-7, 896, 1021; 5.438-9) – broadly atomic interaction and motion – constitute the boundaries restricting what can be created from which atoms. In 2.700-29 Lucretius recalls the first arguments to explain that one of the reasons distinct entities exist is because parts of things cannot combine. Instead they are born from ‘**from fixed seeds and a fixed mother**’ (*seminibus certis certa genetrice* – 708), and preserve their *genus* (709) as they grow. Because seeds ‘differ’ (*distent* and *differre* – 725) in shape and in their ‘spaces, paths, interweavings, weights, blows, collisions and motions’, they must create a variety of different, distinct entities – and not just animals (700-17, 727), but also the realms of the

⁴³⁸ On multiple proofs, cf. 5.526-32, 6.703-11; Asmis (1984) 321-30; Hankinson (2013).

world (728-9). The nature of atoms, their movements and interactions restrict what can be born, and boundaries set at birth account for distinct entities.

The limits of atomic motion were introduced in Part 2 Section D in relation to the atomic swerve (2.216-93), which is limited in extent and partially in timing. In the subsequent passage (2.294-307) Lucretius combines his theories of atomic motion, unlimited matter and the unlimited universe to explain another boundary of birth. Because the universe is boundless, and atoms are eternal and unlimited, the overall density of matter remains constant (294-6). Similarly, atomic motions have always been the same and always will be (297-9), so that

[...] *quae consuerint **gigni gignentur eadem** 300*
***condicione** et erunt et **crescent** vique valebunt,*
*quantum cuique datum est per **foedera Naturai.***

(2.300-2)

[...] whatever has been accustomed **to be born will be born by the same terms**, and will be and **grow** and stand strong in strength, as much as is granted to each by the **pacts of Nature**.

Lucretius explains, via the ‘natural laws are boundaries restricting things’ strand of the BOUNDARIES thread (expressed especially here by *foedera* and *condicio*, which usually depicts a socially or legally binding ‘agreement’),⁴³⁹ that the possibilities of motion govern the possibilities of birth. The restrictions on birth also apply to the sum of matter, which remains constant because ‘nothing **increases** and nothing **dies from** it’ (*neque **adaugescit** quicquam neque **deperit** inde* – 296). There is nowhere into which matter could flee (*effugere* – 305) from the sum,⁴⁴⁰ or from where the power ‘to change the nature of things and turn their motions’ (307) could originate. Since atoms are limited in variety and power (as explored in Part 2 Section D), only new forces from outside the universe could alter their motion: the limitless universe disproves this. Motion causes birth, which in turn must also be unchanging, and eternally restricted by the same laws.

Birth and (lack of) boundaries

In addition to boundaries restricting birth, in an opposite but complementary proof, the limitless universe enables birth to occur. This is because (as Part 2 Section D considered) the

⁴³⁹ e.g. a truce (as in Cic. *Inv. rhet.* 2.73, *Att.* 11.12.3; Sal. *Iug.* 112.1; Livy 42.62.3) or a marriage or marriage contract (apparently in Enn. *scen.* 373 War.; also in Plaut. *Trin.* 159; Cic. *Amic.* 34).

⁴⁴⁰ Recalling the spear cast at the boundary of the universe in 1.983. See pp.120-1 for discussion.

limitless universe contains limitless matter and void. If either were limited, things would not be born (1.1014-20).⁴⁴¹ Lucretius expresses this emphatically:

*nam dispulsa suo de coetu materiai
copia ferretur magnum per inane soluta,
sive adeo potius numquam concreta creasset
ullam rem, quoniam cogi disiecta nequisset.* 1020
(1.1017-20)

For the abundance of **mother-substance**, driven out from its own **union**, would be untied and carried across the great void, or for that matter could rather never have **grown together** and **given birth** to anything, since it could not be forced together, having been thrown apart.

If matter were finite in an infinite universe, it could not perform the appropriate 'sexual' unions (*coetu*; cf. *coetus experiundo*, 'by trying out unions' – 1025; *conciliata*, 'married' – 1043)⁴⁴² for birth to occur. Lucretius then (1021-51) describes perpetual atomic motion and union, exemplified by the perpetual flow of rivers, the generative cycle of living things, and the movement of the stars. These rely on an abundance of *materies* supplied 'from the infinite' (*ex infinito* – 1036), since all things are diminished when new bodies cease to be supplied (1038-41). Furthermore, bodies often fail to cohere when they collide (1042-8), and so 'there is a need for an infinite strength of mother-substance from all directions' (*infinita opus est vis undique materiai* – 1051). A careful balance of boundaries governs Lucretius' birth-death cycle, since matter, void and the universe must be unlimited to facilitate birth and growth, which are themselves restricted by several boundaries.

While matter and the universe are unlimited, atomic variety is restricted. These two theories combine to prove that our world is not unique in the universe (2.1048-88), and that Nature creates worlds without divine assistance (2.1090-1104). Lucretius restates, with striking pleonasm, that the universe is infinite:

*principio nobis in cunctas undique partis
et latere ex utroque supra subterque per omne
nulla est finis; [...]* 1050
(2.1048-50)

Firstly, for us everywhere and in all directions, on both sides, above and below through the universe, there is no **limit**; [...]

⁴⁴¹ Assuming that the lacuna between 1013 and 1014 (printed by all recent editors) refers to the impossibility of finite void. An approximation of this argument, supplied by Diels, is supported by Bailey (1947) *ad loc.* and printed by Smith (1992).

⁴⁴² See n.202.

He then emphasises that this totality consists of ‘unlimited space everywhere’ (*undique [...] spatium [...] infinitum* – 1053) ‘and seeds of innumerable number’ (*seminaque innumero numero* – 1054). Together these assertions deny that our world was ‘born’ (*creatum* – 1056) alone, because seeds, being infinite, must have combined elsewhere to make other worlds (1058-66). Logic informed by the knowledge of boundaries can deduce the birth of other worlds, unprovable by observation alone.

This deduction is strengthened by an analogy that there is nothing in the universe that is ‘born unique and grows unique and alone’ (*unica [...] gignatur et unica solaque crescat* – 1078) in its kind (*genere* – 1080). The language brings to mind animals, and a comparison with animals follows: just as no animal is alone in its kind (1081-3), the same must be true of the world, the sun and the moon, which

*non esse unica, sed numero magis innumerali,
quandoquidem vitae depactus terminus alte
tam manet haec, et tam nativo corpore constant,
quam genus omne quod hic generatimst rebus abundans*

(2.1086-9)

[...] are not unique, but rather are **innumerable** in number, seeing that an equally **deeply-established boundary post of life** awaits these things, and they consist of a body that was just as much **born** as every kind of thing here which abounds in individuals **of the same kind**.

The infinite universe must contain innumerable worlds, and these, like animate beings, have a limited lifespan and an inborn (i.e. established at birth) body – both intrinsic entailments of birth. Furthermore, the established boundaries governing matter and *quid possit oriri, quid nequeat* dictate that these worlds must be like ours, containing the same life-forms (1076), since ‘the same power’ (1072) and ‘such abundance of seeds’ (*seminibus [...] tanta [...] copia* – 1070) cause them to be born. The passage recalls 2.532-40, which uses the abundance of each kind of animal to prove the unlimited number of each kind of atom (532-40). The reader, recalling this passage, will more readily comprehend that there are innumerable worlds, limited in variety. Thus Lucretius universalises the concept of ‘limitless abundance, limited variety’, from the atomic to the most macroscopic level.

In Book 6, similar specific cases of abundance are explained by the same arguments. Great clouds form from an abundance of bodies combining in the air. Because these are of ‘innumerable number’ (*innumerabilem [...] numerum* – 485) and they come ‘in all directions’ (*undique* – 492) from the ‘unlimited’ (*infinitam* – 486) universe, a great mass of cloud can form suddenly (489-91). Rain ‘grows together’ (*concrescat* – 495) in these clouds, formed

bodies being broken and transposed – representing death and rebirth.⁴⁴⁵ If fire is the first element, but it dies and is reborn to create new things, what does it die into? If it dies into nothing, then rebirth must occur from nothing (but this is impossible). This recalls the first arguments, both in content and birth terminology, and also in the repetition of *e nilo* (669) and *ad nilum* (673) from the first two principles (1.150 and 1.216 respectively). Again Lucretius has employed his threads to tie two arguments together, as he accounts for the conjecture that, instead of indestructible first-bodies existing, things might change into others.

The important theory that change constitutes death and rebirth is repeated verbatim three further times in the epic. The first of these (1.792-3) is in a similar context, dismissing the Empedoclean theory of four elements. Part of this theory argues that the four elements change into one another (1.782-802) – an impossibility, because rebirth requires ‘something unchangeable’ (*immutabile [...] quiddam* – 790) to remain, so things do not return *ad nilum* (791). The second occurrence of the law (repeating 1.789-93 in 2.750-54) is in the rather different context of proving that atoms are colourless. Because we see that colours change, and atoms themselves cannot change (or ‘die’), atoms themselves must be colourless. The third (3.519-20) occurs within an argument that, because medicine can change the soul, the soul must be mortal.⁴⁴⁶ The BOUNDARIES thread extends across three important proofs: that the primary elements must be unchangeable; that colour must be caused by changed atomic arrangement, not by atoms changing colour; and that the soul must be divisible into first-bodies. The conceptual boundary limiting a thing’s lifespan also denotes the point whose transgression entails death.⁴⁴⁷

LIFE-CYCLE and WEAVING

Part 1 highlighted that the first mention of death in the *DRN* (in 1.57) is expressed by a weaving metaphor, in which the spent force of *Natura* ‘unties’ (*resolvat*) things into their *primordia*. This is picked up in the first arguments of Book 2, in which Lucretius promises ‘I shall **disentangle** by which motion the **generative bodies of mother-substance give birth** to various things and **untie** them again once **born**’ (*quo motu genitalia materiai / corpora res varias gignant genitasque resolvant [...] expediam* – 62-6). The link is made especially by the

⁴⁴⁵ The explanation originates from Epicurus, *Ep. Hdt.* 54, but there the focus is on changing configuration, expressed without a boundaries metaphor. Cf. also 1.1102-13, in which the world’s death is depicted as a departure from the broken *moenia mundi*.

⁴⁴⁶ For the soul’s mortality, see Section D of this Part.

⁴⁴⁷ Segal (1990) 46: for Lucretius ‘death is an invasion of our physical boundaries.’

untied and die, the first-threads remain intact and eternal – otherwise ‘reweaving’ or ‘birth’ would be impossible. By the correspondence between the WEAVING thread and the death strand of the LIFE-CYCLE thread in these prominent arguments, Lucretius urges the reader to consider death as a process of unweaving, and unweaving as constituting death, throughout the epic. This will be particularly important in Book 3, in relation to the soul’s mortality.

LIFE-CYCLE and LIQUIDS

The depiction of things being born from *primordia* and untied into them again at death epitomises Lucretius’ birth-death cycle, as discussed in Part 1. Alongside this intertwining of the LIFE-CYCLE and WEAVING threads, a third thread is central in depicting this key doctrine: LIQUIDS. This is first evident in an image (1.250-64), brilliantly analysed by West,⁴⁴⁹ depicting the cycle of life initiated by rains from *Pater Aether*.⁴⁵⁰ ‘The rains die’ (*pereunt imbres* – 250) when Father Ether has hurled them into Mother Earth’s lap, and in turn plants ‘grow and are made pregnant with produce’ (*crescunt [...] fetuque gravantur* – 253) – a vivid image mapping animal insemination (violent, as West observes), conception and pregnancy onto plants. In turn the human race ‘is nourished’ (254) and animals are too, and so ‘we see flourishing cities **blossoming** with children and everywhere **leaf-bearing** woods sing with **new-born** birds’ (*laetas urbes pueris **florere** videmus **frondiferasque** **novis** avibus canere undique silvas* 255-6).⁴⁵¹ At first glance the passage is simply a vivid depiction of birth, with an expected causative chain of water causing plants to grow, which feed animals and enable them to procreate. However the striking *florere*, which maps plant ‘birth’ onto humans, not only compares children growing in a city to flowers growing on a plant, but also associates water more closely with human growth.⁴⁵² This concept persists in the remainder of the image, in which female livestock lie on the grass while their offspring play. Lucretius depicts the animals lactating (*candens lacteus umor / uberibus manat distentis* – 258-9) and the effect feeding has on their young, who gambol about as though drunk, ‘struck to their young hearts with neat milk’ (*lacte mero mentes percussa novellas* – 261).⁴⁵³ Again Lucretius suggests, as West observes, that the same water from *Pater Aether* feeds young animals as milk.⁴⁵⁴ In this passage, Lucretius suggests, by using the water cycle as pictorial evidence for the

⁴⁴⁹ West (1969) 4-7.

⁴⁵⁰ For the provenance of the image of union between heaven and Earth, see Bailey (1947) *ad loc.*

⁴⁵¹ See West (1969) 5-6 for an illuminating analysis of this image.

⁴⁵² *ibid.* 6 notes the former correspondence, but not the latter.

⁴⁵³ The ‘alcoholic’ effect is expressed particularly by *mero*; see *ibid.* 6-7.

⁴⁵⁴ *ibid.* 6.

transmission of matter from one thing to another, that liquids provide an appropriate model for portraying the cycle of life.

This is summarised in the conclusion to this *exemplum*, which resumes the death image from 250:

*haud igitur penitus **pereunt** quaecumque videntur,
quando alid ex alio reficit **Natura**, nec ullam
rem **gigni** patitur nisi **morte** adiuta aliena.*

(1.262-4)

Therefore anything that seems to does not completely **die**, since **Nature** restores one thing from another, nor does she allow anything to be **born** unless benefitted by another's **death**.

Lucretius has shown that, while birth and death alternate, matter itself perpetuates like water in the water cycle.⁴⁵⁵ Although the liquids imagery of the previous lines has dried up here, the keen reader, with flowing liquids in mind (and with *pereunt* recalling *pereunt imbres* in 250), would envisage the material reality behind the birth-death cycle in these terms. Again Lucretius introduces a theory expressed by a clearly defined metaphor (here the 'flow' of matter within the birth-death cycle) in a prominent and richly poetic passage in order to encourage the reader to envisage the theory in these terms throughout the epic.

It is not, of course, a Lucretian innovation to portray a creative cycle in liquid terms. The image stems from his philosophical predecessors, and a solid theory of the processes causing flux and change is a fundamental cornerstone of any, in particular Presocratic, ancient philosophy. The theory is associated in particular with Heraclitus, especially in the phrase πάντα ῥεῖ, attributed to him (perhaps in paraphrase) by Plato (*Cra.* 402a),⁴⁵⁶ and of particular interest is his analogy (Arius Didymus *ap.* Eusebium *P.E.* xv.20 = fr.214 KRS) between the ever-changing constancy of matter and the river that is the same but constantly flowing with different water. In this image, the river consists of fixed points from which matter has departed and into which matter is yet to arrive. When mapped onto matter in general, these points represent intersections between creation and destruction. As a whole, however, the

⁴⁵⁵ Nichols (1976) 54 suggests the emphasis is predominantly on birth, to suppress the unpalatable concept of death at this early stage of the epic.

⁴⁵⁶ Barnes (1982) 65-69 argues convincingly that this theory was Heraclitus'. The concept of 'flowing' representing perpetual change is also common in Plato, and in *Cra.* 401e-402d he attributes Heraclitus' river paradigm for flux to the names of titans, which are linked to rivers (Rhea and ῥεῖν; Chronos and κρουνός, 'spring'; and Tethys and Oceanus, both bodies of water); for flux in Plato cf. e.g. *Cra.* 411C, 439C; *Tht.* 182C; and Sedley (2003) 99-122, on the Cratylus specifically and Plato more generally. For Plato's and Aristotle's misappropriation of Heraclitus' doctrine, see KRS on Heraclitus, fr.214. In addition to Heraclitus, see Garani (2007) 198-200 for the metaphor of 'flowing' matter in Empedocles and Epicurus.

river remains the same, just as the universe remains constant in its flux. Other predecessors of Lucretius, meanwhile, employ flowing liquids metaphors to describe the coming together of matter – half of the cycle of creation and destruction. For example, συρρέω, ‘flow together’, is applied by Diog. Laert. 9.31 (= KRS 563) to Leucippus’ theory of the formation of worlds, and ῥέω, ‘flow’, is used metaphorically to describe death in Pl. *Phd.* 87D (εἰ γὰρ ῥέου τὸ σῶμα καὶ ἀπολλύοιτο).⁴⁵⁷ The flowing water in these explanations is mirrored by Lucretius’ LIQUIDS thread, and so Lucretius’ metaphor ‘the cycle of creation and destruction is the ebbing and flowing of matter’, marking a convergence between the LIFE-CYCLE and LIQUIDS threads, is firmly rooted in the philosophical tradition.

Therefore, Lucretius, in the introduction to his theory of atomic movement as a cause of creation (2.62-79), states how ‘we perceive everything **flowing**, as it were, through prolonged time’ (*quasi longinquo fluere omnia cernimus aevo* – 69). Lucretius extends the image, arguing that the movement of bodies ‘forces these things to grow old, and those to flourish (*florescere*) in turn’ (74). The keen reader would recall the striking image of *florere* in the similar context of 1.250-64, and map the liquids correspondence in that passage onto this introduction. As there, the flow of atoms is potentially a life-giving or destructive force, depending on the direction of the flow.

This concept is expanded towards the end of Book 2 in a passage explaining that the world was born from a congregation of bodies, which will depart again when it dies (1105-43). The LIQUIDS thread enters in an analogy with living things, which grow to full maturity and subsequently decline by the same process of added and subtracted bodies. The liquids metaphor first depicts the point of decline in living things, which occurs when less is given into the veins than ‘**flows out** and departs’ (*fluit atque recedit* – 1119). This is contrasted with nourishment – the absorption of food into the veins (1122-7) – thus depicting a stream of bodies, either combining to nourish things or flowing out to leave them empty and dying. Lucretius concludes that we must be sure that ‘many bodies **flow out** and depart from things’ (*fluere atque recedere corpora rebus / multa* – 1128-9), and as a result ‘age breaks strength and adult vigour, and **melts** into an inferior state’ (*vires et robor adultum / frangit et in partem peiorem liquitur aetas* – 1131-2). This striking metaphor (perhaps rooted in the Greek τήκω, used of the body wasting away in e.g. Pl. *Resp.* 609C) appropriately continues the liquids metaphor established in the preceding lines to describe a steady flow of bodies pouring from things, causing their decline and, ultimately, death.

⁴⁵⁷ An image also in Soph. *Trach.* 698: ῥεῖ πᾶν ἄδηλον.

The next lines expand the analogy with food dispersed in the veins, to explain why decline follows when growth ceases. The larger or broader something is, Lucretius states, once bodies stop being added to cause growth, ‘the more bodies it **sprinkles** and sends out from itself’ (*plura modo **dispargit** et ab se corpora mittit* – 1135).⁴⁵⁸ Simultaneously the veins absorb food less easily ‘and it is insufficient to replace in the same quantity the vast **flood** [of bodies] it **floods out**’ (*nec satis est, proquam largos **exaestuat aestus*** – 1137).⁴⁵⁹ Owing to this negative balance, ‘therefore they rightly **die**, when they have been made loose-knit **by flowing away**’ (*iure igitur **pereunt**, cum rarefacta **fluendo** / sunt* – 1139-40).⁴⁶⁰ Thus the progression from nourishment and growth to death is described as an increasing and decreasing ‘flow’ of bodies, depicted especially through the image of veins carrying food. The striking etymological figure *exaestuat aestus* suggests waves cast out until none remain (the *ex-* prefix signifying exhaustion),⁴⁶¹ at which point death occurs. Even the niceties of detail fit our comprehension of liquids, since water evaporates more swiftly from a broader pan, just as broader and larger things emit bodies more swiftly. Thus the LIQUIDS and LIFE-CYCLE threads intertwine in a complex web to depict birth, growth and death, with each employed both metaphorically (the flowing of bodies, the ‘melting’ of age) and literally (veins flowing, and the birth, growth and death of living things), and in turn mapped metaphorically onto the world.⁴⁶²

The intake of food is addressed directly in 4.858-76, in relation to hunger, which is caused by a continuous outward ‘flow’ (*fluere* – 860) of bodies – exemplified by liquids excreted by sweating (863) and panting (864). The body again ‘grows loose-knit’ (*rarescit* – 865; cf. 2.1139 above)⁴⁶³ owing to this departure of moisture, which causes pain (866), and so food is sought to fill the gaps, and drink to satisfy ‘whatever parts beg for fluid’ (870-1). In these parts are bodies of heat that ‘bestow fire (*incendia*) on our stomach’ (872), which the fluid ‘extinguishes like a fire’ (*restinguit ut ignem* – 873).⁴⁶⁴ Thus the heat of thirst is ‘washed away’ (*abluitur* – 876) and hunger ‘is filled up’ (*expletur* – 876).⁴⁶⁵ Having read this passage,

⁴⁵⁸ See n.339 on *spargo*.

⁴⁵⁹ *nec satis [...] proquam* indicates both the relative proportion of bodies (*nec satis quam*) and the replacement entailed (*pro*).

⁴⁶⁰ The sense is enhanced by *rarefacta*, an unweaving image marking the point of death, see n.275 on *rarus*.

⁴⁶¹ Frequently expressed in English by ‘out’ or ‘thoroughly’, or by suggesting achievement (each incorporated in *OLD*, *ex-*).

⁴⁶² Section E of this Part will consider the analogy between the human body and the world.

⁴⁶³ For the weaving sense, see n.275 on *rarus*.

⁴⁶⁴ Because water successfully quenches burning thirst, the same remedy is sought by plague victims in 6.1163-77 to quench their burning pain.

⁴⁶⁵ For the liquids sense of *expleo*, see n.340.

the keen reader might map this example back onto 2.1105-43, to expand the liquids metaphor there and reinforce the ‘ebb and flow’ of matter in the world.

When Lucretius returns to the world’s mortality in 5.235-415 he again employs the LIQUIDS thread to depict its growth and decline. First Lucretius depicts the earth diminishing as dust is exhaled into the air (251-4), and as it is washed away by water and rivers (255-6), and increasing as things return to the earth (257-60). Lucretius’ conclusion *terra [...] libatur et aucta recrescit* (260) hints at liquid flux, since *libo* commonly means ‘to pour a libation’.⁴⁶⁶ The Earth, previously described as *Mater Terra* (2.598-9, 998), now receives things at death – emphatically confirming her as the ‘grave of things’ (*rerum commune sepulcrum* – 259), an idea previously hinted at in 2.999-1001.⁴⁶⁷ Lucretius then considers water, in a proof more abundant in visual imagery, terms relating to liquids and flow, and several emphatic rhetorical techniques: an asyndetic triplet (*mare flumina fontes* – 261); pleonasm (*umore novo [...] abundare et latices manare perennis* – 261-2); and synonyms depicting copiousness (*abundare* – 261; *abundet* – 265; *magnus decursus aquarum* – 263), pouring (besides *abundo* and *mano*, we find *percolo* and *remano* – 269; and *fluo* – 271) and water (*umor* – 261, 265, 270; *mare*, *flumen* and *fons* – 261; *latex* – 262; *aqua* – 263, 264; *aequor* – 266; *amnis* – 270; and *liquidus* and *unda* – 272). Through the appropriate paradigm of the LIQUIDS thread, this passage embodies in the reader’s mind the crucial doctrine of ebbing and flowing matter as the basis of creation and destruction in the world.

In typically Lucretian style, the thread spills into the next proof, which depicts the growth and decline of air, and becomes metaphorical. The ‘great **sea** of air’ (*aeris [...] magnum [...] mare* – 276) is increased because it receives ‘whatever **flows** from things’ (*quodcumque fluit de rebus* – 275); but contrarily it must also ‘give birth again’ (*recreet* – 277) to the same things by an outward flow of bodies (*fluentis* – 277), or else all, ‘having been untied’ (*resoluta* – 278), would now be air. Air is constantly born (*gigni* – 279) from things and constantly returning (*reccidere* – 280) to them again, and ‘remains in constant **flow**’ (*adsidue [...] fluere [...] constat* – 280). In 261-72 Lucretius depicted the cycle of water from the sea to the river source and back again. Here, in a clear comparison, bodies return to and flow from the ‘sea’ of air. Thus the process of growth and decline is universalised via the LIQUIDS thread, and, as with the wind/river analogy in 1.271-97, the liquids image makes the invisible air visible. This thread is intertwined with the LIFE-CYCLE (*recreet*, *gigni*) and WEAVING (*resoluta*) threads to depict a threefold process, of birth via the conflux of bodies, and death via the

⁴⁶⁶ OLD, *libo* 1.

⁴⁶⁷ *cedit item retro, de terra quod fuit ante, / in terras, et quod missumst ex aetheris oris, / id rursum caeli rellatum templa receptant.*

unweaving and subsequent flowing away of those bodies. The three threads are introduced in turn in 5.247-280: LIFE-CYCLE (*perire* – 249; *gigni* – 250; *alut auget* – 257; *aucta recrescit* – 260), then LIQUIDS (first by *dispargunt* in 254, before the section on the water cycle) and WEAVING (278). The conceptual threads guide the reader through the proofs in turn and intricately interweave to universalise key doctrines. The passage emerges as a prime example of the threads' centrality to Lucretius' argumentation.

LIFE-CYCLE and PLEASURE

Part 1 and Part 2 Section E introduced three aspects of the PLEASURE thread in Lucretius, namely leading, persuasion and blows. In particular Venus and *voluptas* in the Book 1 prologue were interpreted as instigators of creation through these three aspects, which, as we have seen, Lucretius often employs in sexual or creative contexts. This reading is enhanced by several further passages, where the LIFE-CYCLE and PLEASURE threads intertwine as part of Lucretius' theory of creation. The first of these occurs in Lucretius' second principal argument, that nothing dies to nothing. He denies that time past could have totally destroyed all *materies* (225-38), because if this were the case

*unde animale genus generatim in lumina vitae
redducit Venus, aut reductum daedala tellus
unde alit atque auget generatim pabula praebens?*
(1.227-9)

[...] from where does Venus **lead back** a kind of animal into the light of life according to kind, or, **having been led back**, from where does the skilful earth nourish them and make them grow, providing food, according to kind?

Lucretius describes Venus' role in leading animals to sexual union and subsequent birth, and the perpetuating of their *genus*. The polyptoton *redducit [...] reductum* pointedly recalls the animals led to procreate by Venus in 1.15-20.

This conceptual framework later supports a dismissal of the conjecture that the gods change the seasons and produce things including crops (2.167-83). Instead, 'divine pleasure the **leader** of life **leads**' (*deducit dux vitae dia voluptas* – 172)⁴⁶⁸ men in the direction of pleasure (*suadit adire* – 2.171), and '**charms** them **to propagate** the next generations by the **act of Venus**' (*res per Veneris blanditur saecla propagent* – 173). Here *voluptas* assumes Venus' role of leading and her divinity (*dia*) – re-emphasising the relationship between Venus

⁴⁶⁸ Boyancé (1962) 409 notes the connection with *te sequitur cupide quo quamque inducere pergis* (1.16).

and *voluptas* established in the prologue. There, as considered in Part 1, Venus and *voluptas* represent desire and expected pleasure, and also resultant pleasure. Here the roles of Venus and *voluptas* are transposed, as *voluptas* brings ‘Venus’ (in the form of sexual intercourse), rather than *vice versa*. Again this passage depicts the important theory of pleasure instigating creation by persuasion and leading.

This process occurs not just with animate beings. Among the first arguments (1.174-83), Lucretius states that ‘we see the rose, corn and grapevines poured forth by **persuading** spring, heat and autumn’ (*vere rosam, frumenta calore, / vites autumno fundi suadente videmus* – 174-5).⁴⁶⁹ The verb *suadeo*, also seen in 2.171, recalls the Venus prologue, mapping the persuasion from that context onto plants. This image occurs later in an example within the exploration of the development of farming (5.1361-78), whereby wild fruits were tamed ‘by **tender care** and **persuasive** tilling’ (*indulgento blandeque colendo* – 1369). Lucretius again recalls the prologue, in which Venus strikes *blandus amor* into animals’ hearts, causing them to procreate, and thus reiterates that persuasion – and by association, pleasure – instigates creation.

A further role of pleasure in creation is sexual intercourse, by which conception and subsequent creation occur. This is expressed by the verb *concipio*, which was introduced in the opening address to Venus: ‘since by you every kind of living thing **is conceived**’ (*per te quoniam genus omne animantum / concipitur* – 1.4-5). The term is literal here, and also in Book 4, where it describes wives conceiving (4.1266, 1269),⁴⁷⁰ but is elsewhere applied metaphorically to things in general. In 1.551-55, Lucretius states that each thing is ‘conceived’ (*conceptum* – 555) from unbreakable *materies* – the atomic term enhancing the metaphor of procreation. Later, in 2.544-6, Lucretius asserts that without unlimited *materies* no individual thing (*unica res* – 542) ‘could be **conceived** and brought to birth, nor could it be born, nor, what is more, grow and be nourished’ (*progigni possit concepta, creari / non poterit neque, quod superest, procreare aliq̄ue* – 545-6) – embodying a full scheme of atomic creation from conception to birth and growth. The intended metaphor of *concipio* is emphasised in 5.539-49, which argue that the parts of the world cohere in a joint nature because the Earth was ‘**conceived** from the birth of the world’ (*concepta ab origine mundi* – 548) together with air, just as we are one with our limbs (549). In mapping mortal nature and growth onto the Earth, sexual conception is also applied to the Earth. Conception from atoms

⁴⁶⁹ *suadente* should be taken with all three ablative nouns.

⁴⁷⁰ The word is used elsewhere in a non-sexual context, drawing on its root meaning of ‘to seize together’ (*cum + capio*), in the sense ‘to absorb’: 6.210, 273 (clouds absorbing ‘seeds of fire’); 6.308 (similarly, clouds catching fire), 6.472 (clothes absorbing water), 6.503, 628 (clouds absorbing water), 6.880 (tow catching fire).

dictates that when things grow their nature remains fixed. Thus, the threads of PLEASURE (depicting both the impulse for sexual union, and the act itself), LIFE-CYCLE and BOUNDARIES intertwine to create a scheme of consistent development from pre-creation to death, for both animate and inanimate things.

Pleasure in atomic creation

Building upon the established role of pleasure in instigating the conception and creation of all things, animate and inanimate – the former by sexual union, the latter by the union of atoms – the role of pleasure in atomic creation can now be considered in more detail. The careful reading advanced in Part 2 Section A of the passage on sex in Book 4, in which successful conception relies upon appropriately ordered combinations of compatible *semina* (which simultaneously represent sexual seed and the atoms from which it is formed), revealed that atomic combination can be understood in sexual terms.⁴⁷¹ Similarly, as considered in Part 1 and Part 2 Section E, pleasure can be instilled in things by blows, encouraging them to perform certain actions including joining together in (sexual) union. Since blows are one of the principal aspects of atomic creation (1.633; 2.726; 5.438), again atomic union might be understood in sexual terms. Further aspects of Lucretius' theory of atomic combination can be read in this way, with unexpected results.

In the passage on sex at the end of Book 4, alongside the LIFE-CYCLE thread (which, through the term *semina* in particular, explains the reasons behind successful conception, inherited characteristics and a child's gender) the PLEASURE thread unsurprisingly also occurs. Its role in conception is hinted at first in 4.1218-26, in which Lucretius explains that Venus 'leads forth' (*producit* – 1223; recalling her 'leading' role from the prologue) characteristics from the bodies hidden in the parents' seed. In other words, sexual intercourse facilitates the combination of seed from which characteristics arise and are passed on. Venus, as in the prologue, is not creation itself, but the enabler of creation.

The reading of other passages can be enhanced in this way. In 4.1233-77 Lucretius offers various reasons for failed conception, including how the thickness of the man's *semen* affects its ability to mix with the woman's (1242-7), and, related to this, how compatibility between male and female seed is essential for successful conception (explaining why apparently barren women or infertile men successfully conceive with a new partner). Lucretius' summary is clear:

⁴⁷¹ See pp.62-4.

2.894-6).⁴⁷⁵ Therefore, just as here the configuration of sexual *semina* enables successful cohesion (suggested by the *aptus* in 1258, used elsewhere in a weaving sense of atomic bonding), and appropriate movements are required to help seed combine, so *ordo*, *positura* and *motus* are crucial to atomic cohesion. In contrast, while expected pleasure persuades to sexual intercourse, successful conception is not dependent on the resultant pleasure itself. Therefore, by extending this analogy we might infer that pleasure plays a similar role in atomic creation: it initiates atomic union, but does not itself ensure successful union, which depends upon the appropriate movements, positions, shapes, etc. of atoms.

A further correspondence between sexual and atomic union supports this tentative conclusion. Section E of Part 2 showed that, for Lucretius, blows cause animate things to seek pleasure in the direction of the blow, and therefore initiate desire for the pleasure of sexual union – a sequence evident in the Book 1 prologue, where Venus causes animals to procreate by striking them to the heart. The act of attaining this pleasure involves a ‘blow’ in the form of ejaculation (expressed by *ictus* in 4.1245, 1273). Blows are associated with sexual intercourse elsewhere in Latin, with Juvenal 6.126 employing *ictus* to denote a sexual thrust.⁴⁷⁶ Therefore a sequence emerges, whereby a blow causes desire for pleasure, and in turn the blow that might initiate successful conception.

The terms *plaga* and *ictus* in Lucretius depict bodily blows as a cause for many things, including perception⁴⁷⁷ and dissolution.⁴⁷⁸ They are also frequently applied to lightning (*fulminis ictus*), often drawing attention to results brought by the blow: creating heat;⁴⁷⁹ and causing dissolution (*ictus* – 6.240). Among the most common results of blows, however, are motion⁴⁸⁰ and creation caused by motion⁴⁸¹ – and so blows (*plagae*) are included in the repeated asyndetic list of atomic variables dictating creation and variety in things (1.633; 2.726; 5.438). From these correspondences a sequence emerges, in which blows cause motion, which in turn leads to creative motion and creation itself. Frequently this chain of

⁴⁷⁵ The phrase also occurs in 4.984-6 (expressing how a person’s hobbies and interests enter their dreams) and 5.545 (expressing the relationship between parts of the world).

⁴⁷⁶ See Adams (1982) 145-9 for these correspondences. He also suggests that *tundo*, ‘strike’, might have been used of sexual acts (based partially on *pertundo* in Catull. 32.11, describing the penis striking a hole through clothes). Perhaps *tunditur ictu* (4.1284) – denoting light ‘blows’ causing a man to love a woman – hints at a sexual blow. This reading is tentative, however, since the female is supplying the blow.

⁴⁷⁷ *plaga*: 2.810; 4.263, 703; and *ictus*: 2.808; 4.746.

⁴⁷⁸ *plaga*: 1.528, 583; 2.715, 1111, 1140, 1143; 3.810 (=5.357), 817 (= 5.363); and *ictus*: 1.222, 528, 1055; 2.448, 952; 3.807, 813; 4.934; 5.352, 358.

⁴⁷⁹ *plaga*: 5.1095, 6.309; and *ictus*: 5.607; 6.311, 313, 316.

⁴⁸⁰ *plaga*: 4.188; 6.336, 339, 347, 1003, 1020; and *ictus*: 2.85, 99, 136, 272; 3.429; 6.294.

⁴⁸¹ *plaga*: 1.1025, 1042, 1050; 2.141, 285; 5.188, 423; and *ictus*: 2.241.

blows applies specifically to atoms, for example to depict the creation of the world (1.1021-51) and to deduce the existence of the atomic swerve (2.216-93).

Returning to the Book 1 prologue, it is Venus, representation of *voluptas*, who deals out blows instigating movement. By introducing blows in this context, Lucretius alerts his reader to consider them in the context of pleasure elsewhere in the *DRN*. In Book 4 blows cause desire, which leads to sexual pleasure and conception. Therefore, extending atomic correspondences there, we might imagine blows having a similar effect on atoms: causing a metaphorical 'desire' resulting in atomic 'conception' (i.e. union). Atomic 'blows' have previously been read not in a sexual sense, but as part of Lucretius' military metaphor, describing the 'warfare' of hectic atomic collisions.⁴⁸² Certainly this metaphor is persistent in the *DRN*; however, it does not especially enhance the reader's understanding of how atomic collisions occur, and why a collision might result in combination and resultant growth.⁴⁸³ For this purpose, Lucretius supplies various metaphors from his WEAVING, LIFE-CYCLE and PLEASURE threads. In this context, the PLEASURE thread sits well alongside the military metaphor, since it was an ancient literary commonplace to express love and sexual intercourse in these terms, referring to the blows, wounds and battles of love,⁴⁸⁴ as Lucretius does in the closing section of Book 4.⁴⁸⁵ Alongside the military metaphor, a sexual metaphor can be defined, expressing desire and resulting conception in atomic blows.

The swerve

This surprising reading requires extensive defence, which can be sought in Lucretius' portrayal of the swerve. This is perhaps the most hotly debated and variously interpreted of all Epicurean theories, principally because its longest treatment, in Lucretius 2.216-93, is complex, at times frustratingly compact, and apparently unclearly explained. The theory has

⁴⁸² See Murley (1947) 343-4; Gale (1994) 117-8, and (2000) 232-69.

⁴⁸³ The metaphor may have a more general purpose, for example in 2.323-32, in which, as De Lacy (1964) argues, comprehending atomic collisions by viewing military action from afar is an appropriate metaphor for scientific observation.

⁴⁸⁴ In fact in Latin, as in English, there is a common gestalt metaphor 'love is war' (see Lakoff & Johnson (1980) 49), consisting of multiple corresponding parts. Some of the parts occur in a sexual context in Latin, as listed by Adams (1982) 145-9 (striking), 152 (wounding), 157-9 (wrestling and fighting; killing and dying). Kenney (1970) 380-4 argues that in Book 4 Lucretius satirises the Greek epigrammatic commonplace of wounds of love.

⁴⁸⁵ The arrows of desire or Venus (1052-4; 1278); words cast like arrows, causing jealousy (1137-38); wounds (1048-57; 1070); blows (1050; 1070; 1245; 1285). See West (1969) 94-5, who reads an extensive military simile in 4.1045-60. Brown (1987) 64 argues that such correspondences recall the imagery of erotic poets, which is 'stripped by Lucretius of its normal decorative function and pressed into the service of his relentlessly physical analysis.'

implications for our understanding of the Epicurean position on atomic combination⁴⁸⁶ and free will,⁴⁸⁷ and so its correct interpretation seems crucial.⁴⁸⁸ Yet it is frequently acknowledged that a consensus is far from being reached,⁴⁸⁹ or argued that the theory itself is flawed and resists comprehensive understanding.⁴⁹⁰ Solving these issues will be impossible here, and it will be unnecessary to reject existing interpretations of the swerve, as seems *de rigueur*.⁴⁹¹ Instead, interpretations will be formed by reading the swerve in light of Lucretius' methodology of universalisation by means of conceptual threads and analogy. Tracking the PLEASURE thread will support and expand Bollack's radical interpretation that Lucretius expresses his understanding of the force behind the swerve with a metaphor of 'le Plaisir'.⁴⁹² If correct, this most likely represents a departure from, or at the very least an unexpected presentation of, Epicurus' theory.

Specifically, tracking the PLEASURE thread might provide an alternative interpretation of the connection between the swerve and free will. Lucretius describes the actions of both atomic swerves and our movements by free will in similar terms, perhaps considering them to be caused by comparable processes. This radical reading emerges from a comparison between the portrayal of the swerve in 2.216-50 and 284-93, and free will in 2.251-83. This connection is most clearly evident at the start of the latter passage, in which Lucretius supplies a *modus tollens* deduction: without the swerve, free will would not exist; free will does exist, so the swerve must too. Lucretius describes our ability to break free from fate by our will:

*libera per terras unde haec animantibus exstat,
unde est haec, inquam, fatis avolsa voluntas,
per quam progredimur quo **ducit** quemque **voluptas**,
declinamus item motus nec tempore certo
nec regione loci certa, sed ubi ipsa tulit mens?* 260

⁴⁸⁶ Perhaps intended to improve on Democritus here, in the light of Aristotle's criticism of his theory. See Furley (1967); Sedley (1983) 11; O'Keefe (1996).

⁴⁸⁷ Perhaps partially a response to (Peripatetic, Stoic or Democritean) determinism, for which see Furley (1967) and Sedley (1983), who argues the swerve is only a small part of this response.

⁴⁸⁸ For the opposing view, see Annas (1992) 188.

⁴⁸⁹ O'Keefe (2009) 143: 'The texts on this topic are suggestive and philosophically rich enough to fuel a huge range of views, but sketchy and obscure enough that no consensus has emerged'.

⁴⁹⁰ Long (1984) 61 states 'Obscurities persist, and we cannot rule them out in order to make the theory more palatable or convincing.' Sharples (1996) 65, following Furley (1967), concedes there are 'admitted oddities' in Lucretius' exposition. Annas (1992) is particularly dismissive of the theory's success.

⁴⁹¹ Esp. Annas (1992) ch. 6 and 8; Purinton (1999) 275-94.

⁴⁹² Bollack (1976).

(2.256-60)⁴⁹³

[...] from where exists this free will in living things across the lands, from where, I say, is this will torn from the fates, through which we proceed to wherever **pleasure leads** us, and again we deviate in movement not at a fixed time, nor in a fixed region of space, but where the mind itself carries us?

Here the jingle of *voluntas* (will) and *voluptas* (pleasure) at the end of consecutive lines closely connects them by (probably *faux*) etymological figure.⁴⁹⁴ Specifically, pleasure leads us in a particular direction, but our movement only takes place through will. Strikingly, the atomic swerve of 2.216-54 is mapped onto our movements, as both are described in the same terms: our will allows us to deviate (*declinamus*, cf. *declinare* in 2.221, 250, 253 and *inclinare* in 243),⁴⁹⁵ takes place at unfixed times and in unfixed places (*nec tempore certo / nec regione loci certa* – 259-60, cf. *incerto tempore ferme / incertisque locis* – 2.218-9), and breaks restrictions of fate (*fatis avolsa* – 257, cf. *fati foedera rumpat* – 2.254).

From these linguistic resonances one might infer a causal chain of swerving atoms bringing successive swerves, culminating in the ‘swerve’ of motion by free will. This interpretation has damaging implications, however, since our movements cannot occur by free will, if this itself is caused by the random swerving of soul atoms. In turn, Lucretius’ ethical theory would be compromised, since the chance swerving of atoms, rather than *ratio*, would inform decisions, and his power over his reader’s conversion to Epicurean philosophy would be limited.⁴⁹⁶ Therefore, if the atomic swerve and free will are somehow linked, the relationship must not be causative, so that our will has power over decision-making.

These linguistic resonances may be intended to draw a comparison between the *processes* underlying the swerve and movement by will.⁴⁹⁷ This fits within Lucretius’ methodological approach of universalisation by comparing apparently different processes via shared terminology. The technique is effective enough to link depictions of processes separated by many lines (or even books); here the correspondence is maintained over merely fifty lines. Assuming Lucretius is employing the same universalising approach here, the

⁴⁹³ The manuscripts have *voluptas* at the end of 257, and *voluntas* at the end of 258. Fowler (2002) 324-6 argues convincingly for their transposition.

⁴⁹⁴ Maltby (1991) lists no popular etymologies connecting the words, and Lucretius was probably unaware of the etymological link between them through *volo*. However, as previously noted, it is typically Lucretian to connect words by aural similarity alone (see n.77 in general; p.34 – *ordo-ordior*; p.71 – *primordia-exordia* and *primordia-ordo*).

⁴⁹⁵ As Fowler (2002) *ad loc.* notes, *declino* is used ‘properly of men [...] and often of decisions’. Perhaps, therefore, its application to atoms in 2.221 and 250 surreptitiously introduces the analogy between atoms and humans drawn later – a typically Lucretian technique.

⁴⁹⁶ Long (1984) 61; Sharples (1996) 65; O’Keefe (2009) 148-9.

⁴⁹⁷ See Bollack (1976) 182-3: ‘la structure causale est la même dans les atomes et dans le cœur.’

comparable processes behind the atomic swerve and movements by will must be ascertained. As seen in other instances of universalisation, the process is not explicitly stated here, but must be inferred. Lucretius does not depict a force behind the swerve, but does for movements by will: the initial cause is *voluptas*, which leads us to move by our *voluntas*. Perhaps, therefore, *voluptas* plays a role in the atomic swerve.

At face value this reading seems to imply that atoms are affected by feelings, in this case pleasure, and therefore to contradict the very essence of Epicurean atomic theory. However, perhaps the comparison is less specifically defined, between the process of human will, which is guided at unfixed times and in unfixed places by *voluptas*, and the process of the swerve, by which atoms are guided at unfixed times and in unfixed places by an unspecified remote force. Lucretius' proof, in addition to providing evidence for the swerve by the existence of free will, may also suggest the processes causing them are similar.

This suggestion can be supported by the next passages, which depict two different types of movement: the horse bursting at will from the racing gate (2.263-71); and the forced movement of a person when struck from without (2.272-83). Our will, Lucretius argues (2.257-62), initiates movement in the limbs, by which we progress in whatever direction *voluptas* leads us. A more detailed example (with the connection made by *etiam* – 263) of a horse bursting from the racing gate expands upon this chain: led by (expected) pleasure (of running, or of being unconfined), the horse wants to run, but, even once the gate has opened, it cannot move until the mind has transmitted its will to the limbs.⁴⁹⁸ In contrast, Lucretius provides an example where an external blow forces us to move. In this case we move instantly, because the will does not initiate movement. However, crucially, we can soon regain our desired position, once the will has 'reined in' (*refrenavit* – 276, cf. *refrenatur* – 283)⁴⁹⁹ the substance of our body.⁵⁰⁰ The same process that causes the horse to run enables us to regain our position⁵⁰¹ – therefore, a similar delay occurs between being pushed and regaining our desired position.

⁴⁹⁸ Annas (1993) 69 notes that Epicureans considered certain animals to be responsible agents, and therefore able to reason.

⁴⁹⁹ With *refreno* Lucretius pointedly refers back to the preceding *exemplum* of the horse, perhaps with an intended contrast. There, Lucretius described what happens when the will has (as it were) 'free rein' to act; in the human example the will 'reins in' movement after force. The reader might return, via *refreno*, to the horse example and consider the process involved when a rider reins in his horse against its will. By this connection the two examples can be seen together to explain that both internal will and external force can 'rein in' movement. Thus *refreno* is pointedly used here, rather than, *pace* Smith (1992) *ad loc.*, simply being suggested to Lucretius by the preceding racing context.

⁵⁰⁰ As in the horse example, we infer that the counteracting movement is delayed until the mind's 'reigning in' communication reaches the limbs.

⁵⁰¹ Long (1984) 59.

decide whether we should enact this swerve.⁵⁰⁶ This *voluntas* may follow a rational decision, or an instinct, informed by experience, of whether something will be pleasurable or painful.⁵⁰⁷ The atoms, lacking *voluntas*, simply move in the direction of the unexpressed force that causes the swerve.⁵⁰⁸

If the processes behind free movement and the swerve are comparable, this has consequences for the interpretation of Lucretius' premise that free will would not exist without the swerve. This premise does not imply that the swerve *causes* free will – indeed this would remove human agency from free will – but rather that the swerve is a *necessary condition* for free will to exist.⁵⁰⁹ This swerve, we must infer, occurs in the soul (or specifically the intellect – *ut videas initum motus a corde creari* – 269),⁵¹⁰ and then transfers movement to the limbs, causing us to move.⁵¹¹ However, by our *voluntas* we can control whether or not this transferral occurs.⁵¹² In other words, movement at will is possible because our soul atoms are able to swerve – but our *voluntas* decides whether the swerve is exploited (although the process behind this decision is unclear).⁵¹³ This allows both for the swerve to be random and for human agency through free will to exist. However, it does not allow the swerve to be occasional,⁵¹⁴ since acts of free will would then be infrequent. Frequent swerves, however, would allow our *voluntas* to initiate desired movement at the desired time.⁵¹⁵ With this

⁵⁰⁶ Kleve (1980) 29 suggests *voluntas* puts 'the soul and body in such a state that they only react to some of the swerves.'

⁵⁰⁷ *arbitrium* (281) may represent both of these mental processes, which initiate a return to a desired position, by depicting an instinct instigated partially by our will being compromised, and partially by our experience that being forced to move is rarely beneficial. It cannot mean 'judgement' here, and still less 'moral choice', which Fowler (2002) *ad loc.* indicates is a common sense of the word.

⁵⁰⁸ Purinton (1999) 264, 267.

⁵⁰⁹ See Purinton (1999) 266-7; Fowler (2002) 332; and O'Keefe (2005) 29, who argues we should similarly not 'conclude that Epicureans think that motion is caused or constituted by the void, since the existence of void is a necessary condition for the existence of motion'. In contrast Annas (1992) 184 argues that 'Lucretius' passage suggests that swerves are responsible for free actions rather directly.'

⁵¹⁰ The two form a conjoined entity for Lucretius, who scarcely maintains a distinction between them; see n.230.

⁵¹¹ The soul itself, being fine, is especially susceptible to the swerve. It is unnecessary to infer, with Annas (1992) 187, that swerves only affect the soul, or, with Sharples (1996) 66, to locate the swerve specifically in the nameless fourth part of the soul.

⁵¹² See Kleve (1980) 29 (supported by Saunders (1984) 38): 'the swerves represent forces that can be utilized' – i.e. by the soul or *voluntas*. Purinton (1999) argues, in contrast, that swerves cause volition 'from the bottom up'.

⁵¹³ This supports the Epicurean belief that only reason enables the correct choice between beneficial and damaging desires. Furthermore, moving is later (4.881-91) described in similar terms: images of movement strike the mind, and our mind causes us to enact them – but only when an act of will decides to (*inde voluntas fit; neque enim facere incipit ullam / rem quisquam, quam mens providit quid velit ante* – 4.883-4); see Fowler (2002) 415-9.

⁵¹⁴ As argued by Furley (1967).

⁵¹⁵ Argued by Long (1984) 60 and, somewhat exasperatedly, Annas (1992) 186-7: 'The only way that the theory has a hope of working is on the assumption that swerves are extremely frequent, so as to

reading, the two supporting *exempla* would be more than simple analogies, but rather ‘internalised analogies’ – a favourite Lucretian technique whereby a microscopic process is exemplified by a macroscopic process, which is itself caused by the microscopic process in question. Prominent examples of this technique include the movement of dust motes (2.112-24) and the moving-yet-stationary flock of sheep and army of men (2.308-32), which pictorialise atomic motion, while being internally driven by atomic motion.⁵¹⁶ The latter ‘internalised’ analogy follows shortly after the swerve passages, perhaps highlighting a connection in their shared methodology.

Returning to the force behind the swerve, this is difficult to define, since neither Lucretius nor other Epicurean sources provide an explicit explanation. However, some clues, expressed as facets of the PLEASURE thread, can be found in the *DRN*. An important image in this section is of *voluptas* leading us in a given direction (*quo ducit quemque voluptas* – 258)⁵¹⁷ – part of the PLEASURE thread, in which *voluptas* and Venus are described as leaders.⁵¹⁸ Therefore, returning to the Venus prologue, in which this image is particularly prominent, might prove fruitful.⁵¹⁹ There, as discussed, Venus, metonymy for *voluptas*, exhibits the powers of leading (inciting animate and inanimate things to certain actions), ‘steering’ birth (or, metonymically, *Natura*), and persuading. These powers are carried out by two essential forces: a tangible force, described as ‘striking’, and a remote force, which persuades and leads. Importantly, *Natura*, whom Venus steers, creates things from atoms (1.55-7).⁵²⁰ We might analogously infer that the creative deeds of *Natura* are also instigated by a tangible ‘striking’ force, and a remote ‘leading’ or ‘persuading’ force. This interpretation holds in the depiction of atomic union in Book 2, where atoms move and combine by being struck (atomic collisions) and by being led (the atomic swerve) – just as the human (pushed by an external force) and the horse (led by pleasure) do in the accompanying analogies. The actions of Venus, therefore, might be analogous for both types of atomic movement, and *voluptas*, which Part 1 suggested is synecdoche for Venus in the prologue (representing only her

produce a standard physical condition.’ Fowler (2002) 417-9 stresses that swerves in the mind are more frequent than acts of *voluntas*, and furthermore the swerve usually causes predictable actions, and only occasionally deviations (= free will).

⁵¹⁶ Further examples include 2.700-17, 826-33, 834-41; 3.136-60, 548-57.

⁵¹⁷ Bollack (1976) 176-78 keeps the manuscript reading of *voluptas* in 257 and *voluntas* in 258, but (after Bailey (1947) *ad loc.* and Furley (1967) 174) *libera voluntas* is a more likely expression. Furthermore, *voluptas* frequently occurs as a leader in the *DRN*.

⁵¹⁸ Bollack (1976) 164 notes *dux vitae dia voluptas* (2.172) as an example of *voluptas* the instigator of movement.

⁵¹⁹ Bollack (1976) 176.

⁵²⁰ Brown (1987) 93 considers Venus in 1.20 as ‘metonymy for the sexual instinct’. Considering Venus’ role as steersman of birth (*Natura*) of all things, this would support a sexual reading of atomic combination.

powers of causing pleasure and sexual attraction by leading and persuading), might represent only the attractive 'leading' force behind the swerve.⁵²¹ This reading would surely represent a departure from the standard Epicurean theory of the swerve – but this is not necessarily detrimental to Lucretius. Indeed it outlines a further connection between the movements of atoms and animate things, and suggests that the Venus prologue may be read as a complex analogy for atomic creation.

This analogical reading is complex. However, if Lucretius considered the force behind the swerve as a kind of attraction comparable to *voluptas*, he would be well advised to suppress an explicit link.⁵²² Therefore, perhaps Lucretius' presentation is intentionally obscure, in both its choice of words (such as the deliberately vague *ferme* and *paulum*, qualifying the restrictions on the swerve in 2.218-9) and its connection to the Venus prologue through the PLEASURE thread. Instead of making a direct comparison between the swerve and leading by *voluptas*, Lucretius partially compares the two, and relies on the reader's knowledge of the PLEASURE thread to complete the comparison. The mental process employed here, labelled 'conceptual blending' in cognitive theory, is an everyday function of the brain, which enables comparisons to be made between conflicting or incompatible concepts and scenarios, by partial mapping of each scenario onto an intermediary scenario, known as a 'blend', which can in turn be mapped onto the two scenarios to enhance their meaning.⁵²³ In Lucretius' theory of the swerve, the PLEASURE thread is the blend, merging aspects of atomic movement and animal movement with the role of *voluptas* in attraction, in turn enabling an indirect comparison between the swerve and movement by pleasure, where a direct comparison would be problematic. Whether or not Lucretius succeeds is debatable, and the interpretation advanced here may reveal inadequacies as much as coherence and scientific sense in his theory. Furthermore, Lucretius' brief exposition of this idiosyncratic Epicurean theory does not lend itself to easy, cohesive understanding.⁵²⁴ Nevertheless, Lucretius guides the reader to this interpretation via the strands of the PLEASURE thread prominent in the Venus prologue.

⁵²¹ Bollack (1976) 181 argues on the contrary that an internally formed force causes the horse (and analogously atoms) to move.

⁵²² Compare, for example, the teleological issues created by Charles Darwin's metaphor of 'natural selection', which erroneously implies an active process of choosing evolutionary paths; Young (1985).

⁵²³ For conceptual blending, see especially Fauconnier & Turner (2003). Notably, not all aspects of each scenario must be mapped onto the blend, nor must the blend only consist of aspects mapped from the scenarios. This is the case in Lucretius' presentation of the swerve.

⁵²⁴ This is a frequent concession in arguments on the swerve, see Sharples (1996) 66: 'There does, however, seem to be a relation here between different types of explanation that has not been fully worked out.' Annas (1992) is especially critical of the theory, arguing (p.188) not just that the theory was 'unrefined' in Epicurus, but also that 'it is hard to conclude [...] that the swerve was a good idea'.

Returning at last to the earlier consideration of atomic union in sexual terms, the following reading develops: the attractive force behind the swerve instigates atomic collisions, but these will not result in successful conception and birth unless certain restrictions of *positura*, *conexus* and *motus* are fulfilled; and similarly *voluptas* instigates sexual union, but successful conception depends upon the relative ‘consistencies’ of male and female *semina* – ultimately dictated by the *positura* and *conexus* of their constituent bodies – and appropriate sexual *motus*. In Book 4, therefore, the PLEASURE thread is employed in a literal context to expand upon its previous metaphorical application to atoms, and to reemphasise that all processes are dictated by atoms and their interactions.⁵²⁵ This inverts Lucretius’ usual methodology of establishing a clear metaphor in an atomic context, before applying it literally and metaphorically to other concepts. Here, the sexual metaphor is latent in the atomic context, but clarified by the literal *exempla* in Book 4.

A scheme of creation

The investigation of the arguments formed when the LIFE-CYCLE thread intertwines with the BOUNDARIES, WEAVING, LIQUIDS and PLEASURE threads has outlined a complex scheme of creation. Forces of attraction and collision (part of the PLEASURE thread by association with Venus and *voluptas*) initiate possible atomic combination. Whether or not atoms combine depends on appropriate motions and physical compatibility, in terms of shape and position, to enable interweaving in bonds. Successful combination is successful conception, which brings about birth, or the creation of complex composite bodies. The addition of more atoms, or ‘seeds’, brings growth, and growth is maintained as long as more seeds are added than ‘flow away’, having been ‘untied’. When more bodies depart than are gained, decline occurs, eventually culminating in death as the bodies are all untied from their bonds. The LIQUIDS and BOUNDARIES threads run throughout this scheme. The overall chain of atomic combination, birth, growth and death is conceived as a ‘flow’, with atoms causing growth by flowing together, before things reach a limit of growth, when they decline and die as their atoms flow away. At death, the atoms untie and flow away, marking a convergence of the LIFE-CYCLE, WEAVING and LIQUIDS threads. Finally, every aspect of the chain is governed by boundaries, dictating *quid possit oriri, quid nequeat* and the *finita potestas* restricting all things. Boundaries govern what sort of atoms exist, which atoms can combine to make things, when they can combine and for how long, and how far atoms can swerve to initiate creation; a lack of boundaries enables the

⁵²⁵ Brown (1987) 69 hints at this.

combination of matter in the universe – both of which are infinite; and each entity exists within boundaries, the transgression of which marks the point of death. Throughout this complex network of correspondences, Lucretius applies the threads metaphorically (often to atoms or atomic processes), and literally (often in analogies, or to reinforce the choice of metaphor) to universalise his materialist philosophical theory.

*nec foret omnino caelum neque lumina solis,
quippe ubi **materies** omnis cumulata iaceret 990
ex infinito iam tempore **subsido**.*

(1.984-91)

Besides, if all the space of the whole sum existed **closed in** from all sides by **fixed boundaries**, and if there were a **limit**, by now the abundance of mother-substance would have **flowed together** from all sides to the bottom by its solid weights, and nothing under the roof of the sky could be done, nor could the sky exist at all, nor the light of the sun, when clearly all **mother-substance** would lie accumulated **by sinking** throughout already infinite time.

The image extends established notions of the birth of things from *materies*. We are aware that birth requires an unbounded universe, and atoms able to ‘flow’ together through the void. For example, as discussed (in Section A of this Part), things are born seasonally when seeds ‘flow together’ (1.177; 5.661) at specific times. However, here all atoms (not just those able to combine) have flowed together into a confused mass. The natural atomic qualities of downward movement and pouring through the void combine to prove that the universe must be unbounded, so that matter does not congregate from the bottom up like a liquid filling a container. Lucretius has carefully intertwined the LIFE-CYCLE, LIQUIDS and BOUNDARIES threads in three stages to construct this important proof. This ability of body to fill void space in body forms the basis for several other theories, including the nature of body and soul, the processes of ‘squeezing’ (ἔκθλιψις) and magnetism, and the ethical theory of pleasure – to be considered later in this Part.

WEAVING and LIQUIDS: ease of motion

A further application of the LIQUIDS thread, as discussed in Part 2 Section C, depicts how certain things, in particular atoms, the soul and light, ‘pour’ at speed through the void. Nothing moves as quickly as atoms, as Lucretius proves in 2.142-64, by intertwining the WEAVING thread with this part of the LIQUIDS thread. Although sunlight moves apparently instantaneously, atoms move more quickly through the void, because they move singularly (*singillatim* – 153; cf. *singula* – 2.396, 397) and unimpeded, whereas sunlight meets opposing air atoms, and ‘**beats its way through**, as it were, airy **waves**’ (*aerias quasi dum **diverberat undas*** – 152),⁵²⁹ and its atoms ‘move **intertwined** and **massed together in a ball**’ (*complexa*

⁵²⁹ West’s (1969, p.92) interpretation of *diverberat* as symbolising strenuous swimming strokes is particularly attractive.

meant *inter se* **conque globata** – 154),⁵³⁰ impeding their movement further. Sunlight's speed of pouring is reduced by the intertwined configurations of its constituent atoms.

From this we can infer that anything that moves more slowly than sunlight must consist of atoms intertwined more thoroughly in a mass. This is expressed in 2.381-97, which explains how certain substances pass through the void openings in others. These openings become progressively larger in each example. First, lightning 'flows' (*fluat* – 383) with more penetration than 'terrestrial fire' because it 'consists of **finer texture** and smaller shapes' (***subtilem magis e parvis constare figuris*** – 385).⁵³¹ Next, while light passes through horn, rain 'is spewed back' (*respuitur* – 389), because light consists of 'smaller bodies' (*minora / corpora* – 389-90) than water. In each case, the size of atomic congregations, not of individual atoms, is the focus, since we know from 142-64 that even sunlight consists of atoms intertwined into larger groups, and *subtilis* (385) suggests several threads woven finely together.

Lucretius then turns to visible openings, in a comparison between wine and oil being strained through a sieve (2.391-7). Wine passes through 'as quickly as you like' (*quamvis subito* – 390), while 'slow olive oil lingers' (*tardum cunctatur olivum* – 2.392).⁵³² This is because the oil consists of either 'larger elements' (*maioribus elementis* – 392):

*aut magis hamatis inter se perque plicatis,
atque ideo fit uti non tam diducta repente* 395
*inter se possint primordia singula quaeque
singula per cuiusque foramina permanare.*

(2.394-7)

[...] or ones more hooked and thoroughly **entwined** among themselves, and for that reason it happens that all the single **first-threads** could not be **drawn apart** so swiftly among themselves and ooze through each one's single holes.

As with the preceding examples, *elementa* must refer to atomic congregations, rather than single atoms. These congregations are themselves entangled (*plicatis*)⁵³³ in a jumbled mass,

⁵³⁰ *conглоbo* is not specifically a weaving term, but supports the weaving image here; see n.279 on *conglomerо*.

⁵³¹ For the weaving term *subtilis*, see n.276.

⁵³² The contrast is embodied by a deft transition from a dactyl symbolising the speedy wine to spondees symbolising the slow oil: *pērflüër(e), āt cōntrā tārđūm* (392), an effect echoed by the spondaic fifth foot (*pērmānārē*) in 397.

⁵³³ Lucretius commonly applies three connected verbs to create an image of things either entangled – in the case of *perplicо* (2.394 – oil atoms; 4.828 – limbs; 6.1087 – magnet and iron), and *implicо* (4.1149 – a man and the knots of Venus; 6.1232 – a man and plague) – or being untied – as with *explicо* (2.882 – fire 'unravell'd' from wood). Cf. *OLD*, *plico*, 2, 'to twine, coil' (Verg. *Aen.* 5.279, of snakes, with *nodus*); *explicо* 1 (Cic. *De or.* 1.161, with *vestis*); *implicо* 1, 2, 4 and 5 (of hair (Verg. *Aen.* 4.148, Ov. *Fast.* 5.220); of a spider's web (Plin. *HN.* 11.81)). Compare also *plecto* and its derivatives, see n.271.

owing to their essentially thread-like nature and external hooks.⁵³⁴ Within these congregations of *elementa*, the first-threads cannot be ‘drawn apart’ (*diducta* – suggesting the untying of knots)⁵³⁵ and ooze through the sieve’s holes quickly and singularly.⁵³⁶

This passage expands upon the comparison between the movement of sunlight and single atoms in 2.142-64. Both the oil and sunlight are slow (*tardius* – 156; *tardum* – 392), and their bodies cannot move singularly (*singillatim* – 153; *singula* – 396, 397) because they are intertwined (*complexa* – 154; cf. *perque plicatis* – 394)⁵³⁷. Two striking instances of tmesis strengthen the connection between the passages (*conque globata* – 154; *perque plicatis* – 394). The keen reader, or re-reader, will recognise the extensive correspondence between the constituent structures and movements of these substances. Their structures cannot be equally intertwined, but both are more intertwined than those of the substances they are compared with. By this comparison, Lucretius extends his argument *a fortiori* further: sunlight, although exceedingly swift, must, on account of its intertwined bodies, ‘flow’ more slowly than single atoms, *to a similar degree* as oil, on account of its intertwined bodies, flows more slowly than wine. How quickly a substance moves is directly related to how intertwined its constituent structure is: the more intertwined, the larger the *elementa* and the slower their ‘flow’. This important theory, expressed by the intertwined LIQUIDS and WEAVING threads, will return later in this Part, in relation to sensation, the soul, and various phenomena including lightning and magnetism.

Interactions between substances

Part 2 Section C considered Lucretius’ portrayal of substances flowing across wide void space, and through the void in things. This marks a convergence between the LIQUIDS and WEAVING threads. All things are *rarus* (‘loose-knit’) to an extent (1.347; 6.936), but the ease of liquid movement within them depends both on how interwoven the ‘flowing’ substance is (as with

⁵³⁴ One thinks anachronistically of Velcro here.

⁵³⁵ As in Ov. *Met.* 2.560: *nodosque manu diducit* (‘untied the knots by hand’). Note also the sense ‘cause to come apart’, used of wool in Col. *Rust.* 7.4.5, and of clouds ‘teased out’ like wool by the wind in Lucr. 6.215 (see pp.90-2 for ‘woven’ clouds in Lucretius). The verb appropriately depicts the separating of threads in atomic compounds.

⁵³⁶ Reading *elementa* as a synonym for *primordia* would create the impossibility of visible atoms sticking in the holes of the sieve – suggesting a mistake on Lucretius’ part, as argued by Giussani (1923) *ad loc.* (‘epperò credo che Lucrezio qui non avrebbe inteso che il suo testo epicureo parlava non d’atomi, ma di molecole’) and Bailey (1947) 866 (Lucretius ‘probably misunderstood – not for the only time – his Epicurean authority’), which Smith (1992) *ad loc.* seeks to excuse. Reading *elementa* as ‘groups of atoms’ (as opposed to Giussani’s and Smith’s anachronistic ‘molecules’) absolves Lucretius, and enables the reappraisal of other passages, such as 1.827-9, which contrasts the potential variety caused by rearranged *elementa* and *primordia*.

⁵³⁷ *perplico* and *complector* are etymologically related; see n.271.

From this analogy, Garani states that ‘Lucretius suggests that a body that can be squeezed must have a spongy texture’,⁵³⁹ and argues that Lucretius’ reader, when confronted with other instances of ‘squeezing’ (via the terms *premo* and *exprimo*) in the *DRN*, should ‘bring to mind all the parameters involved in [this] archetypal model’.⁵⁴⁰ This is a legitimate process of inductive reasoning in Lucretius’ methodology of metaphor and argumentation – aided by the established framework of the LIQUIDS thread.

However, it is not necessarily the case that everything capable of being squeezed must specifically be spongy – and one might protest that 4.617-21 is a relatively obscure archetype, being brief and related to a specific, minor doctrine of Lucretius’ philosophy.⁵⁴¹ Additionally, the specific example of a sponge only occurs here in the *DRN*. Instead, an alternative image can be read, supported by Lucretius’ WEAVING thread. In this passage, Lucretius contrasts two types of movement by one substance through another: of flavour being squeezed out of food, and entering through the (relaxed) pores of the tongue. The latter process relies on the tongue’s loosely-woven texture, denoted by *rarus* – a central term of the WEAVING thread⁵⁴² – the former on the food’s ability to be squeezed (presumably on account of its *rarus* texture). With this reading the sponge, as a structure containing void space, is conceptually analogous with any woven substance,⁵⁴³ and Lucretius’ theory of ἔκθλιψις marks a further intersection between his LIQUIDS and WEAVING threads.

Several instances of *premo* and *exprimo* in the *DRN* support a ‘squeezing out the cloth’ metaphor. As Section F of this Part will consider, this supports the explanation of several meteorological and terrestrial phenomena, the reading of which is informed by an explanation (5.416-508) of how the first stages of the Earth’s formation occurred. The bodies of matter arranged themselves in order, starting with those forming the Earth:

*quippe etenim primum terrai corpora quaeque,
propterea quod erant gravia et **perplexa**, coibant 450
in medio atque imas capiebant omnia sedes;
quae quanto magis inter se **perplexa** coibant,
tam magis **expressere** ea quae mare sidera solem
lunamque efficerent et magni moenia mundi;*

⁵³⁹ Garani (2007) 212.

⁵⁴⁰ Garani (2007) 213.

⁵⁴¹ We might compare the ‘movement is pouring through a void’ metaphor, which is introduced in a sustained fashion by analogies of water permeating caves and living bodies, and fish moving through water (see pp.95-7).

⁵⁴² See n.275. Garani’s (2007, p.212) translation of *rarus* as ‘spongy’, although supporting her metaphor, implies that fluid can be similarly squeezed out of the tongue.

⁵⁴³ Elsewhere, roots are similarly used as an image conceptually reminiscent of threads in relation to the soul (3.325) and the world (5.554) – for which see Sections D and E of this Part.

(5.449-54)

Besides, clearly first of all every body of earth, because they were heavy and **entangled**, united in the middle and all seized the lowest resting places; however much more they united, **entangled** among themselves, so much more they **squeezed out** those bodies which would make up the sea, stars, sun and moon, and the walls of the great world; [...]

The weaving term *perplexa*, not especially redolent of a sponge, is strikingly repeated in the same place in 450 and 452, supporting an image of first-threads of earth squeezing out those of other substances.⁵⁴⁴ The more intertwined the congregations of earth become, the more other substances are squeezed out – like a wet cloth being wrung out.⁵⁴⁵ Garani suggests, perhaps rightly, that this image has unintentional ‘teleological implications’, which are made particularly problematic by a perceived connection with the sponge being wrung out specifically by hand in 4.617-21.⁵⁴⁶ If the image of a cloth is intended in our passage, this connection is less clear, as is the accompanying suggestion of a purposeful action behind the process.

Light and ‘filling the container’

Lucretius’ portrayal of light as a fast-flowing liquid, capable of filling void space swiftly and totally, has been considered in Part 2 Section C. Further aspects are brought out by correspondences between the LIQUIDS and BOUNDARIES threads. The ability of darkness to ‘pour’ like light, and similarly fill a container (*complese cavernas* – 4.171), explains why we can see things in the light when we are in the dark, but not vice versa. In the first instance, darkness enters the eyes first (338-9), followed by the light, and, once this ‘has filled’ (*replevit* – 4.344) the eyes, the images of things in the light are seen. In the second instance, light possesses the eyes first, before darkness ‘fills the pores’ (*foramina complet* – 4.350) so images of things in the dark cannot be seen. Light and darkness move so swiftly that they reach and fill our eyes before the images of objects situated in them arrive.

⁵⁴⁴ Compare 5.483-8, which describes the sea as a ‘salt sweat squeezed out of the [Earth’s] body’ (*expressus salsus de corpore sudor* – 487) – an image Arist. *Mete.* 357a25-8 (= DK 31A6) attributes this description of the sea to Empedocles. Aristotle criticises the metaphor as only satisfactory to poetry. Lucretius describes sweat similarly as ‘pressed out from the depths’ (*ex alto pressa*) of the body in 4.862.

⁵⁴⁵ The image persists to depict these bodies ‘flowing away’ to create ether with its ‘liquid bodies’ (*corporibus liquidis* – 499), ‘most liquid’ (*liquidissimus* – 500) in nature, which ‘flows above’ (*influit* – 501) the air, but does not mix its ‘liquid body’ (*liquidum corpus* – 502) with it. Ether is then said to ‘flow’ (*fluere* – 506) like the Pontus, ‘which flows with fixed current’ (*certo quod fluit aestu* – 507).

⁵⁴⁶ Garani (2007) 218.

The threads intertwine later (5.592-603) in an analogy for why such a small sun (roughly the same size as it appears to the eye – 5.564-75) can emit so much light

*quod maria ac terras omnis caelumque **rigando**
compleat et calido **perfundat** cuncta vapore. 595
nam licet hinc mundi patefactum totius unum 597
largifluum fontem scatere atque erumpere lumen,
ex omni mundo quia sic elementa vaporis
undique conveniunt et sic coniectus eorum 600
confluit, ex uno capite hic ut **profluat** ardor.
nonne vides etiam quam late parvus **aquai**
prata **riget fons** interdum campisque **redundet**?*
(5.594-603)

[...] which **fills** the seas and all lands and the sky by **irrigating**, and **drenches** all with warmth and heat. For it may be that from here one **free-flowing fountain**, opened on the whole world, **gushes forth** and light bursts out, because in this way particles of heat from the whole world come together from all directions and their gathering **flows together** in such a way that heat **pours forth** from here from one source. Besides, do you not see how widely a small **fountain of water irrigates** the meadows and sometimes **overflows** in the fields?

The explanation is striking, because the sun is described as a fountain purely metaphorically before the analogy is explicitly drawn in 602-3.⁵⁴⁷ This passage is among the richest metaphorically in the *DRN*,⁵⁴⁸ and its effectiveness depends on the established strand of the LIQUIDS thread applied to light. The passage expands the description of the sun as a ‘fountain of light’ (5.281-3), discussed in Part 2 Section C, to depict the source from which the fountain emanates.⁵⁴⁹ Specifically, the reader, based on their understanding of Lucretius’ ‘filling the container’ metaphor, is invited to envisage light as stored in a tank, perpetually replenished from all around. The sun acts like a valve, which we infer opens only at fixed times, when sufficient ‘liquid’ light has ‘flown together’ (an image later expressed by *confluere* in 5.661, 668 and 702 to explain the regularity of dawn) and filled the ‘tank’, and so bursts through the ‘valve’ and gushes out. This reading relies on a tight network of established correspondences, expressed as a ‘container metaphor’, between the LIQUIDS and BOUNDARIES threads.

⁵⁴⁷ West (1969) 91 sees a negative effect on the analogy: ‘in characteristic Lucretian style, the first argument is expressed in metaphorical terms which anticipate and perhaps even weaken the analogy that follows’. Rather than the analogy being weakened, I argue the metaphor is strengthened by this technique. The sun is not *like* a fountain but *is actually* a fountain, pouring light onto the world below.

⁵⁴⁸ Pope (1949) 74-5 uses the passage to disprove that *confluo* is a dead metaphor when applied elsewhere to the confluence of matter. West (1969) 90-1 considers the imagery of this passage, additionally suggesting that *vapor* here means ‘steam, exhalation, as well as heat’.

⁵⁴⁹ See p.103.

Section C

Sensation

Lucretius' application of the WEAVING and LIQUIDS threads to depict sensory effluences is built upon the explanation, considered in the previous Section, that the free 'flow' of a substance is dictated by how intertwined its structure is. Part 2 introduced the 'fine texture' of these effluences and their 'perpetual flow' from things, and together these weaving and liquids metaphors, as in the depiction of light, explain their speed of movement.

The importance of these metaphors to Lucretius' theory of sensation is evident in the famous awning analogy in which they are introduced. We see many things casting films from their outer surface, and:

<i>et volgo faciunt id lutea russaque vela</i>	75
<i>et ferrugina, cum magnis intenta theatris</i>	
<i>per malos volgata trabesque trementia flutant;</i>	
<i>namque ibi concessum caveai subter et omnem</i>	
<i>scaenai speciem patrum matrumque decorem</i>	
<i>inficiunt coguntque suo flutare colore.</i>	80
<i>et quanto circum mage sunt inclusa theatri</i>	
<i>moenia, tam magis haec intus perfusa lepore</i>	
<i>omnia conrident correpta luce diei.</i>	
<i>ergo lintea de summo cum corpore fucum</i>	
<i>mittunt, effigias quoque debent mittere tenvis</i>	85
<i>res quaeque, ex summo quoniam iaculantur utraque.</i>	
<i>sunt igitur iam formarum vestigia certa</i>	
<i>quae volgo volitant subtili praedita filo,</i>	
<i>nec singillatim possunt secreta videri.</i>	

(4.75-89)

Yellow, red and purple **awnings** also do this habitually when, stretched out in great theatres across posts and beams, they **flow**, fluttering in the public view; for then they **dye** the audience in the cavern below, and all the appearance of the stage, and the finery of the senators and matrons, and force them **to flow** in their colour. And the more the walls of the theatre are enclosed around, the more everything, **flooded** with beauty, laughs in the captured daylight. Therefore since awnings send out **dye** from their outermost body, all things must also send out **fine** semblances, since each casts out from the edge. There are, therefore, now fixed traces of shapes endowed with **fine-textured thread**, which flit about habitually and cannot be seen singularly and separated.

The image is rich, depicting vibrant colours (*lutea russaque vela / et ferrugina* – 75-6; *inficiunt coguntque suo fluitare colore* – 80; the splendour of the crowd – 79),⁵⁵⁰ cast from the awnings and reflecting off the crowds below. While the preceding analogy, explored in Part 2 Section B, depicts ‘woven’ outer layers cast off by animals,⁵⁵¹ here woven linen awnings provide a more appropriate analogy to support the accompanying weaving metaphor.⁵⁵² These awnings were dyed, and probably as natural fibres pre-weaving, so multi-coloured woven patterns could be created – in which case, just as every thread of the awning carries dye, so even the finest film, formed from the awning’s ‘first-threads’ cast from the outermost edge, is imbued with it. With this reading, *fucus* (84) might depict ‘dyed films’ as an example of the *effigiae tenuis* cast from all things. The weaving meaning of *tenuis* and *subtili praedita filo*⁵⁵³ ties the *effigiae* more closely to the awnings and their cast-off *fucus*. The sustained weaving metaphor across these concluding lines clarifies Lucretius’ logic, which would otherwise jump from dye to ‘images’ without explanation.

The weaving metaphor in this passage is supported by extensive liquids imagery, which West skilfully analyses.⁵⁵⁴ In particular, Lucretius states that the colours cast onto the auditorium ‘flow’ (*fluitare* – 80) just as the awnings themselves ‘flow’ (*flutant* – 77) in the wind. By using two near identical verbs (*fluto* being a contracted form of *fluito*),⁵⁵⁵ Lucretius emphasises that the movements of the awnings and the colours in the auditorium are similar, and therefore that the former causes the latter.⁵⁵⁶ The films of colour therefore are understood to move like a liquid, and the auditorium is ‘flooded’ in their beauty.⁵⁵⁷ Deeper metaphorical correspondences pertaining to liquids, beyond West’s interpretation, can be discerned. In describing colour cast from an awning and dyeing the audience below, Lucretius supplies a specific subsidiary image, of liquid sunlight – an established image in the *DRN* – ‘pouring through’ the awning like water and washing out the dye (but scarcely dulling the

⁵⁵⁰ Reading *patrum matrumque decorem* with West (1969) 38-41, who argues that the senators’ white togas and the matrons’ colourful clothing ‘would provide the most striking colour effects under the coloured awnings’, supporting his assertion with well-chosen extratextual comparisons (Verg. *Aen.* 5.340-1; Ov. *Ars am.* 1.93-99).

⁵⁵¹ See pp.85-6.

⁵⁵² Awnings were a recent invention in Lucretius’ time. Q. Lutatius Catulus is accredited with providing the first shading device for Roman spectators in 69B.C. (Val. Max. 2.4.6; Plin. *HN.* 19.6.23), but the first linen awning was apparently introduced by Lentulus Spinther (Plin. *HN.* 19.6.23), presumably during his praetorship of 60.B.C. See Beacham (1991) 67-7 for this and other innovations.

⁵⁵³ A weaving correspondence noted by Snyder (1983) 42. See n.276, 277 for discussions on *subtilis* and *tenuis*.

⁵⁵⁴ West (1969) 38-9.

⁵⁵⁵ OLD, *fluito*. I draw attention to the repetition by translating *flutant* as ‘flow’, in reference to the awnings.

⁵⁵⁶ *ibid.* 39.

⁵⁵⁷ *ibid.*

cloth's colour). This is appropriate to Lucretius' theory of effluences, which, when cast from a given thing, do not seem to diminish it. Thus by the example of dye Lucretius introduces his LIQUIDS thread in relation to sensation. Similar liquid qualities are possessed by Lucretius' sensory effluences, which will later be seen to flow with the swift motion of liquids.

In this complex image, the WEAVING thread persists from the preceding animal *exempla* and is joined by the LIQUIDS thread to introduce the effluences. The passage is a startlingly rich web of complementary and contrasting metaphors, but Lucretius, by employing sustained images and multiple terms from each metaphor, helps his reader to unpick them. By introducing the primary conceptual threads of his theory of sensation in this prominent context, Lucretius urges his reader to understand effluences as 'woven forms flowing from things' throughout the book.

The WEAVING and LIQUIDS threads combine in the passages preceding and following the animal skin and awning analogies. In contrast to the animal skins, which are 'more **interwoven** and crowded together' (*contexta magis condensaque* – 57), diffuse substances like smoke or heat are 'poured out loosened' (*diffusa solute* – 55)⁵⁵⁸ when emitted from things – a crucial image in Lucretius' theory of dissolution. The threads return after the awning image to bookend the analogies, describing the same diffuse substances, which '**flow away, poured out** from things' (*diffusae e rebus abundant* – 91) because '**they are torn up** in the course of their twisting journey' (*scinduntur per iter flexum* – 93)⁵⁵⁹ out of things. Contrarily, a 'skin' of colour, *tenuis* (95) though it is, has nothing in the way 'to tear it up' (*discerpere* – 96),⁵⁶⁰ because it is emitted from the very surface. The finely-woven texture of effluences enables them to 'flow' quickly, but also makes them fragile.

These aspects are repeatedly emphasised in Lucretius' theory of vision. In 4.176-238 Lucretius considers the speed of vision films, introducing the topic as 'what movability has been bestowed upon them in **swimming through** the air' (*quae mobilitas ollis tranantibus auras / reddita sit* – 177-8). He then asserts that light things made from *minutis / corporibus* (183-4) are swift, including sunlight, which is driven on by a constant chain of light following light. We have previously seen that sunlight consists of small 'interwoven' atomic

⁵⁵⁸ Later Lucretius compares the formation of composite images in the air with the formation of clouds. When clouds disperse, they melt (*liquentia* – 4.141), and so images are pictured in the same way, with their dispersal causing them to pour away.

⁵⁵⁹ For the weaving sense of *scindo* and its cognates, see n.270.

⁵⁶⁰ This term is applied to wool in 2.829 (its first occurrence in the *DRN*); E-M, s. v. *discerpo*: 'dans la langue de tissage, <<détirer, démêler brin à brin (la laine, le lin)>>'. The verb can depict anything being pulled apart piece-by-piece, but is appropriately applied to the 'woven' effluences here. See also p.190-1 on Cic. *Tusc.* 1.71, in which *discerpo* is applied to the soul.

congregations, and ‘flows’ quickly through the air. The keen reader might apply these qualities analogously to vision films.

The conclusion of this comparison confirms the connection, asserting that films move swiftly by a similar chain of impulses, and:

*deinde quod usque adeo **textura** praedita **rara**
mittuntur, facile ut quasvis penetrare queant res
et quasi **permanare** per aeris intervallum.*

(4.196-8)

[...] next because they are emitted endowed with such a **loose-knit texture**, so they can easily penetrate any manner of things, and as it were **ooze** through the intervals between the air.

Like sunlight, the films pass through the air like a liquid, because they are only slightly impeded by air atoms (cf. 2.142-64 of sunlight), and, being ‘loose-knit’, they can also penetrate ‘any manner of things’ (as sunlight passes through horn – 2.388). Were the films more tightly woven, they would be impeded or broken up by substances and not seep through. The verb *permanare* recalls the olive oil’s slow progress through a sieve in 2.397, but here suggests that the films, owing to their loose-knit nature, can contract and squeeze between the bodies in air and things. Although *penetrare* does not in itself suggest liquid movement, there is surely an intended comparison between *quasvis penetrare queant res* and *permanare per aeris intervallum*. In this description *aeris intervallum* cannot refer to the gap between the source of the film and the film’s destination, but to the void gaps between air atoms,⁵⁶¹ as it does in reference to sunlight in 4.187.⁵⁶² Vision films penetrate things and move through the air in the same way – by passing through the void space between bodies. We should therefore perhaps envisage both processes as a kind of ‘liquid’ flow, although only one is explicitly portrayed in this way.

Vision films do not only move swiftly but are also formed swiftly (4.143-75). In this explanation the WEAVING and LIQUIDS threads are again prominent, as Lucretius states that something always ‘streams away’ (*abundat* – 145) from the surface of things, and this is

⁵⁶¹ *intervallum* is often accompanied by the genitive of things separated (*OLD, intervallum* 2; *Vitr.* 8.1.7; *Livy* 8.8.9; *Sen. Ben.* 4.19.2) – atoms in our case. It also occurs with the genitive to denote spaces in time *between* events (*OLD, intervallum* 3), e.g. *intervallo temporis* (*Cic. Part. or.* 59), and St. Jerome’s portrayal of Lucretius composing *per intervalla insaniae*, ‘through intervals *between* insanity’ not ‘of insanity’.

⁵⁶² Depicting the intervals within the air through which sunlight passes (simultaneously suggesting resistance caused by intervening air atoms – cf. 2.152, in which sunlight ‘beats through airy waves’). Leonard & Smith (1942) *ad* 4.198 note the difficulty of *aeris intervallum* in 198, stating it is ‘less specific’; however they consider it impossible to apply the meaning from 4.187 here.

proved by mirrors, from which images ‘stream back’ (*redundent* – 154). Indeed, mirrors reflect instantly when placed in front of something,

*perpetuo fluere ut noscas e corpore summo
texturas rerum tenuis tenuisque figuras.*

(4.157-8)

[...] so that you may recognise that **fine textures** and **fine** shapes of things continuously **flow** from the outermost body.

The metaphor of ‘pouring’ explains both the films’ speed and their continuous emission – a correspondence which, as seen in Part 2 Section C,⁵⁶³ is then applied to sunlight (161-7). These lines are also the most emphatic statement of the films’ woven nature, and the keen reader will recall that their finely-woven texture contributes to their speed.

The woven and liquid nature of these films explains why they are sometimes distorted or destroyed when they interact with things. In the same passage, their finely-woven texture makes vision films fragile: one ‘is torn up’ (*scinditur* – 149) when it interacts with stone and timber; whereas a mirror allows them neither to pass through nor ‘to be torn up’ (*scindi* – 153) – the polyptoton emphasising the weaving metaphor. Lucretius recalls the example of stone and timber to explain why voices can leave a closed room but image films cannot – the latter being ‘utterly torn up’ (*perscinduntur* – 601) as they try to leave. However, even effluences of sound cannot always pass through walls undamaged. A voice, on its way through ‘the closed-off parts of a house’ (*clausa domorum* – 612), i.e. those separated by more than one wall,⁵⁶⁴ ‘is blunted and penetrates the ear having been **poured together**’ (*obtunditur atque auris confusa penetrat* – 613), compressing the voice into mere sound (614). The liquids metaphor in *confusa* is activated by the already established liquid ‘flow’ attributed to sensory effluences.

Voices are similarly affected when travelling over distance (557-62), because intervening air causes the words ‘to be poured together’ (*confundi* – 558) and ‘disordered’ (*conturbari* – 559), and as a result the utterance arrives ‘poured together’ (*confusa* – 562).⁵⁶⁵ An additional weaving image is supplied, stating that the utterance is ‘entangled too’ (*inque pedita* – 562), depicting the jumbling of its constituent threads, which we assume its loose-knit nature makes easier. A smell is affected even more, being ‘gradually **drawn out**’

⁵⁶³ See p.105.

⁵⁶⁴ It seems *clausa* marks an intended distinction from single walls, which allow voices to pass through.

⁵⁶⁵ Contrast the moon, which cannot be much larger than it appears, since over a great distance things become ‘poured together’ (*confusa* – 5.580) and lose shape before they lose size.

(*paulatim distractus* – 693) in the air, like threads being pulled from a cloth.⁵⁶⁶ This occurs because the smell is emitted from the depths of a thing (694-7), which was earlier shown to cause effluences to be torn up. Sounds ultimately break up without being heard if the distance traversed is too great, and so when a voice ‘divides itself’ in the air (566) some parts ‘die in vain, **poured out** through the air’ (*perit frustra diffusa per auras* – 569)⁵⁶⁷ before they reach a listening ear – just as spilt water swiftly disperses on contact with a surface. Again a combination of the WEAVING and LIQUIDS threads explains the dispersal of effluences from things.

Lucretius’ description of effluences ‘pouring’ from things creates a possible issue in relation to his theory of flux, which, as Section A of this Part discussed, is also expressed in liquid terms. Lucretius has argued for a constant flow of image films from things, but visual evidence proves that things are not diminished. The reader, from their knowledge of the LIQUIDS thread, should expect this constant flow to cause death. To avoid this impossibility, Lucretius, following Epicurus (*Ep. Hdt.* 47), stresses the fineness of these images – at greatest length, we assume, in the passage missing after 4.126, but elsewhere by the weaving metaphor of the adjective *tenuis*, which depicts the fine *textura* of the films. This allows a constant stream of films with no visible diminution of the source object. Thus the WEAVING thread addresses a contradiction created by the LIQUIDS thread.

Throughout Book 4 Lucretius pointedly expands the WEAVING and LIQUIDS threads from his introductory analogies (4.54-89) to depict the fragility and ‘pourability’ respectively of sensory effluences. This ‘pourability’ increases when the effluences are more loosely interwoven, and even more so when they are fully untied – recalling the portrayals of the speed of sunlight and olive oil in Book 2. Lucretius again highlights the shared processes underlying all movement, by the technique of universalisation, which is enhanced by the conceptual threads. The metaphor of things being ‘untied and poured out’ recalls the destructive element of Lucretius’ theory of flux, and is a central image in Lucretius’ theory of the soul.

⁵⁶⁶ For the weaving sense of *distraho*, cf. 2.827, 231 (of a thread – see pp.70-1) and 5.1421 (of clothing). It is also applied to hair (the same shape as thread) in Apul. *Met.* 8.8. Lucretius applies the term metaphorically to the soul, as Section D of this Part will discuss.

⁵⁶⁷ As in the theory of flux, discussed in Section B of this Part, effluences die when ‘poured out’.

Section D

The Body and the Soul

Part 2 addressed various elements of Lucretius' portrayal of the nature of the soul and its relationship with the body. The LIFE-CYCLE thread depicts the soul as born and therefore mortal; the WEAVING thread explains the interwoven compound nature of body and soul; and the LIQUIDS thread depicts the soul's mobility, attributed to its small round seeds, like those of a liquid. This Section will outline how these threads combine to explain further aspects of the soul and the body, and what happens to each at death. Further applications of each of these threads will be introduced, in addition to facets of the BOUNDARIES thread, revealing the utility of metaphor in theories of the soul,⁵⁶⁸ and showing that Lucretius' threads create a comprehensive scheme for this important element of his scientific and moral philosophy.

The nature of body and soul

Section B of this Part explored the 'container' metaphor, formed from the intertwined BOUNDARIES and LIQUIDS threads, by which a body can contain void in which other body can sit or move. The relationship between body and soul is expressed in these terms in the *DRN*, and indeed the metaphor 'the body is the container of the soul' is established in ancient philosophy. However, while in Plato and the Stoics the body is a temporary container for the immortal soul,⁵⁶⁹ for Lucretius, although the body contains the soul,⁵⁷⁰ the two die together. In order to accommodate this theory he introduces aspects of his WEAVING thread alongside his own container metaphor.

Taking the container metaphor first, Lucretius argues that, just like other things with fixed abodes (3.549-50, 784-7), the soul's 'fixed power' (*certa [...]* / *vis* – 3.746-7) is located in a 'fixed' (*certus*) place within the body (3.98,⁵⁷¹ 548-9, 617-8, 794-5), established at birth (3.618-9). The body is described as the soul's 'covering' (*tegmen* – 3.577, 604) and 'vessel'

⁵⁶⁸ See Pender (2000) 30-6.

⁵⁶⁹ In the *Phaedo*, Plato refers to the soul being 'set free' (the verb ἀπαλλάσσω, and the noun ἀπαλλαγὴ – 64C, 66D, etc.) and 'separated' (the adverb χωρίς and the noun χωρισμός – 66E, 67D) from the body at death, as something released from confines; see Pender (2000) 165-70, 176-81. Cf. Cic. *Tusc.* 1.52: *nam corpus quidem quasi vas est aut aliquod animi receptaculum.*

⁵⁷⁰ Görler (1997) 207 argues that Lucretius' 'body-vessel-analogy' is not metaphorical, but rather depicts the body as a literal vessel. However, this simplifies Lucretius' application of this term, and denies the conceptual depth of metaphor enabled by depicting the body as the soul's vessel. For Lucretius the vessel serves as a gestalt image consisting of multiple metaphorical correspondences.

⁵⁷¹ With the missing line after 3.97 suggested by Bailey (1947) *ad loc.*: *at quidam contra haec falsa ratione putarunt* (combining and amending Diels' and Marullus' suggestions).

reader to find their own explanatory examples, as in 1.400-9, where they should sniff out further proofs like hounds tracking prey. Here he tests his reader's understanding of the conceptual thread of WEAVING by urging them to make their own analogy within its framework – thus consolidating their knowledge of the body and soul as a thoroughly interwoven joint entity.

Lucretius' alternative to the Stoic conception of the body as container for the soul is expressed by two contrasting but complementary metaphors: the container representing the soul's fixed place in the body; the woven *nexus* representing their intrinsic connection. The WEAVING thread clearly marks Lucretius' divergence from the Stoic theory by depicting the shared mortality of body and soul. This image occurs in a description of a faint, in which onlookers fear the worst and hope the sufferer 'regains the **bond** of life' (*vitae reprehendere vinclum* – 599). The image of bonds is used by Plato (*Phd.* 73b3-4) to depict the soul's confinement in the body.⁵⁷⁷ For Lucretius, the bond also represents the interconnection of body and soul, the untying of which constitutes death for both ('a slightly more serious cause could untie (*dissolvere*) [body and soul]' – 602).

This is expressed more fully after the image of the *vas*, in a proof stating that body and soul only exist in union (558-79). Lucretius resumes his analogy with body parts to argue that the eye cannot see when 'torn from its roots' (*avolsus radicibus* – 3.563). The threadlike roots in this image conceptually support the weaving metaphor applied to body and soul,⁵⁷⁸ hinting additionally that neither would survive being torn apart. However, in the subsequent lines this weaving metaphor is suppressed, with the soul described as 'mixed throughout the veins and flesh, throughout the nerves and bones' (*per venas et viscera mixtim / per nervos atque ossa* – 3.566) – a relationship elsewhere expressed in weaving terms, in almost verbatim phrases (with *nexam* – 3.217; with *conexa est* – 3.691). Instead, the mind and soul are described, via the BOUNDARIES thread, as 'held in' (*tenentur* – 567) and 'enclosed' (*conclusa* – 569) by the body, enabling them to transmit motions to it. When mind and soul depart at death these motions cease, 'because, by the same reasoning, they are not **held in**' (*propterea quia non simili ratione tenentur* – 572). The focus, currently on the soul's proper place in the body and its initiation of movement within it – appropriately depicted by the BOUNDARIES thread – shifts in the conclusion:

corpus enim atque animans erit aer, si cohibere

⁵⁷⁷ See Pender (2000) 166.

⁵⁷⁸ Cf. 2.100-4, in which iron and stone are *indupedita suis perplexis ipsa figuris* (102) and consist of *validas [...] radices* (103).

*sese anima atque in eos poterit **concludere** motus
quos ante in nervis et in ipso corpore agebat. 575
quare etiam atque etiam, **resoluto** corporis omni
tegmine et eiectis extra vitalibus auris,
dissolui sensus animi fateare necessest
atque animam, quoniam coniunctast causa duobus.*

(3.573-9)

For air will be body and living, if soul could **hold** itself **together** and **enclose** the motion, which it made before in the sinews and the body itself. Therefore again and again, when the **covering** of the whole body has been **untied** and the vital breath is cast outside, you must confess that the sensation of the soul is **untied**, and the soul too, owing to the conjoined nature of the two.

Lucretius maps the container metaphor onto the air, to create a *reductio ad absurdum* in which the air assumes both the body's role of container and its other qualities – enabling the soul to carry out its usual motions. The WEAVING thread expresses Lucretius' dismissal, stating that the untying of the bodily 'covering' causes the soul to untie too, since the two are conjoined. The boundaries aspect of the container metaphor could not express this important argument alone, and so the WEAVING and BOUNDARIES threads combine to strengthen the argument.

Finally, complementing this correspondence, Lucretius uses the LIQUIDS thread to depict an additional aspect of the body and soul. Since the two form an interwoven mass, this must be porous, owing to the void space between the interwoven first-threads. Therefore, the body allows things to ooze within it, including pain (3.249-55), which can, although not easily, penetrate and 'ooze through' (*permanare* - 252) to the body's depths – and by reaching this far threaten life itself. A similar effect is caused by wine (3.476-86), which is distinguished from other food and drink by its ability to penetrate and confound the whole body. Alongside well-known effects such as sluggish limbs (478-9), a slurring tongue (479), and involuntary noises and coughs (480), Lucretius states that 'the mind is wet, the eyes swim' (*madet mens, / nant oculi* – 479-80). We are to assume that the wine has penetrated this far through the pores in the body.⁵⁷⁹ Like all composite things our bodies consist of interwoven first-threads with void in between, through which other substances can permeate.

The soul's mobility

⁵⁷⁹ The Athenian plague had similar effects (6.1145-62): *fervor* was 'poured out under' (*suffusa* – 1146) the eyes; the throat 'was sweating' (*sudabant* - 1147), the tongue 'oozing' (*manabat* – 1149), with blood; the disease 'had filled' (*complerat* – 1151) the head and 'flooded' (*confluxerat* – 1152) the mind.

Not only can things pour through the totality of body and soul, but, as considered in Part 2 Section C, the soul's swift movement in the body is described as 'pouring', which it does more easily than water owing to its smaller and rounder constituent bodies. In turn its easy movement effortlessly causes the body to move. In Section B of this Part, a thing's loose-knit structure was seen to contribute to its ease of motion. In Book 3 the soul is depicted in both ways, creating a possible contradiction: its swift movement is attributed both to its 'exceedingly fine' (*persubtilem* – 179) – i.e. 'loose-knit'⁵⁸⁰ – nature, and to its 'exceedingly round and exceedingly minute seeds' (*rutundis / perquam seminibus [...] perquamque minutis* – 186-7), the same shape as those in liquids and similarly mobile things like smoke, clouds and flames (*levibus atque rutundis* – 2.451, 258). One might reasonably object to the soul consisting of round bodies in a 'loosely-woven' configuration. However, the liquids metaphor of the former and the weaving metaphor of the latter denote different aspects of the soul: the former its speed, and its ability to fill the body and 'pour' to cause movement; the latter its speed, lightness and fragility. Each metaphor, as with Lucretius' atomic birth and weaving terminology, emphasises certain qualities of the soul that the other suppresses and vice versa; and although the two should perhaps not be taken together, the soul's complex nature cannot be explained without both of them. These images are often applied individually in separate proofs, but here they are sufficiently close together to cause a potential contradiction.

Unweaving body and soul

Part 2 Section B showed that Lucretius considers body and soul as closely interwoven from first birth, and, briefly, that the two die together. The latter is expressed most frequently throughout Book 3 via the intertwining of the WEAVING thread with the death strand of the LIFE-CYCLE thread. As considered in Section A of this Part, anything woven can be unwoven, which is synonymous with dying in the *DRN*. Therefore the woven body and soul are mortal both as a compound and individually. This was seen briefly in the analysis in Part 2 of 3.688-97, where Lucretius states the body and soul are 'so **interwoven**' (*tam contextae* – 695) that they cannot '**untie** themselves safely from all the flesh, bones and joints' (*exsolvere sese / omnibus e nervis atque ossibus articulisque* – 696-7).⁵⁸¹ In fact this recalls 1.809-16, which argues that we require food and water to supply new atoms, or life '**would be untied** from

⁵⁸⁰ In the same passage, honey is said to cohere in a jumbled mass (*haeret enim inter se magis omnis materiai* – 193), because it consists of 'bodies not so fine and round' (*corporibus neque tam subtilibus atque rutundis* – 195) – but rather, we infer, tightly-woven and jagged.

⁵⁸¹ See p.79.

our flesh and bones' (*e nervis atque ossibus **exsoluatur*** – 811), and 2.944-62, in an argument explaining how a blow brings death:

*dissoluuntur enim positurae principiorum
et penitus motus **vitales impediuntur**,
donec materies, omnis concussa per artus,
vitalis animae nodos a corpore **solvit** 950
dispersamque foras per caulas eiecit omnis.
nam quid praeterea facere ictum posse reamur
oblatum, nisi discutere ac **dissolvere** quaeque?*

(2.947-53)

For the **arrangements** of first-things are **untied** and the vital motions are deeply **entangled**, until the mother-substance, shaken up throughout all the limbs, **unties** the **vital knots** of the soul from the body, and, scattered outside, casts it out through the pores. For what else do we reckon the inflicted blow could do, except to shatter and **untie** everything?

The blow unties the body's atoms from their woven pattern, binds up (i.e. 'restricts') the vital motions, and unties the soul from the body. The 'vital knots' conjoining soul and body maintain life, and their untying constitutes death. This passage previews the soul's dissolution before its full introduction in Book 3.

The concept of the soul being untied from the body is in fact employed by Plato, expressed by the term λύσις and the image of the soul 'being freed from the body as from bonds' (ἐκλυομένην ὡσπερ ἐκ δεσμῶν ἐκ τοῦ σώματος) (both *Phd.* 67D).⁵⁸² Plato's metaphor depicts the soul as anchored to the marrow by bonds, which can be untied (*Tim.* 73d5-7), allowing the soul to depart the body fully intact (*Tim.* 81d4-e1).⁵⁸³ For Lucretius, however, untying is a universal process affecting all things down to the atomic level, and so both body and soul are untied at death. The importance of the WEAVING thread for Lucretius' depiction of the soul is proved by the introduction to Book 4, which lists the principal content of Book 3 as: the nature of the soul; the bodies that make it strong (26-7); 'and in what way, **drawn apart**, it returns into its first **threads**' (*quove modo **distracta** rediret in **ordia** prima* – 28).⁵⁸⁴

In Book 3 the metaphor occurs first in the opening arguments for the united nature of body and soul (3.323-416). First a container metaphor describes the soul as 'held' (*tenetur* – 323), and therefore protected, by the body. Then Lucretius supplies a horticultural metaphor, that body and soul 'cling among themselves by roots' (*inter se radicibus haerent* – 325), and

⁵⁸² For Epicurus' varied responses to the theory of the soul in the *Phaedo*, see Warren (2006). For Plato's image of bonds, see p.185.

⁵⁸³ Pender (2000) 167-70.

⁵⁸⁴ For the weaving sense of *distraho*, see n.566.

cannot ‘**be torn apart** without destruction’ (*sine pernicie **divelli** – 326*).⁵⁸⁵ Conceptually this metaphor, as in 3.563 in reference to the eye, recalls Lucretius’ weaving metaphor, implying tearing apart of (first-)threads. Lucretius then gives an analogy with frankincense, from which one cannot ‘tear away’ (*evellere – 327*, continuing the metaphor with etymological figure) its scent ‘without its nature also **dying**’ (*quin **intereat** natura quoque eius – 328*). This mortality applies analogously to body and soul, and Lucretius expresses this correspondence explicitly with a weaving metaphor:

*sic animi atque animae naturam corpore toto
extrahere haud facile est, quin omnia **dissoluantur**: 330
inplexis ita principiis ab origine prima
inter se fiunt consorti praedita vita;*

(3.329-332)

[...] thus it is not easy to **drag** the nature of mind and soul **away** from the whole body without everything being **untied**: with first things **interwoven** in this way from first birth they exist among themselves endowed with shared life; [...]

So established is the synonymous nature of death and untying in the *DRN* that a death term is unnecessary here. Furthermore, by mapping the preceding image of roots onto this deduction, the reader can picture the body disintegrating like the earth when a plant is uprooted.⁵⁸⁶ The triplet *divelli-evellere-extrahere* represents thread-like shapes being drawn from a larger network.⁵⁸⁷ Parallel to this image, the soul is understood to be as intertwined with, and as intrinsic a part of, the body as odour is to frankincense; and, just as ‘tearing’ odour from frankincense (i.e. by burning) destroys the whole, so drawing the threads of soul from the body unties both entities on account of their closely interwoven nature.⁵⁸⁸ The soul dissipates just like the odour of burning frankincense, albeit quicker – as is appropriate for the soul’s exceedingly fine nature. Similarly, later in Book 3 the soul is said to disperse more quickly than smoke (435-9), and in Book 4 the ‘untying’ and dissipation of smoke and smell

⁵⁸⁵ Cf. e.g. Cato *Agr.* 161-2: *asparagum vellito ab radice*.

⁵⁸⁶ A metaphor noted by Leonard & Smith (1942) *ad* 3.310, 325 and 327.

⁵⁸⁷ See n.287 on *vellere* and its derivatives. *extrahere* sometimes depicts the pulling out of thread-like things (Plaut. *Rud.* 984, with *rete*; Cic. *Tusc.* 4.57, with *radices*), but more importantly recalls *distrahere*, whose weaving meaning in an atomic context was proved in the analysis of 2.826-33 (pp.70-1). Compare also *diduco* (see n.535), employed in 3.287 to argue for the unity of the four parts of the soul: ‘**having been drawn out, they would destroy and untie** sensation’ (*interemant sensum diductaque solvant* (3.287)). We might also add *deduco* to this group of verbs depicting the loosening of the soul’s threads, for which see n.591.

⁵⁸⁸ I argue that Lucretius has purposely chosen *evellere* to describe the burning of frankincense in order to bring out this ‘tearing’ correspondence, rather than the more neutral *seiungi seque gregari* used of other inseparable ‘properties’ (*coniuncta*) similar to odour in 1.451-4.

are considered (e.g. 55-6, 90-4), retrospectively strengthening Lucretius' argument for the soul's mortality.

The WEAVING thread persists in the subsequent lines, in which Lucretius contrasts the soul departing the body with water losing heat, by which water is not 'torn apart' (*convellit* – 340, responding to *divelli* and *evellere* in the preceding example).⁵⁸⁹ The body, however, cannot survive 'the soul's **tearing apart**' (*animai / discidium* – 341-2) as it departs. Rather both 'totally **die, having been torn up, and utterly decay**' (*penitus pereunt convulsi conque putrescunt* – 343) because they are conjoined at first birth, 'so **tearing apart** cannot occur without **destruction** and harm' (*discidium ut nequeat fieri sine peste maloque* – 347). There may be a subsidiary weaving metaphor in the image of *contagia* ('contacts' – 345) formed between body and soul in the womb, since these are described as *reposta* ('laid out' – 346), which recalls the weaving sense seen in its cognate terms *dispono* and *dispositura* elsewhere in the *DRN* (and prominently in 1.52),⁵⁹⁰ of warp threads laid out before weaving. The interweaving (or, even without a weaving metaphor, 'conjoining') of body and soul at this early developmental stage would presage the image in 3.370-95 of body and soul interwoven from birth like a single cloth, the untying of which causes the death of the whole.

This correspondence, emphasising Lucretius' opposition to the Platonic and Stoic portrayal of the soul, is extensive in Book 3. In 3.526-46, Lucretius considers a gradually dying man, who feels his sensation fail in certain areas first because his soul 'is torn' (*scinditur* – 531)⁵⁹¹ – thus proving it 'must have a **mortal** nature' (*natura [...] mortalis habendast* – 531-2).⁵⁹² Again, in 3.679-98 body and soul are described as 'so **interwoven**' (*tam contextae* – 695; cf. *adnecti* – 688, *conexa* – 691) that souls cannot enter from without (688-97, answering Pl. *Phd.* 81e2, where souls wander until ἐνδεθῶσιν εἰς σῶμα), and cannot '**untie** themselves' (*exsolvere sese* – 696, answering *Phd.* 67D, discussed above) from the body and leave intact. An echo of Lucretius in Cicero's *Tusculan Disputations* supports the conclusion that Lucretius' stance contrasts with the Platonic and Stoic view.⁵⁹³ In *DRN* 3.634-41, Lucretius states that,

⁵⁸⁹ Because, as Smith (1992) *ad* 3.340 observes, 'heat is an accident, not a property, of water'.

⁵⁹⁰ See discussion pp.34-5, 72.

⁵⁹¹ For the weaving sense of *scindo*, see n.270. Here it is juxtaposed with two further weaving terms: the spirit does not 'draw together' (*conducere* – 534, i.e. its threads) into one place, and 'draw away' sensation from parts of the body (*deducere* – 535, i.e. by 'drawing away its first-threads'). For *deducere* in the sense 'drawing out, spinning out the thread' (*OLD, deduco* 4) cf. Catull. 64.312-3 (with *fila*); Tib. 1.3 (with *stamina*); and Ov. *Met.* 4.36, *Am.* 1.14.7, *Her.* 9.7 (all with *filum*); and E-M, s. v. *dux*, who translate *deduco* as 'tirer de haut en bas (les fils)'.

⁵⁹² See also 3.640-1 (*at quod scinditur et partis discedit in ullas, / scilicet aeternam sibi naturam abnuat esse* – with *scinditur* echoing *discissa* in 639).

⁵⁹³ It is generally agreed that the *magister* character 'M' in *Tusculan Disputations* represents Cicero, although the extent to which his views are represented is unclear: Douglas (1985) 16; Gildenhard (2007) 25-6; Altman (2009). Cicero's own philosophy is difficult to pigeon-hole, since, as Powell (1995)

when the body is severed, the soul ‘having been split [...] and **torn apart** together with the body [...] is scattered’ (*dispertita [...] et discissa simul cum corpore dissicietur* – 638-9).⁵⁹⁴ *Tusc.* 1.71 opposes this view, echoing its linguistic presentation: the soul ‘can neither be divided nor torn apart nor drawn apart’ (*nec dividi nec discerni nec distrahi potest*), ‘because perishing is like the separation and severance and divorcing of the parts’ (*est enim interitus quasi discessus et secretio ac diremptus [...] partarum*). These passages, like *DRN* 3.634-41, contain triplets terms with a *-dis* prefix, each denoting kinds of separation. Furthermore, Cicero’s choice of vocabulary, in particular *discerni*, *distrahi* and *interitus*, is strongly reminiscent of Lucretius, and he corrects Lucretius’ unweaving metaphor by denying the soul can be ‘torn apart’ or ‘drawn apart’. A direct contrast arises between Lucretius’ and Cicero’s (Stoic or Platonic) position, emphasised by their opposing applications of the unweaving metaphor.

In 607-14 Lucretius recalls the gradually dying man of 526-46, to deny that the soul departs intact through the throat, since the man feels his soul fail in a particular region first. An extraordinary image is supplied, arguing that if the soul left intact, ‘it would not complain of being **untied**, but rather of going outside and abandoning its **clothing**, like a snake’ (*non [...] dissolvi conquereretur, sed magis ire foras vestemque relinquere, ut anguis* – 613-4).⁵⁹⁵ Lucretius does not complete the argument, because this image is a sufficiently absurd proposal.⁵⁹⁶ The reader can ascertain multiple correspondences in the analogy by applying reasoning based on their knowledge of Lucretius’ application of the WEAVING and LIFE-CYCLE threads to the body and soul: while the snake’s ‘clothing’ remains intact, the body is untied; while the snake remains alive, the soul does not. This is because an individual is not interwoven with their clothing from first conception, unlike the body and soul, which are untied together at death.

Lucretius summarises these correspondences in one of his last proofs of the soul’s mortality:

quare, corpus ubi interiit, periisse necessest

3 argues, he often examines philosophical theories admirably even-handedly. However, he clearly wished to emulate Plato in *De Republica* and *De Legibus* – and his interest in Platonic philosophy is revealed in his writings on the soul, e.g. in *Somnium Scipionis* (*ibid*, p.6, with bibliography in n.14). For Cicero’s philosophical variety, see also Douglas (1985) 9-12.

⁵⁹⁴ Contrary to Smith’s (1992) translation (‘sundered apart and cleft apart and cut apart’) the verbs denote three different processes: division, tearing and dispersal, united, as Smith notes (*ad loc.*), by their shared *dis-* prefix.

⁵⁹⁵ The image of ‘going outside’ recalls Plato’s ἀποδημία (*Ap.* 41a5; *Phd.* 61e2, 67c1), but denies its additional sense of ‘finding a new home’, for which see Pender (2000) 152.

⁵⁹⁶ For the snake leaving its ‘clothing’ behind, cf. 4.60-1, in which *vestis* is a visual *exemplum* for the films emitted from things.

*confiteare animam **distractam** in corpore toto.*

(3.798-9)

Therefore, when the body **dies** you must confess the soul, **drawn out** throughout the body, **perishes**.

The juxtaposition *interiit, periisse* emphasises the shared mortality of body and soul – a collocation translation cannot capture. Neither body nor soul can survive the ‘unweaving’ of their shared ‘cloth’, because unweaving and death are synonymous.

The association between unweaving and death is exploited in several analogical arguments supporting the proofs of the soul’s mortality. Specifically these are formed by arguments *a fortiori*, that if the soul is injured by diseases or shock, it must be destroyed at death. These arguments are expressed principally by the WEAVING thread, which describes the soul being ‘untied’ (470) by disease. In the specific example of an epileptic fit (3.487-509), the symptoms of shaking and foaming at the mouth occur because the soul is ‘drawn apart throughout the limbs’ (*distracta per artus* – 492) by the disease. The term *distracta* is repeated again in 501 and in the conclusion (507), which argues *a fortiori* that since the spirit can be drawn apart in the body it could not survive in the air after death. The image is of the (threads of) soul being separated, suggesting its fragility. Building upon this image, Lucretius states that a large shock to the body can seem to make the spirit try ‘to depart and be untied from the whole body’ (*ire [...] ac toto solui de corpore* – 594). A faint follows, causing onlookers to hope that the victim can ‘grasp the last **bond** of life’ (*extremum [...] vitae reprehendere vinclum* – 599). A faint unties the soul to the last bond (or, more likely, few bonds), thus closely approaching the full untying of death. Indeed, Lucretius concludes that mind and soul are so shaken ‘that a slightly graver cause could **untie** them’ (*ut gravior paulo possit dissolvere causa* – 602). The soul’s susceptibility to partial unweaving by diseases, shocks and fainting proves it is fully unwoven at death.

Sleep is portrayed in a similar way in 4.907-61. Recalling Lucretius’ explanation of epileptic fits, the soul in sleep is ‘drawn out’ (*distracta* – 916, 946; *distractior* (‘more drawn out’ following a large meal) – 961) throughout the limbs. Contrary to the epileptic fit, in sleep the limbs ‘are untied’ (*dissoluuntur* – 919; *resolvunt* – 953; cf. *solvit* – 6.796; *solvunt* – 6.798)⁵⁹⁷ and the body ‘becomes loose-knit’ (*rarescit* – 865) and limp.⁵⁹⁸ Despite this untying

⁵⁹⁷ Contrary to these metaphors of ‘untying’, Lucretius creates possible confusion by describing children as ‘fastened down by sleep’ (*somno devincti* – 1027) in his description of dreams (4.962-1036). Although the limbs of the body are ‘untied’, the body as a whole is held largely still during sleep, and it is presumably this to which Lucretius refers here.

⁵⁹⁸ A similar description is given by Cicero in *de Divinatione* (44B.C.): *si [...] animus [...] somno relaxatus solute moveatur ac libere* (2.100); cf. also Ov. *Met.* 11.238.

(3.434-9)

Now, therefore, since you perceive **water flowing away** and **liquid** departing when **vessels** are shaken about, and since clouds and smoke depart into the air, believe that the spirit is also **poured out** and **dies** much faster and is **untied** much more quickly into its first bodies, when it has once been carried away and has receded from the limbs of men.

The image of a vessel of water is mapped onto the body and soul, and the latter is in turn compared to cloud and smoke (the *tenuis causae* of 429). Lucretius argues *a fortiori* that, because the soul moves more quickly than water, it must pour out more quickly when it leaves its ‘vessel’; and since it is finer-knit than smoke, it must be ‘unwoven’ more quickly.⁶⁰² In fact the soul unties almost instantaneously,⁶⁰³ whereas smoke merely ‘departs’, suggesting it is not untied as instantaneously. Smoke is later described as being ‘poured out loosened’ (*diffusa solute* – 4.55),⁶⁰⁴ just as the soul is here. Again, pouring and unweaving constitute death.

The images of containers, liquids and unweaving persist in the conclusion:

*quippe etenim corpus, quod **vas** quasi constitit eius, 440
cum cohibere nequit conquassatum ex aliqua re
ac **rarefactum detracto** sanguine venis,
aere qui credas posse hanc **cohiberier** ullo,
corpore qui nostro **rarus magis incohibescit?***

(3.440-4)

Why clearly, since the body, which exists as it were as its **vessel**, cannot, when shaken violently by some other cause and made **loose-knit** by blood **drawn** from the veins, contain it [i.e. the soul], how could you believe it could **be contained** by any air, which **is a container** more **loose-knit** than our body?

An additional deduction *a fortiori* is couched within the one outlined above. The *con-* prefix of *conquassatum* suggests more violent shaking than *quassatis* in 434: if water spills when its *vas* is shaken a little, the soul (being lighter and swifter) must depart much more quickly when its *vas* is shaken violently. In addition, whereas we do not assume that the body from which smoke departs is loose-knit, the soul easily departs the body, which has become ‘loose-knit’ by ‘drawn-out’ blood (*detracto* suggests pulling out thread). Lucretius then offers a further deduction *a fortiori*, that, since the ‘loose-knit’ body cannot contain the soul, the air, being ‘more loose-knit’, certainly cannot. Containers must be tight-knit to hold substances,

⁶⁰² A comparison reiterated in 3.455-6: *ergo dissolui quoque convenit omnem animai / naturam, ceu fumus, in altis aeris auras.*

⁶⁰³ The soul’s unsurpassed speed is also emphasised by the pleonasm *ocius et citius*.

⁶⁰⁴ See p.85.

which otherwise pour out through the void spaces between threads, and are untied. The pourable soul cannot be confined by a body made loose-knit at death, and so it disperses untied into the surrounding air.⁶⁰⁵

Such is the combined nature of body and soul that the bodily container also unties and becomes liquid when the soul pours out at death.⁶⁰⁶ This is summarised emphatically in an argument that the body cannot survive ‘tearing apart’ (*discidium* – 581) from the spirit without ‘**melting away** in foul odour’ (*in taetro tabescat odore* – 581).⁶⁰⁷ There can be little other reason, he says, why the body would decay when the soul ‘has **oozed out, poured out** like smoke’ (*emanarit uti fumus diffusa* – 583), than the body’s structure being compromised ‘by the **oozing** soul’ (*manante anima* – 586). We can conclude that the soul’s woven texture was ‘drawn out’ (*distractam* – 590; cf. 3.798-9, discussed above) before it ‘swam out’ (*enaret* – 591) into the air. In this combined image, we envisage the soul as pouring out gradually at death, with some soul threads remaining partially entangled with the body. These are thoroughly ‘drawn out’, but only fully untied when the entire soul has poured into the air. Together these two proofs emphasise why (as established in 550-7) Lucretius considers the ‘container and contents’ metaphor insufficient for his depiction of the body and soul. The soul is again seen to pour from its bodily container when the latter becomes ‘loose-knit’; however, since body and soul exist closely intertwined, the body is torn when the soul’s threads are ‘drawn out’ at death.

The metaphors of pouring, unweaving and container/contents combine differently to argue that the soul’s mortality is proved by its ability to be healed by medicine:

*addere enim partis aut ordine traiecere aequumst
aut aliquid prorsum de summa detrahere hilum,
commutare animum quicumque adoritur et infit 515
aut aliam quamvis naturam flectere quaerit.
at neque transferri sibi partis nec tribui vult
immortale quod est quicquam neque defluere hilum;
nam quodcumque suis mutatum finibus exit,
continuo hoc mors est illius quod fuit ante. 520*

⁶⁰⁵ Cf. 3.1033: Xerxes ‘poured (*fudit*) his soul from his dying body’.

⁶⁰⁶ Suggested by the sensory organs ‘melting’ when cut off in 3.553.

⁶⁰⁷ The word *tabesco* can refer either to mental or physical decay or, more figuratively, to melting (*OLD, tabesco* 1, 3 and 2 respectively). The conceptual link between decay and melting in this term was already established in Latin (And. *trag.* 17 *War.*; Plaut. *Stich.* 684) and felt by Cicero (*Nat. D.* 2.26). Lucretius also captured the correspondence in *liquor* (see n.574). The first attested use of the noun *tabes* to denote the liquid resulting from melting (*OLD, tabes* 3b) is *DRN* 1.806 (cf. also Livy 21.36.6; Luc. 10.225). The subsequent lines strengthen the liquids sense of *tabesco* here, showing the dissolution of body and soul to be a shared process. This reading is supported by *linquuntur tabe* in 553, which equates rotting with liquefaction.

that food ‘makes another nature out of itself’ (704) when absorbed by the body – an argument recalling the metaphor ‘death is the departure from boundaries’.

This link is drawn further in 3.754-9, where Lucretius restates that immortal souls do not enter bodies at birth. He suggests there is intrinsic false reasoning in arguing

*immortalem animam **mutato** corpore flecti;* 755
*quod **mutatur** enim **dissolvitur**, **interit** ergo.*

(3.755-6)

[...] an immortal soul is contorted by a **change** of body; because that which **is changed is untied, dies** therefore.

Mortality and change are incompatible, because, as discussed in Section A of this Part, change constitutes a departure from boundaries, and therefore death. 756 is repeated from 701 above, but with *permanat* replaced by *mutatur*, confirming that oozing and departing boundaries are synonymous with each other, and with unweaving and death. Furthermore, Lucretius continues, change constitutes altered woven array (*ordine migrant* – 757),

*quare **dissolui** quoque debent posse per artus,*
*denique ut **intereant** una cum corpore cunctae.*

(3.758-9)

[...] for which reason they must also be able **to be untied** through the limbs, so they finally **perish** as a whole together with the body.

The only way change can occur is by unweaving and re-weaving at an atomic level, just as one can alter a cloth only by unravelling it and starting the weaving process afresh. Positing a changeable soul intrinsically implies its mortality, which is expressed via metaphors of oozing, unweaving and transgressing boundaries.

Summary

The LIQUIDS, WEAVING and BOUNDARIES threads intertwine in a carefully balanced relationship in Lucretius’ portrayal of the body and soul. The body is a container for the soul, which is envisaged as a liquid; the liquid soul pours through the body, which is porous or ‘loose-knit’; and the soul and body are a thoroughly interwoven, porous totality. At death, the untying of the soul unties the body, and vice versa; the liquid soul pours from the body, which also melts, and both are fully untied; and the soul in departing transgresses the boundary of its bodily container. In fact, this transgression is of both a conceptual and physical boundary, as expressed in 3.592-606, where Lucretius argues that because the soul is shaken by a faint even when it ‘moves within the **boundaries** of life’ (*finis [...] vitae vertitur intra* – 592), it

could scarcely survive at death ‘with its **covering** removed’ (*tegmine dempto* – 3.604). The soul, in transgressing its bodily container, transgresses the conceptual *finis vitae* restricting its lifespan. The same reading might be applied to 3.548-57, where Lucretius states the soul ‘remains **fastened** in a **fixed** place’ (*loco [...] / fixa manet certo* – 3.548-9) in the body, and, like our other organs, cannot survive if removed (3.549-57, 563-5). Here *fixa*, from *figo*, ‘to fix’ or ‘to drive in’, recalls the *vitae depactus terminus alte* (2.1087) or *alte terminus haerens* allotted to each thing, marking a boundary whose transgression again represents that thing’s death. The human body itself, being a physical boundary to be transgressed, represents the boundary of life. The transgression of one entails the transgression of the other, and the finality of our death is therefore utterly inevitable.⁶¹⁰

⁶¹⁰ See Segal (1990) 94-114.

Section E

The World, the Body and the Soul

A persistent image in the *DRN* maps human physical characteristics onto the world, by which the world can be seen as *makranthropos* (a ‘large-scale human’), a term applied by Schrijvers and subsequently Garani.⁶¹¹ The comparison is especially strong in relation to the Earth’s maternal qualities.⁶¹² Lucretius establishes in the first two books that the Earth, as *Mater Terra*, currently bears plants and nurtures animate beings (1.250-64; 2.594-8, 604-5, 991-8), and bears worms (2.871-2, 898-901, 928-9; cf. also 3.719-36; 5.797-8), and indeed once bore all animals too (2.1151-2). The comparison is outlined in depth in Book 5 – most vividly in depicting animals being born from the Earth (5.795-836), a portrayal Garani labels ‘turning the Earth into a woman’.⁶¹³ Alongside this, the conceptual threads draw a further important correspondence between the mortality of the Earth and of man, creating a strong connection between Books 3 and 5 and reinforcing the reader’s belief in the universal cycle of birth and death.

Section A of this Part considered an analogy, expressed by the LIQUIDS thread, between the ebb and flow of matter from things and the need for animate beings to replenish food in their veins (2.1122-43). This sits within a wider analogy, expressed principally by the LIFE-CYCLE thread, of the world’s growth and decline with that of the human body. The preceding lines (2.1105-21) explain that many bodies have been added to the world from without since its birth, but this increase only happens until ‘no more is now given into the veins of life (*vitalis venis*) than what flows away and passes out’ (1117-8) – signifying the end of growth. The phrase unexpectedly introduces the human analogy in the next lines, that whatever is seen to grow, ‘climbing the steps of adult life’ (*gradus aetatis scandere adultae* – 1123), is receiving more bodies than it gives out (1122-4). The reader’s focus is drawn towards humans, and the analogy is strengthened in the subsequent lines by West’s ‘transfusion of terms’.⁶¹⁴ the analogy flits between human images (*in venas cibus* – 1125,

⁶¹¹ Schrijvers (1977) 95-101; Garani (2007) 71-81. Garani, drawing resonances with Empedocles, considers how Lucretius negotiates the Platonic and Stoic connotations of a human-like world. On the metaphor, see also Schiesaro (1990) 74-83.

⁶¹² Perhaps enhanced by the jingle of *mater* and *terra* in e.g. 2.993, 998; 5.795-6, 821-2; Friedländer (1941) 20.

⁶¹³ Garani (2007) 81-93.

⁶¹⁴ West (1969) 43-8; see n.6 of this thesis. Editors, perturbed by the human terms applied to the Earth in this passage, have attempted to rearrange the line order of the manuscripts. Considered especially suspicious are 2.1146-9, which (as Smith (1992) *ad loc.* summarises) Leonard & Smith (1942) and

quos ubi tempore maturo patefecerat aetas
infantum, fugiens umorem aurasque petessens, 810
convertebat ibi Natura foramina terrae
et succum venis cogebat fundere apertis
consimilem lactis, sicut nunc femina quaeque,
cum peperit, dulci repletur lacte, quod omnis
impetus in mammas convertitur ille alimenti. 815

(5.805-15)

You see, the Earth first gave forth mortal generations at that time; for much heat and **moisture** were ruling **in the fields**. Because of this, wherever a favourable region of space was supplied, **wombs would grow**, tied to the Earth by roots; when the age of infants, when the time was ripe, opened these up, fleeing the **moisture** and seeking the air, **Nature** would develop openings of the Earth there, and force it to pour **sap**, similar to **milk**, from open veins – just as now a **woman**, when she has **given birth**, is filled with sweet **milk**, because all that drive of **nourishment** is directed into the **breasts**.

Lucretius maps the characteristics of a human *mater* onto *Mater Terra*. The biological detail is precise, including the anatomical term *uteri*,⁶¹⁶ the warm and damp environment required for pregnancy,⁶¹⁷ an appropriate gestation period (*tempore maturo*), the change of environment from moisture to air at birth, and the sap similar to milk.⁶¹⁸ In the context *umor in arvis* might be a sexual metaphor, following common Roman sexual metaphors relating the female genitals to fields.⁶¹⁹

The explicitly-drawn analogy with a pregnant woman is aided by an intermediary plants metaphor. Garani considers this in depth,⁶²⁰ and it suffices to summarise her arguments briefly here. The full personification, rather than a simple partial analogy, legitimises the theory that the Earth had wombs.⁶²¹ The concurrent plant imagery, mapped onto the ‘Earth as mother’ analogy, vividly answers the hypothetical question, ‘how would one depict the Earth as a pregnant woman?’. Thus, the connections between the wombs and the Earth (representing the internal connection attaching the womb in the female body) are

⁶¹⁶ Garani (2007) 90 questions the plural, contending that only a ‘monstrous’ mother could have multiple wombs. However, it would be improbable for the Earth to give birth to all animals from a single womb. Lucretius depicts the Earth as being larger, having more ‘limbs’ and producing more offspring than a woman, and so it appropriately has more wombs.

⁶¹⁷ As Garani (2007) 85-6 notes, the spontaneous creation of worms in 5.797-800 is also facilitated by the warm, moist Earth. Conception requires both warmth and moisture, to facilitate sexual intercourse and for producing seed, according to Aristotle ([*Pr.*] 4.5-6). Similarly, for successful gestation, the womb must be warm (Arist. *Gen. an.* 1.12, 719a31) and various fluids must be supplied (*Gen. an.* 2).

⁶¹⁸ For pregnancy, and specifically embryological, cosmological analogies in the Presocratics, see Baldry (1932); Wilford (1968).

⁶¹⁹ For the sexual metaphors of ‘ploughing’ and ‘sowing’, see Adams (1982) 154-5, which quotes Lucretius 4.1107: *atque in eost Venus ut muliebria conserat arva*.

⁶²⁰ Garani (2007) 89-92.

⁶²¹ Perhaps advanced first by Epicurus, although this is disputed; see discussion in Gale (2009) *ad* 808.

described as *radices*,⁶²² and the *sucus* supplied by the Earth for her offspring simultaneously suggests sap and the milk supplied by lactating women. This additional imagery is employed (successfully or not) to make the concept of the Earth as a mother giving birth to animals seem more likely.

In 821-36 Lucretius abandons the plant imagery and resumes the simple analogy between *Mater terra* and *mater humana*. He reasserts that the Earth's maternal designation is apt (*maternum nomen adepta / terra tenet merito* 821-2; cf. 795-6), since she gave birth (*creavit* – 822) to all living things.⁶²³ He then explains her present greatly reduced fertility⁶²⁴ with an analogy with a menopausal woman (thus confirming the intended analogy in 2.1150-2): *sed quia finem aliquam pariendi debet habere, destitit, ut mulier spatio defessa vetusto* – 826-7).⁶²⁵ The Earth ages and is therefore mortal (as expressed in 2.1105-43), and subject to the universal birth-death cycle – as expressed by the antithesis of *namque aliud putrescit et aevo debile languet, / porro aliud concrescit et e contemptibus exit* (832-3).⁶²⁶

Notably, in this description the Earth's 'menopause' is expressed as a boundary – 'a limit of bearing' (826). Similar boundaries are expressed in 2.1105-43, in which the point of decline of things, including the world, is described as ***extremum crescendi [...]*** ***finem*** ('the **extreme limit** of growing' – 1116) and *alescendi summum [...]* ***cacumen*** ('the **highest peak** of growing' – 1130). By this boundary Nature 'reins in' (*refrenat* – 1121) infinite growth. These limits of size recall the impossible giant men of the first arguments (1.199-207) – a further connection between the world and humans. Both are ultimately restricted by the limits of size and variety governing atoms (seen in Part 2 Section D), which dictate what size things can grow to. Again, the BOUNDARIES thread is shown to embody the universal laws governing all things in Lucretius' science. Coupled with the extensive applications of the LIFE-CYCLE thread, the Earth is shown to be subject to the same laws as all composite things. This should strengthen the reader's acceptance of the world's mortality.

The mortality of the world, the body and the soul

⁶²² Garani (2007) 90 denies these represent umbilical cords. However, they are compared to roots (as vehicles for nourishment) by Aristotle, *Gen. an.* 2.4, 740a24-740b13. See also Campbell (2003) *ad loc.*

⁶²³ Garani (2007) 81-2 argues convincingly that this constitutes a firm denial of the Earth's divinity.

⁶²⁴ As mentioned above, Lucretius believed the generation of worms from the soil still occurred in his time.

⁶²⁵ Garani (2007) 92-3 provides an enlightening analysis of this passage.

⁶²⁶ The antithesis is emphasised by the lines' identical metrical form, the elision of a conjunction and *aliud* at the start of each line, the shared position of metrically identical -sco verbs, and the third person singular verbs in the final feet.

The world's place within the universal birth-death cycle is emphasised in particular by the description of the world and its parts as *mortalis* ('mortal') and *nativus* ('born'). These terms, belonging to the LIFE-CYCLE thread, occur frequently in the *DRN* but often in certain specific applications. The adjective *mortalis* and its antonym *immortalis* occur 89 times in the *DRN*, of which 11 describe the world or its parts either directly or by analogy,⁶²⁷ but by far their most common application is to humans, totalling 69 instances (including 19 denoting the soul⁶²⁸ and three the body in Book 3;⁶²⁹ and 5.348 pointedly referring to the body in contrast with the Earth). *nativus*, meanwhile, occurs 12 times, of which eight depict the world or its parts either directly or by analogy,⁶³⁰ and two of the remaining four refer to the soul.⁶³¹ Interestingly, the terms occur together nine times, embodying the birth-death cycle, of which seven refer to the world or its constituent parts either directly or by analogy,⁶³² and another refers to the soul – prominently in the first line of the first argument for the soul's mortality (3.417).⁶³³ The intended comparison between the world and the body and soul drawn by these terms is made clear in the Book 5 prologue, which recaps the principal topic of Book 3 – that the soul 'was born and consists of body **that had birth**' (*nativo [...] consistere corpore creata* – 60) and has a finite lifespan (59-61) – before introducing the focus of Book 5 – that 'the world consists of **mortal** body and **had birth**' (*mortali consistere corpore mundum / nativomque* – 65-6).⁶³⁴ This correspondence, expressed by the LIFE-CYCLE thread, draws attention to the general comparison between the world and the human body, addressed at length in the book.

The comparison is resumed emphatically in the first argument that the world is mortal (5.235-46). Lucretius argues, *pars pro toto*, that because the world's constituent parts (Earth, water, wind and heat – 235-6)⁶³⁵ 'consist of a body born and mortal' (*nativo ac mortali corpore constant* – 238), the whole must be mortal too.⁶³⁶ A broad comparison is

⁶²⁷ *mortalis*: 5.65, 248, 238, 248, 321, 377; 6.43 (of the world); 5.241, 243 (animal analogies with the world) and 5.348 (human analogy with the world); *immortalis* (in denial): 5.159 (of the world).

⁶²⁸ *mortalis*: 3.417, 423, 512, 521, 532, 543, 668, 767, 831; *immortalis* (in denials): 3.612, 624, 670, 715, 748, 755, 775, 778, 804, 819.

⁶²⁹ *mortalis*: 3.778, 799, 804.

⁶³⁰ 2.1088; 5.66, 238, 321, 376; 6.44 (of world); 5.241, 243 (analogy with world).

⁶³¹ 3.417; 5.60.

⁶³² 5.65-6, 238, 241, 242-3, 321, 376-7; 6.43-4 (this instance in a recap of Book 5).

⁶³³ The only other occurrence relates to Empedocles' four elements (1.755), to mark a contrast with the *immortale corpus* of Lucretius' atoms (cf. also *mortalis* used of Anaxagoras' *homoeomeria* – 1.855).

⁶³⁴ Bailey (1947), Costa (1984) and Gale (2009), all *ad loc.*

⁶³⁵ A surreptitious link with the soul (*anima*) may be intended in the pleonastic *aurarum [...] animae* ('breezes of wind – 236).

⁶³⁶ Further terminology of the LIFE-CYCLE thread supports this: the air receives particles and 'gives birth to them again' (*recreet* – 277) – allowing them to form new things; the sky never stops 'being born' from things and returning into them again (*haud igitur cessat gigni de rebus et in res / reccidere* – 279-

then drawn with ‘things’ in general, which, because their ‘parts and limbs’ (*partis et membra* – 240) consist of ‘born body and mortal shapes’ (*corpore nativo ac mortalibus [...] figuris* – 241), must themselves be ‘mortal and born as well’ (*mortalia [...] nativa simul* – 242-3).⁶³⁷ This implicitly recalls the arguments in Book 3 that the soul, if mortal in parts, must be mortal as a whole (see Section D of this Part). The connection is supported by *membra* in 240,⁶³⁸ drawing a subtle personification supported by *mortalia* and *nativa*. In 5.318-23 Lucretius states that the sky consists of *nativo ac mortali [...] corpore* (321) and, like the Earth, gives birth to things (*procreat* – 319), makes them grow and nourishes them (*auget alitque* – 322), and even receives things when they are destroyed – recalling the image of the Earth as *commune sepulcrum* in 5.258-60. These similarities, supported by *nativus* and *mortalis*, guide the reader to recall the Earth and, by analogy, the body and soul.

The reader should keep this analogy in mind, since it soon returns in an argument (5.338-50) that if previous disasters have struck the world, it must be mortal.⁶³⁹ This is because a greater disaster than (possible) previous floods or fires would be sufficient to destroy the world entirely. Lucretius concludes:

*nec ratione alia mortales esse videmur,
inter nos nisi quod morbis aegrescimus isdem
atque illi quos a vita Natura removit.* 350
(5.348-50)

Nor by any other reasoning are we seen to be **mortal**, when in turn we grow ill from the same diseases by which Nature has **removed** others from life.⁶⁴⁰

80); and the light of the sun is renewed in constant supply, so there never seems to be a break and the ‘death’ (*exitium* – 301) – i.e. departure – of one light beam ‘is hidden by the swift birth’ (*celeri celatur origine* – 301) of another. In the latter example, the perpetual cycle of creation and destruction is emphasised by the tmesis *nec loca lux inter quasi rupta relinquit* (299) and *radios inter quasi rumpere lucis* (287). For this technique in Lucretius, see Hinds (1987) 450-3.

⁶³⁷ Cf. 5.318-23, in which the sky is said to consist of *nativo ac mortali [...] corpore* (321) because, like the Earth in 5.258-60, it gives birth to things (*procreat* – 319) and receives them again when they are destroyed (*perempta* – 320), and must be diminished (*diminui* – 323) and reborn (*recreari* – 323) in the cycle of growth, nourishment (*auget alitque* – 322) and death of things.

⁶³⁸ See Garani (2007) 75-81 on Lucretius’ use of *membra* in relation to the world.

⁶³⁹ The use of the term *exitium* (344) to describe the world’s inevitable ‘death’ has mortal connotations, supported by the preceding lines that offer proofs that the world had a ‘birthday’ (*genitalis origo* – 324), and that this was recent (*habet novitatem summa recensque / naturast mundi* – 330-1) – proved by the lack of poems sung about civilizations before Thebes and Troy. This latter assertion seems to contradict Lucretius’ account of the world’s creation and his history of man, who evolved over time (5.925-1457). Perhaps Troy and Thebes were the first civilisations of man with deeds worthy of poetic tales.

⁶⁴⁰ Segal (1990) 57 suggests the root ‘birth’ sense of *Natura* is activated by juxtaposition with *a vita* here, together embodying the birth-death cycle.

The reader is by now attuned to analogies between the Earth and the human body. However, this one is loosely made. Lucretius' argument that a single world suffers afflictions of differing gravity is supported by an analogy involving multiple human individuals suffering the same diseases. The reader must perhaps supply additional information to the human example – namely that although we suffer light illnesses and survive, we know stronger illnesses are fatal, and therefore we are mortal. This argument occurred in 3.592-606, that since we know shocks affect the soul, a greater shock would be fatal. The connection seems difficult for the reader to follow. However, in the argument directly following ours – that eternity is a quality only possessed by atoms, void and the sum of things – 5.351-63 repeat 3.806-18 almost verbatim, following which Lucretius argues (3.819-29) that the soul cannot be immune to destruction like atoms, void and the universe, because it is susceptible to disease.⁶⁴¹ The keen reader (and re-reader), guided by the LIFE-CYCLE thread and its application to the Earth and the human body, might recall the correspondences with the soul in Book 3 and map them onto the analogy of 5.348-50. In turn, the conclusion (364-79) that the world is mortal, and therefore its parts must be *nativa* (376) and consist of *mortali corpore* (377), by analogy strengthens the reader's belief in the soul's mortality.

The other principal way in which the world and the body are compared is in their internal structure. This is hinted at by the LIFE-CYCLE thread in an image considered in Part 2: the Earth and the sky live as a composite just as they did when they were first conceived (*prima concepta ab origine* – 5.548; *ex ineunte aevo* – 5.555). This recalls the nature of body and soul, which live 'with first-bodies interwoven **from first birth**' (*inplexis [...] principiis ab origine prima* – 3.331). Here the WEAVING thread depicts the body and soul's combined nature, and this is echoed by Lucretius' description of the parts of the world.

In 5.534-64 Lucretius explains that the earth rests in the middle of the world because it is 'conjoined and **bound** as one' (*coniuncta atque uniter apta* – 537; repeated in 555 and 558)⁶⁴² with the air. The weaving meaning of *apta* is strengthened by a neighbouring metaphor, that the earth and sky 'cling together among themselves by shared **roots**' (*communibus inter se radicibus haerent* – 554). This image, conceptually reminiscent of entangled threads, is applied (as we saw in Section D of this Part) in 3.325 to the relationship between the body and the soul (with the implicit weaving image supported by *divelli, evellere*,

⁶⁴¹ The soul's susceptibility to disease as a proof for its mortality is common in Book 3 (459-78, 487-509, 510-25).

⁶⁴² The elisions emphasises the conjoined nature, as with *anima atque animus* (and its variations) discussed in n.230.

extrahere, dissoluantur and *inplexis* nearby).⁶⁴³ The keen reader would notice this resonance and map the interwoven nature of body and soul onto the Earth and the air. Lucretius confirms the intended analogy:

*nonne vides etiam quam magno pondere nobis
sustineat corpus tenuissima vis animai
propterea quia tam coniuncta atque uniter apta est?*
(5.556-8)

Do you not see also how the **finest** strength of soul holds up our body with its great weight, for the reason that it is so conjoined and **bound** to it as one?

The analogy is strengthened by the weaving metaphor of the repeated phrase *coniuncta atque uniter apta*, and *tenuissima*, an adjective frequently applied by Lucretius to the soul. The connection is in fact drawn in the bridging section (5.91-109) between the Book 5 prologue and first arguments, in relation to the seas, Earth and sky: ‘one day will hand over these three such woven **textures** to **death**’ (*tria talia texta, / una dies dabit exitio* – 94-5). The reader well-versed in the LIFE-CYCLE and WEAVING threads will know that a substance’s woven nature betrays its mortality. More specifically, however, after the recap of Book 3 in the prologue to Book 5, the reader will recall the body and soul. The proofs of the world’s birth and inevitable death are similar to, and as conclusive as, those applied to the soul in Book 3. Each depiction of the world’s mortality recalls the soul, reinforcing the reader’s belief in the soul’s mortality. The processes of birth and death, depicted by the LIFE-CYCLE and WEAVING threads, are relentless and universal.

⁶⁴³ See pp.188-9.

sends out the cold which it holds in itself, and **unweaves** the ice and **loosens** its knots.

Here *exsolvit [...] nodosque relaxat* bridges the proofs as a synonym for *rarescit*, and emphasises the weaving metaphor in Lucretius' explanations⁶⁴⁸ – supported by *radii*, which can also mean 'shuttles'.⁶⁴⁹ Interestingly, whereas wringing out always involves one substance departing another, 'loosening' enables bodies to both enter and depart the containing substance. This mirrors Lucretius' established explanations (expressed by the LIQUIDS and WEAVING threads) for how one substance pours through something loose-knit, an explanation seen in relation to the human body in Section D of this Part.⁶⁵⁰ In addition, the reader should also recall Lucretius' 'emptying and filling the container' metaphor. The reader's receptiveness to Lucretius' explanations here will perhaps be correlative to their understanding of the conceptual threads and their application in depicting the interactions between substances.

Magnets

The explanation of the magnet (6.906-1089) also relies strongly on the extensive web of correspondences between threads in the preceding five books. Book 6 as a whole, and the magnet passage in particular, encompasses Lucretius' methodology of encouraging the reader to combine established theories (and the metaphors that explain them) to explain new and complex scientific problems for themselves.⁶⁵¹ The magnet was a common puzzle to be solved in ancient philosophy, previously addressed by Thales (Diog. Laert. 1.24 = KRS 90),⁶⁵² Empedocles (Alex. *Quaest.* 2.23 = DK 31A89)⁶⁵³ and Diogenes of Apollonia (Alex. *Quaest.* 2.23 = DK 64A33), and its mysterious nature is acknowledged by Lucretius – men 'wonder' at it (*mirantur* – 910). His explanation is supported by applications of the WEAVING and LIQUIDS threads echoing those already established in the *DRN*.

The threads combine in the introduction to the theory as Lucretius depicts a magnet holding a chain of iron rings: its 'strength and **bonds**' (*vim vinclaque* – 915) are obvious, 'to

⁶⁴⁸ For the unweaving (i.e. melting) of ice, see p.90.

⁶⁴⁹ Cf. 5.266-7, 388-9, discussed pp.87-8; and also n.179.

⁶⁵⁰ We might also compare how heat makes the skin contract or 'draw together' (*trahit et conducit* – 6.967) – a process the keen reader might imagine as 'squeezing out' sweat.

⁶⁵¹ Applying the method of 'one proof kindling light for other proofs', outlined in 1.1114-7; see Clay (1998) 141.

⁶⁵² This reports that Aristotle and Hippias attribute the theory of magnets containing soul to Thales. For discussion, see KRS, pp.95-7.

⁶⁵³ Based on a theory of effluences, apparently taken up in Diogenes' account. Garani (2007) 165-70 compares Lucretius' treatment with Empedocles', focusing specifically on metaphors of binding and fitting together, rather than of pouring (which is mentioned only in passing).

such an extent does its strength prevail **by oozing** (lit. ‘oozingly’) (*usque adeo permananter vis pervolet eius* – 916). It is not yet stated explicitly which processes these metaphors denote. Lucretius reveals this throughout his explanations, returning to several of his established theories and metaphors. This methodology is hinted at as Lucretius asserts that ‘many things must be confirmed’ (917) before an explanation can be deduced, and solicits the reader’s attention for this task (*quo magis attentas auris animumque reposco* – 920). He then compares in turn: the discharge of particles from things (921-35); the porosity of all things (936-58); the different effects one thing has on several different things (959-78); and the varying shapes of bodies and ‘openings’ (*foramina*) accounting for different interactions between things (979-97). Finally, when summarising his various explanations for magnetism, Lucretius considers other things with special affinities (6.1065-94). Throughout these confirmations Lucretius resumes previous arguments and applications of the LIQUIDS and WEAVING threads – embodying the method of universalisation by applying shared explanations to many disparate things. The LIQUIDS thread, being more prominent, will be considered first, however it will become apparent that its effectiveness at explaining magnetism relies both explicitly and implicitly on the WEAVING thread.

The first confirmation in this section establishes the importance of the LIQUIDS thread to Lucretius’ theory.⁶⁵⁴ He argues (6.921-35) that there is a perpetual discharge from all things, since vision-provoking bodies ‘must perpetually **flow** and be sent out and **sprinkled**’ (*perpetuo fluere ac mitti spargique necessest* – 6.922) from everything. The subsequent lines (923-35) repeat 4.217-29 almost verbatim, and 921-2 may supply part of the lacuna before 4.217.⁶⁵⁵ Lucretius extends the liquids examples and vocabulary used in 4.217-29 (supporting the theory of sensory effluences flowing perpetually from things)⁶⁵⁶ by replacing *volitare* (4.221) with *manare* (6.927) to depict the movement of sound. By repeating these lines Lucretius universalises the (liquid) processes behind magnetic and sensory effluences, while being careful to distinguish between their physical natures by not applying the same term to the two kinds of effluences. This contrasts Empedocles’ use of the liquid term ἀποροή, which applies to both sensory and magnetic effluences (Plat. *Meno*, 76C-D, and Alex. Aphrod. *Quest.* 2.23 = DK 31A89).⁶⁵⁷

⁶⁵⁴ See Serres (2000), 95-6.

⁶⁵⁵ Cf. also *fluere et mitti volgo spargique putandumst* in relation to smell (4.676), discussed on pp.107-8.

⁶⁵⁶ See pp.106-8.

⁶⁵⁷ For ἀποροή in theories of sensation, see pp.104-5 and note there. For Empedocles’ effluences, see Garani (2007) 157-60.

Lucretius' terms for magnetic effluences, unlike those that cause sensation, carry liquids connotations – in particular *aestus*. Although this can mean 'heat',⁶⁵⁸ the intended sense of 'wave' or 'current' is clear when Lucretius first addresses magnetism directly (6.1002-21), stating that attraction occurs when seeds 'flow' (*fluere* – 1002) from the stone, or a 'wave' (*aestum* – 1002)⁶⁵⁹ beats away the intervening air, allowing the *primordia* of iron to fill the space created. The image of a wave prepares the reader in advance for Lucretius' explanation (1022-41) of the iron's movement towards the magnet, when air penetrating the iron's *foramina* propels it forward, like wind propelling a ship by its sails (1031-3). The keen reader will remember the *aestus* and perhaps envisage the iron 'ship' being carried on a 'tide' of air, suggesting a joint impulse of air within the iron and without.

The liquids sense of *aestus* is clear in the next passage (6.1042-55), where Lucretius explains how a magnet repels iron filings in a bronze bowl.⁶⁶⁰ The bronze, like the magnet, emits an *aestus* (1049), which fills the iron's pores before the magnetic *aestus* (1051) can enter. As a result, the magnetic *aestus* cannot 'swim through' (*tranet* – 1052) as normal. Lucretius concludes:

*cogitur offensare igitur pulsareque fluctu
ferrea texta suo; quo pacto respuat ab se
atque per aes agitat sine eo quod saepe resorbet.* 1055
(6.1053-55)

Therefore it is forced to collide and to beat the woven texture of iron with its **flood**; by which means it **spews back** from itself and stirs up through the bronze that which without the bronze it often **swallows**.

Being unable to fill the iron, the magnetic wave buffets it with its *fluctus* – here a synonym for *aestus*. The reader might recall the ship analogy here.⁶⁶¹ The image of the iron being 'spewed back' by the *aestus*, rather than being 'swallowed' as normal, might direct the keen reader towards 2.196-200 in which a wooden beam is 'spewed out' (*respuat umor aquae* – 2.197; also *revomit* – 199) when pushed into water.

⁶⁵⁸ OLD, s. v. *aestus*, 1-4.

⁶⁵⁹ The term suggests a continuous flow of invisible particles, a concept shared with Lucretius' explanation of the spread of disease (*mortifer aestus* – 6.1138; cf. *aestu*, of the plague – 6.1262-3). The liquids reading there is supported by *confluxit* (6.1260), of disease 'flowing together'. Perhaps, however, *aestus* may appropriately carry a sense of 'heat' here, as a common cause and symptom of illness (*passim* in [Arist.] *Pr.*).

⁶⁶⁰ See Wallace (1996) on this proof.

⁶⁶¹ In a further correspondence, *pulsare* recalls both *discutit* in 1003, and also *diverberat* in 2.152 (*aeris quasi dum diverberat undas* – for West's 'swimming' image here, see n.529). Water is able both to beat and be beaten through.

It is evident that the reader should envisage magnetic force as a ‘liquid’ wave. This is strengthened further in the subsequent consideration (6.1056-64) of other items unaffected by the magnet’s *aestus* (1056), owing either to weight, as in the case of gold, or, like wood, a *rarus* texture, through which the *aestus* (1059) passes intact. Lucretius then emphatically completes his argument, stating that the iron’s weight and texture together allow it to be filled with *corpuscula* of bronze and propelled by the magnet’s ‘river’ (*flumine* – 1064). The occurrence of *flumen* at the very end of Lucretius’ explanation strikingly confirms the liquid process behind magnetism. The metaphor, a vivid embodiment of a liquid flow from magnet to iron, is undermined when translated as ‘flow’ (Rouse, Melville, Stallings) or ‘current’ (Latham, Godwin). Lucretius wishes his reader to consider magnetic force not simply as possessing liquid qualities, but as an actual liquid. His closing remarks (6.1065-89), listing other things with singularly close affinity, consist entirely of liquid examples: glue and wood; grape juice and spring water; purple dye and wool; and solders between metals. A contrasting example is of pitch and olive oil, which will not mix owing to their different viscosities.⁶⁶² By the end of the long explanation of the magnet, the reader, tracking the LIQUIDS thread, is certain that magnets attract or repel iron not by magic or because magnets contain soul, but by a wave of bodies.

In the passages just analysed, the WEAVING thread is also evident. Section B of this Part outlined Lucretius’ theory that woven structures enable ‘liquid’ movement through them. This is utilised here to explain how attraction is possible and the way in which the iron and magnet cohere. In 6.1053-5, Lucretius states that the magnetic ‘flood’ beats into the iron’s *texta* because the iron’s pores have been filled with the *aestus* of the intervening bronze dish. Normally the iron’s *texta* would allow free passage to the magnetic *aestus*. Lucretius draws attention to the opposite effect here.

Indeed, the expected metaphors depict normal magnetic attraction. The second proof confirmed before the magnet is addressed is ‘of how **loose-knit** a body things consist’ (*quam raro corpore sint res* – 936) – on which several later arguments in the theory rely (with *rarus* occurring a further four times – 958, 1024, 1035, 1059). Lucretius directs his reader back to Book 1 (*quod in primo quoque carmine claret* – 937), and in particular they should recall 1.346-57, with which our passage shares several examples: caves dripping with moisture (1.348-9; 6.942-3); food dispersed throughout living things (1.350-3 (including trees); 6.946-7); sounds passing through walls (1.354-5; 6.951-2 (mentioning smells also)); and the

⁶⁶² Garani (2007) 167 notes the similarity here with Empedocles: ‘water combines rather with wine, but does not want to with oil’ (Alex. *Quaest.* 2.23 = DK 31B91).

penetrating power of cold (1.355; 6.948-50, 952-3 (mentioning heat also)).⁶⁶³ The Book 6 passage offers more examples than the corresponding passage in Book 1, including sweat (944), the growth of body hair (945), disease (955), and storms penetrating the sky (956-7, and the possible missing line before 955)⁶⁶⁴ – and the content of the latter two situates the passage firmly in its Book 6 context. The metaphor of ‘pouring through the void’ is brought out by liquids terms, both metaphorical and literal, as with the rocks that ‘sweat with moisture’ (*sudent umore* – 943), and the ‘sweat’ that ‘oozes from our whole body’ (*manat item nobis e toto corpore sudor* – 944). Not all the examples given are of liquids, but those that are not should be considered in liquids terms. Hence, Lucretius describes smell and heat as oozing (*permanat* – 952) through walls. The same word can be applied to the example of cold and heat passing through metal cups (947-50), particularly since in the same example in 1.494-6 the process is described in this way (*permanat* – 494).⁶⁶⁵ The liquid flows in these examples are enabled specifically by the container substance’s *rarus* texture, as in the Book 1 passage (1.347). The passage’s conclusion emphasises this further: ‘there is nothing that is not woven with loose-knit body’ (*nil est nisi raro corpore nexum* – 958).

This process, marking an intersection between the WEAVING and LIQUIDS threads, is emphasised further in 6.979-97, where Lucretius considers how the different pores in different things (*multa foramina [...] variis [...] reddita rebus* – 981) cause different effects when substances interact. Thus, one thing is seen ‘to ooze’ (*manare* – 990) through stone, another through wood; and different things pass through metals and glass – warmth through the former, flowing images (*fluere* – 993) through the latter (990-4).⁶⁶⁶ These examples again recall the water oozing through rocks in 1.348 and 6.943, and hot and cold oozing through silver in 1.494-501. They also echo the explanation in 4.143-67 of how vision films, moving with a constant flow (*abundat* – 145; *perpetuo fluere* – 157), are broken up by stone or wood, but pass through glass and flow back (*redundent* – 154) from mirrors. The examples of stone and wood might also recall 4.595-602, in which sounds ‘swim through’ (*tranant* – 601) walls and are heard from a closed-off room. The passages are linked by the LIQUIDS thread, again

⁶⁶³ The passages are very similar but with minor differences. For example, the moist caves are described with several shared words (*in saxis ac speluncis* (1.348), *in speluncis saxa superna* (6.942); *umor* (1.349), *umore* (6.943); *guttis* (1.349; 6.943)); but in Book 1 the rocks ‘cry’ (*flent* – 1.349), while in Book 6 they ‘sweat’ (*sudent* – 943). This emphasises Lucretius’ method of universalisation by clear signposts, and his urge for *varietas* of metaphor.

⁶⁶⁴ For thoughts on the content of this line, if only one is missing, see Smith (1992) *ad loc.*, with refs. there to Bailey’s and Smith’s suggested interpolations. Godwin (1991) *ad loc.* supports Bailey’s.

⁶⁶⁵ See p.97 for an examination of this passage.

⁶⁶⁶ Other verbs of motion are used here too – *transire* (991), *meare* (992), *transmittere* (994) – however, the shared process of pouring is emphasised by the repetition of *aliud* four times in 990-2, joining these verbs to *manare* in 990.

universalising by shared metaphor the process of movement through the void. However, the Book 6 passage explicitly explains that these flowing movements differ because of ‘the dissimilar nature and **woven textures** of things’ (*dissimilem naturam **textaque** rerum* – 997).

This WEAVING thread not only explains how certain substances can flow through others, but also how one combines with another. From experience, weaving occurs when threads coincide with gaps between other threads – a process that metaphorically explains atomic cohesion. It also explains how iron and the magnet cohere. Garani distinguishes between a construction metaphor depicting this coherence, and a weaving metaphor specifically depicting the iron’s constituent texture.⁶⁶⁷ The iron is described vividly – nothing clings together ‘more **intertwined** among its own elements, **woven together** more **tightly**’ (*magis primoribus ex elementis / **indupedita** suis **arte conexa*** – 1009-10) – while the construction metaphor is evident in a collocation of terms (*iungitur* – 1069, 1074; *iungatur* – 1079; *compages* – 1071, cf. also 1016). However, Garani’s clear distinction in usage cannot always be drawn. In the analogies with pairs of things that cohere closely, Lucretius describes them as *apta* (‘bound together’ – 1067), and employs the verb *copulo* (‘join together’ – 1078),⁶⁶⁸ to assert that ‘in this way the **textures** of these things have fallen mutually against each other’ (*quorum ita **texturae** ceciderunt mutua contra* – 6.1084) so their *cava* and *plena* (empty and full spaces) align (6.1085-6).⁶⁶⁹ Also, in 1031-6 Lucretius describes the air being ‘insinuated **finely**’ (*subtiliter insinuatus* – 1032) in the iron, which is of *raro [...] corpore* (1035) – again suggesting threads interacting. Finally, the examples of various individual substances affecting different things in different ways in 959-78 frequently involve weaving processes. Although the reader may elsewhere envisage the iron and magnet as conjoined like wooden joints (as in Garani’s interpretation), in these proofs a complementary weaving metaphor guides the reader to envisage the iron and magnet becoming interwoven. As a result, the process of magnetism involves a flow of bodies from magnet to iron, which become insinuated in and interwoven with the iron’s woven texture, which is itself sufficiently tightly woven to drag the whole mass of iron towards the magnet (1012-6).

In sum, the reading of the presentation of the phenomena outlined here shows the LIQUIDS and WEAVING threads intertwining to create new and universalised explanations for complex

⁶⁶⁷ Garani (2007) 165-70 (esp. 169-70).

⁶⁶⁸ Garani (2007) 167 also takes *inter se singlariter apta* (1067) and *copulat* (1078) as construction metaphors. However, *aptus* is situated in Lucretius’ WEAVING thread, and *copulo*, whose cognate *copula* means ‘a bond, leash, ligament, tie’ (*OLD, copula* 1, 2), comfortably joins it. These terms are sufficiently ambiguous to undermine Garani’s specific metaphor reading.

⁶⁶⁹ Similarly, Empedocles (Alex. *Quaest.* 2.23 = DK 31A89) asserts that effluences from the iron must be symmetrical with the pores of the magnet; see Garani (2007) 158-60.

processes. For the 'wringing out the cloth' metaphor, Lucretius has appropriated ἔκθλιψις from the Greek tradition and expanded and adapted it with his own persistent metaphors to explain an important facet of his atomic theory. In his explanation of magnetism, meanwhile, Lucretius does not fully express the process as outlined in this Section, but relies on the reader's understanding of established aspects of the WEAVING and LIQUIDS threads, as well as the complementary 'container' metaphor, expressed by the intertwined BOUNDARIES and LIQUIDS threads. To enhance the reader's understanding, Lucretius directs them with the help of the threads towards specific previous proofs, but they are also to search out proofs elsewhere, like the proverbial hound tracking its prey. The closing proofs of the *DRN*, before the plague scene, are partly designed to train the reader in the process of comparing proofs by means of universalisation and analogy, supported by the conceptual threads. They are then prepared to explain by the same method any other phenomena they might encounter, at which point they will be truly well-versed in Epicurean science.

Section G

Moral Philosophy

Lucretius' explanation of his moral philosophy, like his physical science, is shaped by his conceptual threads. Unsurprisingly, the PLEASURE thread is central in explaining pleasure, and it is joined by the BOUNDARIES, LIQUIDS and WEAVING threads to explain several of its aspects. In theory Lucretius' reader will become able to employ their knowledge of the threads to manage their own emotions, or at the very least understand the processes underlying them more clearly. This is especially the case in relation to established applications of the threads in Lucretius' materialist worldview. This Section will explore how the same processes – expressed by the threads – that govern atoms and their interactions, and the effects these have on a macroscopic scale, also dictate how we experience pleasure. This will have consequences for the consolatory aspects of the *DRN*.

Pleasure, limits and containers

The aspect of Epicurean pleasure upon which Lucretius places greatest focus is the limits of pleasure,⁶⁷⁰ addressed especially in the Book 2 prologue. Here Lucretius emphasises the importance of taking pleasure from personal safety and freedom from pain (1-19), and not desiring extravagant things ahead of more natural things (20-61).⁶⁷¹ In this exposition, Lucretius, following Epicurus (*Ep. Men.* 127-32), states that things that are necessary for the body are limited to those that bring pleasure by subtracting pain (20-3), such as relaxing by a stream in nice weather, rather than luxuries such as precious metals and partying (23-33). Similarly, expensive linen cannot dispel the pain of illness any more effectively than a plebeian's cloak (34-6). Luxuries are also unable to dispel fear, since this can only be achieved by *Naturae species ratioque* (53-61).⁶⁷² Elsewhere in the *DRN* these doctrines are expressed principally by the intertwined PLEASURE and BOUNDARIES threads. This is the case when the vanity of luxury is considered again towards the end of Book 5, when Lucretius argues that throughout the history of man possessions, however luxurious, have only been objects of desire until something new exceeds them. This occurs because man 'does not know what the

⁶⁷⁰ See Epicurus, *Ep. Men.* 127-35 and *RS* 3, 18-21; De Lacy (1969) 109; Gosling & Taylor (1982) 352, 355-8; Long (1986) 306-7 Bailey (1947) 61-3, 767-7.

⁶⁷¹ Woolf (2009) argues that Epicurus believed that the desperate pursuit of luxury, rather than luxury in itself, was to be avoided.

⁶⁷² Epicurus, *Ep. Men.* 131 outlines the importance of reasoning in deciding which pleasures to choose; see Woolf (2009), 165.

limit of possession is, and **to what point** true **pleasure** can ever grow' (*non cognovit quae sit habendi / finis et omnino quoad crescat vera voluptas* – 1432-3) – since pleasure is the satisfaction of a need, and unnecessary desires cannot be satisfied.

The limits of pleasure are of great importance to two further fundamental theories of Lucretian moral philosophy – that death should not be feared, and that love is harmful and should be avoided. In the closing passages of Book 3, Lucretius depicts the complaints of men, that their life, and therefore pleasure, is limited. Lucretius in response argues that although pleasure is limited by death, so too is the craving for it. Therefore, mourners should qualify their lamentations with a consolation that 'no more does any **craving** for these things sit upon you' (*nec tibi earum / iam desiderium rerum super insidet una* – 900-1). Later, Lucretius argues by analogy that just as we feel no care in sleep (919-20), so in the 'everlasting sleep' (*aeternum [...] soporem* – 921) of death, no 'craving' (*desiderium* – 922) affects us. Death constitutes a limit both to pleasure and to harmful longing for pleasure. Lucretius emphasises the dangers of craving in the closing passage of the book. He asks why there is 'such evil, extensive **desire** for life' (*mala [...] vitae tanta cupido* – 1077), despite the *finis vitae* (1078) established for all mortals. He then criticises the desire to live longer in order to encounter 'new **pleasure**' (*nova [...] voluptas* – 1081), since, because pleasure is limited, there would be no new pleasure awaiting us anyway. Instead, we crave (*avemus* – 1082) what is absent, and upon finding it we crave (*avemus* – 1083) something else, so 'the same thirst for life' (*sitis aequa [...] vitae* – 1084) always remains.

To strengthen this argument, Lucretius asserts that at death pain, like pleasure and craving (which, we infer, brings pain), is limited.⁶⁷³ This is expressed in particular in the conclusion of the explanation that the storied punishments of the afterlife do not await us after death, but occur in life (3.978-1023). A man who evades punishment for evil deeds in life fears recriminations after death, unaware that there is a '**boundary** of misfortunes' (*terminus [...] malorum* – 1020) and '**limit** of punishments' (*poenarum [...] finis* – 1021), which cannot worsen after death (1022). Lucretius again portrays death as an all-encompassing limit, and reiterates the importance of understanding boundaries as a means of dispelling fear.

The limits of pleasure and pain outlined here are also expressed in a more complex image from Lucretius' 'container' metaphor (formed from the LIQUIDS and BOUNDARIES threads), which first occurs when Nature upbraids the dying man for his lamentations (3.931-63). The man's ability to hold onto pleasure is depicted metaphorically as filling a *vas* (936): if

⁶⁷³ As pain is limited, so should grief be. Konstan (2013) argues that Lucretius' principal criticism of mourners is not that they are grieving, but that their grief might be without limit.

the vessel is without holes, it holds pleasure, and the man is content (935-9) – he should then willingly die ‘like a banqueter **full** of life’ (*ut **plenus** vitae conviva* – 938);⁶⁷⁴ but if it has holes, pleasure will have ‘poured out’ (*profusa* – 940) – he should, however, not seek to add more (941), but draw ‘a limit on life’ (*vitae finem* – 943), and accompanying pleasure and pain. Thus pleasures are envisaged as liquids filling the container of the mind and soul.⁶⁷⁵ The very concept of a container entails a limit of filling, and therefore a limit of pleasure, which is reduced further (causing increased craving) if the container has holes. It is not explained how one could plug these holes, although an answer may be inferred that is similar to Plato’s portrayal of the same allegory in the *Gorgias* (493b-c). There leaky souls are possessed by people prone to both seeking pleasure and to unintelligence. Increased intelligence (*vera ratio* in Lucretius) would be able to plug such holes.

Lucretius resumes this application of the container metaphor in 4.1084-120, which warns that desire for love cannot be satisfied. Lucretius contrasts this with the natural and necessary pleasure of food and drink:

*quae quoniam certas possunt **obsidere** partis,
hoc facile **expletur** laticum frugumque **cupido**.*

(4.1092-3)

Since these [sc. food and drink] can **occupy** fixed parts, this **desire** for liquid and grain is easily **filled up**.

The satisfaction of desire is depicted in terms of filling up, which nourishment does literally. In contrast, desire for love, consisting only of ‘thin images’ (*simulacra [...] tenuia* – 1095-6), cannot fill us up. Within the framework of the ‘filling the container’ metaphor, the reader can envisage these images as an insubstantial liquid, dissipating or evaporating without being able to increase the sum in the vessel of the soul – a reading aided by the subsequent comparison (1097-1100) with a man who cannot quench his thirst simply by dreaming of drink. In liquid terms, love is as insubstantial as dreamt-up water, which consists only of mental image films. Furthermore, because the pleasure of love is an insubstantial liquid, the more we experience it, ‘the more the heart burns with dire **desire**’ (*tam magis ardescit dira **cuppedine** pectus* – 1090), since it cannot quench the flame.⁶⁷⁶ Lucretius exploits the stock metaphor ‘love and

⁶⁷⁴ Nussbaum (1989) 314 points out that the notion of a banquet also incorporates the concept of an ‘appropriate termination’ (i.e. boundary) once the meal has finished.

⁶⁷⁵ Cf. 6.17-23, in which the *vas* of the mind contaminates its contents; see Garani (2007) 194-5.

⁶⁷⁶ Brown (1987) 75 suggests Lucretius is referring specifically to repeated intercourse with the same partner. He also (p.84) notes that sexual thirst is solved by emitting, not taking in, liquid.

Men are also susceptible to purposeful ensnarement by their lovers. Following the famous passage cataloguing various false qualities ascribed by men to their lovers (4.1155-70), Lucretius states (4.1171-91) that all women have faults, and men should realise they have put them on pedestals. This is difficult, however, since women purposely mask their faults 'from those who they want to hold down and be **bound up** in love' (*quos retinere volunt adstrictosque esse in amore* – 1187). These lovers are pointedly called *Veneres* (1185), suggesting they can bind men as Venus does, with the same results. Until now, love's effect on men alone has been discussed, but women are also susceptible to being bound, in cases when they feel genuine pleasure during sexual intercourse:

*nonne vides etiam quos mutua saepe voluptas
vinxit, ut in vinclis communibus excrucientur?*

(4.1201-2)

Do you not also see that often those who mutual pleasure has **bound**
are tortured in shared **bonds**?

The weaving metaphor is extended from hunting to torture as Lucretius argues that pleasure in sexual desire restricts and causes pain for both men and women.⁶⁸⁰ Interestingly, this is supported by an example of dogs unable to part at the crossroads because 'they cling in the strong joinings of Venus' (*validis Veneris compagibus haerent* – 1205). This would not happen 'if they could not experience the mutual joys which could entice them into a trap and hold them in **bonds**' (*nisi mutua gaudia nossent / quae lacere in fraudem possent vincitosque tenere* – 1206-7). This image, recalling the hunting image of 1146-50, reiterates and universalises the power of Venus, showing her to govern both humans and animals, as in the Book 1 prologue. The keen reader can resist her power if, guided by the WEAVING thread, they recall the importance of avoiding such bonds and subsequent pain, and employ their *ratio* to avoid the beginnings of love.

The description of love in terms of 'binding' and 'tying' was commonplace in Latin,⁶⁸¹ embodying the immobility of those who are stricken or the nefarious work of those seducing

⁶⁸⁰ See Brown (1987) *ad* 1202, who notes the metaphor and its application in relation to love in comedy and Catullus.

⁶⁸¹ The image is popular in the Elegists, e.g. Tibullus (*me retinent vincitum formosae vincla puellae* – 1.55) and Propertius, whose description of his relationship with Cynthia as *servitio* (1.4.4, 1.12.18) recalls Lucretius' *vincla*. Horace exploits the commonplace in the gentle mocking of a love-struck youth in *Odes* 1.27.23-4 (*vix inligatum te triformi / Pegasus expediet Chimaera* – where *expediat* denotes the opposite process to *inpeditus* in *DRN* 4.1149), and the positive experience of being bound by Myrtale's 'pleasing fetters' (*grata compede*) in *Odes* 1.33.14. Cf. *vincio* with *Venus* in Plaut. *Trin.* 658, and *amor* in Stat. *Theb.* 2.366, *Silv.* 3.3.109; and Cic. *Cael.* 44-5, which argues against lovers holding Caelius 'entangled' (*impeditum*).

others. The connotations of the WEAVING thread in Lucretius' materialist philosophy give his use of the image special relevance. By describing one experiencing love as being 'bound' or 'tied up', Lucretius invites his reader to consider love in bodily terms. This is supported by the specific terminology used. Love is described as consisting of *nodi* and *vincla*, and the man as *inpeditus* in its bonds – terms elsewhere used to describe tight atomic cohesion (*nodi* and *vincla* together describe the solid structure of metals in 6.356).⁶⁸² From these correspondences, the reader might recall that the more intertwined two substances are (like, for example, the body and soul), the more difficult it is to extricate them. Thus love, as depicted in 4.1146-50, restricts man tightly. The reader is also aware, however, that all woven substances are essentially fragile and prone to being untied – suggesting that it is possible to extricate oneself from love, as Lucretius advises in 4.1149-50. Presumably the *vera ratio* of Epicureanism makes this possible. Lucretius, by directing the reader to view the commonplace of binding love through the prism of his atomic weaving metaphor, might help them overcome their desires.

⁶⁸² Compare also the *vitalis nodi* conjoining body and soul in 2.950; the *nodi* of ice in 6.87; *anima* and *animus* described as 'bound' (*vincti* – 3.415); the *vinclum* of life (3.599); the Earth 'bound' (*revincta*) to the atmosphere (5.553); the *vincla* of magnetic attraction (6.915) and, analogously, glue (6.1071).

Epilogue

The Broader Application of Lucretius' Threads

This thesis has proved the conceptual threads' breadth and importance in explaining the key theories of Lucretius' science. The threads are applied first to fundamental processes, in particular at an atomic level, before being expanded to explain complex concepts on a macroscopic level, where they activate the reader's knowledge of the underlying fundamental processes. These processes are thus shown to be universal. The threads also contribute to the process of forming scientific theories, especially in Book 6. Here Lucretius shows his reader how to apply their knowledge of the threads to understand apparently miraculous or inexplicable phenomena, without reverting to *religio*. By this approach, a reliable proof based on known facts and established principles can be created. The reader, having been shown this methodology, can form their own proofs of any further difficult to explain events or phenomena not covered in the *DRN*. Therefore, the epic can be seen as a training manual for how to understand the world in Epicurean terms, and the threads play a crucial role here. The conclusion of this thesis, rather than simply summarising the arguments of Parts 1 to 3, will consider further aspects of how the threads support Lucretius' methodological approach – in terms of composition, his ethical theory and the consolation of the *DRN*.

The threads and composition

Lucretius' threads express two main aspects of composition: the persuasive power of poetry (expressed by the PLEASURE thread),⁶⁸³ and the method of forming arguments (expressed by the WEAVING thread). These will be considered in turn here. The importance of persuasion in the *DRN* is expressed in the methodological digression of 1.921-50. The 'sweet love of the Muses' (*suavem [...] amorem / Musarum* – 1.924-5) drives Lucretius to portray his philosophy in 'sweet-speaking song' (*suaviloquenti / carmine* – 1.945-6)⁶⁸⁴ – a phrase suggesting the pleasurable and persuasive aspects of his poetry.⁶⁸⁵ The sweetness of Lucretius' exposition is embodied by the honey placed round the cup of medicine in the accompanying analogy (1.936-42): the pleasing taste of honey (= poetry) persuades children (= Lucretius' reader) to

⁶⁸³ See Volk (2002) 96-9.

⁶⁸⁴ We also recall Lucretius' wish that Venus persuade Mars: *suavis ex ore loquellas / funde* (39-40).

⁶⁸⁵ For the linguistic resonance between *suavis* and *suadeo*, see n.77.

drink medicine (= Lucretius' philosophy) by masking its bitterness⁶⁸⁶. Lucretius echoes this methodological approach later by promising that his 'sweet tongue' (*lingua [...] suavis* – 1.413) will pour forth 'copious draughts from great springs' (1.412), and later by asserting that the speed of vision films will be described 'with **sweet-speaking** verses' (*suavidicis [...] versibus* – 4.180).⁶⁸⁷ Pleasing poetry supports Lucretius' philosophical exposition.

It also provides the kind of pleasure valued by Epicureans, an example of which is given in Book 2: instead of wealth and luxury,⁶⁸⁸ sufficient, natural pleasure can be gained by lying in a meadow by a stream 'especially when the weather **laughs**' (*praesertim cum tempestas adridet* – 32). Early man found pleasure in this before they were corrupted by envy and greed (5.1392-6, which repeat 2.29-33 almost verbatim). As the act itself provides pleasure for man, so the image provides pleasure for Lucretius' reader, as do several similar images in the *DRN*. Among these are the depiction of Venus' arrival in the Book 1 prologue (*tibi ridet aequora ponti / placatumque nitet diffuso lumine caelum* – 1.8-9), designed to entice the reader to learn (or perhaps 'swallow') Epicureanism. The pleasant weather in the gods' abode is portrayed similarly in the Book 3 prologue (*large diffuso lumine ridet* – 22).⁶⁸⁹ The PLEASURE thread exhibits Lucretius' poetry as a source of pleasure, both in itself and in the pleasure that can be gained from accepting Epicurean philosophy.⁶⁹⁰ The pleasure Lucretius gains from poetic composition (*iuvat integros accedere fontis / atque haurire, iuvatque novos decerpere flores* – 927-8) is passed onto the reader.

Poetry can of course persuade of falsehoods, and so Lucretius stresses throughout the *DRN* the truth of his philosophy.⁶⁹¹ Without *ratio*, which is required to facilitate correct persuasion, poetry can be misguided, even harmful. Lucretius' reader must not be duped like Heraclitus' followers (1.635-44), who are similarly attracted to pleasing poetic style.⁶⁹²

⁶⁸⁶ Epicureans believed that philosophy should have medicinal qualities, as Nussbaum (1986) observes.

⁶⁸⁷ Shortly after occurs a delightful depiction of stars reflected in the sea: *extemplo caelo stellante serena / sidera respondent in aqua radiantia mundi* (4.212-3).

⁶⁸⁸ Epicureans connected the pursuit of wealth with the (harmful) fear of death, and believed that both should be avoided equally strenuously, as Konstan (2008) 27-77 observes.

⁶⁸⁹ Implying that the man relaxing by the stream is enjoying pleasure worthy of the gods (cf. 3.322).

⁶⁹⁰ Similar pleasing images include the theatre awning (esp. *omnia conridet correpta luce diei* – 4.83) and the peacock's beauty (*aurea pavonum ridenti imbuta lepore* – 2.502). Of course, not all Lucretian imagery is pleasant. As West (1969) 37 points out, Lucretius provides unpalatable examples with equal enthusiasm, such as 4.679-80: *mellis apes quamvis longe ducuntur odore, / volturiique cadaveribus*. In such cases some 'honey' of pleasing imagery is often provided as an accompaniment (literally in the case of 4.679).

⁶⁹¹ E.g. 4.907-15 (of which 909-11 repeat 4.180-2, including *suavidicis versibus*, verbatim), which ask the reader to pay attention to and accept Lucretius' *vera [...] dicta* (914); and 5.108 which urges, 'let reason rather than the fact itself **persuade**' (*ratio potius quam res persuadeat ipsa*).

⁶⁹² West (1969) 26 notes the malice in this description, but not the similarity to Lucretius' own poetic style. The difference is that Heraclitus' philosophy is 'dyed with charming sound' (1.641), whereas

Heraclitus' poetry masks untrue philosophy, and so his unintelligent followers (*stolidi* – 641) are not only tricked (like the children in Lucretius' analogy) but gravely so. They err by seeking pleasing-sounding words instead of the truth (640);⁶⁹³ Lucretius offers his reader both *vera ratio* and pleasing imagery.

Lucretius' methods of deduction and exposition, essential to his persuasive strategy, are portrayed by the WEAVING thread. This is appropriate, since several weaving terms are applied to reasoning and argumentation in both Greek and Latin.⁶⁹⁴ In addition, it is well established that ancient authors, particularly Homer and the Greek lyric poets, associate poetry (or song) with weaving.⁶⁹⁵ This connection is enabled by multiple etymological and semantic links between weaving and singing,⁶⁹⁶ which may reflect the physical similarities between the lyre and the loom,⁶⁹⁷ or more likely the singing that accompanies weaving in several cultures.⁶⁹⁸ Lucretius aptly exploits these metaphors to depict his methodology, composition and presentation of arguments.⁶⁹⁹

Part 1 outlined that Lucretius describes his approach in the Book 1 prologue in terms of 'disentangling' and 'separating out' the facts of things (expressed by *dispono*, *dissero* and *pando*).⁷⁰⁰ Directly after the prologue Lucretius marks the start of his 'warp of discourse' (*exordia* – 1.149)⁷⁰¹. Together the terms introduced here describe Lucretius' methodology of

Lucretius' is like honey on the rim of a cup of medicine, affecting the content only at the point of tasting.

⁶⁹³ The principal thrust of Lucretius' attack, as Marković (2009) 102 argues. Mitsis (1993) 111-15 notes that Lucretius' reader in 1.931-50 is less a consenting adult actively pursuing a cure, and more a passive (indeed child-like) patient receiving necessary treatment.

⁶⁹⁴ Snyder (1981) 193-4 considers weaving terms applied to intellectual processes in Homer. In Latin cf. e.g. *implico* in Cic. *Inv. rhet.* 1.97, and *contexo* in Cic. *Fin.* 5.83 (denoting logical connection). For weaving terminology in verbal composition, cf. e.g. Cic. *Orat.* 140 (*necto* of joining words together) and 195 (*vinctus* and *dissolutus* of rhythmic ordering), *De Or.* 3.176; *Ov. Pont.* 4.2.30 (*necto* of combining words and numbers); Quint. *Inst.* 9.4.13, (*textus* of the 'fabric' made by conjoining words); and especially Sen. *Ep.* 45.5 (*nectimus nodos et ambiguam significationem verbis inligamus ac deinde dissolvimus*). Norman (2006) considers weaving as a means of communication in itself.

⁶⁹⁵ Snyder (1981) 195-6 notes Kalypso and Circe singing while weaving (*Hom. Od.* 5.59-62; 10.220-23, 226-28, 254-5); Sappho's use of κρέκειν (often 'to pass the shuttle through the loom') to describe the 'striking' of lyre strings (*fr.*99 Lobel & Page (1955)); the 'woven word' in Callimachus (*Aetia* 26.5 Try.); and the 'woven' songs in Pind. *Nem.* 4.44-6 and *Bacchyl.* 5 and 19. See further Tuck (2006) 539-40, 546; Nagy (1996b) 61-78 and (2002) 70-98.

⁶⁹⁶ Snyder (1981) 193-6; Scheid & Svenbro (1996) 112; Tuck (2006) 546.

⁶⁹⁷ Yates (1875); Snyder (1981) 194-5. Tuck (2006) 546 dismisses this interpretation, since attestations of the 'weaving song' metaphor in Indo-European languages predate the invention of the loom.

⁶⁹⁸ As metrical mnemonics to recall complex patterns; Tuck (2006).

⁶⁹⁹ Snyder (1983) provides a useful introduction.

⁷⁰⁰ pp.34-5.

⁷⁰¹ *OLD, exordium* 1. West (1969) 80-2 notes the metaphor; as does Snyder (1983) 39, who asserts that it embodies 'the prominence of weaving as a source for imagery in Lucretius (she does, however overlook the important correspondences in 1.50-61). The term also frequently denotes an introductory passage of a speech or book (*OLD, exordium* 4); cf. Cic. *Inv.* 1.20. For weaving and beginnings, cf. Nagy (1996b) 62-3 and (2002) 79.

untying the facts of things and reweaving them for explanatory purposes. The prominence of these metaphors invites the reader to consider Lucretius' composition in this way throughout the epic, and they are reminded when *dispono* occurs in the same sense in 3.420 and 5.529, and when *pertexo* is used of 'weaving discourse' in 1.418 and 6.42. In addition to tying together arguments, Lucretius also refers to 'untying the reasons for things', expressed by various derivations of *solvo*,⁷⁰² and by *expedio*,⁷⁰³ which means 'to explain', but also, appropriate to the weaving metaphor depicting explanation, 'to untie'.⁷⁰⁴ Often the terms appear alongside *ratio*,⁷⁰⁵ creating a complex metaphor, 'to untie by reasoning'.

Most interestingly, as we have seen, Lucretius also applies the majority of these terms (or their cognates) in an atomic context. In particular the persistent sense of *dissolvo*, *exsolvo* and *resolvo* – 'to untie into atomic first-threads' – would suggest to the reader in this context 'untying visual evidence into its facts or proofs'. The same is true of *dispono*, which denotes first-threads 'set out' in their appropriate *ordo* (1.1027; 5.192, 445), as arguments should be, and *pertexo*, which, although only used by Lucretius of 'weaving discourse', recalls the large group of derivatives of *texo* applied to atomic compound structure.⁷⁰⁶ The weaving connotations of *expedio* are supported by its antonym *impedio*, used to denote entanglement of first-threads.

Such findings support the theory that Lucretius' composition mirrors his science.⁷⁰⁷ Things and the reasons for them can be untied respectively into constituent atoms and constituent proofs. Lucretius, by untying things into their shared atoms and processes, connects (or 'ties together') varied and disparate things with shared reasoning. This is appropriate, because atoms create new things when rewoven together, just as new arguments are created by reweaving existing evidence and knowledge. This embodies the role of the *rhapsoidos*, 'the re-sewer of the song', who 'sews together' existing music to create new works⁷⁰⁸ – as Lucretius re-sews the *obscura reperta* (1.136) of the Greeks into Latin. Lucretius achieves this in particular by his conceptual threads. These threads represent

⁷⁰² Four in all: *exsolvo* – 2.381; *resolvo* – 5.773; *dissolvo* – 4.500; 6.46.

⁷⁰³ 13 in all: 1.499; 2.66, 183; 4.634, 931; 5.77, 113; 6.245, 497, 641, 682, 739, 1093.

⁷⁰⁴ *OLD*, *expedio* 4, 'to give an account of, explain, expound'. See n.256 on its weaving sense and its antonym *impedio*.

⁷⁰⁵ 2.381, 4.500 and 5.773 with derivations of *solvo*; 1.499, 5.113, 6.641 and 6.1093 with *expedio*.

⁷⁰⁶ See n.255. Garani (2007) 182 remarks, '[...] everything, even the poem itself, is seen as a small piece of the cosmic fabric (e.g. *pertexere dictis* / "weaving the web of discourse," 1.418)'.
⁷⁰⁷ For this view, see Thury (1987); Schiesaro (1994); Volk (2002) 100-5. See Snyder (1983); Gale (2004) 58; and Garani (2007) 182 on the weaving metaphor in this context. Hendren (2012) even suggests (at times tenuously) that Lucretius' alliteration is analogous with atomic interweaving.

⁷⁰⁸ Nagy (1996a) 85-6.

composite theories – the atoms of his argument – which are shared by several wider concepts. Lucretius' materialist philosophy is even evident in his exposition itself.

The ordering of Lucretius' threads is crucial to his argument – in particular with respect to their metaphorical and literal applications. This was considered especially in the analysis of the LIFE-CYCLE thread in Part 2 Section A. Occasionally both applications occur in one passage, for example 1.159-73, where the fixed birth of living things from fixed mothers and the fixed 'birth' of all things from fixed 'mother-substance' are juxtaposed. Our knowledge of the realities of birth supports the existence of fixed first-bodies, which in turn explains why birth as we know it is fixed. More often only a metaphorical or a literal application occurs, but in such cases whichever is used recalls the other. Therefore, when atoms are said metaphorically to 'give birth' to things, the reader recalls restrictions of real-life birth. Similarly, when heredity and successful conception are discussed in terms of seeds and their ratios (4.1209-62), the reader recalls the established metaphor of fixed things being 'born' from varying ratios of atomic 'seed' (in both cases *semina* is used, strengthening the intended connection). It is unnecessary for Lucretius to mention atoms or their processes in the latter passage. Instead he relies on the reader's understanding of the LIFE-CYCLE thread to activate the metaphor from its atomic context. The complex interplay between the literal and the metaphorical in Lucretius' scientific explanations has implications for the interpretation of his ethical philosophy, which will be addressed shortly. For now, further instances will be considered of the threads' role in depicting one aspect of Lucretius' ethics: his theory of emotions.

Emotion, religio and ratio

We have already seen that Lucretius' threads express aspects of his ethics. He places great importance on the clear understanding of his BOUNDARIES thread, which can help to dispel fear (see pp.111-2). A complex intertwining of the BOUNDARIES, PLEASURE and LIQUIDS threads, expressing the limit to which pleasure can 'fill us up', helps to prevent the pursuit of unnecessary pleasure (see pp.216-9). In a convergence of the PLEASURE and WEAVING threads, an understanding of the physical process of 'binding' by love can help us avoid its harmful consequences (see pp.219-21). Such aspects of ethics are based on, or are used to support, fundamental theories depicted by the threads.

The third of these fits within an important metaphor of Lucretius' ethical theory, which depicts other emotions, via the WEAVING thread, in terms of restriction by binding. In the Book 2 prologue, Lucretius argues that only *ratio* can dispel men's fear, denying that the

sight of warfare might make fear flee ‘and the terrors of death leave the breast empty and **untied** from care’ (*mortisque timores / tum vacuum pectus linquunt curaque solutum* – 45-6).⁷⁰⁹ Rather, only *vera ratio* can have this effect, as expressed in the discourse against the fear of death (3.830-1094). Lucretius expresses regret that mourners, lamenting the deceased being robbed of life’s rewards, neglect to say he will have no craving for such things (894-901). If they understood this, Lucretius says, ‘they would **untie** themselves from great anguish and fear of mind’ (*dissoluant animi magno se angore metuque* – 903). In both cases the emotions are cripplingly binding, and only the *vera ratio* of Epicureanism can untie the bonds.⁷¹⁰

Something else that binds the mind is *religio*. In the methodological explanation of 1.921-50 (repeated almost verbatim at 4.1-25), among the rationale for choosing poetry to present scientific discourse, Lucretius explains that he deserves to be crowned by the Muses not only for his poetry (933-4), but also ‘because I teach great subjects and proceed to **untie** the mind from the **tight knots** of superstition’ (*quod magnis doceo de rebus et artis / religionum animum nodis exsolvere pergo* – 931-2). The philanthropic cause of freeing man from care, although perhaps an unusual criterion for being crowned by the Muses, is central to Lucretius’ poetic purpose. The image of untying suggests Lucretius saw an etymological link between *religio* and *religo*, ‘to bind’⁷¹¹ – perhaps amending a more positive construal of *religio* as a ‘bond of piety’ (suggested by *votisnectere vota*, ‘to weave vows with vows’ – albeit denoting an impious religious ceremony – in 5.1202).⁷¹² While Lucretius’ *ratio* unties the reasons for things, in contrast *religio* binds our minds, restricting our *ratio*.⁷¹³ Furthermore, since the WEAVING thread depicts the emotions and *religio* in the same way (they restrict the mind, but can be ‘untied’ by *ratio*), *religio* appears akin to an emotion and, depending on the degree to which one considers the emotions to be incompatible with reasoning,⁷¹⁴ an obstacle to *vera ratio*. This constitutes a fervent dismissal of the logical

⁷⁰⁹ Sleep can have the same effect. It ‘**unties** cares from the breast’ (*curas e pectore solvat* – 4.908), although this, unlike *ratio*, provides only temporary relief.

⁷¹⁰ For Plato (*Phd.* 83a1-5), philosophy can untie the soul from its bonds with the body; for Lucretius, philosophy frees the mind from the bonds of fear or emotion. See Pender (2000) 179-80.

⁷¹¹ A theory advocated particularly by Springer (1977) 57 including n.12, which lists Roman authors who drew this etymological link.

⁷¹² See also Lactantius, who rejects Cicero’s view that *religio* was linked to *relego* (4.28.3, 4.28.12). Instead, *diximus nomen religionis a vincula pietatis esse deductum, quod hominem sibi deus religaverit*. He paraphrases Lucretius 1.932 in support: *qui ait religionum se nodos solvere*; Maltby (1991) s. v. *religio*.

⁷¹³ Lucretius dismisses all *religio* as harmful, while Epicurus allowed for participation in cult and sacrifice, as long as an Epicurean detachment was maintained; see Summers (1995).

⁷¹⁴ Aristotle, for example, states that emotional arguments (*pathos*) – one of three principal forms of persuasion (*Rh.* 1.2, 1356a1-4, 1356a14-15) – cause changes of opinion by affecting judgement (*Rh.*

credentials of *religio* reminiscent to the modern reader of Richard Dawkins' forthright belief that religion and reasoning are mutually exclusive.⁷¹⁵

Interestingly, the WEAVING thread's most consistent application in the *DRN* – to atomic bonding and dissolution – supports this aspect of Lucretius' ethical theory. Since 'woven' atomic bonding forms the fabric of the universe, it must also form the make-up of the mind and its emotions and fears. The WEAVING thread, by drawing a correspondence between emotions and atomic interaction, roots the emotions in the physical rather than the metaphysical. The reader who tracks the thread here might comprehend more clearly the physical processes underlying the emotions and *religio*. By this understanding, this *ratio*, the reader might be able to untie the bonds restricting the mind, and approach a life free from care and worthy of the gods.

The threads and consolation

We have seen that specific applications of the conceptual threads express aspects of Lucretius' ethical doctrine (limited pleasure, the untying of emotions, etc.). In addition, Lucretius' method of setting out and developing the threads supports his quest to rid man of fear. This is unsurprising, since the threads are essential to Lucretius' explanatory approach, and dispelling fear is the principal moral aim of the epic.⁷¹⁶ Furthermore, the threads help the reader to memorise doctrines,⁷¹⁷ and thus to understand the shared processes underlying things. Understanding the physical realities of the world is, for Lucretius, consolatory in itself. He argues in the Book 1 prologue that fear can be dispelled only through *Naturae species ratioque* (148) – the appearance and reasoning of Nature, but also our reasoning in interpreting it, to understand *quid possit oriri, / quid nequeat* (75-6) and *quae sit natura animai* (112). Our very understanding of Nature, presented by the threads, will rid us of our

2.1, 1378a19-20, 24-27). Konstan (2006) argues convincingly that the ancient Greeks believed emotion to inform and be informed by judgement.

⁷¹⁵ Dawkins' frequent vehement expression of his opinions strongly recalls Lucretius. This is encapsulated by the 'mission statement' (as of 15th October 2013) of the Richard Dawkins Foundation for Reason and Science (founded by Dawkins, 2006): 'Our mission is to support scientific education, critical thinking and evidence-based understanding of the natural world in the quest to overcome religious fundamentalism, superstition, intolerance and human suffering'. The foundation's title and its mission express in plain words the dichotomy, as they see it, between *ratio* ('Reason') and *religio* ('religious [...] superstition'), and imply a belief in *Naturae species ratioque* (= 'critical thinking and evidence-based understanding of the natural world') and its power to overcome *religio*. Thus Lucretian Epicureanism lives on in the twenty-first century.

⁷¹⁶ Proved by its prominence in the prologues (1.62-135; 2.37-61; 3.31-93; 4.6-7 (repeated from 1.931-2); 5.55-90; 6.43-79) – see Cox (1971) – and his 'mission statement' (1.931-2). Nussbaum (1994) 13 notes that Epicurus (Porph. *ad Marc.* 31 = Usener (1887) fr.221) saw the therapy of the soul as the *sine qua non* of philosophy.

⁷¹⁷ Clay (1983) 176-86 notes the importance of this to Epicurean exposition.

cares. Furthermore it is the inevitability in particular of the universal atomic processes of Nature and their outcomes that helps to banish fear.⁷¹⁸ The threads, not just in their content, but also in their order of exposition, including their alternation between literal and metaphorical applications, are central to this ethical purpose.

Examples can be recalled from earlier in the thesis. A straightforward one is how the BOUNDARIES thread introduces in Book 2 the concept of limited atomic variety (333-729), in which Lucretius denies that the best and worst things can be surpassed (500-21). Having understood this doctrine, the reader will more readily accept in Book 3 that there are no new pleasures awaiting man (1080-6) – because such things are limited by the limits of atomic variety. Another example involves the WEAVING thread, which depicts the complex intertwining of body and soul in Book 3, and the same physical relationship between the Earth and air in Book 5 (534-63). In both cases, the interwoven compound is understood to be mortal as a whole. The reader understands the latter, explained in only 30 lines, more clearly by recalling the more extensively outlined image of the body and soul in Book 3. Together the proofs emphasise the inevitable death awaiting all things – one of the principal consolatory aspects of the *DRN*.

This understanding relies in turn upon a more complex and firmly established series of proofs expressed by the LIFE-CYCLE and WEAVING threads in the first two books. The central theory of Epicurean philosophy that death is nothing to us, and therefore should not be feared, is difficult for the Epicurean novice to swallow. To overcome fear of death, the reader must thoroughly understand the proofs for the soul's mortality, which in turn depend on the established atomic processes governing all things, depicted by the threads. Tracking the LIFE-CYCLE thread to the end of Book 2, a complex pattern emerges. Lucretius takes literal aspects of birth and death from human experience – some of which are depicted in the Venus prologue and first arguments – and uses them to create a complex, coherent metaphor of birth and death, introduced in 1.50-61 and extended throughout the first two books, in relation to atomic union, the creation and destruction of composite bodies, and other related processes. The metaphor is so persistently and consistently applied that any small congregation of birth or death terms applied to atomic compounds or composite bodies recalls the LIFE-CYCLE thread and all it entails. Also, separate macroscopic processes are linked together by the thread, universalising Lucretius' birth-death cycle.

⁷¹⁸ Jope (1989) 20.

At the start of Book 3 the reader is fully conversant with the concept that all composite bodies are ‘born’ from, and ‘die’ into, constituent atoms.⁷¹⁹ The description of the soul as a composite body in 3.161-257 activates the reader’s knowledge of the LIFE-CYCLE thread, from which they can infer that the soul undergoes the same processes of birth and death as all composite things. When Lucretius describes the soul as *nativus* and *mortalis* (3.417) and (through words such as *mors*, *pereo*, *interemo* etc.) as dying with the body, the reader should recall how things are born from and die into atoms, and so reduce the terrifying concept of human mortality to the simple joining and separating of atoms. Lucretius, having carefully established an extensive metaphor on a foundation of literal, real-life concepts, now reverses the relationship: the literal death of the human body is comprehended in terms of metaphorical death at an atomic level. Thus we are shown to be simply a part of the inexorable cycle of birth and death. As Lucretius says, ‘mother-substance is required so the next generations can grow’ (3.967): we should accept death when it is our time, to allow rebirth.⁷²⁰ With the help of the LIFE-CYCLE thread, Lucretian atomism is the primary form of consolation in Book 3.⁷²¹

The WEAVING thread also plays an important role here. The death of things is defined in the Book 1 prologue and first arguments as ‘untying’ into constituent atomic ‘first-threads’ – a metaphor supported by the consistent depiction of the ‘woven texture’ of things, in which the woven connections are the very points at which death occurs. Thus a mention of death should activate the metaphor of unweaving in the reader’s mind, while unweaving or even a reference to ‘woven texture’ should suggest mortality. In Book 3 Lucretius presents a carefully-drawn image of the woven soul, and its woven relationship with the body. These images (in fact introduced in 1.696-7, 811; and 2.947-53) activate the reader’s knowledge of the WEAVING thread, and its interaction with the death strand of the LIFE-CYCLE thread to portray mortality. When the soul’s departure and dissolution at death is explained in terms of unweaving later in Book 3, the theory is strengthened by the foundation already provided by the intertwined LIFE-CYCLE and WEAVING threads. The fundamental atomic processes these threads depict desensitise the reader to death, and this is supported by the application of the

⁷¹⁹ This ties Book 3 more firmly to the first two. It is generally agreed that Book 4 was originally intended to follow Book 2, owing to 4.45-53 (of which 45-8 = 3.31-4 with minor variations) in which Lucretius segues from his description of atomic motion (from Book 2) into his theory of sensory effluences; Leonard & Smith (1942) *ad* 4.26-53; Bailey (1947) 36; Godwin (1986) *ad* 26-44; Smith (1992) *ad loc*. The relocation of Book 3 to follow Book 2 creates a clearer development of the LIFE-CYCLE thread, which extracts the greatest possible impact from his theory of the soul’s mortality.

⁷²⁰ Nussbaum (1989) 133.

⁷²¹ Galloway (1986) argues that the hectoring tone at the end of the book goads the reader to seek a better consolation – to be found in Lucretian materialism. For the supposed inadequacy of the consolation in 3.894-1094, see Bailey (1947) 1131; Minadeo (1969) 85-6; Kenney (1971) 31-4.

'unweaving' metaphor to bodily shocks, diseases and even sleep (see pp.192-3), which hints at the precariousness of human existence. The reader is invited to view death as an inevitable part of life, which is itself as fragile as a cloth is prone to unravelling. The reader who has understood the intertwined LIFE-CYCLE and WEAVING threads will more readily accept the soul's mortality. Here the metaphorical (unweaving) and the literal (human mortality) intertwine to enhance the consolatory aspects of Book 3.

The fragility of life is supported further by the intertwined LIQUIDS and BOUNDARIES threads in the 'bodily container' metaphor. In the first two books Lucretius outlines the key theories of free movement through the void, which is portrayed in terms of pouring liquids, and of bodily containers, by which one substance can contain void in which another substance can move and be situated. The introduction of the soul as situated in the body (3.117-29), and moving swiftly and freely like water (3.177-207), activates these earlier images. This sets up the explanation that the soul, upon departing the bodily container at death, disperses more swiftly than liquid from a shaken vessel (3.425-44). This image is supported further by the 'unweaving' metaphor, which also denotes separation on departure. Again, the atomic processes expressed by the threads in Books 1 and 2 prepare the reader in advance to accept the mortality of the soul more readily.

The consolatory aspects outlined here persist as the epic progresses. In Book 4, understanding the atomic reality behind infertility or failure to conceive prevents the common (but futile) recourse to *religio* for a solution (*nequiquam divom numen sortisque fatigant* – 1239). In Book 5 the depiction of the world's mortality is supported by comparisons with the human body, expressed especially by the LIFE-CYCLE and WEAVING threads – again underlining the inevitability of death. In Book 6 Lucretius employs the threads to explain certain apparently miraculous meteorological and terrestrial phenomena – with the specific aim of denying divine provenance and avoiding recourse to religious superstition (and accompanying fear) (43-91, 379-422).⁷²² Lucretius reduces these phenomena to the atomic realities underlying them, again activating the reader's knowledge of the threads, in order to dispel fear.⁷²³ An interesting example of this explanatory method occurs within the exploration of earthquakes (535-607). Men, Lucretius says, 'are terrified that the nature of the earth might **untie** the caverns below' (*metuunt inferne cavernas / terrai ne **dissoluat** natura repente* – 597-8), or that the earth might be 'drawn apart' (*distracta* – 599) and seek to consume itself. They are correct that this might happen, since,

⁷²² The presentation of Book 6 is determined 'by the design of leading the reader to an attitude of philosophical detachment' – Jope (1989) 16.

⁷²³ See Jope (1989) 22.

as the reader is aware from Book 5, the world, as a 'woven' composite body, is prone to being untied at some point in the future. However, men should not be afraid, because unweaving is an inevitable atomic process. Understanding this aspect of Epicurean physics should help the reader to consider, and even experience, earthquakes with a calm mind.

A connection is also drawn between natural phenomena and the more pressing fear of disease. Part 2 Section A considered how Lucretius explains volcanic eruptions as a conflux of fire seeds, just as rain occurs when seeds of water congregate in the clouds, and disease arises from a congregation of certain disease-bringing seeds.⁷²⁴ The strength of this analogy is supported by the extensive comparisons between the world and the human body in Book 5, and further by the reader's understanding of atomic boundaries – i.e. that each variety of seed is unlimited in number. Volcanic eruptions and outbreaks of disease are no more remarkable, or terrifying, than rain. Lucretius reassures the reader: such things are liable to happen to anyone (*siquis* – 655), by chance at any time (*ubi forte* – 672), so fear is pointless. The consolation for disease provided here is founded upon the preceding explanations for other phenomena in Book 6, each of which reemphasises the eternal, inevitable atomic processes governing all things.

The plague

Lucretius extends his explanation of disease further in 6.1090-137. He reiterates that disease arises when seeds capable of bringing illness and death congregate. These seeds make the air diseased, and this spreads to man either directly or via water and food. This description serves as the last reminder of underlying atomic processes before the finale of the plague of Athens (1138-286). Here applications of the threads to explain scientific processes are strikingly sparse. Instead we encounter a relentless stream of symptoms, vividly and disturbingly described, and the fear-ridden desperation of the infected and uninfected alike. Lucretius describes in particular fire as a symptom (1145-6, 1163-77), but it is left to the reader to infer that this is formed from a congregation of fire seeds. When a term from a thread does appear, for example to describe retching, which causes cramps and 'unties' (*dissoluebat* – 1162) the limbs, it occurs alone. Nevertheless this should be sufficient for the reader to recall the thread and its applications – here the WEAVING thread and atomic dissolution.

⁷²⁴ See pp.145-6. Leen (1984) 112-3 notes that the passage is designed not just as an explanation with visually clear *exempla* from experience, but also 'to recall the fundamental Epicurean doctrine that both man and his world are [...] subject to the same governing principles' – i.e. the explanatory method of universalisation.

Unsurprisingly, given the subject matter, the death strand of the LIFE-CYCLE thread is predominant in this passage in its literal sense. This is illustrated by the frequency of *mors* and *pereo*,⁷²⁵ which occur 11 times in the 149 lines of the plague scene (out of 20 instances in total in Book 6) at a frequency found nowhere outside Book 3.⁷²⁶ This ties the end of Book 6 more tightly to Book 3, and its arguments for the soul's mortality and against the fear of death. More specifically, just as the reader is supposed to recall atomic applications of the threads in the plague symptoms described by Lucretius, instances of death terminology in this passage should again recall that the death of body and soul entails a simple untying into constituent first-threads (in accordance with the universal atomic processes outlined in Books 1 and 2). Again, as in Book 3, in the depiction of the plague Lucretius reverses the correspondence between the literal and the metaphorical, intending his reader to understand death from the plague in terms of atomic dissolution. This is not made explicit. Instead Lucretius requires his reader to seek out proofs like keen hounds (1.400-17), based on their knowledge and understanding of the threads.

Our reading supports the common interpretation of the plague passage as a test of what the reader has learnt⁷²⁷ – providing a worst-case scenario to which they should apply their knowledge of atomic processes and their resistance to fear of death.⁷²⁸ This is contrasted with the irrational actions of the Athenians – for example falling into depression when struck with the plague (1230-4), and fighting over the pyres (1281-6) – which represent the wrong reaction to the situation.⁷²⁹ Those who have overlooked or denied this interpretation have assumed that the passage either reveals Lucretius' doubts and/or melancholia,⁷³⁰ or is one of the unfinished parts of the epic.⁷³¹ However, with this reading the passage – assuming the reader does view the plague with a calm mind – succeeds as a consolation, and is an appropriate conclusion to the epic. It is not futile for the reader who

⁷²⁵ Plus their compounds and derivatives (although the statistics discount *mortalis* and *immortalis* when used in the sense 'men' or 'gods').

⁷²⁶ Book 3 incorporates 40.5% of all occurrences of these terms, at a rate of 1/17.6 lines.

⁷²⁷ Müller (2007) 251-4; Clay (1983) 225, 257-66; Segal (1990) 43-5, 234; Gale (2000) 23; Olberding (2005) 123-8; Morrison (2013) 223-32. For the contrary view, see especially Sedley (1997) 16-19.

⁷²⁸ Lucretius sets up this confrontation of disaster in general in the Book 6 prologue (29-32); Müller (2007) 252.

⁷²⁹ Müller (2007) argues that the conclusions to all six books highlight a contrast of correct and incorrect *ratio*.

⁷³⁰ Notably Leonard & Smith (1942) *ad* 6.1286. Lucretius' melancholy in general was a preoccupation for scholars into the mid-twentieth century, following Patin (1875) ch. 7 (see Bradley (1972) notes 2-5 for an overview): Bailey (1947) gives much space to this topic in his introduction (pp.8-16). Wormell (1960) and Kinsey (1964) argue that this interpretation of Lucretius' character is wrong.

⁷³¹ Bignone (1945) 318-22; Kenney (1977) 22-33; also Townend (1979). The transposition of 1247-51 to the end of the book, strenuously argued by Fowler (2007) to provide an appropriate close, does not affect my argument here.

fails to respond calmly: they can return to the beginning and take consolation from the Venus prologue,⁷³² or apply themselves more carefully to understanding Lucretius' scientific explanations and noticing the importance of the threads to his exposition.

It may be objected that the reader is not explicitly told to treat the plague as a test. However, although Lucretius leaves this unsaid here, it is explicitly outlined in the preceding exploration of the magnet (see pp.209-14). Here Lucretius emphasises the importance of establishing principles and analogies before understanding difficult concepts (6.917-20). The lengthy investigation into magnetism puts this to the test, and is therefore an important reminder of Lucretius' approach of using analogies and the threads to highlight the shared universal processes underlying things, and his encouragement of the reader to combine established theories to seek their own proofs.⁷³³ It is the methodological approach of this section, rather than the content *per se*, that is of greatest importance. The magnet serves as the last test-case example before the reader is left to comprehend the plague alone.⁷³⁴

The power of the conceptual threads

Lucretius' conceptual threads run throughout the *DRN*, depicting the fundamental laws and processes governing everything from the atomic to the universal level. The threads enable Lucretius to link processes together without resorting to overly frequent recapitulations of key theories – and the reader should be guided by them to make connections between disparate processes. The network the threads form is comprehensive, and within it the lifespans of all things, including man and the heavenly bodies, are shown to be insignificant in the great, eternal process of atomic movement, combination and dissolution. Together the threads lay bare the inner workings of all things – *Naturae species ratioque* – to show that the soul is mortal, and untie the micro- and macroscopic processes that terrify and confuse man. This expository method should reassure the reader that their place in this eternal cycle is insignificant, and so their fear should be banished for good. This will be possible, if they have only understood and swallowed Lucretius' science and philosophy. The threads unfold the reality of nature before the reader, enabling them to see deep into things hidden, and to overcome their fears. In this way the conceptual threads, and in particular their metaphorical

⁷³² Schrijvers (1970) 324: 'le but que Lucrèce a voulu atteindre avec ce finale: inciter le lecteur à recommencer la lecture du poème.' See also Schiesaro (1994) 102; Gale, (2000) 23, (2004) 62.

⁷³³ This reading suggests Jope's dismissal (1989, p.32) of the lengthy expository introduction to the magnet as 'unnecessary' is misguided.

⁷³⁴ 'The true tests of a reader's mastery of the philosophy of *De rerum natura* come at the end of the poem and beyond the poem.' Schiesaro (2007) 67.

applications and the images they create, are the honey that makes the reader more inclined to swallow Lucretius' unpalatable philosophy.

Abbreviations

DK	Diels, H. & Kranz, W. (eds.) (1964), <i>Die Fragmente der Vorsokratiker</i> (3 vols., 11 th ed.), Berlin.
E-M	Ernout, A. and Meillet, A. (1932), <i>Dictionnaire Etymologique de la Langue Latine</i> , Paris.
KRS	Kirk, G. S., Raven, J. E. & M. Schofield (eds.) (1983), <i>The Presocratic Philosophers: A Critical History with a Selection of Texts</i> (2 nd ed.), Cambridge.
LSJ	Liddell, H. G., Scott, R. & H. S. Jones (1925), <i>Greek-English Lexicon</i> (9 th ed.), Oxford.
OCD	Hornblower, S. & Spawforth, A. (2005), <i>The Oxford Classical Dictionary</i> (3 rd ed.), Oxford.
OLD	Glare, P. G. W. (1983), <i>Oxford Latin Dictionary</i> , Oxford.
TLL	<i>Thesaurus Linguae Latinae</i> (1900-), Leipzig.
Try.	Trypanis, C. A. (ed. tr.) (1958), <i>Callimachus: Aetia, Iambi, Hecale and Other Fragments</i> , Cambridge (MA)
War.	Warmington, E. H. (ed. tr.) (1935-1953), <i>Remains of Old Latin</i> (4 vols.), Cambridge (MA).

(n.b. Abbreviations of primary works and their authors are as per the OCD, unless not included in that list)

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